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# *A Decade of Dental Education* *Faculty of Dentistry*

Published on the Occasion of the 10th Anniversary of the Faculty

Edited by

Etienne M. G. Piette

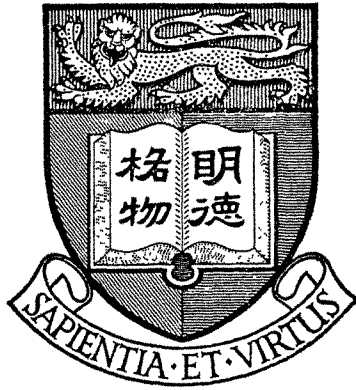
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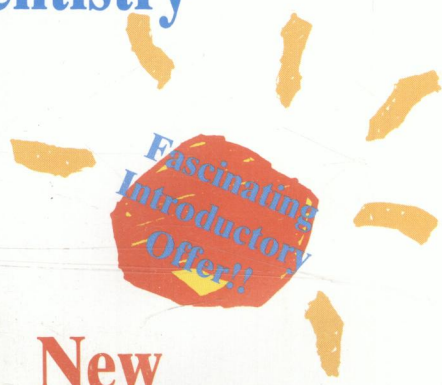


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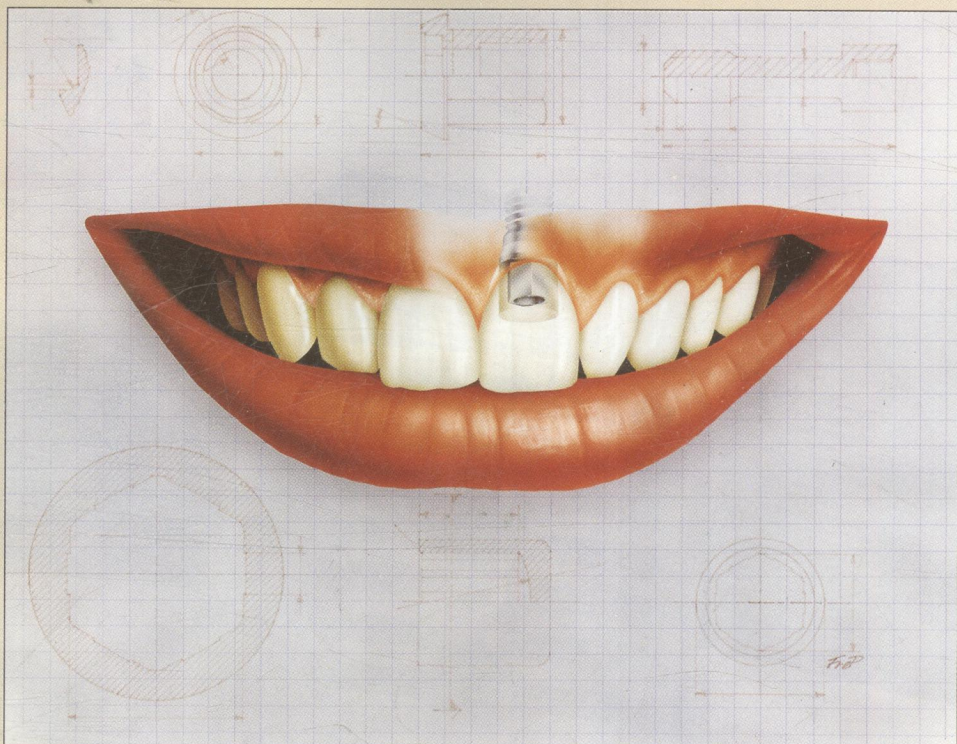
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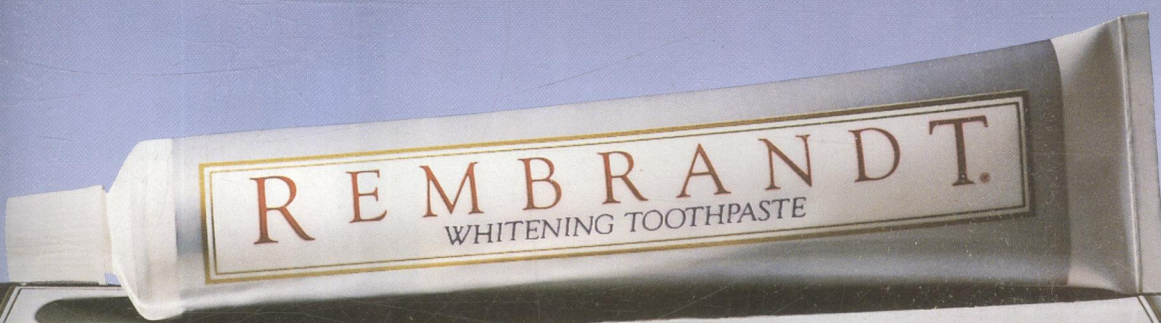
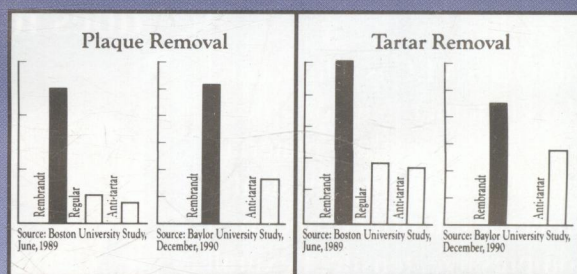
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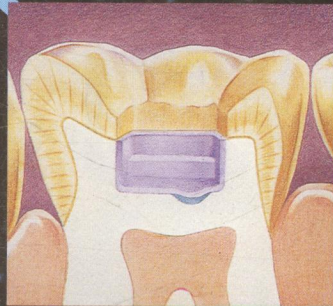
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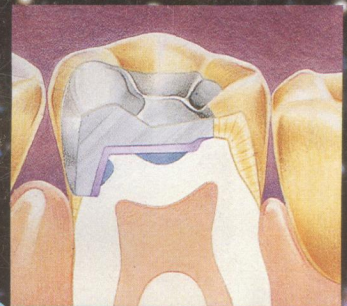


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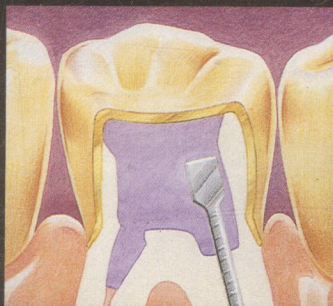
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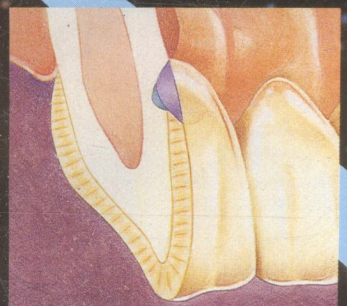
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*A Decade of Dental Education*  
*Faculty of Dentistry*







Staff publications consist of listings of publications by the staff of the Faculty of Dentistry, University of Hong Kong. They are arranged by departments or units. Within each department or unit, the publications are further subdivided into: 1. Articles, 2. Abstracts, 3. Chapters, monographs and books, 4. Dissertations. The overall arrangement is chronological. Bold letters are used to designate staff members during their employment within that department or unit of the Faculty. The Librarian wishes to acknowledge the co-operation of the staff in submitting their publication lists.

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Longitudinal section of premolar sealed with sealant  
viewed under polarized light.

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# CONGRATULATIONS

from  
*Professor Wang Gungwu,*  
*C.B.E., M.A., Ph.D., F.A.H.A.*

*Vice-Chancellor,*  
*The University of Hong Kong*



The first ten years in the life of the Faculty of Dentistry of the University of Hong Kong have been exciting and rewarding times for the founding staff and their students. Under the inspired leadership of Professor W.I.R. Davies and, more recently, Professor S.H.Y. Wei, as Deans of the Faculty, it has gone from strength to strength. It now plays a full and active part in the affairs of the University at all levels and has established itself among the leading dental schools in the world.

The pride in achievement that was so manifest at the first graduation ceremony in 1985 has proved to be well founded. A succession of highly educated and well motivated graduates has served the community of Hong Kong well. Many of these first students have now completed higher training both abroad

and in Hong Kong and some have returned to continue their careers as teachers. Their loyalty and dedication to the Dental Faculty is a sure indication that it will continue to develop and flourish in the future.

Establishing a novel undergraduate course in dentistry was of primary concern in these early years but postgraduate education and research have not been neglected. The list of publications over the past ten years is most impressive and bears testimony to the dedication and industry of the staff and postgraduate students. The Board of Governors has ensured that the facilities of the Prince Philip Dental Hospital, which houses the Faculty of Dentistry, are the envy of the many visitors from other dental schools who spend time there each year. In such an ideal environment scholarship cannot fail to prosper.

The University of Hong Kong will soon be celebrating its 80th Anniversary which has for its theme 'Living in Hong Kong in the Year 2001'. As part of these celebrations it seems fitting that one of its newest members, the Faculty of Dentistry, should be celebrating the beginning of a decade

that will also see it into the next century. There can be no doubt that the contribution to improving the quality of life in Hong Kong in 2001 by the Faculty of Dentistry will be significant indeed.

The University joins with me in wishing the Faculty of Dentistry a happy and successful 10th Anniversary Celebration. We look forward confidently to the next ten years.

## FOREWORD

by

*Professor Stephen H. Y. Wei,*

*B.D.S.(Hons.); M.D.S. Adel.; M.S. Ill.; D.D.S. Iowa;  
Dip.Am.Board; F.R.A.C.D.S.; F.I.C.D.; F.A.C.D.; F.A.A.P.D.,*

*Dean,*

*Faculty of Dentistry*



The Faculty of Dentistry is a young Faculty in the University of Hong Kong and yet it is remarkable how much it has accomplished within the short span of ten years. The unique opportunity of starting a dental project from scratch was seized by the founding teachers who laid a firm foundation for our accomplishments in this first decade.

Dentistry is at an important cross-road today especially with the University re-examining its resources allocation methods. It is increasingly important that the Faculty of Dentistry be able to justify its mission and role in the University. The 10th Anniversary celebration and this publication clearly show that this Faculty has served with distinction in all areas of teaching, research, patient care and services to the University, the profession and to the community.

The new Hong Kong 5-year curriculum is tailored to the disease patterns and community and professional needs. There is a major thrust in our postgraduate programmes including M.D.S., M.Phil. and Ph.D. degrees and the new Postgraduate Diploma in Dental Surgery. Senior members of the Faculty are assisting the dental profession in the formation of the College of Dental Surgeons which would ultimately become one of the Colleges of the Academy of Medicine and would have direct input into specialist qualifications, training and examinations.

In the area of research, the number of books and large volume of publications in international journals attest to the high quality of contribution to new knowledge. One of the seldom realised achievements is the large number of patients seen in the Prince Philip Dental Hospital. In 1991, over 241,000 patient visits were recorded. Increasingly the Prince Philip Dental Hospital has become a specialists' referral centre where the most difficult cases are referred and treated.

The Faculty is also advising Government on the training and future registration of para-dental personnel including dental technicians. The Prince Philip Dental Hospital is already providing



training of para-dental personnel including certificated dental surgery assistants and dental hygienists. The role of the Hospital is therefore enlarging and rapidly increasing in importance. The Faculty is working in a harmonious and positive way with the Hong Kong Dental Association and therefore the 10th Anniversary celebration is held in conjunction with the H.K.D.A.'s '92 Expodent'. The financial resources of the Hong Kong Dental Association have been an important contributory factor in promoting mutual collaborative activities. In return the Faculty's expertise, manpower and facilities catalyse the various essential programmes of continuing education, advisement to government and specialists' training by the Academy of Medicine, and other matters of the profession. This close liaison and mutual support of the Faculty, the profession and Government is an extremely healthy development.

The Prince Philip Dental Hospital is an outstanding facility by any international standard and the strength of our international Faculty together with strong government support and university recognition of our activities, we are an envy to our dental educators from other parts of the world.

We have been fortunate in providing much needed innovative leadership roles in the Southeast Asian Association of Dental Educators, the International Association for Dental Research and the Asian Pacific Dental Federation.

I wish to thank all the Faculty and staff members in the hospital and our alumni for their support during my tenure as Dean of the Faculty and Director of the Prince Philip Dental Hospital. There are numerous exciting and challenging items on the agenda and I look forward to working with all of you in contributing more to the future of our profession in the next decade.

We certainly have an outstanding potential and I am certain we have the matching dedication to achieve even greater progress in the next decade.



We are deeply indebted to our many commercial sponsors for supporting financially all the undertakings of the expenses associated with the 10th Anniversary celebrations of the Faculty of Dentistry. The above sponsors and many other companies have additionally provided generous support for the Hong Kong Dental Association 1992 Expodent being held concurrently in the Hong Kong Convention and Exhibition Centre, in Hong Kong.

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# *THE PRINCE PHILIP DENTAL HOSPITAL*

*From the Office of  
the Dean and Director*

## **Brief History of the Faculty of Dentistry**

The University of Hong Kong dental school has a relatively short, but very successful history. The school's foundation reflects the remarkable economic and societal developments that have taken place in Hong Kong in recent decades, and the speed and efficiency with which the dental project was completed is in itself a notable achievement.

An evaluation of the need for a dental school was undertaken in 1973, when the Hong Kong Government commissioned a review of the development of medical and health services in Hong Kong, including dental manpower and the extent to which local training facilities should be provided for dentists and ancillary personnel. The review elicited a recommendation that dental training should be introduced, on a scale which would facilitate an annual output of some 60 dentists by the 1980's. This proposal was endorsed by the Government in 1974, and it was agreed that the dental school, which would require a new purpose-built teaching hospital, should be a part of the University of Hong Kong.

A Dental Academic Advisory Committee was appointed in 1976 to advise on the detailed requirements of the dental project, including: a curriculum which would meet the specifications set down by the U.K. General Dental Council; schedules of accommodation and staffing requirements for the new dental teaching hospital, taking account also of the need to incorporate a school for Dental Surgery Assis-

ants as well as a Dental Hygienist training programme; and a timetable for the realization of the project. This Committee submitted two reports, the second at the end of 1976, and proposed a target date of 1980 for the admission of the first undergraduate dental students.

In 1978, the University recruited the first two senior members of dental staff, Professor G. L. Howe (the founding Dean of 'Dental Studies') and Professor C. E. Renson, to guide and oversee the initial phases of the dental project. In the same year, work began on the construction of the 11-storey (33,000 m<sup>2</sup> of space) teaching hospital in Sai Ying Pun, a populous district quite close to the main University Campus.

The plans provided for a dental school which would consist of five clinical Dental Departments and several Units together with a Library and other supporting services. Certain subjects within the dental curriculum would be taught by Departments of the University's Medical Faculty, and appropriate additions to the staffing of these Departments were provided for. Much the greatest part of teaching would nevertheless take place in the new hospital, and the Dental Departments and Units to be located there were collectively allocated an establishment of 46 full-time academic staff, plus other clinical posts and supporting professional staff in dental technology, radiography, dental surgery assisting and dental hygiene (figure 1).

By the beginning of 1980, appointments to the Headships of the five clinical Dental Departments had been made, as follows:

**Fig. 1** Prince Philip Dental Hospital Building Plan

Roof	Plant	Plant	Plant	
7	Canteen	Common Rooms	Pathology	Oral Biology Research Labs.
6	General Practice	DSA School	Library	Museum Administration
5	Oral Biology	Speech & Hearing Sciences	Library	Dental Data Processing
4	Prosthetics	Dental Materials Science		Dental Technology
3	Conservative Dentistry	Periodontology		Public Health School of Dental Hygiene
2	Children's Dentistry & Orthodontics	Oral & Maxillofacial Surgery		
1	Reception	Accounts	Records Registration	Patients Entrance Oral Radiology Photography
Ground	Parking	Caretaker	TV & Graphic Studio	Anaesthetic
LG1	Staff Parking	Linen Rooms	Locker Rooms	Animal Research Unit
LG2	Stores	Maintenance workshops		
LG3	Boiler Room and Plant Room			

Children's Dentistry and Orthodontics :

Professor A. H. Brook

Conservative Dentistry:

Professor C. E. Renson

Oral Surgery and Oral Medicine:

Professor G. L. Howe

Periodontology and Public Health:

Professor W. I. R. Davies

Prosthetic Dentistry:

Professor R. K. F. Clark

The programme for the recruitment of other academic and supporting professional staff had been maintained, as had the schedule for the commissioning and equipping of the teaching hospital, and the University was able to meet the originally-proposed target of admitting the first dental students in the autumn of 1980.

The dental teaching hospital was formally opened in March 1981 by His Royal Highness The Duke of Edinburgh, and was named the Prince Philip Dental Hospital. The first intake of students commenced their clinical studies at the Hospital in the autumn of 1981.

In addition to the five clinical Dental Departments mentioned earlier, there were supporting teaching and instructional units as follows: the Oral Radiology Unit, the Anaesthetics Unit, the Dental Material Science Unit and the Dental Technology Unit (figure 2).

Amongst other service units in the Hospital was the Reception and Primary Care Unit, with responsibility for the assessment and treatment of patients attending the Hospital and for screening patients' suitability for inclusion in the teaching programmes. A modern and very well-stocked Dental Library was in place; so too was a Dental Illustration Unit, providing clinical photographic and other supporting audiovisual services; and a Dental Data Processing Unit had instituted the mainframe-based ODONTICS computer system for the management of patient records as well as the records of students' progress in their clinical coursework.

The programme for staffing and equipping the Prince Philip Dental Hospital allowed a higher intake of students to be admitted in the early years, and there was an annual intake quota of 76 places from 1980 to 1983; when student numbers had built up and the clinical places in the Hospital were more fully utilized, the intake quota was set at 60 places from 1984.

Within the University's constitutional framework, 'Dental Studies' during the initial phase of the project was a part of the Faculty of Medicine. Once it was more fully established, however, the University approved a recommendation that Dentistry should be accorded separate and independent status, and the Faculty of Dentistry was formally established with effect from 1 July 1982.

Early in 1983, Professor W. I. R. Davies became Dean of the Faculty and served for six years in this capacity.

As mentioned earlier, a part of the specification of the dental project was that the Hong Kong B.D.S. degree should be accredited by the U.K. General Dental Council, to reflect the high standard of the qualification and to underpin the acceptance of the degree internationally.

The curriculum was designed quite closely on the then U.K. model, being of four-and-a-half years' duration, with an element of integration between the largely pre-clinical studies of the first year and the clinical work which commences in the second year. A visitation by the U.K. General Dental Council took place in 1984, as the first intake of students reached the final stage of the curriculum. The report of the visitors was satisfactory, and the Council granted accreditation to the B.D.S. degree for a period of 10 years in the first instance. The first students completed the curriculum in January 1985.

With the successful implementation of the undergraduate curriculum, the Faculty began to develop further its postgraduate teaching and

research activities. The two-year postgraduate programmes leading to the degree of Master of Dental Surgery (M.D.S.) were offered for the first time in 1985-86, and the Faculty began to recruit more research students for the degrees of Ph.D. and M.Phil.

The Faculty had recognized the importance of research and postgraduate activities from the outset, and a long-standing aim had been the creation of a research unit which would have as a major part of its remit the encouragement of collaborative research involving clinicians and scientists. This aim was fully realized with the formal establishment of the Oral Biology Unit, staffed by two senior members of academic staff and supporting technical staff, in July 1988.

Professor S. H. Y. Wei became Dean of the Faculty early in 1989, and has continued to serve in this capacity to date.

The resources available to the Faculty include a scanning electron microscope, and the Faculty has built up a solid research base in all of the Dental Departments and Units, and in collaboration with Departments in the Faculty of Medicine.

The Oral Biology Unit increasingly serves as a focus for clinical research work, whilst the Dental Materials Science Unit is very well equipped for other areas of research.

The undergraduate curriculum has been kept under constant review by the Faculty, not least because of developments in undergraduate dental education which have been occurring in the U.K. and in other countries. As a result of this, the B.D.S. curriculum in Hong Kong has been re-designed and extended to a full five years' duration. This longer curriculum will be fully implemented by 1994-95 and will reflect many of the changes that have taken place in the U.K. and elsewhere, including a greater vocational emphasis in the final year. The Faculty will receive a further visitation from the U.K. General Dental Council in 1995 in connection with the renewal of the accreditation of its B.D.S. degree.

The Faculty reduced its undergraduate intake quota from 60 to 50 places in 1990, pending further evaluations of Hong Kong's dental manpower needs.

The Faculty is, however, currently increasing its postgraduate teaching commitments. A Postgraduate Diploma in Dental Surgery course was introduced in 1991, and the Faculty's annual quota of postgraduate places (covering Ph.D., M.Phil., M.D.S. and P.Dip.D.S. programmes) will have risen from 25 to 38 between 1990 and 1994.

### **Administration and Governance**

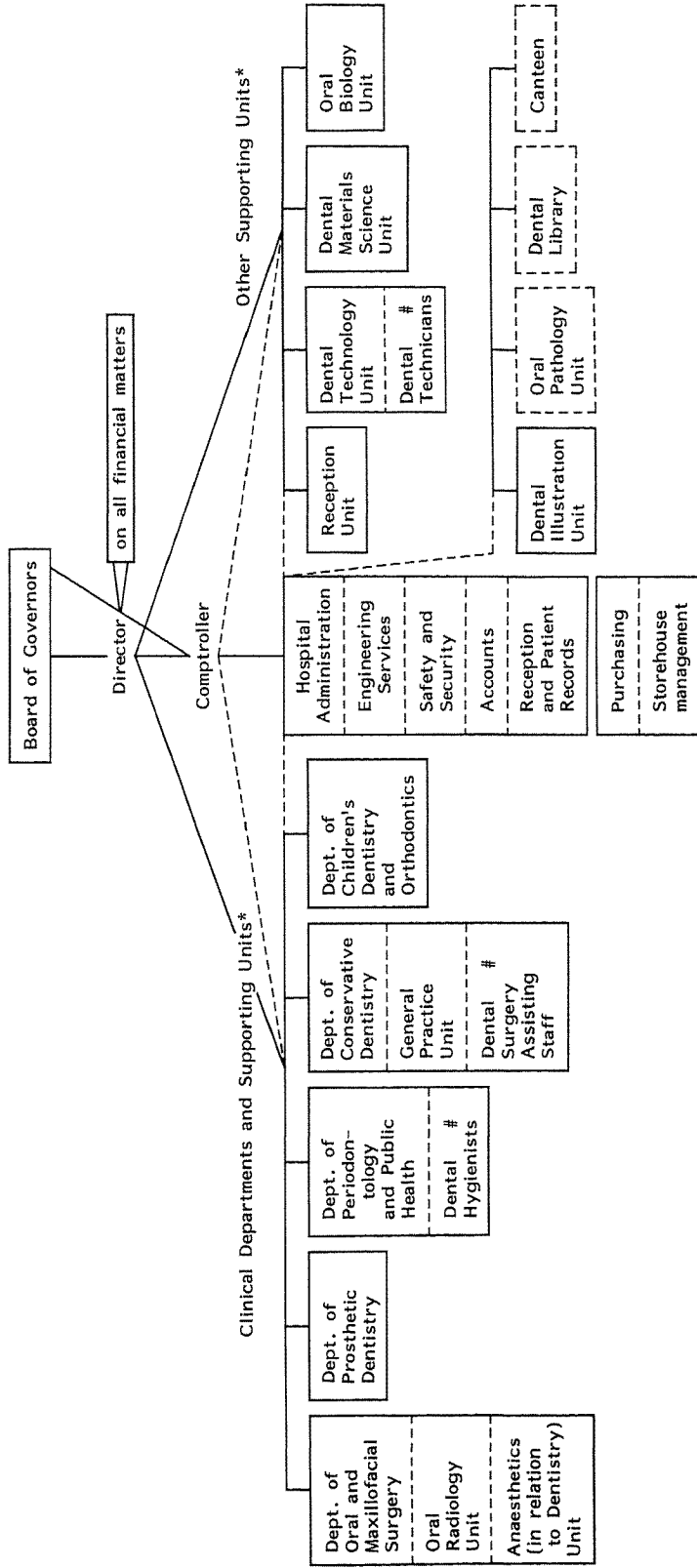
The Faculty of Dentistry is one of nine faculties within the University of Hong Kong, and has a significant degree of delegated responsibility for the conduct of its academic and associated activities.

The Board of the Faculty of Dentistry, which has the Dean as its Chairman, and which includes in its membership all full-time dental teachers, is the body through which the academic administration of the Faculty is conducted. The Faculty Board has a number of sub-committees which advise it on particular aspects of business, such as admissions, curriculum design and content, postgraduate matters including higher degree candidatures, and other areas such as student progress, research, ethics and library and other services.

The Faculty Board is in turn responsible to the Senate of the University, and decisions involving major policy and certain other matters are subject to the endorsement of the Senate.

Whilst the teaching facility of the Faculty is housed in the Prince Philip Dental Hospital, the Hospital has its own system of governance separate from that of the University, and funds for the staffing and maintenance of the Hospital and for the provision of services and supplies are obtained from the Government through the Department of Health.

**Fig. 2 Organisation of Prince Philip Dental Hospital**



\* under the administration of the Faculty of Dentistry

# Board employees working under the direction of HKU teaching staff

[ ] units not directly under the administration of the Faculty of Dentistry, responsible to the University Library or to the respective Department of the Faculty of Medicine



The Hospital is governed by a Board of Governors established and incorporated under The Prince Philip Dental Hospital Ordinance Chapter 1081 of the Laws of Hong Kong, and the Board comprises representatives from Government, the University of Hong Kong, and professional and lay members.

The Hospital has a Director (and to date the Dean of the Faculty has also occupied the office of Director, which ensures co-ordination of

policy and administration), who is a member of the Board of Governors (figure 2).

The Hospital also has a Comptroller, who is directly responsible to the Board of Governors for the financial matters and benefits relating to the operation of the Hospital, and who assists the Director in the date-to-date running of the Hospital. The total staff establishment on the Hospital side is 330, which includes 193 posts in para-dental and nursing grades.

## **THE PRINCE PHILIP DENTAL HOSPITAL AND DENTAL FACULTY OFFICE CURRENT STAFF LIST**

### **Dean of the Faculty and Director of the Hospital:**

Wei, S.H.Y., B.D.S.(Hons.); M.D.S. *Adel.*; M.S. *Ill.*; D.D.S. *Iowa*; Dip. Am. Board;  
F.R.A.C.D.S.; F.I.C.D.; F.A.C.D.; F.A.C.D.

### **Hospital Comptroller:**

Peake, M.E., Dip. P.M. *Strathclyde*; C.I.P.M.; F.I.P.M. *H.K.*; F.B.I.M.; M.I.T.D.

### **Hospital Administrator:**

Chan, M.S.Y., B.A. *N.S.W.*; M.Com. *N.S.W.*

### **Hospital Purchasing Officer:**

Wong, M.T., M.I.P.S. *H.K.*

### **Faculty Secretary:**

Cross, P.A., B.A. *Exon*

### **Faculty Executive Officer:**

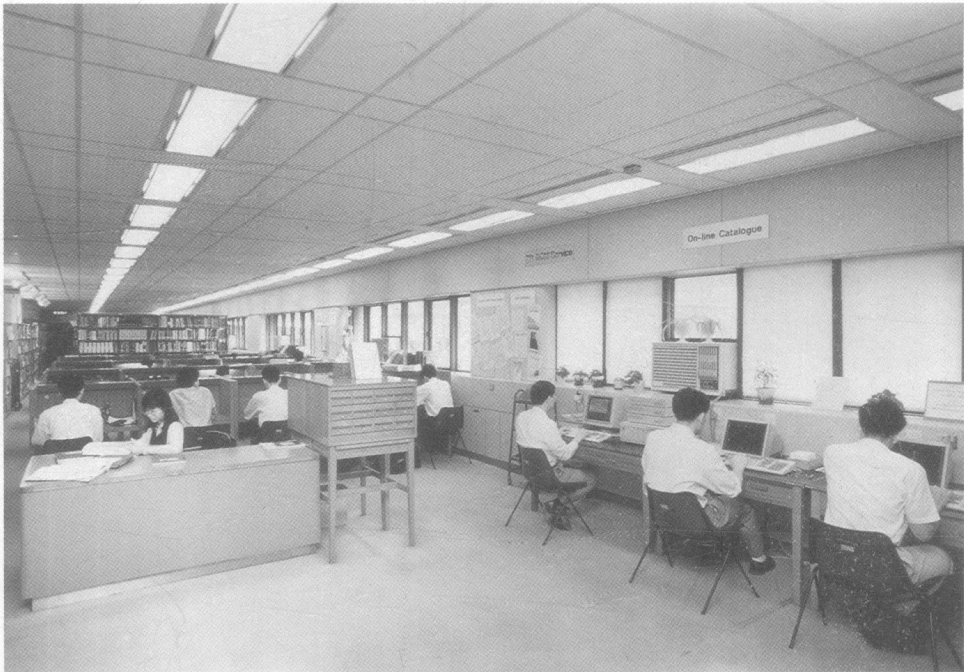
Wong, V., B.A. *H.K.*

## Other Services

The **Dental Library** was established in 1981. Over the decade, library services have been expanded and improved. The initial collection of 3,000 volumes, 280 journal titles and 350 audiovisual materials has grown to about 22,000 volumes, 480 journal titles and 600 audiovisual materials. Loan is increased from below 6,000 to over 20,000 a year (figure 3). Floor space has been extended to twice its original area.

At present, the Dental Library is equipped with modern electronic technology for information retrieval and delivery in its service to the Faculty, students and supporting staff. In 1989, the Dental Library began implementation of the D.R.A. Integrated Library System. Library processing and procedures become automated

and services are enhanced. Users may now access the University Libraries' books and serials collections via the On-line Public Access Catalogue (O.P.A.C.) and may request reserved items directly on-line. In reader services, traditional manual search of Index Medicus is replaced by MEDLINE on CD-ROM; and the printed current awareness tool, Current Contents, is replaced by Current Contents on Diskettes with Abstracts. The Dental Library has just been connected to the Campus Network. Users are now connected to HARNET, allowing on-line access to library catalogues of the seven U.P.G.C. institutions; and to INTERNET and JANET, allowing access to on-line catalogues and databases around the world.



**Fig. 3** The Dental Library

The goal of the Dental Library has been, and will continue to be, to strive toward quality and improvement of library services.

## **DENTAL LIBRARY CURRENT STAFF LIST**

### **Dental Librarian:**

Chan, J.L.Y, B.A. *Manit.*; M.L.S. *W.Ont.*

### **Library Assistants I:**

Wong, P.H.C.  
Yeung, K.K.M.

### **Library Assistants II:**

Lee, S.K.  
Liu, V.W.L.  
Tsui, D.P.L.

The Faculty has a **Dental Illustration Unit** which provides central services encompassing photography, graphics production, audiovisual aids including video production (figure 4), and which looks after the supply and maintenance of all related equipment. The Unit is well-equipped for all aspects of photography, video production, slide production, graphics and all types of artwork.

The activities of the Unit are overseen by a committee of management, and its day-to-day running is the responsibility of the Audio Visual Officer who heads the Unit. There are three other staff with responsibilities for particular areas of the specialised aspects of the Unit's work, together with three further supporting members of staff including clerical and secretarial personnel.



**Fig. 4** Video work in the Dental Illustration Unit.

## **DENTAL ILLUSTRATION UNIT CURRENT STAFF LIST**

### **Audio Visual Officer:**

Leung, R.T.C., A.R.P.S.; A.B.I.P.P.; A.M.P.A.

### **Audio Visual Assistants:**

Chan, R.P.K.  
Hui, S.K.O.

### **Audio Visual Assistant (Graphics):**

Yip, V.W.M.

Data processing occupies an important role in the activities of the Faculty, and specifically in support of the management of patient records and the monitoring of student progress. This has been the case since the Faculty was first established, when the first system (ODONTICS) was put in place under the guidance of the Dental Data Processing Unit.

Although that Unit has since been merged with the University's central Computer Centre, former staff of the Unit continue to provide support for the Faculty's computing needs. Within the last year, a revised and updated mainframe system, with the acronym DELPHI ('Dental Education Logistics and Patient Health Information'), has successfully been introduced. DELPHI is a computer system for dental teaching hospitals which assists in the management of students and patients and also provides a considerable research resource. It yields great advantages in terms of control of patient and student progress by providing information on a scale not possible by manual means. A major system aim is to match patient treatment requirements with student experience. For research and planning purposes, the whole database of patients can be scanned very quickly to produce results which might take months of manual effort.



*DEPARTMENTS AND UNITS*  
*A Decade of Activities and Progress*

*Children's Dentistry and Orthodontics*

*Conservative Dentistry*

*Oral and Maxillofacial Surgery*

*Periodontology and Public Health*

*Prosthetic Dentistry*

*Dental Technology*

*Dental Materials Science*

*Oral Biology*



# DEPARTMENT OF CHILDREN'S DENTISTRY AND ORTHODONTICS

## *Achievements and Perspectives*

*Professor S.H.Y. WEI*

### **Introduction**

Professor Alan Brook, the founding chair together with Drs. Michael Cooke and Nigel King developed our initial curriculum in 1979 to 1980 on two principles. The first was the necessity of the curriculum to satisfy the accreditation requirements for the British General Dental Council. The second was a departmental philosophy of total patient care based on the small groups teaching system developed in the 1970's at the London Hospital Medical College Dental School. This curriculum has served the Faculty of Dentistry well and our B.D.S. graduates have been able provide a valuable service to the community since 1985.

When I joined the Department in September 1984, I had already commenced editing my second textbook entitled "Pediatric Dentistry: Total Patient Care" and hence I embraced completely the departmental philosophy as we try to integrate as best as we can the two specialty disciplines of Children's Dentistry and Orthodontics in the delivery of total patient care. I was very fortunate to have the outstanding support of Dr. P.K.Y. Yen who was Reader and the senior orthodontist in the Department and we worked very closely to develop the undergraduate and research programmes of the Depart-

ment. He initially provided supervision for Drs. Cooke and Ling's Ph.D. theses.

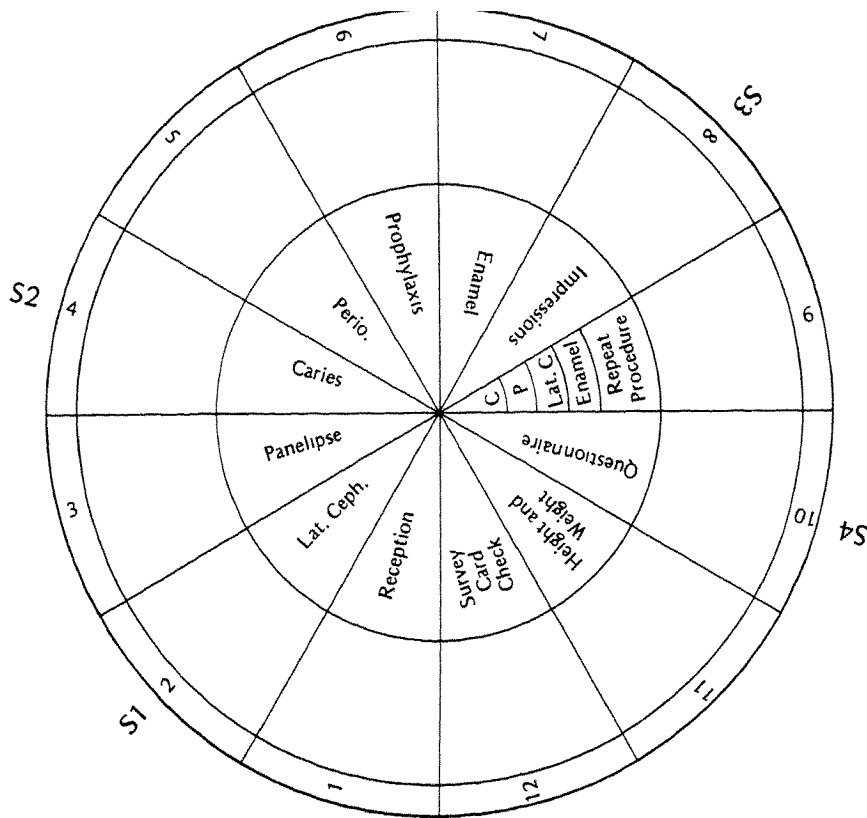
### **The Oral Health Status of Children and Adolescents in Hong Kong**

The original curriculum could not have taken into consideration the disease patterns, the community's treatment needs and the tremendous lack of dental awareness of the Hong Kong public. Therefore it was the appropriate strategy to institute a large scale departmental survey to assess the oral health status of children in Hong Kong including the disease patterns, oral health services, the craniofacial norms, prevalence of malocclusion, etc., so that the future curriculum will be much more relevant. This survey which included over 1,200 12-year-old children formed the essence of several Ph.D. theses of the teaching staff (figure 5).

As a result of this survey, Drs. B. Ng and N.M. King found that over 90% of the 12-year-old children had enamel fluorosis, hypoplasia and discolouration. The dental caries prevalence was very low and tends to occur in pits and fissures of the permanent molars.

My inaugural lecture addressed the problem of excessive fluoride concentration in the





**Fig. 5** The design of the 12-year-old survey showing the comprehensive nature of the study.

drinking water in Hong Kong. Fortunately, the Government has since decreased the fluoride content of the drinking water to 0.5 ppm F, which is more near the optimal concentration.

Dr. J.C.Y. Chan and I have comprehensively reviewed the fluoride content of drinking water in Hong Kong including all dietary sources of fluoride in the infants' diet. Dr. Chan's Ph.D thesis work includes a longitudinal study of a cohort of Chinese children in Shatin from birth to 8 years of age. Their dietary patterns and dietary contents of all the food have been carefully analysed. The goal is to correlate the aetiology and amount of enamel fluorosis with the total dietary intake of fluoride. It is the first study of its kind.

Dr. L.S.M. Tong's Ph.D. thesis work compared several methods of acid treatment and

bleaching to treat stained teeth from fluorosis and mild tetracycline staining.

### The Craniofacial Patterns and Orthodontic Needs

The work of Dr. M.S. Cooke helped to establish clearly the craniofacial patterns of Southern Chinese youths who generally have a very short maxillary jaw base with relatively large permanent teeth resulting in bi-maxillary protrusion. It confirmed the clinical impression that there are relatively fewer cases of minor malocclusion in the Chinese that may be appropriately treated using simple removable orthodontic appliances.

Dr. J.Y.K. Ling's work showed that only 1/3 of the Chinese youths surveyed had no need for

orthodontic treatment, another 1/3 needed it very badly while the remaining 1/3 would benefit from some orthodontic treatment. There must be much unmet needs for orthodontic care in the community. Dr. Ling's Ph.D. data on dentitional analysis using the image analyzer also established new norms for dentitional space analysis for the Chinese which would more accurately predict the tooth size and jaw-size discrepancies.

Dr. P.J. Davis has studied the panoramic radiographs of these children to assess dental malformations to establish the prevalence of supernumerary teeth, congenital absence of teeth and other oral pathology so that we can better predict the treatment needs of these children.

Dr L.L.Y. So has systematically studied the handwrist radiographs of a large number of children to establish maturity indicators in order to better predict their pubertal growth. This study should help more accurately to determine the optimal time for orthodontic treatment.

Dr. S. Yuen's Ph.D. thesis determined the muscle function in different types of skeletal patterns.

In Hong Kong, the prevalence of Class III malocclusion is much higher in the Chinese than in Caucasians. In a collaborative study with Dr. P.W.H. Ngan of the Ohio State University, Drs. U. Hägg, C.K.Y. Yiu and others have found that the early treatment of skeletal Class III malocclusions can achieve very positive results utilising a protraction headgear. If Class III malocclusion can be reduced by maxillary protrusion, it should help to minimize orthognathic surgery in many patients.

### **Additional Departmental Studies and Surveys**

In the important area of dental treatment for the special-needs patient, Dr. D. O'Donnell's work which he initially collaborated with Dr. R. Bedi

on the dental status and treatment needs of this group in Hong Kong has gone a long way towards the planning of a relevant undergraduate course given to the present fourth year students. With the development of the new five year curriculum, Dr. O'Donnell's current research into stigma as a barrier to dental treatment will help to develop a more broadly-based sociological approach to the dental problems of the special needs patient in the new curriculum. Data from his research have also been submitted to the Medical and Dental Advisory Committee in order to assist them in their recommendations on the future provision of treatment for the special-needs patient.

The M.D.S. thesis work of Dr. E. Kwan has shown that there is very little difference in the dental caries status of 13 and 15-year-old adolescents who attended the School Dental Care Service from those who did not. It also emphasised the need for a mechanism to refer patients when they leave their primary school to enter secondary school.

### **The Changing World Standards in Paediatric Dentistry and Orthodontics**

Changing world's standards in Paediatric Dentistry and in Orthodontics have meant that the original concept that general dental practitioners should treat a large number of simple malocclusions in their practices is not as easily applicable in Hong Kong. Rather we must train more orthodontists to serve the community and to provide a better referral base for general practitioners. Furthermore, improved materials, techniques and greater patient awareness have meant that limited compromised treatment with removable appliances alone are no longer satisfactory. In order to achieve proper standards and results and to satisfy patient's expectations, fixed appliances, functional appliances and combined orthodontic and surgical treat-

ment have become the normal choice of treatment.

### **The New Hong Kong Curriculum**

It is with this background that the entire curriculum in our department has been extensively revised for the new B.D.S.-5 years' course. There is now much more diagonal integration of the paedodontic and orthodontic parts of the curriculum. For example, second year students will be given more time to learn technical and laboratory exercises and clinical applications of preventive dentistry, and restorative dentistry. As the students become more familiar with the management of young and sometimes uncooperative and special patients, the orthodontic curriculum will be phased in during the third term of the second year. Secondly, there will be an increasing emphasis on the teaching of growth and development, diagnosis and treatment planning and understanding of orthodontic management of patients using fixed appliance principles and philosophy. There will also be more demonstrations of treatment techniques and modalities so that students would be exposed to more patients who need a greater variety of treatment in a group setting. The third and fourth year B.D.S. students will devote alternate weeks to clinical orthodontics and paedodontics. This will allow a more concentrated teaching effort of each discipline as well as better utilization of the staff resources.

The primary goal of the orthodontic part of the curriculum will be on students' ability to diagnose and discriminate between simple and complex cases in order to make a proper judgement as to who and when to refer to specialists in practice. For those who wish to do more orthodontics it appears that continuing education courses especially the full-time courses leading to the M.D.S. degree would be more appropriate.

On the Paediatric Dentistry side there will be renewed emphasis on a broader scope of paediatric dentistry which aims to deliver quality care to not only normal children but also the medically compromised and physically disabled, so that they may be best managed using the latest behaviour management techniques, whether it be behaviour modification, premedication or hospitalisation. There will also be increased emphasis on hospital aspects of paediatric dentistry which is the specialty that is often called upon to treat disabled adults as well. For example, increased clinical use of posterior composites will be encouraged as well as aesthetic dentistry. The paedodontic curriculum obviously will take on a greater role in the area of treatment of minor malocclusions in the primary and mixed dentitions since the orthodontic curriculum emphasizes the management of the more complicated skeletal malocclusions. This is where the paedodontic and the orthodontic curriculum is best integrated. Students will also participate more in the treatment of handicapped patients, and not simply visit homes for the handicapped. Treatment will be provided either at satellite clinics or patients will be transported to the Prince Philip Dental Hospital for comprehensive care during the fifth year in a special clinic and the scope of work will include the treatment of such patients in the operating theatre under general anaesthesia.

Our increased collaboration with the Departments of Paediatrics, Medicine and Surgery at the University of Hong Kong has meant that there should be more referrals of medically compromised and physically handicapped patients to be seen in our clinics. There will be more elective opportunities so that students may participate in the dental care of children in the Duchess of Kent Children's Hospital in Sandy Bay. It is planned to include experience in the School Dental Care Service provided suitable arrangements can be made.

## The Postgraduate Education

A major development for our department has been in postgraduate training in orthodontics and paediatric dentistry (figure 6). Government has realized that there is a need for more consultants in both disciplines in government service to supervise the large number of children in the School Dental Care Service and we are pleased to be able to offer these training programs. Each year we accept two government dental officers and one to two dentists from the private sector for training in each of the orthodontic and children's dentistry M.D.S. programmes. We have also received many applicants from overseas and the goal of the department will be to establish a regional presence by training perhaps one postgraduate student in each discipline from our region each year. We have already trained two orthodontists for Singapore and Thailand respectively and a Post-

graduate Diploma candidate in Children's Dentistry for Singapore. This year we have accepted one student from Singapore and one from Mainland China.

Our graduate development has benefited greatly by the close collaboration with the Department of Oral and Maxillofacial Surgery. The severe malocclusion cases require the combined expertise of the surgeons and the orthodontic specialists. Many cases of severe pathology are now diagnosed and treated at an early age. Paediatric dentists participate in the total patient care of cases by providing the aesthetic restorations and prostheses in conjunction with the surgical, orthodontic, speech and hearing management of these patients.

Our M.D.S. graduates, Drs. T. Tng, T.C.K. Chan and P.Y.W. Lau have completed research theses in cephalometrics, reviewing the basic errors in the use of this diagnostic tool. Dr. G.W.K. Wong has investigated the skeletal and



**Fig. 6** One of the busiest clinics in our Department is the Postgraduate Clinic for M.D.S. and diploma students. Dr. E.U.O. Hägg and Professor S.H.Y. Wei discuss the diagnosis and treatment planning of a patient with a group of M.D.S. students.

dental effects in the treatment of severe skeletal Class II: Division 1 malocclusion with the Herbst appliance, comparing the treatment results in Chinese and Swedish children while Dr. C.K. Yip is investigating the demand and need of orthodontic treatment in young adult Chinese.

Dr. E.W.S. Lau completed studies in the efficacy of the one minute versus four minutes topical fluoride treatment while Dr. T.F.F. Chik showed that a new fluoride foam should produce as much fluoride uptake as a conventional fluoride gel and has much less potential ingestions by children. Dr. C.H. Chu studied the clinical wear of glass cermet cements compared with silver amalgam restorations.

Our postgraduates have fulfilled the functions of serving the community needs in government, in private practice and as future teachers and educators for the Faculty of Dentistry. Among those who are in private practice of paediatric dentistry include Drs. E.W.S. Lau and T.F.F. Chik and those in orthodontics include Drs. K. Ling and T.C.K. Chan. Several of our M.D.S. graduates are now serving as teachers and clinical dental surgeon in the Faculty of Dentistry and they include Dr. E.L.K. Tang, Dr. L.L.Y. So and Dr. C.K.Y. Yiu. Dr. Chan is a Part-time Clinical Lecturer. They have also helped to contribute to the establishment of new knowledge base on the disease patterns and needs in Hong Kong.

### **The Joint Cleft Lip and Palate Clinic**

In the early 1980's, the Department established a multidisciplinary clinic known as the Joint Clinic which met once a month to screen and arrange treatment for patients with cleft lip and palate. The Joint Clinic was organised by Dr. N.M. King and there has been numerous participants but notably Dr. L.L.Y. So, the orthodontist, Mrs. J. Williamson, a speech therapist, Dr. G. Ma and Dr. S.K. Chow, plastic surgeons

who were originally from the Princess Margaret Hospital. Over the last decade, more than 530 such patients have been treated in this hospital. Recently, the Government has proposed the setting-up of a specialist referral centre to care for these and other special patients. Therefore, a broader base team has been formed known as the University Cleft Lip and Palate Clinic. This clinic operates twice each month and is jointly co-ordinated by Drs. King and So and is staffed by experts in paedodontics, orthodontics, oral and maxillofacial surgery, speech and hearing science, and plastic surgery. Other expertise is available in prosthodontic, crown and bridge and periodontology. The expertise and the resources of various other clinical departments of the University are also being drawn upon to screen and treat these patients. In addition, dental hygienists provide preventive dental care, and J.H.D.O. and M.D.S. students are in attendance. A University of Hong Kong Cleft Lip and Palate Clinic should have participation from almost every clinical department in the Faculty of Dentistry and some departments in the Faculty of Medicine and Education.

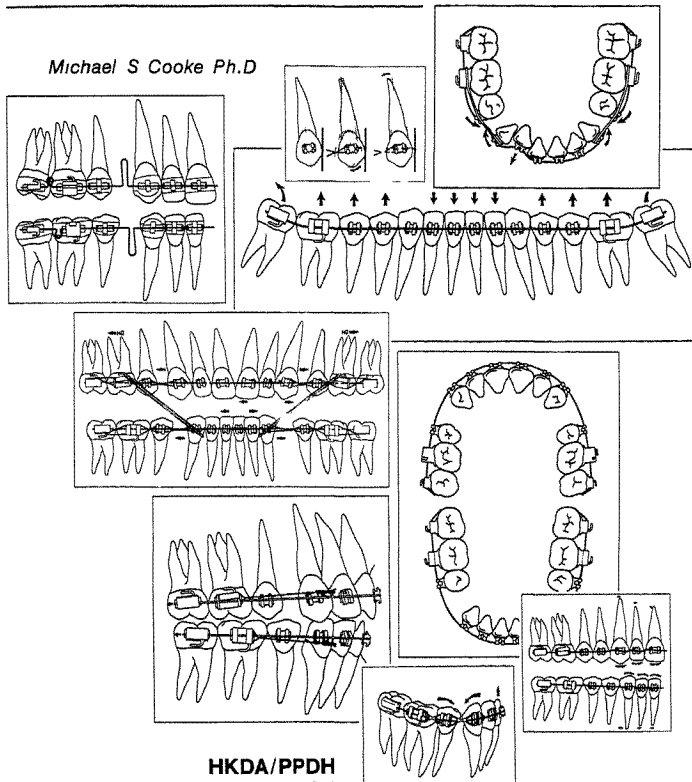
Drs. Tang and So showed that this congenital defect did affect and was manifested in severe growth disturbance in very young patients. Dr. So has started a prospective study of treating maxillary retrognathism with rapid maxillary expansion and reverse headgear in the mixed dentition. In addition, both maxillary growth and dental development after bone grafting of residual cleft alveolus are being evaluated in conjunction with the oral and maxillofacial surgeons. The ultimate goal of providing the best and predictable treatment strategy for such patients.

### **The Continuing Education Courses**

The Department has supported the Hong Kong Dental Association and has given a series of courses each year (figure 7). Specially invited

“ Practical Introduction to Edgewise  
**STRAIGHT WIRE**”  
Fixed Appliance Technique  
Part 1

Michael S Cooke Ph.D



**Fig. 7** Design cover of the 'Manual of the Straight Wire Course' given by Dr. M. S. Cooke. This course is usually filled to capacity.

HKDA/PPDH  
POSTGRADUATE COURSE  
1992

lecturers including Drs. G. Christensen, V. Thompson, R. Bertolotti, A. Lacy and other distinguished clinicians have been sponsored by our department to give one day and half-day courses to update the clinical status of various aspects of restorative dentistry. In addition, many distinguished orthodontic clinicians including Drs. I. Neilson, G. Semb, W. Shaw and others have given full day courses in collaboration with the Hong Kong Society of Orthodontists.

Furthermore, the Hong Kong Society of Paediatric Dentists has organised several meetings with the officers of the I.A.D.C. with speakers including Dr. F. Pulver and others. The most popular courses that the Department

has supported were the laminate veneers course and the straight wire course which are filled to capacity each year. The Department considers it an important primary function to contribute to the continuing education of the profession and will work closely with the Hong Kong Dental Association, the Hong Kong Society of Paediatric Dentists and the Hong Kong Orthodontic Society.

### The International Involvement

The Department has collaborated with many international groups especially in China and in Japan. In fact a three country survey of the oral

health status of children in China, Japan and Hong Kong has been completed. This project was funded by the Japanese Government and a team of over 20 investigators participated in the oral health survey of 3, 6, 12, 15 year children in Hong Kong (figure 8).

We also have international collaborations in orthodontics with Pakistan and additional projects with Japan.

I have the distinguished honour to be the President-Elect of the International Association for Dental Research and helped to organize the International Conference on Oral Biology held in Hong Kong in 1988. Such international participation helps to put our Department on the international map in dental research and education.

## Conclusion

The Department (figure 9) has been extremely active in all phases of undergraduate curriculum development, postgraduate education and continuing education and has consistently produced a large body of research data and publications. In this context, we had the privilege of having outstanding external examiners including Professor P. Sutcliffe from the University of Edinburgh followed by Professor P. Vig from the University of Michigan, and our current external examiner Professor H. Fields who is Dean of Ohio State University.

Our leadership role in training specialists in paediatric dentistry and orthodontics is being recognised by dental professionals in South East



**Fig. 8** The clinical investigators from Japan, China and Hong Kong are shown in this three countries' collaborative study on the oral health of children in the People's Republic of China, Japan and Hong Kong.



**Fig. 9** The full-time members of staff of the Department of Children's Dentistry and Orthodontics (including Mr. P. Cross, Faculty Secretary and Mr. E. Peake, Comptroller, PPDH; Dr. Endarra Tang was on leave).

Asia. We have also been able to deliver very comprehensive dental care services to children, adolescents and adults as we have had extremely high patient visits every year. Consequently I feel our Department has more than adequately practiced the concept of total patient care. The teaching staff and our postgraduate students have truly contributed to all dimensions of

teaching, research and service to an international standard.

There are many new and exciting developments on the horizon. I am sure that the dedicated teachers and the clinical staff in our Department are enthusiastic and eager to participate in our future developments for the betterment of dentistry in Hong Kong.



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## **Dissertations**

### **Doctor of Philosophy**

**1986**

**Cooke, Michael Stephen**

Cephalometric analyses based on natural head posture of Chinese in Hong Kong.

**1989**

**Yuen Wing Ho, Stephen**

Surface electromyogram power spectra in the masseter and anterior temporal muscles in southern Chinese children and adults.

**1990**

**King, Nigel Martyn**

Prevalence and characteristics of developmental defects of dental enamel in Hong Kong.

**Master of Dental Surgery**

**1987**

**Lau Wai Sum, Eilly**

Fluoride analysis and SEM studies of human enamel surface after in vivo topical fluoride application.

**1988**

**Chik Fu Fai**

Fluoride retention in children and young adults following professionally applied APF gel and a new APF foam.

**Ling Kit Tong**

Cross-sectional study of skeletal age, dental age, body height, body weight and sexual maturity of 12 years old southern Chinese boys.

**So Lai Ying, Lisa**

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**1989**

**Tang Lai King, Enderra**

Assessing treatment effectiveness of removable and fixed orthodontic appliances using the occlusal index.

**Yiu Kar Yung, Cynthia**

Evaluation of interdental cleaning in adolescents and young adults in Hong Kong.

**1991**

**Chan Chi Kwong, Tommy**

Effects of cephalometric landmark validity on incisor angulation.

**Tng Thiam Huat**

Validity of cephalometric landmarks.

# **CHILDREN'S DENTISTRY AND ORTHODONTICS CURRENT STAFF LIST**

**(Head of Department: Prof. S.H.Y. Wei)**

## **Professor:**

Wei, S.H.Y., B.D.S.(Hons.); M.D.S. *Adel.*; M.S. *Ill.*; D.D.S. *Iowa*;  
Dip.Am.Board; F.R.A.C.D.S.; F.I.C.D.; F.A.C.D.; F.A.A.P.D.

## **Reader:**

Hägg, E.U.O., D.D.S.; Ph.D. *Lund*

## **Senior Lecturers:**

Cooke, M.S., B.Ch.D.(Hons.); L.D.S. *Leeds*; Ph.D. *H.K.*; D.Orth.; D.D.P.H.  
R.C.S. *Eng.*; F.D.S.R.C.S. *Edin.*; F.F.D.R.C.S. *Ire.*  
King, N.M., M.Sc.(Hons.); B.D.S.(Hons.) *Lond.*; Ph.D. *H.K.*; L.D.S.R.C.S. *Eng.*

## **Lecturers:**

Chan, J.C.Y., B.D.S.; M.Sc. *Lond.*; L.D.S.R.C.S. *Eng.*  
Davis, P.J., B.D.S. *Lond.*; D.Orth. R.C.S. *Eng.*; F.D.S.R.C.S. *Edin.*  
O'Donnell, D., B.D.S. *N'castle-upon-Tyne*; M.Sc. *Lond.*  
So, L.L.Y., B.D.S.; M.D.S. *H.K.*  
Tang, E.L.K., B.D.S.; M.D.S.*H.K.*

## **Clinical Dental Surgeon:**

Yiu, C.K.Y., B.D.S. *Lond.*; M.D.S. *H.K.*

## **Part-time Clinical Lecturers:**

Chan, C.L.S., B.D.S. *Lond.*; M.Sc.D. *Wales*; M.Orth.R.C.S. *Eng.*;  
M.D.O.R.C.P.S. *Glas.*; D.Orth.R.C.S.*Eng.*; L.D.S.R.C.S. *Eng.*  
Cheuk, W.P., B.D.S.*Lond.*; D.Orth.R.C.S.*Eng.*  
Chan, T.C.K., B.D.S.; M.D.S. *H.K.*  
Chik, T.F.F., B.D.S.; M.D.S. *H.K.*  
Lau, E.W.S., B.D.S. *Adel.*; M.D.S. *H.K.*; F.R.A.C.D.S.  
Ling, J.Y.K., B.D.S. *Lond.*; D.Orth.R.C.S. *Eng.*  
Pang, A., B.D.S. *Liv.*  
Sung, S.Y.S., L.D.S.R.C.S. *Eng.*  
Tay, F.R.C.M., B.D.Sc. *Q'ld.*  
Tong, L.S.M., B.D.S. *H.K.*  
Wong, T.C., B.D.S.; M.Sc. *Lond.*; D.Orth.; L.D.S.R.C.S. *Eng.*

## **Honorary Professor:**

Yen, P.K.Y., D.D.S. *W.China Union*; D.M.D. *Harv.*

## **Honorary Clinical Lecturers:**

Chow, S.K., M.B.B.S. *H.K.*; F.R.C.S. *Edin. and Glas.*  
Lo, K.H., M.B.,B.S. *H.K.*; F.R.C.S. *Edin.*; F.A.C.S.  
Tsang, J.Y.S., B.D.S. *Sing.*; D.Orth.R.C.S. *Eng.*; F.I.C.D.  
Yiu, E.S.Y., B.D.S. *Adel.*; M.D.Sc. *W. Aust.*; F.R.A.C.D.S.



**Postgraduate Dental Officers:**

Choi, R.Y.L., B.D.S. *Syn.*  
Chu, C.H., B.D.S. *H.K.*  
Kaveewatcharanont, P., D.D.S. *Chula*  
Kwan, E.L., D.D.M. *Phil.*; D.D.P.H. *Syn.*  
Lau, P.Y.W., B.D.S. *H.K.*  
Wong, G.W.K., B.D.S. *H.K.*  
Yip, C.K., B.D.S. *H.K.*

**Diploma in Dental Surgery Candidate:**

Chua, T.C., B.D.S. *Sing.*

**Junior Hospital Dental Officers:**

Chen, K.F., B.D.S. *H.K.*  
Chow, T.M., B.D.S. *H.K.*  
Lam, A.S.Y., B.D.S. *H.K.*

# DEPARTMENT OF CONSERVATIVE DENTISTRY

## *Achievements and Perspectives*

*Professor A.G. ALEXANDER*

### Introduction

As the newly appointed Professor and Head of the Department of Conservative Dentistry and the first External Examiner in Conservative Dentistry in the Faculty of Dental Surgery of the University of Hong Kong, I am in a unique position to give an objective assessment of the development of the Department over the past decade and to give some indication of how it might progress in the next ten years.

The first appointment in Conservative Dentistry the University of Hong Kong made was in November 1977, when Professor C.E. Renson was appointed to the newly established Chair in the subject and made Head of Department. I am greatly indebted to him for giving me much of the background on these early years and especially for his clear statement of the aims and ideals which guided his hand in establishing the department. I hope to show how far these aims and objectives have been met and where circumstances or experience have modified them.

Having been closely associated in 1964 with the planning and rebuilding of one of the oldest dental hospitals and schools in the United Kingdom, I can well imagine the exciting challenge that the formation of a totally new school of Dentistry in a university that previously had no such school, must have presented to the founding Professors and their colleagues. They were not fettered by tradition or by the jealously guarded and entrenched ideas of established staff, as one inevitably is in rebuilding an old

school but could choose and develop the most modern concepts of dental education and purpose build a school to teach them in. The Prince Philip Dental Hospital that one sees today is a fitting tribute to their far-sighted vision and what is more it was all accomplished in an extraordinarily short time even by Hong Kong standards.

### The Specialty of Conservative Dentistry

By tradition, Conservative Dentistry has been regarded as one of the main disciplines in Dentistry. It is usually the largest department in a dental school and is concerned with the prevention of dental disease, particularly dental caries, and with the conservation of teeth that are malformed, diseased or have suffered traumatic injury.

This includes fixed bridge prosthodontics and bridges and crowns supported by implants. Inevitably, it has become associated with the restoration of appearance for its own sake, which has led to ethical arguments over what is termed pejoratively as *cosmetic dentistry*.

The practice of operative dentistry was established on a scientific basis by G.V. Black when he published his principles in 1898. They remained almost unchanged and unchallenged until the late 1960's when it was appreciated that the introduction of the air turbine handpiece a decade earlier had resulted in massive destruction of sound natural tooth tissue in applying

these principles on a wide scale. The resulting over-preparation of the tooth weakened the remaining sound tissue so much, that fractures of cusps occurred and the tooth was lost as a result and not because of the original disease. In consequence new principles were introduced with minimal cavity designs coupled with strict preventive regimes.

Widespread use of fluoride-containing toothpaste and fluoridation of domestic water supplies has changed the pattern of disease and there is now much less need to restore teeth because of dental caries. New materials have been introduced, in particular the adhesive resins, and these have changed the practice of conservative dentistry beyond recognition. The philosophy now is one of minimal intervention with prevention as the first priority and remineralization procedures the first choice for managing early carious lesions. When there is no alternative and teeth have to be restored there is a wide range of minimal invasive procedures for restoring them and improving appearance. These are less demanding of the operator and much more tolerable for the patient.

Conversely, the air turbine handpiece has made it easier to prepare teeth for multiple crowns and bridges with relative ease. As a result, more complex crown and bridge work is now possible and a sound knowledge of the principles of occlusion has become a primary requisite for conservative dentists. Advances in endodontic techniques, especially in multi-rooted teeth, have made it possible to save many teeth that would have been extracted at one time. The increasing number of people surviving into advanced old age has presented the conservative dentist with special problems such as root caries and extensively worn or fractured teeth. Indeed, the range and complexity of the skills required of a newly qualified dentist has meant that the undergraduate student now does tasks routinely in the clinic that a generation or so ago would have been referred to a specialist.

This puts a particular strain on their teachers and it is pleasing to see that the staff of the Department of Conservative Dentistry have risen to this challenge. In the future prevention may reduce the need to treat dental caries but the ageing and worn dentition and patient expectations of a reasonable appearance will still require the existence of this specialty.

### The Early Days of the Department of Conservative Dentistry

Professor Renson was clearly much influenced in his planning by his experiences at the London Hospital where the concept of the dentist as the leader of a team was a major theme in the teaching. An early decision was made by the two Foundation Professors that the Department of Conservative Dentistry would serve as the pivotal department in the clinical undergraduate programme. To this end Professor Renson was appointed Chairman of the Curriculum Committee and partly as a result of that decision the administrative structure of the Department of Conservative Dentistry became complex as I soon discovered on taking up my appointment. In addition to accepting teaching responsibilities for operative dentistry, crown and bridge work and endodontics which reflected the pattern of a typical department in the United Kingdom, responsibility was also accepted for the organization and administration of oral diagnosis and treatment planning, close support dentistry courses and the general practice unit. Additionally, the Head of Department became the administrative head of the training programmes for Extended Duty Dental Surgery Assistants which were subsequently phased out and for Dental Surgery Assistants. It was through these programmes, established prior to the opening of the Prince Philip Dental Hospital, that it was possible to ensure a supply of properly trained assisting staff throughout the hospital for the teaching staff and students.

There was a deep conviction in planning the undergraduate course that teamwork was essential in dentistry. The course in general, but particularly in conservative dentistry, was designed to produce a dentist equally able to work independently or act as the leader of a team, able to delegate responsibility and prescribe accurately. To quote Professor Renson "We aimed to produce an educated and thinking individual, skilled and interested in all branches of dentistry. One trained constantly to re-appraise the standard and extent of his knowledge and skill and capable of keeping abreast of research and development".

An early decision was made to teach small groups on a 'clock system' rather than the more traditional 'block' teaching current at that time in many schools in the United Kingdom. There was to be diagonal integration so that basic medical sciences and clinical sciences were taught throughout the course but decreasing as the course progressed. Much emphasis was placed on community and preventive dentistry from the beginning of the course in the early days and individual learning and communication skills, first-aid and behavioural sciences were taught with all departments expected to contribute to these courses.

Clinical teaching was to be organised in small groups of eight students with each group being the responsibility of a nominated teacher for each year. Formal teaching took place during three ten-week terms and the remaining 16 weeks, after deducting leave, was designated as the 'period of guided learning' and was used to the best advantage for individual students. Electives and participation in research projects were to be encouraged for students who were abreast of the course work.

Formal lectures to large numbers of students were not used and certain subjects such as caries and occlusion were taught as topics with a multi-disciplinary approach to teaching. All clinical subjects were examined in the Final

Examination with equal emphasis and a detailed student assessment system based on tutors and group teachers was introduced with regular written assessments on each student.

The results of this imaginative and innovative programme were plain to see when I examined the first students to take their finals examination in Conservative Dentistry. When the question of the recognition of the Hong Kong B.D.S. degree for inclusion in the UK Dentists Register was debated by the General Dental Council in London, I was able to report that the standard of conservative dentistry that I had seen in these Final Examinations was uniformly the best that I had ever seen and that some individual students were quite exceptional.

### The Present Day Department

In many dental schools in the United Kingdom Conservative Dentistry is no longer a separate department but is grouped together with Prosthodontics and Periodontology under the departmental heading of Restorative Dentistry. In the United Kingdom a dentist wishing to become a Consultant in Restorative Dentistry in the National Health Service must study each of these disciplines before becoming accredited for promotion to Consultant. This contrasts sharply with other countries where smaller subsections of conservative dentistry such as Endodontics, are the subject of intense specialisation. There are advantages and disadvantages in these disparate approaches in different schools but they are often concerned more with administrative convenience than with scholarship. In Hong Kong conservative dentistry was established as a separate department from the inception of the school.

The main Department is situated on the third floor of the Prince Philip Dental Hospital and there is a General Practice Unit and Operative Technique Laboratories on the sixth floor.

In the main clinic there are 52 open clinic bays for student use and eight separate surgeries, including three large demonstration surgeries, a room for radiography, a store room and a technical laboratory. The departmental offices and two seminar rooms are situated adjacent to the main clinical area.

There are 64 student places in the Operative Technique Laboratories on the sixth floor and three teaching surgeries. These large laboratories are served by several satellite laboratories and seminar rooms.

The **General Practice Unit** consists of 14 fully equipped surgeries where students in their final year are encouraged to carry out whole patient care on a one session a week basis. The unit has its own reception, waiting area and stores.

The environment has been designed to simulate as nearly as possible, conditions in general dental practice. Patients are selected for their suitability for total care and all of the treatment is carried out by the student in the Unit. Should specialist advice be needed then the student will seek this through correct referral procedures, much as would be the case in general dental practice. One surgery is set aside for emergency patients and each student takes part in the emergency rota. The role of the Unit will be central to the new five year course that has already started.

One of the most remarkable achievements commented on frequently by visitors and external examiners is the standard of the **Dental Surgery Assistants**. The D.S.A.'s are all trained by Tutor D.S.A.'s and certificated at the Prince Philip Dental Hospital, and are included in the Department of Conservative Dentistry. All the students practise four-handed close support dentistry from the moment they start in the clinics. They derive great confidence in having expert assistance at the chairside especially in their junior years.

The dental hospital has an enviable supply of well trained D.S.A.'s who lend great weight to the smooth and efficient running of all departments.

## Teaching and Administration

The Department is responsible for teaching the aetiology, histopathology, diagnosis, prevention and treatment of dental caries and pulpal diseases and the clinical use of restorative dental materials. The kinesthesiology and treatment of occlusal disharmonies is also the responsibility of conservative dentistry together with the management of the dental team.

In addition the Department is responsible for all dental surgery assistant courses in the hospital and for the organization of oral diagnosis and treatment planning clinics (figure 10).

## Research and Postgraduate Teaching

Starting research in a new teaching establishment presents very special problems. There is no research ethos and no on-going research for junior staff to join in and learn research techniques before branching out on their own. It must all be started from scratch.

Inevitably, the energy and resources available were deployed in the first few years to building up the teaching course, establishing treatment and referral clinics and recruiting staff as the number of student years increased to a full intake over four and a half years. In these circumstances the Department has a very creditable record for research.

Two members of staff completed Ph.D.'s with Dr. N.B. Pitts (now a Professor in Dundee) gaining the first ever Ph.D. in dentistry in the University of Hong Kong although it was an external degree of the University of London. In 1985 a two-year M.D.S. degree course was



**Fig. 10** The staff of the Department of Conservative Dentistry.

introduced and four people have gained this degree in conservative dentistry. A Postgraduate Diploma in Dental Surgery was started on a part time basis in 1991. Four Junior Hospital Dental Officer posts provide new graduates with an opportunity to gain experience in emergency work and to improve their skills in all aspects of conservative dentistry, and at the same time providing support for the teaching programme. Currently two students are registered for the M.D.S. degree, three for the Diploma and one student is registered for the M.Phil. degree.

The present research interests in the department range from studies into marginal leakage in adhesive restorations, the performance of resin bonded bridges, the longevity of cast restorations and tooth wear, to evaluations of educational methods, the testing of the biocompatibility of materials and the evaluation of the Stryker implant system. Other subjects being studied include a comparative study of root canal morphology, an analysis of

endodontic treatment and studies of caries indicators.

The departmental staff treat a wide range of referred and casual patients and provide a most important consultant service for the dental profession and the public of Hong Kong in all branches of conservative dentistry.

A full programme of postgraduate courses is given by staff members for the Hong Kong Dental Association, and regular lectures and seminars are arranged in the Department by eminent dental surgeons visiting Hong Kong.

A major effort will be made to optimise the research and postgraduate activities of the department from this already impressive baseline.

## Conclusion

It has been truly a *decade of progress* which has laid the foundation for the next decade. To quote the two founding Professors: "Few dental teachers are afforded the opportunity to start

completely afresh. The dental studies team of the University of Hong Kong are fortunate enough to be in that position. They relish the chance to re-examine traditional practices and evaluate new concepts. Undeterred by the number and magnitude of the problems still to be overcome they look forward to a challenging and intriguing future". These sentiments are still valid today as the Department of Conservative Dentistry faces the second decade. It was a

fitting tribute when Professor C.E. Renson was made the first Emeritus Professor of Dentistry at the University of Hong Kong.

The future of the Department lies in the hands of the excellent local students who are returning to their school as teachers after gaining further training and experience and higher degrees. They have a firm foundation to build on.

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**Tse Chung Ming**

Study of conventional root canal therapy performed by dental students.

**CONSERVATIVE DENTISTRY  
CURRENT STAFF LIST**

**(Head of Department: Prof. A.G. Alexander)**

**Professor:**

Alexander, A.G., B.D.S.; M.D.S. *Lond.*; F.D.S.R.C.S. *Eng.*

**Emeritus Professor:**

Renson C., B.D.S.; Ph.D.; D.D.P.M.; L.D.S. R.C.S.; F.I.C.D.; F.R.S. Med.

**Reader:**

Kirkwood, J., B.D.S. *Syd.*; D.D.S. *Tor.*; Cert.Perio. *Indiana*; F.D.S.R.C.S. *Eng.*;  
F.R.A.C.D.S.

**Senior Lecturer:**

Holmgren, C.J., B.D.S. *Lond.*; F.D.S.R.C.S. *Edin.*  
Newsome, P.R.H., B.Ch.D. *Leeds*; M.B.A. (Dist.) *Warwick*; F.D.S.R.C.S.; D.R.D.R.C.S.  
*Edin.*; L.D.S.R.C.S. *Eng.*

**Temporary Senior Lecturer:**

Dimmer, A., B.D.S. *Lond.*; F.F.D.R.C.S. *Ire.*; F.D.S.R.C.S. *Eng.*

**Lecturers:**

Cheung, G.S.P., B.D.S.; M.D.S. *H.K.*; M.Sc. *Lond.*  
Howden, G.F., B.Sc.; Ph.D. *Leeds*; B.D.S. *Lond.*; L.D.S.R.C.S. *Eng.*  
Joe, K.L., B.Sc. (Hons.); B.D.S. *Otago*  
Kei, L.H., B.D.S. *N'cle-upon-Tyne*; M.D.S. *H.K.*  
Tse, C.M., B.Sc. *McMaster*; D.D.S. *Tor.*; M.D.S. *H.K.*

**Part-time Lecturers:**

Bong, R.C.M., B.D.S. *Lond.*  
Burrows, S.C., B.D.S. *Lond.*; L.D.S.R.C.S. *Eng.*  
Fung, I.Y.C., B.D.S. *H.K.*  
Green, S.H., B.D.S. *Lond.*  
Hancock, P.M., B.Sc. *N'cle-upon-Tyne*; B.D.S. *Lond.*  
Horton, C.H., B.D.S. *Lond.*  
Kwan, J.K.H., B.D.S. *H.K.*  
Lang, J., D.M.D. *Br.Col.*  
Lau, R.P.H., B.D.S. *Sheff.*; L.D.S.R.C.S. *Eng.*  
Lee, D.M.C., B.D.S. *Syd.*  
Leung, A.Y.H., B.D.S. *H.K.*  
Leung, S.F., B.D.S. *H.K.*; M.Sc. *Lond.*  
Liu, H.W.M., B.D.S. *H.K.*  
Pratap, A., D.M.D. *Penn.*  
Siu, K.W., B.D.S. *H.K.*  
Stanhope-Jones, P., B.D.S. *Dundee*  
Tong, D.W.K., B.D.S., *Lond.*; L.D.S.R.C.S. *Eng.*  
Tong, P.T., B.D.S. *H.K.*  
Walters, R.P., D.D.S. *Minn.*  
Wang, G.S.C., B.D.S. *H.K.*; D.M.D. *Tufts.*

Wat, P.Y.P., B.D.S. *Lond.*; L.D.S.R.C.S. *Eng.*  
Wu, C.H.P., D.D.S. *Indiana*

**Clinical Dental Surgeon:**

Hillgren, B.G., Dip.D.S. *Roy. Caroline Medico-surgical Inst., Sweden*

**Tutor in Dental Surgery Assisting:**

Crosswaite, M.A., Nat.Cert.D.S.A.; F.E.T.C.

**Assistant Tutor in Dental Surgery Assisting:**

Pyburn, S., Nat.Cert.D.S.A.

**Instructors in Dental Surgery Assisting:**

Leung, L. K., Dip.E.D.D.S.A.

Yeung, S.W., Dip.E.D.D.S.A.



# DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY

## *Achievements and Perspectives*

*Professor H. TIDEMAN*

### Introduction

Oral and Maxillofacial Surgery is a dynamic specialty undergoing continuous evolution worldwide while at the same time consolidating its position within the array of surgical specialties.

Surgery for maxillofacial disorders is known to have been performed for centuries, however as a specialty, in common with many other disciplines, maxillofacial surgery achieved its most spectacular advances during armed conflicts. The wars of this century gave dentists the opportunity to make unique contributions to the management of facial injuries. Their important input heralded the emergence of a new role for dentists in this field, and this wider experience of surgery was a significant factor in the growth of the scope of oral surgery as practised by dentists.

During its more recent evolution, the specialty has been beset with problems of identity and recognition, particularly in the United States of America. These are reflected in the change of name from 'Oral Surgery' to 'Oral and Maxillofacial Surgery' and in the controversy surrounding the eventual need for both medical and dental training as a prerequisite to enter the specialty.

Traditionally, otolaryngologists and plastic surgeons disputed the field of maxillofacial surgery, whilst Europeans had a long tradition of a well established specialty, notably in Germany and in France. The addition of the term 'Maxillofacial' was recommended in the sixties

when, on the background of the above mentioned disputes, American oral surgeons extended their scope to major facial trauma and to the then developing orthognathic surgery, and Europeans started lecturing in the United States of America.

The dual degree issue, still the subject of frequent and fierce debate at national and international meetings and in international publications, is still pending although recent trends, at least in the Western Hemisphere, seem to favour a double qualification.

These turmoils in the West are in sharp contrast with the situation of Oral and Maxillofacial Surgery in China, where the whole scope of highly sophisticated procedures is performed by stomatologists.

### Organization of the Department

The Department of Oral and Maxillofacial Surgery has a relatively short history. Clinical activities began in 1981 with the aim of teaching dental undergraduates to reach an internationally acknowledged standard of dental practice. The teaching, spanning the whole duration of the undergraduate course, is based on didactic lectures, practical demonstrations, small group seminars and clinical tutorials covering oral and maxillofacial surgery, oral medicine, oral pathology, oral microbiology and the principles of oral radiology.

The curriculum also includes introductory



courses in the basics of inhalation and intravenous sedation, resuscitation and anaesthesia. The relevance of the general medical condition of patients, and the measures required when dealing with concomitant systemic disease are highlighted throughout the course.

### *The Prince Philip Dental Hospital*

The Department of Oral and Maxillofacial Surgery is situated in block B on the second floor of the building where there are fourteen surgeries which are mainly used for consultation and minor oral surgery procedures under local anaesthesia. Nine surgeries constitute the Local Anaesthetic Clinic and these are intercommunicating and specially designed for teaching dental extraction techniques and minor oral surgery. An ambulatory day surgery facility, unique in Hong Kong, consists of two operating theatres, with separate anaesthetic rooms and patient examination rooms, is designed for short general anaesthetic outpatient cases and intravenous sedation cases.

The Oral Radiology Unit is housed on the first floor and contains a skull unit, a cephalostat, two panelipse machines, and four dental X-ray machines and supporting facilities including a seminar room.

The offices and teaching laboratory of the Anaesthetics Unit are located on the ground floor.

### *The Tung Wah Hospital*

The Tung Wah Hospital in Po Yan Street on Hong Kong Island belongs to the Tung Wah Group which provides medical, educational and social services to the Hong Kong community.

The Department of Oral and Maxillofacial Surgery occupies the 10th floor of the Hospital which is within walking distance of the Prince Philip Dental Hospital, where 16 in-patient

beds, with an associated twin-theatre operating suite, are provided. Prior to the commissioning of the Maxillofacial Unit at Queen Mary Hospital, the inpatient capacity was extended to its maximum of 20 beds, and the operating theatre was operational daily for major and minor oral and maxillofacial surgery

Currently, surgery is performed during 1 full-day and 5 half-day operating sessions, each week Monday to Friday (figure 11). The range of procedures is limited to minor oral surgery.

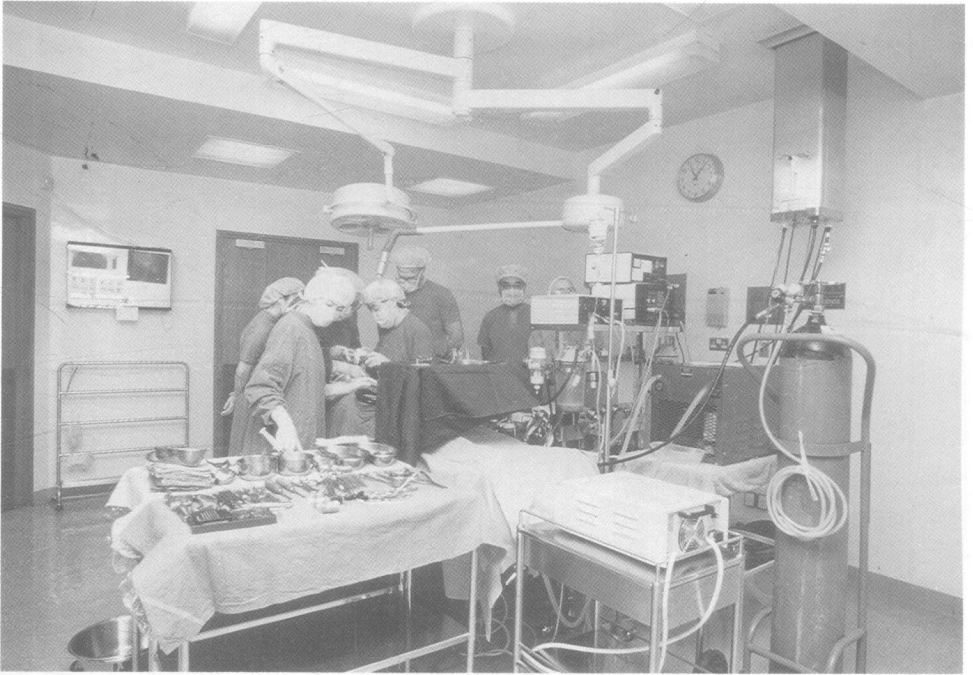
### *The Queen Mary Hospital*

Built in 1937 along the Pokfulam Road in Hong Kong Island, the Queen Mary Hospital is a 1,310-bed hospital providing facilities for the clinical departments of the University of Hong Kong as well as Government medical services. This, the main teaching hospital on Hong Kong Island, houses all medical and surgical specialities including the Accident and Emergency service.

The Maxillofacial Unit, a new inpatient facility for the Department of Oral and Maxillofacial Surgery, University of Hong Kong was officially opened on January 21st, 1991. The Unit is located on the 19th floor of K Block (figure 12). The accommodation is worldclass, comprising a 24-bed ward (figure 13, 14), two operating theatres and supporting facilities, two dental surgeries, one seminar room, three offices, one laboratory and one reading room. Maximum use is being made of these new and superb facilities, together with their location in this major teaching hospital, to the increased benefit of patients and students. This unit is currently used for major oral and maxillofacial surgery only, complemented by Tung Wah Hospital.

### **Current Activities**

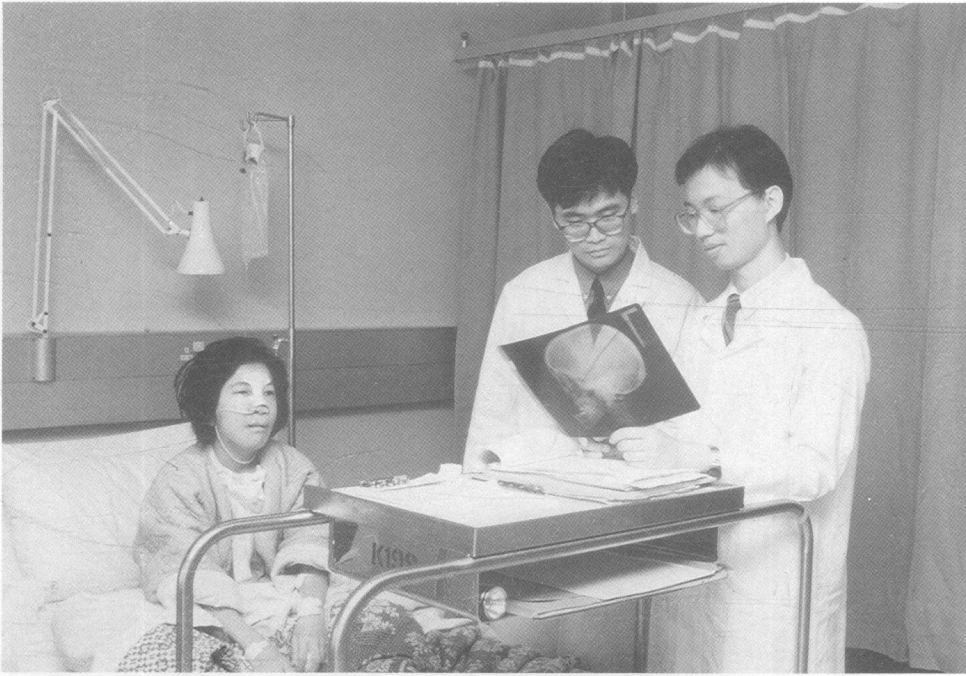
The work of the department revolves around teaching, at both undergraduate and post-



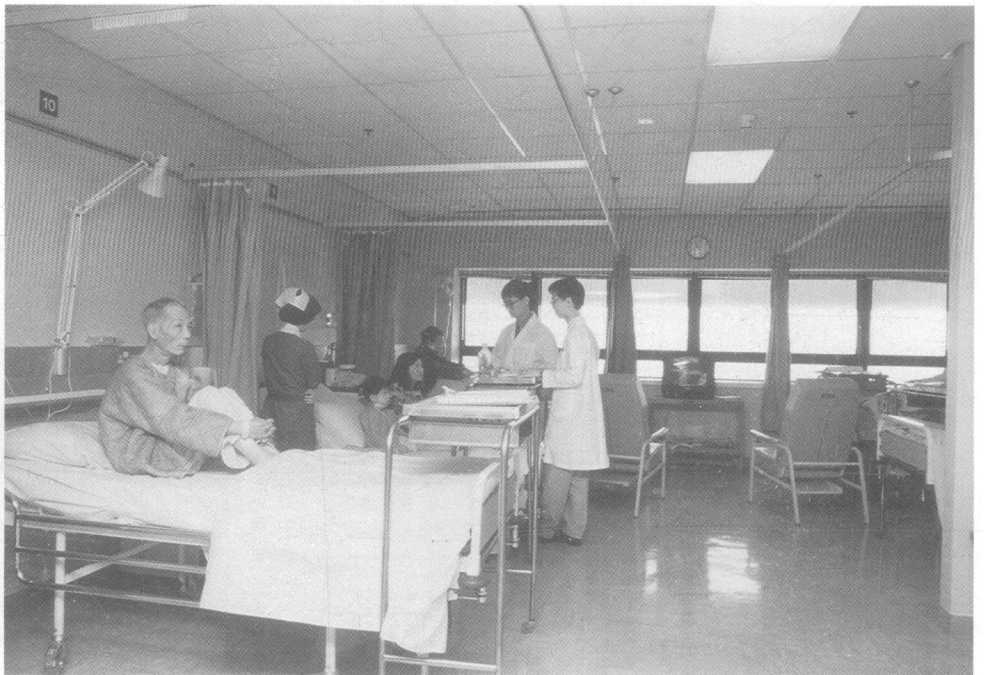
**Fig. 11** Operation in progress under general anaesthesia (Tung Wah Hospital).



**Fig. 12** Queen Mary Hospital, Block K. The Maxillofacial Unit occupies the 19th floor.



**Fig. 13** Opportunistic ward teaching in progress.



**Fig. 14** View of section of the ward at Queen Mary Hospital.

graduate levels, clinical activities and research, augmented by programmes of continuing education.

### *Undergraduate Teaching*

The teaching of oral and maxillofacial surgery and oral medicine spans the whole duration of the course, and is based on didactic lectures, small group seminars, clinical tutorials and demonstrations, and supervised clinical practice. Use is made of the latest audio-visual teaching aids and the students are rostered to staff consultation clinics. The fourth-year students, in small groups, also spend a block period of two weeks in the department, where they are exposed to inpatient care and operating sessions in addition to staff consultation clinics and other activities, and are introduced to the full scope of the specialty. Every effort is made to provide the students with the opportunity to witness the wide range of clinical material encountered in Hong Kong, and to gain an appreciation of the various principles of management.

The Oral Radiology Unit, in addition to teaching undergraduates the principles of oral radiology and safety regulations, trains the students in the taking of intra-oral radiographs and the interpretation of intra-oral and extra-oral skull and facial radiographs, the latter made possible by the wealth of clinical material available within the department. The Oral Radiology Unit also provides services for the other departments of the faculty.

In anaesthesia, undergraduate teaching is diagonally integrated. In the second, fourth and fifth years, there are comprehensive courses of lectures and tutorials in resuscitation, sedation and anaesthesia augmented by hands-on clinical experience. The whole course is the first within the Commonwealth to comply with the Wylie and B.M.A. recommendations on undergraduate teaching in sedation and anaesthesia.

### *Postgraduate Teaching*

Ph.D. and Master's degree students are enrolled and are engaged in research which complements the overall research activities of the department. Currently there are 3 Masters students and 2 Ph.D. candidates.

Clinical postgraduate teaching is organised for junior and middle grade staff, postgraduate degree students and visiting postgraduates, the latter mainly from China, Australia and the United Kingdom and U.S.A. The overall aim is to train such staff and visitors in all aspects of the clinical practice of the specialty in its widest sense, and to assist them in obtaining specialist status eventually.

The department is already recognised for the purpose of the general and specialist fellowships of the Royal Australasian College of Dental Surgeons and the Royal College of Surgeons of England.

### **Clinical Activities**

It is believed that the role of a clinical University department is to teach undergraduates and postgraduates, and produce knowledgeable and safe practitioners, with a sound foundation upon which rests the professional future of the graduate, and the future of the profession. It is also believed that, additionally, a University department must take the leading role in determining the direction of future activities within its field. For a clinical department, this means both the comprehensive adoption of the scope and range of the specialty and the pioneering of new techniques, with a view to maintain the university's rightful place at the forefront of innovative thinking.

The University department must also take the responsibility of evaluating and reporting to the profession the results of conventional, original and experimental methods of treatment,

which will then influence the pattern of practice of the specialty, to the benefit of the population, and for this to be possible, an adequate amount and variety of clinical material must be continuously managed within the department. An adequate patient load is therefore vital to a clinical department, and the wide variety of clinical material seen in Hong Kong enables the teaching of undergraduates and postgraduates, as well as applied clinical research, to be accomplished to a high standard (figure 15).

To this end, the Department of Oral and Maxillofacial Surgery, with its Anaesthetics and Radiology Units, has substantially widened the scope of clinical activities during the past 4 years to encompass the current concepts adopted by the specialty worldwide, and to fall in line with the guidelines issued by the International Association of Oral and Maxillofacial Surgeons at its consensus conferences of 1987 in Tenerife, and of 1988 in Bermuda.

The scope of clinical activities includes the following:

- (1) Oral pathology and medicine, and oral mucosal disease management;
- (2) Dentoalveolar surgery;
- (3) Management of cysts and benign tumours of the jaws;
- (4) Maxillofacial traumatology;
- (5) Major preprosthetic surgery of the jaws and implantology;
- (6) Orthopaedic (orthognathic) and soft tissue surgery for facial deformity (specialist orthodontic input by the Department of Children's Dentistry and Orthodontics is gratefully acknowledged);
- (7) Management of temporomandibular joint disorders including open and arthroscopic surgery;
- (8) Cleft lip and palate surgery, both primary and secondary, and within a Faculty of Dentistry cleft palate team;



**Fig. 15** Departmental clinical audit meeting held once a week.

- (9) Management of benign and malignant salivary gland disease;
- (10) Maxillary sinus surgery;
- (11) Comprehensive surgical management of oral cancer;
- (12) Reconstructive techniques including tissue grafting, pedicled flaps and microsurgery;
- (13) Sedation and general anaesthesia for the whole range of the above surgical procedures.

Contemporary technology and innovative techniques of anaesthesia are applied as an appropriate complement to the specialised field of surgery by staff of the Anaesthetics Unit.

### Research

Based on the achieved prerequisite of adequate clinical material, both experimental and clinical research are undertaken within the department in a variety of subjects, in addition to on-going clinical studies, within the broad field of oral and maxillofacial surgery.

The topics of current interest to the Department range over a wide area and are at various stages of progress.

The following list includes funded and non-funded projects: microvascular supply of the temporomandibular joint; microvasculature and epithelialisation of the temporalis muscle flap; prospective evaluation of alveolar cleft grafting techniques; evaluation of growth changes after cleft lip-palate repair; role of CT scanning in growth monitoring after cleft lip/palate repair; comparative study of CT scan and nuclear magnetic resonance imaging (MRI) in implant surgery; prospective long-term study of treatment of oral squamous cell carcinoma; evaluation of reconstructive techniques after maxillectomy and mandibulectomy; prospective evaluation of arthroscopy and arthroscopic surgery of TMJ; scanning electron microscope study of odontogenic cysts; recurrence charac-

teristics of keratocysts; retrospective analysis of ameloblastomas; retrospective analysis of apicectomies of posterior teeth; classification of fibro-osseous lesions in Hong Kong Chinese; pharmacodynamics of anaesthetic and sedative agents, drugs and their antagonists; monovalent sedation techniques; hypoxaemia during sedation; analgesia for day and ambulatory oral surgery; development of nasal masks for use in the sedation of Chinese patients.

The department is also very active in the international arena of scientific communication and publication (figure 16).

### Continuing Education

The Department conducts a series of post-graduate courses for general dental practitioners each year on various suitable topics in the field, and the Anaesthetics Unit regularly conducts specialist postgraduate courses for candidates taking primary and final fellowship examinations in anaesthesia.

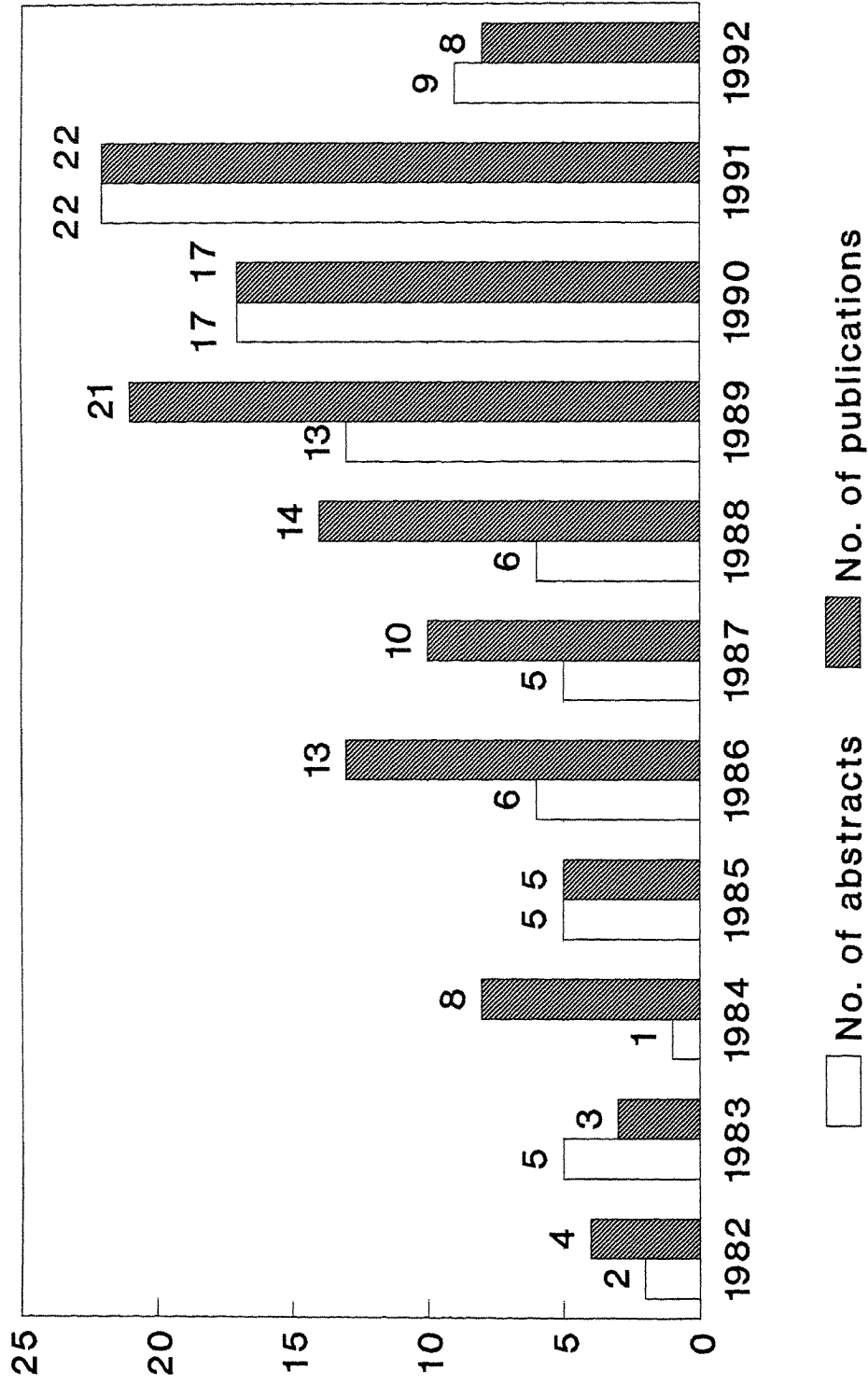
The Department also has its own programme of continuing education within the University and Faculty in the form of a journal club, literature review meetings, clinicopathological conferences and joint clinical meetings.

### Perspectives

Hong Kong is a highly dynamic city, and as such has a strong and positive influence on the work and ambitions of the Department.

In the area of undergraduate teaching, the latest methods will continue to be implemented to further develop the quality of the graduate, and assist him or her in gaining their professional status in a worldwide context. Here the exposure to the wholoscope of the specialty's work is vital to prepare the graduate for an expanding role within the profession.

## Department of Oral and Maxillofacial Surgery



**Fig. 16** Publications 1982–92.

With regard to 'scope' of clinical work, the current situation is already in line with international guidelines and compares favourably with that prevalent in China today. With 1997 in sight, this is most relevant and appropriate. It is hoped to expand further into the general areas of cleft lip and palate management and oral cancer management and to improve the mastering of microsurgical reconstructive techniques and laser surgery.

Postgraduate education is being developed, not only for the department's own junior and middle grade staff and postgraduate degree students but also, subject to funding, for Government-sponsored personnel based on the statistics of the ratio of oral and maxillofacial surgeon to population of 1:300,000 in Hong Kong compared with 1:125,000 in Europe and 1:50,000 in the United States of America.

For dental graduates wishing to train in oral and maxillofacial surgery, a general five-year training programme is adequate, shortened to three years for graduates holding both medical and dental degrees. Candidates would be rotated to the Prince Philip Dental Hospital, the Tung Wah Hospital and the Queen Mary Hospital for training, with an emphasis on teaching applied clinical research and encouraging scientific publications. Some trainees will be

able to complete a Master's degree during their training. The programme will be organised as a smooth and progressive practical training following the recommended international standards of clinical and surgical practice in the field of oral and maxillofacial surgery, with appropriate rotations to general or ENT surgery or anaesthesia and intensive care arranged on an individual basis.

The trainee is expected to have obtained the general dental fellowship of one of the Royal Colleges prior to entering the program. At the end of the five years, the candidate is expected to take the specialist fellowship in Oral and Maxillofacial Surgery. For trained postgraduates, integration into the Academy of Medicine of Hong Kong will be sought.

Research will be developed further, aided by the wealth of clinical material available, and experimental techniques will continue to be improved.

The Department of Oral and Maxillofacial Surgery of the University of Hong Kong is already fulfilling the requirements of such a programme, which encompasses contemporary international guidelines and aligns the postgraduate University training in Oral and Maxillofacial Surgery in Hong Kong with worldwide standards.



## ORAL AND MAXILLOFACIAL SURGERY

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## **Dissertations**

### **Master of Dental Surgery**

#### **1986**

**McKenna, John Joseph Iain**

Qualitative and quantitative analysis of the anterior dentition visible in photographs and its application to forensic odontology.

#### **1990**

**Leung Wai Keung**

Microbiological study of pericoronitis of impacted lower third molars in Hong Kong Chinese.

## **ORAL AND MAXILLOFACIAL SURGERY CURRENT STAFF LIST**

**(Head of Department: Prof. H. Tideman)**

### **Professor:**

Tideman, H., D.D.S. *Utrecht*; M.D. *Nijmegen*; Ph.D. *Amst.*; F.R.A.C.D.S.

### **Senior Lecturers:**

Comfort, M.B., B.D.S.; M.Sc. *Manc.*; F.D.S.R.C.S. *Eng.*

Piette, E.M.G., M.D. *Liège*; B.D.S.; Cert. Stom. Chir Max.-Fac. *Louvain*

### **Lecturers:**

Cheung, D.L.K., B.D.S. *Glas.*; F.F.D.R.C.S. *Ire.*; F.D.S.R.C.P.S. *Glas.*; F.R.A.C.D.S.;  
F.R.A.C.D.S.(O.M.S.)

Kerscher, A.J., B.D.S., M.D. *Kiel*

Ormiston, I.W., B.D.S. *Edin.*; L.R.C.P. *Lond.*; M.R.C.S. *Eng.*; F.D.S.R.C.S. *Eng.*

Samman, N., M.R.C.S. *Eng.*; L.R.C.P. *Lond.*; B.D.S. *Syd.*; F.D.S.R.C.S. *Eng.*

### **Part-time Clinical Lecturers:**

Aw, A.M.C., B.D.S. *Dundee*; F.R.A.C.D.S.

Chan, C.K.M., B.D.S. *N'castle-upon-Tyne*; L.D.S.R.C.S. *Eng.*

Chau, K.K., B.Sc., B.D.S., M.D.S. *Adel.*; F.R.A.C.D.S.; D.O.S.R.A.C.D.S.

Cheng, J.C.F., B.D.S. *Syd.*; F.F.D.R.C.S.I. *Ire.*

Cheung, K.S., B.D.S. *Syd.*; F.D.S.R.C.S. *Edin.*; F.F.D.R.C.S. *Ire.*

Kwok, K.T., B.D.Sc. *Melb.*; L.D.S. *Vic.*; F.D.S.R.C.S. *Edin.*

Lam, P.P.K., B.D.S. *Otago*; M.Sc., Cert. Immunology *Lond.*; F.D.S.R.C.S. *Eng.*;  
F.F.D.R.C.S. *Ire.*

Lee, K.H., B.D.S. *Otago*; F.D.S.R.C.P.S. *Glas.*

Tsang, A.C.C., B.A., D.D.S. *Loyola*; M.Sc. *Lond.*; F.F.D.R.C.S. *Ire.*

Tse, A.S.K., B.D.S. *Glas.*; F.D.S.R.C.S. *Edin.*

Yan, S.W., B.D.S. *Otago*; M.Sc. *Lond.*; F.F.D.R.C.S. *Ire.*

Yau, C.K., B.D.S. *Dundee*; M.Sc. *Lond.*; F.F.D.R.C.S. *Ire.*

Yuen, R.H.L., B.Sc. *C.U.H.K.*; B.D.S. *Syd.*

### **Clinical Dental Surgeon:**

Chan, S.C., B.D.S. *H.K.*; F.R.A.C.D.S.

### **Dental Officers (seconded from the Hong Kong Government):**

Chow, B.K.C., B.D.S. *H.K.*; F.R.A.C.D.S.

Tong, A.C.K., B.D.S. *H.K.*; F.R.A.C.D.S.

### **Postgraduate Dental Officers (Master's students):**

Cheung, L.M., B.D.S. *H.K.*; F.R.A.C.D.S.

Chow, J.K.F., B.D.S. *H.K.*; F.D.S.R.C.S. *Eng.*

Hui, E.K.W., B.D.S. *H.K.*; F.D.S.R.C.S. *Eng.*

**Junior Hospital Dental Officers:**

Lee, S.C.M., B.D.S. *H.K.*  
Yan, W.W., B.D.S. *H.K.*  
Yu, N.F., B.D.S. *H.K.*  
Yung, R.K.L., B.D.S. *H.K.*

***ANAESTHETICS (IN RELATION TO DENTISTRY)***

**Reader:**

Moles, T.M., M.B.,B.S. *Lond.*; D.T.M.&H *Lond.*; F.F.A.R.C.S.

**Senior Lecturer:**

Rodrigo, M.R.C., M.B.,B.S. *Ceylon*; F.F.A.R.C.S.I.; F.F.A.R.C.S.

**Lecturer:**

Campbell, R.C.H., M.B., Ch.B. *Edin.*; F.C. Anaes.

**Part-time Clinical Lecturer:**

Allison, J.M., M.B.,B.S.; D.A. *Eng.*; F.F.A.R.C.S.; F.A.N.Z.R.A.

***ORAL RADIOLOGY***

**Part-time Lecturers:**

Foster, K., B.D.S. *Bristol*; Dip.For.Odont.  
Li, T.K.L., B.D.S. *H.K.*

**Instructor Radiographers:**

Cheung, M.F., D.C.R.; M.I.R  
Keown, V.J., D.C.R.; S.R.R.  
McKenzie, A., D.C.R.; S.R.R.  
Mills, D., D.C.R.; Cert. O.M.I.M.S.; C.T.C.; S.R.R.; M.I.S.M.





# *DEPARTMENT OF PERIODONTOLOGY AND PUBLIC HEALTH*

## *Achievements and Perspectives*

*Professor W.I.R. DAVIES*

### **Introduction**

It is rare indeed for an academic, particularly one in dental academia, to be given the opportunity to devise, plan and institute a completely new educational programme in his chosen specialty, which is to be taught in a totally new, purpose-built teaching facility. This affords an exceptional opportunity, posing unique challenges, an opportunity which demands proper analysis, fresh initiatives and new approaches.

The acceptance of the responsibilities imposed by this unique opportunity on the part of the founding fathers of the Dental Faculty will be apparent to those who have seen the Faculty's Curriculum Document which was constructed in 1979 in preparation for receiving the first class of undergraduates in September of 1980. As the last of the five original professors to take-up appointment in Hong Kong, I can well remember the spirit which imbued all those involved in 'Dental Studies', as it was then called, and the evident wish to give our individual subject areas a new sense of direction. As that Curriculum Document put it, we were to construct courses in our disciplines which would 'produce an educated, thinking and complete individual who is both skilled and interested in all branches of dental surgery' and one who would be 'trained in an environment characterised both by the co-operation of motivated

individuals endeavouring to achieve common aims and by the spirit of enquiry'.

Lofty objectives and we do no harm to remind ourselves of them a decade after the curriculum plans were put into practice. For those of us in the Department of Periodontology and Public Health there was a particular challenge which added zest to the planning process: it had been decided that an essentially clinical discipline - Periodontology, should be married with the community-based teaching of Dental Public Health. There was to be no separate Department of Preventive Dentistry as such in the Dental Faculty, for the preventive approach was to permeate the teaching of every single dental clinical discipline. On the other hand, the disparate strands of Prevention would have to be drawn together in the courses in Dental Public Health, as would Behavioural Sciences, Ethics and Jurisprudence, and all these areas of teaching would have to interface with both Community Dentistry and the whole corpus of knowledge and clinical training embraced by the term Periodontology.

It is fair to say that all who have been involved in the Department's teaching programmes over the first decade have risen to these challenges and all have contributed in their various measures to the curriculum in Periodontology and Public Health as it is today. From the beginning it was decided that we should not simply be an 'um-

brella' of two disciplines which just happened to have been placed within a single departmental structure. On the contrary, there was to be a genuine attempt to fuse some of the concepts which underpinned the two disciplines. After all the founding fathers of the Dental Faculty had not put the two subjects together simply as happenstance, but because they considered a community based programme for the provision of oral health care, and in particular periodontal care, was relevant to Hong Kong and the Region.

### **Issues and Priorities in Teaching and Research**

An immediate issue which confronted the Department was the one of inquiry into the nature of oral health needs and demands in the Hong Kong community. Thereafter the task remained of rendering the teaching programmes, which had been constructed on the basis of experiences in quite different socio-cultural environments, as relevant and appropriate to the Territory and the Region as possible. At the same time the teaching in Periodontology and Public Health had to meet international standards such as to ensure that the curriculum was to be acceptable for recognition by the General Dental Council of the United Kingdom.

Within months of the creation of the Department, staff members therefore began the first of their excursions into the community, an involvement with the community which has extended and deepened over the first decade of our existence. That first oral health screening and education exercise took place in Tai-O, a remote fishing village on the Southern tip of Lantau Island. As it happened, that village became the focus of many community-based projects which were to be carried out by successive groups of dental students. More significantly that first Tai-O exercise in 1980 was to mark the initiation of the Department's

commitment to investigating, analysing and providing appropriate oral health care for the wider community Hong Kong. It is worthy of note that it was out of these Departmental activities that water fluoridation was brought to Tai-O, one of the last communities to benefit from the water fluoridation programme in the Territory. It was this 'hands-on' experience of the community's oral health status and perceived needs for dental care that the Department was to use as a basis for prioritising its teaching and research activities (figure 17).

In terms of Periodontology, the value and appropriateness of indices of periodontal disease have been investigated, as well as the periodontal status of various age cohorts in the Hong Kong population being clearly defined. The disease patterns led us to conclude that the bulk of the periodontal disease treatment should be firmly within the ambit of general dental practice, and the undergraduate curriculum was so structured. The Faculty's longitudinally-based, diagonally-integrated curriculum could not give a better basis for the Department's biological approach to periodontal therapy. Students provide comprehensive care for their patients over a four-year clinical curriculum in which they will practice within the periodontal clinics at least once each teaching week - ample time to observe and evaluate tissue responses to therapy. Ample time, too, to consider the behavioural changes inherent in patient motivation and to provide for the long-term maintenance of periodontal health. Advanced and more complex approaches in therapy are thereby put in proper context. Several staff members have been involved in a number of clinical research projects essentially investigating how much improvement in periodontal health can be achieved with minimal forms of therapy. It will not need me to point out the relevance of these investigations to the Region.

On the Public Health side, research has focused upon epidemiology, behavioural science,



**Fig. 17** Health Education for Secondary School Students Tai-O. Community Health Project 1988.

approaches to prevention, especially the effects of fluoridation in Hong Kong and the success of the School Dental Service, together with investigations into attitudes to oral disease, its treatment and prevention. The fluoridation studies were themselves instrumental in the Hong Kong government adjusting downwards the fluoride content of the water supplies in Hong Kong. An undoubted success-story in the first decade of the Dental Faculty has been the Community Health Projects completed by each group of dental undergraduates. A requirement to complete some form of out-reach project had been built into the original curriculum, but no-one could have envisaged how successful these projects have been in helping the undergraduates to establish a health-orientation in the Hong Kong dental curriculum, which goes some way, at least, in balancing the disease-oriented approaches of the conventional dental curriculum.

As part of the B.D.S. curriculum the Department requires senior students to plan and execute a community health project. The projects have the following aims:

– to encourage the dental students to explore

the oral health situation of the people living in the local community in order to obtain a realistic 'working picture' of population needs and expectations.

- to provide the dental students with practical and real experiences to illustrate the dentist's need for social managerial skills.
- to expose the dental students to practical problems involved in the planning and implementation of preventive, curative and health educational programmes for the local community.
- to stimulate the dental students to discuss the future roles of the oral health care team in the light of the need for effective preventive programmes in the local community.
- to develop the dental students' skills in effective utilization of existing human resources.
- to stimulate critical assessment of collected data and information as to their appropriateness as a basis for planning preventive programmes.
- to develop the dental students' skills in effective reporting and communication of results, conclusions and recommendations drawn from the community health projects.

Since 1984, 65 projects have been completed, with a degree of accomplishment which has not only added considerably to our data base on oral health in Hong Kong, but which has also attracted international praise not least from our external examiners. The students have extended their investigations overseas, to complete projects in other countries, most notably in the People's Republic of China (figure 18). These 65 projects have involved about 500 students, some 30 staff and have touched one way or another, it is estimated, over 1.5 million people. The annual presentation of these projects by the students in an IADR format is a highlight of the Faculty's Academic year, and the top project wins support to be presented at the Southeast Asian Divisional Meeting of IADR.

On the postgraduate front, the Department has enrolled 3 Master's candidates in periodontology and 5 Master's candidates in Public health since postgraduate teaching began in 1985. In addition we were joined for a period by a sociologist who completed his M.Phil degree on the factors affecting the utilization of

dental services. One teacher has recently been awarded her Ph.D., one his Doctorate in Odontology, and a further four staff members are enrolled for higher degrees at present.

Departmental staff have contributed consistently to the annual programme of courses of continuing education for members of the dental profession organised in conjunction with the Hong Kong Dental Association. We are now poised to embark upon the teaching of our first Postgraduate Diploma in Dental Surgery students who commence their courses in Clinical Periodontology in the academic year 1992-93.

There is a third strand to the Department's teaching activities, in addition to undergraduate and postgraduate education, and that is the Training Programme for Dental Hygienists. There are Hygienist teaching posts in the Department for that purpose, but all teachers in the Department are involved in the educational process. This is a situation we prize and value, for it helps underline the merits of team approaches in the provision of periodontal health care. This is constantly reinforced as under-



**Fig. 18** Primary Health Care for Primary Schoolchildren in Conghua County, Guangdong province, People's Republic of China. Community Health Project 1988.

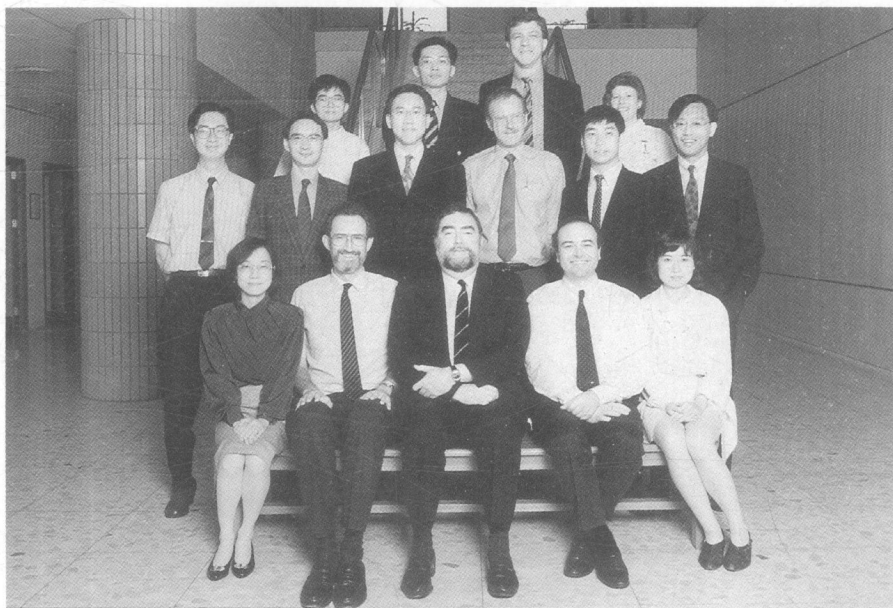
graduates, postgraduates, clinical staff, staff hygienists and trainee hygienists all work together in caring for patients in the Department.

### The Wider Perspective

Gratifying though the experience has been to be involved with each and everyone in the Department in constructing teaching and research objectives and then in working together to strive towards their achievement (figure 19), it would be wrong of me only to consider the internal affairs of the Department in isolation. Just as gratifying for me have been the very substantial contributions the Department of Periodontology and Public Health has made to the Dental Faculty as a whole, the University of Hong Kong, to the Hong Kong community and to the Dental profession in Hong Kong.

In the last decade this single Department has provided: the Faculty Dean and the Director of the Prince Philip Dental Hospital for a period of six years; two Associate Deans of the Faculty;

the Faculty's Principal Clinical Tutor; the position of Chairman of the majority of the Faculty's Committees (Library Committee, Dental Illustration Committee of Management, Committee on Students Progress, Ethical Committee, Research Committee, Computer Committee, Admissions Committee and Curriculum Review Committee) has been or is presently held by Departmental staff members. The current President and the Secretary of the Southeast Asian Division of IADR are from the Department; one full-time staff member and two part-time lecturers sit on the Council of the Hong Kong Dental Association; while the Chairman of the Government of Hong Kong's major advisory body on Dentistry (the Dental Sub-Committee of the Medical Development Advisory Committee) from 1984 to 1992 was from the Department of Periodontology and Public Health. It is now my honour to serve the University as Pro-Vice-Chancellor and I am conscious that this remarkable record of service of Department members would be impossible without the cooperation of all in the Depart-



**Fig. 19** Teachers, Dental Hygiene Tutors and Postgraduates – 1992.

ment working together as a dedicated team, and I include in this our splendid and loyal band of support staff (figure 20).

## Conclusion

It has been an extraordinary decade of experience, opportunity and achievement. Living and lively teaching programmes in both Periodontology and Public Health have been produced in a decade when there has been an information explosion in both of these disciplines. Every effort is expended to ensure that the programmes in both the undergraduate and postgraduate curricula do not become fossilised but are themselves constantly evolving to take account of the most up-to-date research developments. This is evinced by the student handouts which are designed to supplement seminars and lectures, ultimately making collectively a text of some 1,100 leaves covering the two subject areas, and these handouts are updated each year to take into account most recent research findings.

The research themes of the Department have

an internal cohesion in addressing issues of fundamental importance to the Region and strong international links have been developed in these activities particularly with colleagues and institutions in the People's Republic of China and with the World Health Organisation. This gives maximum opportunity to promote as widely as possible scientifically based prevention and therapy which are the very kernel of the Department's approach to clinical practice in Periodontology.

To name all those who have contributed to the Department would be invidious, and in any case too lengthy a process, for it would be a list running from staff members, past and present, to undergraduate and postgraduate students and to the clinical and secretarial support staff. It is sufficient to acknowledge with the utmost sincerity that it is they who have made the Department what it is. I am deeply grateful to them all for the last decade and I enthusiastically look forward to facing the challenges of the next decade from this foundation which they have built as a stepping-stone to further academic development and enhanced clinical service.



**Fig. 20** Department of Periodontology and Public Health Support Staff – 1992.

**PERIODONTOLOGY AND  
PUBLIC HEALTH  
Publications 1982-1992**

**Articles**

Daly CG, Seymour GJ, Kieser JB, **Corbet EF**.

Histological assessment of periodontally involved cementum. *J Clin Periodontol* 1982; 9:266-74.

Kaplis NA, **Lind OP**, Poulsen S.

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**Davies WIR.**

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**Davies WIR.**

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**Davies WIR.**

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## **Dissertations**

### **Doctor of Philosophy**

**1991**

**Lim Lum Peng**

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### **Master of Philosophy**

**1988**

**Mak Kwong Yuen, Kelvin**

Utilization of free dental services - a socio-dental study of Hong Kong Chinese civil servants.

### **Master of Dental Surgery**

**1986**

**Agnew, Eryn Clare**

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**1987**

**Lo Chin Man, Edward**

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**1988**

**Lee Kwok Lun**

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**1989**

**Chiu Kai Chung**

Retrospective clinical study of the correlation between the degree of control of diabetes mellitus and the severity of periodontal disease.

**PERIODONTOLOGY AND PUBLIC HEALTH  
CURRENT STAFF LIST  
(Head of Department: Prof. W.I.R. Davies)**

**Professor:**

Davies, W.I.R., B.D.S. *Lond.*; M.Sc.; Dip. Periodontics *Penn.*; F.D.S.R.C.S. *Eng.*; J.P.

**Reader:**

Schwarz, E., D.D.S. *R.Dent.Coll. Copenhagen*; M.P.H. *Hebrew*

**Senior Lecturer:**

Corbet, E.F., B.D.S. *N.U.I.*; F.D.S.R.C.S. *Eng.*; F.F.D.R.C.S. *Ire.*

**Lecturers:**

Birn, H., D.D.S.; Dr.Sci.(Dr. Odont.) *R.Dent. Coll. Aarhus*  
Lim, L.P., B.D.S. *Sing.*; M.Sc. *Lond.*; Ph.D. *H.K.*; D.D.P.H.R.C.S. *Eng.*  
Lo, E.C.M., B.D.S.; M.D.S. *H.K.*

**Clinical Dental Surgeon:**

Chiu, G.K.C., B.D.S.; M.D.S. *H.K.*

**Demonstrator:**

Wong, E.K.L., B.D.S. *H.K.*

**Tutor in Dental Hygiene:**

Dando, P., E.D.H. *Eng.*; Dip.D.H.Ed. *Roy.Soc.Health*; F.E.T.C. *City & Guilds*

**Assistant Tutor in Dental Hygiene:**

Tong, A.C.H.

**Part-time Clinical Lecturers:**

Law, Y.H., B.D.S. *Malaya*; D.P.D. *St. Andrews*  
Sun, D.Y.W., B.D.S. *H.K.*  
Tang, P.S.L., D.D.S. *Tor.*; L.D.S.R.C.D.S. *Ont.*  
Yau, P.K.M., B.D.S. *H.K.*  
Yeung, F.I.S., B.D.Sc. *Q'ld.*; M.Sc. *Lond.*

**Honorary Lecturer:**

Lee, K.L., B.D.S.; M.D.S. *H.K.*

**Postgraduate Dental Officers:**

Chan, D.K.Y., B.D.S. *H.K.*  
So, F.H.C., B.D.S. *H.K.*  
Yu, F.S.H., B.D.S. *H.K.*

**Junior Hospital Dental Officers:**

Cheung, C.K., B.D.S. *H.K.*  
Fung, C.K.Y., B.D.S. *H.K.*  
Woo, B.M.S., B.D.S. *H.K.*



# *DEPARTMENT OF PROSTHETIC DENTISTRY*

## *Achievements and Perspectives*

*Professor R.K.F. CLARK*

### **Introduction**

The Department of Prosthetic Dentistry was the first to open in the Prince Philip Dental Hospital in January 1981. The first intake of second year undergraduates entered the Department in October 1981.

Initially our activities were confined to clinical work, curriculum development and teaching but over the years our activities have expanded to include undergraduate teaching, postgraduate teaching, clinical work and research.

### **Undergraduate curriculum**

At the time when it was set up, the undergraduate curriculum was innovative in three important ways.

The amount of technical work that the students were expected to do was drastically reduced when compared with many other courses. The Dental Academic Advisory Committee who advised the University on setting up dental studies laid down this requirement because it was felt that there was not enough time in the undergraduate course for students to spend the hours in the technology laboratory making dentures. Provision was made for the students to be supported by technicians employed by the Prince Philip Dental Hospital.

Secondly, because of the reduced technology component, the course is arranged so that the clinical teaching precedes the laboratory teach-

ing and the clinical teachers are involved in the teaching of dental technology work to their students. In many more traditional courses students are only allowed into the clinic after completion of a purely laboratory based course.

The other revolutionary feature of the course was that students were to be taught to make removable partial dentures before complete dentures. At the time there were very few, if any, dental schools taking this approach. We decided on this approach for two reasons: first, it seemed to us to be a much more logical way of approaching the difficulties of providing dentures for people with a large number of teeth missing and at the time we were also told that there were very few complete denture patients in Hong Kong and it seemed to us that if this was the case, then a senior student might get more benefit from treating only one or two complete denture cases than would a junior student. In the event it transpired that there are many complete denture patients in Hong Kong but many of them have their dentures made by unregistered practitioners. We must, at least, be winning the competition with the illegal dentists as we now have a waiting list in excess of five hundred patients. The list is growing with satisfied patients recommending us to their friends and neighbours.

The partial denture course begins in the first term of the second year with an innovative phantom head course (figure 21) which allows the students to practise all the clinical and laboratory stages including preparation and re-

shaping of teeth to accept partial denture components.

The success of our undergraduate course may perhaps be judged by the generous praise that we have received from three different external examiners but we have come to the conclusion after ten years that perhaps a little more technology work would be beneficial and we are looking to see how this can be done in the five year curriculum.

including graduates from Hong Kong, Australia and China.

In 1991 we implemented a Diploma Course which is designed to be a postgraduate training for general practitioners and is very much orientated towards general practice. This is a part-time two year course enabling practitioners to study part-time while they continue to run their practices. We have four students in the first year and two in the second.

**Fig. 21** A second year student working on the specially designed phantom head.



### Postgraduate teaching

The Master in Dental Surgery course in Prosthetic Dentistry started in 1987. So far we have four graduates, one of whom was the first postgraduate student from China to complete the Hong Kong M.D.S. Two new students have completed one year, and another has just started. The course includes a large proportion of clinical teaching and practice and a research project. The clinical teaching is arranged on a modular basis. All students are required to take a complete denture and a removable partial denture module. They may then choose additional modules from occlusion, maxillofacial prosthetics and now implantology. The students have come from different backgrounds

### Qualifications gained by staff since 1980

Since the department opened in 1980 a number of staff have gained postgraduate qualifications. Dr. N.H. Cheung, lecturer 1983-88, completed the requirements of the M.D.S. Adelaide in 1984. Dr. T.W. Chow was awarded D.R.D.R.C.S. (Edin.) in 1985 and F.R.A.C.D.S. in 1988. Dr. Ted Fan, a part-time lecturer, was successful in the M.G.D.S. (Edin.) in 1987. Two staff members, Dr. Elizabeth Sinn and Dr. Theresa Leung completed the London M.Sc. in Prosthetic Dentistry in 1987 and 1989 respectively. Dr. M.F.Y.W. Eccles received the F.D.S.R.C.P.S. (Glas.) in 1989. Dr. Connie Chiu was the first to receive the M.D.S. (H.K.) in Prosthetic Dentistry and

Dr. M.D. Murray was awarded the Doctor of Philosophy Degree of the University of Hong Kong in 1990. Drs. George Lau and Robin Chung graduated M.D.S. (H.K.) in 1990. Miss Dorothy Chan gained the Certificate for laboratory technicians of the Hong Kong Polytechnic in 1987 and Miss Annie-Winnie Cheng became an Associate of the Chartered Institute of Secretaries in 1990.

### Clinical work

The clinical facilities of the department are on the fourth floor of the hospital and comprise 25 student places and 8 enclosed surgeries.

The staff of the department (figure 22) undertake clinical work in all aspects of the speciality of Prosthetic Dentistry, treating patients referred from other departments within the hospital and from other hospitals and practitioners.

The major areas of clinical work include difficult complete denture cases, restoration of partially dentate cases with fixed and removable prosthesis, implants, non-surgical treatment of temporomandibular disorders and maxillofacial prosthetics.

### Research

The main research themes in the Department are:

- (1) denture retention including physical aspects of complete denture retention, efficacy of clasps, properties and use of magnets, adhesive semi-precision attachments, new partial denture designs;
- (2) anatomical variations in Southern Chinese including the facial soft-tissue profile, the incisive papilla, the closest speaking space, the orientation of the occlusal plane and Frankfort plane;
- (3) acrylic resins including bond strength of acrylic resin and reinforcement of acrylic resin with high performance fibres;
- (4) dental handpiece performance.

Dr. M.D. Murray was awarded the Reckitt Prize by the British Society for the Study of Prosthetic Dentistry in 1985 and the Dentsply Shield by the European Prosthodontic Association in 1986.



**Fig. 22** The staff of the Department of Prosthetic Dentistry, June 1992.

## Academic Interchanges with China

Contacts have been established with several dental schools in China. Professor Clark has been appointed Visiting Professor at Jinan University, Guangzhou, and at Sun Yat Sen Medical University, Guangzhou, and has made many visits to these institutions.

Teachers from China have visited the Department for training and the first postgraduate student from China to take the M.D.S. course, Dr. Lu Guang Hong, has recently graduated. Academic interchange with China is expected to increase in the future. Three more Chinese academics are expected to come for training later this year.

## Further developments

The new five year curriculum offers exciting possibilities for increasing the clinical experience of undergraduates but this depends on how much time is available in the fifth year for this kind of work. If adequate time is available we would then hope to be able to modify the second, third and fourth year courses to provide more experience in the laboratory and techno-

logical aspects of the subject which as has been noted above, is perceived as a weak area now. In the fifth year students will be encouraged to treat more complex partial denture cases involving fixed prosthesis and complete overdenture cases. The department hopes also to be able to collaborate with other departments in the teaching of primary care, oral diagnosis and treatment planning of the more complex restorative cases and general practice within the fifth year.

The department will continue to be actively involved in research and looks forward to collaborate with the Oral Biology Unit and Department of Speech and Hearing Sciences in new projects as well as continuing our excellent collaboration with the Dental Materials Science Unit. We are also playing an active part in forming the Hong Kong College of Dentistry which will be part of the Academy of Medicine.

It is hoped that the diploma course will prove to be popular with practitioners and that increasing numbers may want to take this course. However, we anticipate that the number of people wanting to pursue the M.D.S. will not increase unless better opportunities for those with specialist training are provided.

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### **Doctor of Philosophy**

**1989**

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## **Master of Dental Surgery**

**1990**

### **Chung Wai Chung**

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### **Lau Chi Kai, George**

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**1991**

### **Lu Guang Hong**

Closest speaking space in native Cantonese speakers.

**PROSTHETIC DENTISTRY  
CURRENT STAFF LIST**  
**(Head of Department: Prof. R.K.F. Clark)**

**Professor:**

Clark, R.K.F., B.D.S.; Ph.D. *Lond.*; F.D.S.R.C.P.S. *Glas.*

**Senior Lecturer:**

Chow, T.W., B.D.S.; M.Sc. *Lond.*; L.D.S.R.C.S. *Eng.*; D.R.D.R.C.S. *Edin.*; F.R.A.C.D.S.

**Lecturers:**

Chiu, C.S.W., B.D.S.; M.D.S. *H.K.*

Dias, A.P.L., B.D.S. *Sri Lanka*; M.D.S. *Sing.*; F.D.S.R.C.P.S. *Glas.*

Dyson, J.E., B.D.S. *Lond.*

Ho G.F.C., D.D.M. *East*; M.Sc. *Mich.*

**Part-time Lecturers:**

Lau, G.C.K., B.D.S.; M.D.S. *H.K.*

Lee, Y.T., B.Sc.; M.Phil. *C.U.H.K.*; B.D.S. *H.K.*

San H.H.C., D.M.D. *East*; Cert.Med.Sc. *H.K.*; Cert.F.D. *Conn.*

**Clinical Dental Surgeon:**

Chung, R.W.C., B.D.S.; M.D.S. *H.K.*

**Honorary Clinical Lecturer:**

Tso, H.W.K., B.A. *Pacific*; D.D.S. *Northwestern*

**Postgraduate Dental Officers:**

Chan, C.H., B.D.S. *Melb.*

Yeung, K.C., B.D.S. *H.K.*

**Junior Hospital Dental Officers:**

Lau, I.K.Y., B.D.S. *H.K.*

Wu, P.B.C., B.D.S. *H.K.*

**Technician:**

Hui, C.O.L., C&G Final *U.K.*

**Laboratory Assistant:**

Man, J.S.F.



# DENTAL TECHNOLOGY UNIT

*Professor R.K.F. CLARK*

*Chairman,  
Dental Technology Unit  
Committee of Management*

Unlike many dental teaching hospitals we have a single Dental Technology Unit which provides technology services and teaching to all relevant departments and units. The Unit is staffed by a Senior Instructor and Instructors employed by the University of Hong Kong and technicians employed by the Prince Philip Dental Hospital.

The Unit is situated on the fourth floor of the Prince Philip Dental Hospital and consists of a large student teaching laboratory with 80 student places, attached to which are separate laboratories for casting, polishing and

plasterwork. The production technicians have two twenty-four-seat laboratories with their own polishing, casting ceramic and plaster rooms.

Satellite laboratories are located in the Department of Oral and Maxillofacial Surgery, Children's Dentistry and Orthodontics, Periodontology and Public Health, and Conservative Dentistry to allow technicians to work near the clinic areas used by these departments. There is another satellite laboratory adjoining the 6th floor junior and senior operative technique laboratories.



**Fig. 23** A group of technicians awarded the special prize instituted by the Dental Technology Unit Committee of Management for the outstanding achievement of obtaining all four Advanced City and Guilds Certificates with Professor Clark (Chairman, D.T.U. Committee) and Instructors.



Teaching in dental technology in relation to Children's Dentistry and Orthodontics, Conservative Dentistry and Prosthetic Dentistry is given by Instructors in the Dental Technology Unit under the direction of the Departments concerned and is integrated into the teaching programmes of those departments. Overall policy for the conduct of the Unit is the responsibility of a Committee of Management consisting of the Heads of Prosthetic Dentistry, Conservative Dentistry and Children's Dentistry and Orthodontics and the Senior Instructor in Dental Technology. The Head of Prosthetic Dentistry is the current chairman. Once policy is established instructors and technicians work to the instructions of the department to whom they are allocated.

Of the 42 technicians employed by the Prince Philip Dental Hospital, 22 have been successful in all four Advanced Certificates of the City and

Guilds of London Institute (figure 23); 5 have three and 14 have two.

Henry Luk Wai Kuen has gone on to an M.Phil. degree of the University of Hong Kong and has been appointed as Instructor in Dental Technology. He is now pursuing a Ph.D. Ho Kwok Hung is now a lecturer in Dental Technology at Hong Kong Polytechnic and is a candidate for the M.Phil. degree of the University of Hong Kong. Two other technicians, C.F. Ho and Y.Y. Cheng are also registered for M.Phil. Amongst the Instructors, Wayne Robinson is reading for the M.Sc. of the University of Surrey. C.F. Ho has been awarded a B.B.A. and seven other technicians are taking first degree courses.

A group of technicians won the Fuji Silver Award for 'Fine Work' at the 2nd International Dental Technology Congress, Kyoto (Japan), 1988.

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**Publications 1982-1992**

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## **DENTAL TECHNOLOGY UNIT CURRENT STAFF LIST**

### **Senior Instructor Dental Technologist:**

Torrance, A., C&G Final; Adv.Ortho.Cert.; Adv.Gen.Cert.; T.Cert.F.E.

### **Instructor Dental Technologists:**

Bentham, A.J., C&G Final; Adv.Ortho.Cert.

Crabbe, J.P., C&G Final; Adv.Crown & Br.Cert.; F.B.I.S.T.

Leung, C.K., C&G Final; Adv.Gen.Cert.; Adv.Crown & Br.Cert.; Adv.Ortho. Cert.; L.B.I.S.T.

Leung, S.F., C&G Final; Adv.Gen.Cert.; Adv.Max.Fac.Cert. (Dist. ); Adv.Crown & Br.Cert.; Adv.Ortho.Cert.; L.B.I.S.T.

Li, J.T.L., C&G Final; Adv.Gen.Cert.; Adv.Crown & Br.Cert.; Adv.Ortho.Cert.; F.B.I.S.T.

Luk, W.K., Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Max.Fac.Cert.; M.Phil. *H.K.*; L.B.I.S.T.

Ngai, S.K., C&G Final; Adv.Gen.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; L.C.G.; F.B.I.S.T.

Robinson, W., C&G Final; Adv.Ortho.Cert.(Cr.); Adv.Crown & Br.Cert.; L.B.I.S.T.

To, K.C., C&G Final; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; F.B.I.S.T.

Wong, K.K., C&G Final; Adv.Gen.Cert.; Adv.Crown & Br.Cert.; F.B.I.S.T.

## **Technicians I**

### **for the Department of Prosthetic Dentistry:**

Chan, H.W., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.

Chan, K.C., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.

Chan, L.Y., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.

Chan, Y.O., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.

Cheng, L.Y.Y., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Prosth.Cert.; Adv.Cons.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.

Cheung, K.K., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Ortho.Cert.; Adv.Max.Fac.Cert.

Cheung, W.W., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.

Fong, L.K., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.

Fong, S.K., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Intermediate Cert. in Teaching Methodology *H.K.Polytechnic*

Fung, C.S.C., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.

Ho, C.F., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.; *B.BA East Asia Open Institute*

Hui, C.F., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Cons.Cert.; Adv.Ortho.Cert.; Adv.Max.Fac.Cert.

Li, J.T.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.

Lui, A.M.L., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.  
 Ma, C.M., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.  
 Ng, C.F., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.  
 Ng, S.C.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Max.Fac.Cert.  
 Tsang, K.M., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; L.B.I.S.T.  
 Wong, C.Y., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Cons.Cert.  
 Wong, K.B., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Endorsement to Higher Cert. Dent. Tech. *H.K.Polytechnic*; Adv.Crown & Br.Cert.  
 Yeung, L.H., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.; L.B.I.S.T.

#### **for the Department of Children's Dentistry and Orthodontics:**

Chow, P.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Max.Fac.Cert.  
 Keung, W.S., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Max.Fac.Cert.  
 Lai, B.P.L., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.  
 Lam, Y.H., Cert.Dent.Tech.; Higher Cert.Dent.Tech.; Endorsement Cert.Dent.Tech.  
 Leung, K.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Ortho.Cert.; Adv.Prosth.Cert.

#### **for the Department of Conservative Dentistry:**

Chan, Y.L., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.  
 Cheung, K.C., Dip.Dent.Tech. *H.K.Polytechnic*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Max.Fac.Cert.; Intermediate Cert. in Teaching Methodology *H.K.Polytechnic*  
 Cheung, S.L., Higher Cert.Dent.Tech. *H.K.Polytechnic*; Endorsement Higher Cert.Dent.Tech. *H.K.Polytechnic*; C&G Intermediate; C&G Final; Adv.Crown & Br.Cert.; F.B.I.S.T.  
 Fung, Y.F., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Cons.Cert.;  
 Kam, A.C.K., Endorsement Adv.Cert.Dent.Tech. *H.K.Polytechnic*; Higher Cert.Dent.Tech.; C&G Intermediate; C&G Final  
 Lam, L.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Max.Fac.Cert.; L.B.I.S.T.  
 Lee, V.K.F., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Cons.Cert.; Adv.Prosth.Cert.  
 Mok, S.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.  
 Siu, Y.C., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Endorsement Higher Cert.Dent.Tech. *H.K.Polytechnic*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.  
 Tang, I.M.K., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.; Adv.Crown & Br.Cert.  
 To, L.Y.S., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.; Adv.Max.Fac.Cert.  
 Wong, K.S.C., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Crown & Br.Cert.; Adv.Prosth.Cert.

**for the Department of Oral and Maxillofacial Surgery:**

Cheung, K.H., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Prosth.Cert.;  
Adv.Crown & Br.Cert.; Adv.Max.Fac.Cert.; Adv.Ortho.Cert.; L.B.I.S.T.  
Leung, M.F., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Max.Fac.Cert.;  
Adv.Prosth.Cert.; Adv.Ortho.Cert.; Adv.Crown & Br.Cert.; L.B.I.S.T.  
Liu, C.Y., Dip.Dent.Tech. *H.K.Polytechnic*; Dip.Dent.Tech. *T.E.C.*; Adv.Max.Fac.Cert.;  
Adv.Prosth.Cert.

# *DENTAL MATERIALS SCIENCE UNIT*

## *Achievements and Perspectives*

*Dr. B.W. DARVELL*

### **Introduction**

Whilst it is necessarily true that dental materials have existed since the birth of dentistry, only sporadic attempts seriously to understand properties as functions of recipes and handling seem to have been made until about the 1920's. A handful of workers subsequently elevated such studies to systematic, but still largely pragmatic, enquiries after **what** exactly to teach as the best way of handling a given type of product, best in the sense of strongest, stiffest, or shiniest. It was not until materials science, in the wider sense, was conceived of in the 1960's as a discipline in itself was there any opportunity for further improvement. The opportunity was not taken. It took some 10 years for the idea to filter through to some of those in dentistry more receptive to new ideas that a comprehension of the effects of structure on properties was beneficial in considering the design of products for clinical use.

There has subsequently been an explosion of literature in the field, albeit of variable quality, such that very few cannot have heard of the subject. But in how many schools is it actually taught? There's the rub! "Very few" is the answer, and of those that do use the title, fewer actually do more than teach the old recipes and numbers and mixing instructions.

The argument for teaching dental materials science as a subject in modern dental degree curricula is simple: there is too much data on too many products to be assimilated, data which is outdated as soon as taught (if not before). Understanding of the structure and property

relationships of classes of materials is, on the other hand, of universal and enduring applicability.

The argument against is short-sighted: no immediate practical benefit (i.e. profit) can be perceived. The evidence for this is supposed to be the large numbers of dentists who have never had the benefit of such teaching yet have been perfectly successful in their careers. Yet there is no dental procedure which does not rely on a *dental material* of one kind or another: is it seriously a tenable proposition that a dentist of whatever flavour should not understand his materials? An engineer could not get away with being so unprofessionally ignorant.

### **Teaching and Research**

Dental materials science was included in the curriculum in Hong Kong from the outset, the Unit created as a separate, autonomous teaching entity, and facilities provided, yet it is not certain that its name was understood as more than a high-flown title for the old dental materials teaching - recipes and mixing instructions. The shock came when the course, written from scratch on first principles, was unveiled. It has been an uphill battle ever since. Gradually, it has been possible to get some recognition in the eyes of a few that it does have merit, that there is a point to basic understanding in the place of the rote learning of lists of numbers and 'facts', and that dentistry has no right to arrogate the epithet *scientific* unless this basic premise is properly instilled into its practitioners and installed in their teaching.

The problem has been, and one imagines that it will continue to be so for some time yet, the kind of clinical teacher who does not understand the subject and assumes that it is therefore unnecessary. The attitude that dental materials science does not matter will not be hidden to students, even if not overtly stated (which, rather surprisingly, has been the case at some times in some places), seriously undermines the development of the subject. The attitude goes so far as lead to the presumption that, because it is not understood, the way that the subject is taught is necessarily wrong or, worse, that what is being researched in the field is irrelevant.

Considerable progress has been made in that this year, after some 10 years of actual teaching of the subject, it has been made formally examinable as part of the curriculum, rather than just tested 'internally'. It is to be hoped that this strong signal would help convince the detractors that understanding is better than the mere regurgitation of received wisdom or model answers. In the course of the development of the teaching, a 200,000-word text has been produced dealing not just with the more conventional topics but also with many matters of great importance previously ignored. It has been gratifying to have graduates return to ask for a copy of the most recent version of the course text - because they now realise its value. In fact, enquiries have been received from two other dental schools wishing to adopt this text for their courses.

The Dental Materials Science Unit itself was originally allocated space and facilities without much conception of what was actually needed. On inspection, it was found that a considerable reorganisation and rebuilding was necessary. After pursuing the arguments, which were many, in favour of a reconstructed laboratory through numerous meetings, over more than a year, funds were won and a design approved. This laboratory is now perhaps the best in the world for its type: self-contained air-conditioning to a

high standard, clean electrical power supplies, and numerous other services and design details which permit a very wide range of kinds of investigation to be accommodated. In the face of considerable competition for resources, considerable amounts of equipment have been accumulated to support those investigations, and indeed used effectively by many Faculty members and others.

It is the combination of facilities and equipment that win the laboratory praise from all of the distinguished visitors that we have had over the years since it was built. These same aspects have enabled the 6 Ph.D.'s, 4 M.Phil.'s and 1 M.D.S. candidate that have been successful or are currently working for their degrees in this laboratory to pursue their studies in excellent conditions. Other proposals are in the pipeline which are stretching, even exceeding, the capacity of the Unit's staff to handle them. The popularity of the area for research has become such that it may be necessary to turn potential higher degree candidates away in the near future; it will be a great pity to stifle the enthusiasm generated in an atmosphere of better recognition of the value and scope of materials science in dentistry, and it must be to the detriment of the Faculty as a whole.

The research done in the Unit has centred on the understanding and development of test methods for dental materials. That is, with a view to having test results which are properly interpretable in the service context, for it is a sad fact that many tests used to date have no discernible relevance to application conditions. Even so, one major project, conducted by Dr. Hugo Ladizesky and his team, concerns the reinforcement of acrylic denture bases with special polyethylene fibre. This work has won substantial financial support from central funds and promises to generate several more important publications.

The Unit is also provided with a machine workshop, an essential adjunct to any such

laboratory, which can produce, through the inestimable services of its technicians, nearly all that is required in the way of specialist jigs, moulds and other apparatus for its research.

The initial establishment for the Unit was the just the Head, one technician and one secretary. However, the volume of work anticipated was enough to permit the rapid expansion of staff, adding a lecturer, a demonstrator and two senior technicians very early on.

Dr. Brian Darvell has been since 1980 the Hong Kong Observer Member of the International Organization for Standardization Technical Committee for Dentistry (ISO TC106), playing on active part in the development of a number of dental standards. In 1986, the annual business meeting of TC106 was held in the Prince Philip Dental Hospital, and organized by the staff of the Unit. This was a very successful event, and one that did much to establish the international reputation of the Unit.

The Unit's staff have also been involved in many varied dental projects in an advisory or collaborative capacity, where help in experimental design, data analysis and interpretation have supplemented and nurtured the simple spirit of enquiry in the clinical context, which spirit is the essence of good research. The Department of Prosthetic Dentistry has, in particular, availed itself of these facilities, with the Department of Conservative Dentistry increasingly doing so. In fact, recently a joint 'Advanced Restorative Materials' research laboratory has been established with the latter department. Again, the volume of work from this general source within the Faculty has steadily increased as the expertise of the Unit in such matters has become recognised, and the departure this year of one of the teachers in the Unit will add to the difficulties of satisfying the demands made on it. Staff of departments elsewhere within the University have also made good use of the facilities, for example Anatomy

and Mechanical Engineering. It is a pity that this Unit, one of the most productive divisions of the Faculty, is now suffering a severe curtailment of its funding because of external pressures.

The importance of the subject is, however, recognized by industry. In 1988 I.C.I. Dental instituted a prize in Dental Materials Science, now carried on by G.C. Dental. It is to be hoped that the mere fact that such a prize can be awarded meaningfully is enough to demonstrate that the subject is accessible to dental students when properly motivated.

## Perspectives

Dentistry is facing difficult times, with economic constraints being imposed by those who, it will be said by our clinical leaders, do not understand dentistry and the need for dental health provision. Yet, internally, the least understood subjects will suffer in analogous fashion when the cuts are made, and dental materials science unfortunately comes into that category. But if dentistry is to remain credible, with medical and technical advance occurring at an increasing pace all around, the nettle must be grasped. Dentistry can only survive as a **scientific** discipline, and its science must be defended and promoted, preached and demonstrated. The prospects for Dental Materials Science depend, ultimately, on the recognition of its importance to dentistry as a whole by those who wield the power. This is not a matter of good will or favour, but a relinquishing of the old view that clinical dentistry is a closed shop that needs no help from outside its own narrow confines, and the true adoption (rather than mere lip service) of the attitude that it is a fundamental subject, committed to one thing and one thing only - better dentistry.



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### **Doctor of Philosophy**

**1989**

#### **Leung Wing Hang, Vitus**

Calcium phosphate system in saliva-like media.

### **Master of Philosophy**

**1991**

#### **Luk Wai Kuen**

Aspects of dental casting in phosphate-bonded investments.

**DENTAL MATERIALS SCIENCE  
CURRENT STAFF LIST**

**(Head of Unit: Dr. B.W. Darvell)**

**Senior Lecturer:**

Darvell, B.W., M.Sc. *Wales*; Ph.D. *Birm.*; C.Chem.; F.R.S.C.; F.S.S.

**Lecturer:**

Ladizesky, N.H., Lic.P.; Ph.D. *Brist.*; M.Inst.P.

**Demonstrator:**

Leung, V.W.H., B.Sc.; Ph.D.; C.Chem.; M.R.S.C.

**Senior technicians:**

Ho, B.S.W.

Yuen, T.D.B.

**Technicians:**

Cheung, G.S.K.

Lee, P.K.D.

# ORAL BIOLOGY UNIT

## *Achievements and Perspectives*

*Dr. H.P. PHILIPSEN*

### Introduction

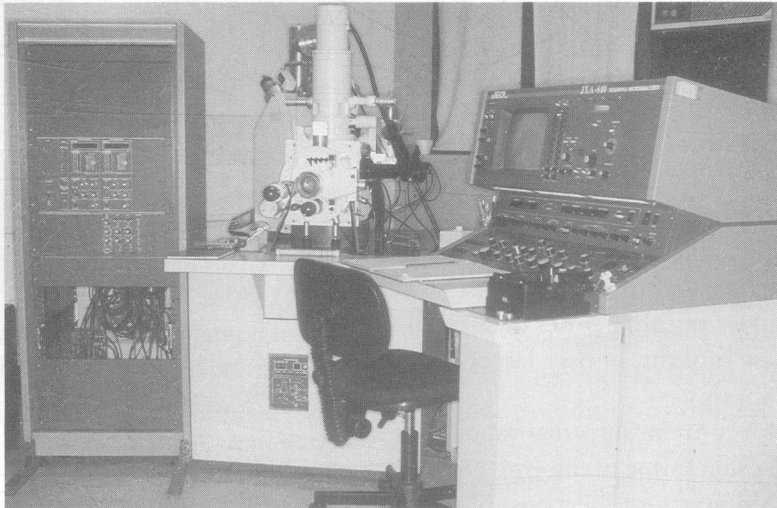
In 1983, the Board of the Faculty of Dentistry submitted planning proposals for the establishment of a Department of 'Science in Relation to Dentistry' (S.R.D.). In addition to having teaching responsibilities at both undergraduate and postgraduate levels, it was envisaged that this Department would serve as a centre for multidisciplinary research in the Prince Philip Dental Hospital, and promote the integration of basic and clinical sciences.

Subsequently, the Faculty was visited by Professor D.K. Mason, University of Glasgow, whose advisory remit included the future devel-

opment of research in the Faculty, with particular reference to the S.R.D. facilities. Professor Mason's report which included the creation of a new Faculty Unit was considered and approved by the Faculty Board in November 1987, and then by the Senate in February 1988.

In July 1988, the Oral Biology Unit (O.B.U.) came into being as a multi-purpose laboratory facility on the fifth floor of the hospital. At that time, Dr. E. Theilade was appointed Reader in Oral Microbiology.

On October 1, 1989, the post as Reader in Oral Pathology was filled by Dr. H.P. Philipsen. Upon the resignation of Dr. E. Theilade in October 1990, Dr. L.P. Samaranayake took up



**Fig. 24** The scanning electron microscope installed in the OBU is used for studying the ultrastructure of cell surfaces of lining epithelia (oral mucosa, odontogenic cyst linings), of microvasculature of tongue papillae and surface topography of polyethylene fibres used to reinforce denture base resins.

the vacant post as Reader in Oral Microbiology and Immunology, on June 1, 1991.

### Teaching commitments

Being a teaching unit, the two academic staff members are also responsible for organizing, co-ordinating and participating in several courses, seminars and practicals in oral pathology and oral microbiology for B.D.S. students.

Further, the staff participates in courses for trainee D.S.A.'s and Dental Hygienists, and seminars to postgraduate students working in the Unit. A proposal for an Oral Biology Unit-monitored 'in-house' M.D.S. core course has recently been submitted as per the request of the Faculty Higher Degrees Committee.

The Unit's teaching programme is continuously being revised and is evolving to suit the changing requirements of the new B.D.S. curriculum.

### The Oral Biology Unit Guide Book

As it was felt that faculty staff members were not all fully conversant with the guidance and the assistance the Unit may offer, an Oral Biology Unit Guide Book was produced in November 1991 for distribution to all Departments and Units.

It contains an overview of the services and the expertise the Unit is able to provide. The Guide Book is meant to be a 'pathfinder' for colleagues who wish to initiate research either on a small scale, lasting a few months, or on a larger scale leading up to a thesis.

The Guide also contains information on the current research programme of the Unit and an inventory of equipment and their possible use.

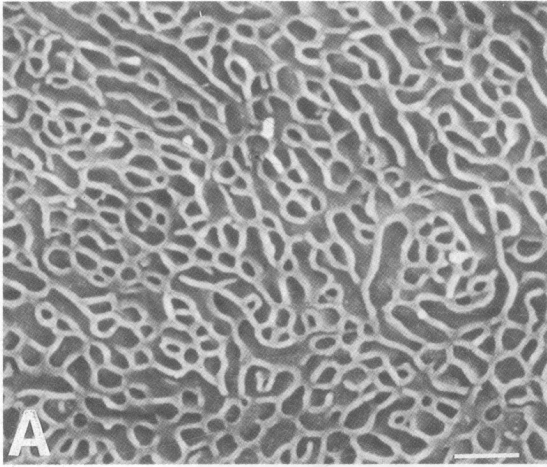
### Research

Being a Faculty Unit, the Oral Biology Unit is

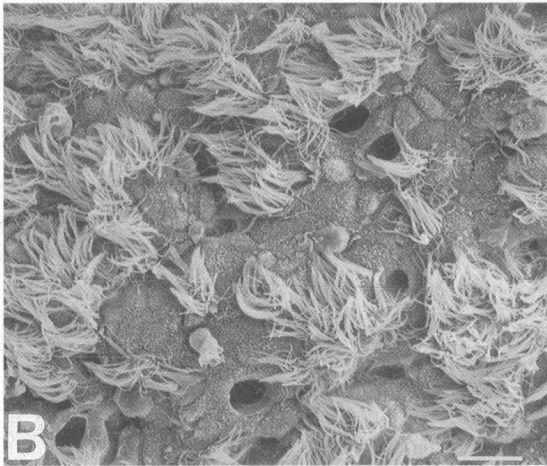
open to all staff members of the Prince Philip Dental Hospital who want to pursue biological research. The Unit is well-equipped with modern research tools, including a fully equipped scanning electron microscope (figure 24), and has a good provision of purpose-built laboratory space. Facilities for microbiological research are available on the seventh floor.

The Unit also promotes collaborative research projects with researchers from other University Faculties (in particular the Departments of Anatomy and Microbiology), the Chinese University of Hong Kong, and, Universities and Research Institutions outside Hong Kong (namely the Free University of Berlin [Germany], the University of Bristol [UK], the University of Aarhus [Denmark], the University of Helsinki [Finland], the Sun Yat Sen University of Guangzhou [China], the University of Beijing [China] and the University of Hiroshima [Japan]).

On-going research projects (some of which for M.D.S., M.Phil. and Ph.D. degrees) presently include the following subjects: denture base resins reinforced with polyethylene fibres; marginal adaptation of bonded composite resin restorations; fissure caries model; scanning electron microscopy of micro-cracks in teeth; effect of bleaching on discoloured dental enamel; surface morphological changes and wear behaviour of glass-cermet cement and amalgam restorations in primary molars; age determination based on regressive changes in human hard dental tissues; clinical and microbiological features of lateral periodontal abscess; structure of the squamous epithelium in odontogenic cysts; (figures 25 and 26) clinical and histopathological features of the desmoplastic ameloblastoma; scanning electron microscopy of the rat mandibular joint; vasculature of the temporalis muscle flap; role of intercellular junctions and intermediate filaments as structural markers during malignant transformation in human epithelial neoplasms; microvasculature of the



**Fig. 25** Part of the outermost surface of a single cell of the epithelial lining of a radicular cyst as seen in scanning electron microscopy. Notice the well-developed pattern of microprojections characteristic of a non-keratinized cell membrane. Bar = 1  $\mu\text{m}$ .



**Fig. 26** Part of the luminal surface of a residual cyst showing focal epithelial metaplasia. Notice several "hairy" (ciliated) cells. The black circular holes indicate recently emptied goblet cells. Bar = 100  $\mu\text{m}$ . Scanning electron microscopy.

human oral mucous membrane; coaggregation of *Fusobacterium nucleatum* EF 9126 with other oral bacteria and the ability of monoclonal antibodies to inhibit this coaggregation;

ultrastructural features of penetration of *Candida* pseudohyphae through oral epithelium in HIV-associated oral candidiasis; surface morphology of normal and cancerous human oral epithelium grown *in vitro*; pathogenic features of *Candida krusei*; biotypes of oral *Candida albicans* isolates in HIV infection; oral carriage of *Candida* species and coliforms in children before and during orthodontic therapy; effect of lactoferrin and apolactoferrin on *Candida* species; phenotypic changes in *Candida albicans*; oral carriage of *Candida* species and their biotypes in an adult Chinese population; microbiology of titanium dental implants; coral implantation in canine mandibles; microbiology and ultrastructure of angular cheilitis; attitudes of Hong Kong patients towards the HIV infection and AIDS; halitosis: characterization of oral malodours; effect of low dose laser on fibroblasts and oral epithelium *in vitro*.

Detailed information on current research programmes can be read in the Oral Biology Unit Guide Book.

Finally, it has recently been approved by the Faculty Board that the activities of the so-called 'Forensic Odontology Group' - established some years ago by the then Professor R. W. Fearnhead - are to be monitored by Dr. H.P. Philipsen of the Oral Biology Unit.

## Perspectives

The Dental Faculty is now celebrating a successful first decade of its existence. It has an undergraduate educational programme second to none in addition to an excellent dental health care delivery system benefiting the Hong Kong community.

The Oral Biology Unit, as the youngest division of the Faculty of Dentistry, is aiming to fulfil the above needs and aspirations of the Faculty by serving as a focus for both research and diagnostic sciences while fulfilling its broader



commitments as a teaching Unit. Our perceptions of the future perspectives of the Unit are briefly outlined below.

The availability of multipurpose and well-equipped laboratory facilities have already made an impact on the recruitment of young researchers from the Faculty as testified by the list of on-going research. It is hoped that this trend will continue in the future.

The Unit is actively seeking to encourage collaborative research with the People's Republic of China mindful of both the enthusiasm of these research workers and the political changes in the offing. Currently, collaborative research is being conducted with Sun Yat Sen University, Guangzhou, and Beijing University, Beijing.

Apart from China, the Unit is presently conducting collaborative research with workers from Germany, Denmark, Finland, England, and Japan. It is felt that continued international collaboration will not only raise the research profile of the Unit but also the Faculty of Dentistry as a whole.

On the local scene good collaboration is well established with the Chinese University and the City Polytechnic.

The infection control aspects of Dentistry has assumed a renewed importance with the advent of the HIV-infection. Dr. L.P. Samaranayake has expertise in this area and is continuing to act as a consultant to both the dental hospital and dental clinics and, hospitals in the territory.

Diagnostic oral microbiology is a young discipline which, so far, has not been practised in

Hong Kong. The proposed establishment of an in-house diagnostic microbiology facility in the Oral Biology Unit will result in a fast and specialist reporting system - a necessary prerequisite for a teaching Hospital.

Plans are also afoot to seek contacts with scientists in the Asian/South-East Asian region in an attempt to establish regional seminars and workshops on topics of mutual interest and to arrange courses for young researchers in order to disseminate current research knowledge and experience. For instance, the Oral Biology Unit staff having expertise in oral aspects of HIV-infection plan to launch a regional workshop on oral manifestations of HIV infection.

The Oral Biology Unit intends to liaise with the Faculty Research Committee with the purpose of identifying areas of research excellence/potential in the Faculty and to coordinate the development of research projects on the basis of individual and departmental initiatives. The recent appointment of Dr. L.P. Samaranayake as chairman of the Faculty Research Committee should help facilitate these plans.

Undergraduate B.D.S. students are the researchers of the future. Hence the Oral Biology Unit aims to encourage and expose students to research-oriented activities by actively participating in elective research projects undertaken during the undergraduate curriculum.

An 'open-house' day for B.D.S. students is planned with the aim of demonstrating a 'working research laboratory'.

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**ORAL BIOLOGY  
CURRENT STAFF LIST**

**(Head of Unit: Dr. H.P. Philipsen)**

**Readers:**

**Oral Pathology:**

Philipsen, H.P., D.D.S. *R.Dent.Coll. Copenhagen*; Dr.Sc. *R.Dent.Coll. Aarhus*

**Oral Microbiology:**

Samaranayake, L.P., B.D.S. *Sri Lanka*; D.D.S. *Glas.*; M.R.C. Path.; C.Biol.;  
M.I.Biol.

**Chief technician:**

Pang, M.K.M., C.L.T. *H.K.Polytechnic*; H.C.S.L.T. *City & Guilds*; C.S.E.M. *Jeol Japan*;  
D.C.P. *Austria*

**Laboratory technicians:**

Chui, Y.P.

Lee, M.T., C.L.T. *H.K.Polytechnic*

Lee, S.H.W.

Yung, K.L., C.L.T. *H.K.Polytechnic*

**Laboratory assistant:**

Chan, I.R.





# STUDENTS' LIFE IN THE FACULTY

*Contributed by Drs. E.F. Corbet  
and E.C.M. Lo*

During the research (unfunded) for this overview of students' life, throughout the years of the Faculty, one realization dawned. It became apparent that what are perceived by undergraduates to be hardships and tribulations while the course is being undertaken, come to fade in the warm glow of reminiscence that portrays undergraduate studies as the best days of one's life. As this research was only preliminary in nature, it cannot be concluded whether this shift in perception of student life in the Faculty is due to the pressures of professional life after qualification bringing about a reassessment of the nature of the graduates' experiences prior to qualification or due to a more fundamental reevaluation.

On the face of it, the life of a dental student in the Faculty is tough. Initially the first year was a very testing one for recent school leavers, both in academic and social terms. Despite a reduction in teaching load, it still is. Then follow the clinical years, with their apparently unceasing and relentless acquisition of knowledge and skills. Each day, commencing before 08:30, seems to blur daily, into a surreal journey from a quick change into blue in the locker room — to seminar room — to clinic — to the computer room — to canteen — to lecture theatre (for a welcome period of rest and respite) — to seminar room — to techniques laboratory — to library — to late night phone calls trying to manage the family of patients — to home, minihall or hall (figure 27).

Those students able to distance themselves from this circuit (and staff members and visitors who have studied dentistry elsewhere) can real-



**Fig. 27** In the Library — study and study !

ize, even if not fully appreciate, that in their daily rounds the Hong Kong students receives much help, aid and assistance from receptionists, computer operators, dental surgery assistants, dental technicians and dental hygienists. The level of support offered to dental students in this Faculty must equal, if not surpass, that found in any dental school anywhere in the world. That students' most common description of their life is 'harsh' (see for reference the 17th A.P.D.S.A. Congress Journal) the demands placed by the Faculty on the students, despite the level of support, must indeed be considerable (a neat non-judgemental adjective that).

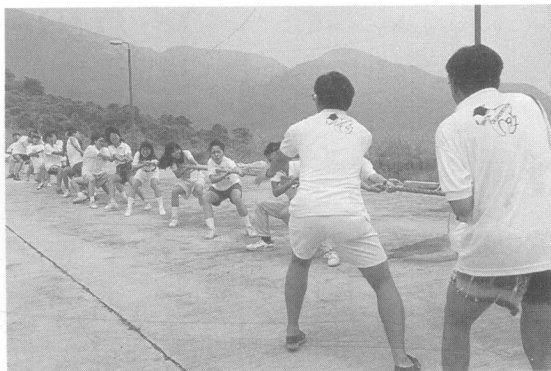
When D.S.A.'s are more of a permanent fixture than less mature students who pass through any clinic year-by-year, as would be expected, occasional friction arises, reminding us all that the teaching in behavioural sciences and communication skills needs to be consistently reinforced. There have been a few, but not that many, marriages of graduates to D.S.A.'s

and hygienists. Perhaps, like other Asian dental students, the Hong Kong dental students might be provided with a course on social skills, but who on earth could be found to teach it.

It appears as though many of the features which the founding fathers of the Faculty adopted as central to the attainment of the educational aims which they set are more tolerated than welcomed by the consumers, the students. The small group teaching system, which puts six to eight students together for most of their undergraduate career, is accepted rather than treasured. However this constant exposure, one to another, of a small group of student colleagues, has fostered close friendships, working partnership and relationships of an even closer and hopefully enduring nature. Having a small group of colleagues helps, through mutual support, in what is every dental students' most consuming occupation: remembering what answer to give to the same question in each of the different departments.

With English being the language of instruction but not of conversation, the small group teaching method allows for a relatively satisfactory mix of languages in educational interaction. The Group Tutor scheme, being largely a cultural import, has been treated to the Hong Kong strategy for the management of unwelcome foreign impositions. The scheme has now been Hongkongized.

A student's formal introduction to student life comes about through the Orientation Programme, including the Orientation Camp, organized by the student society, the Dental Society (figure 28). The Dental Society is the expression of organised student life within the Faculty. Over the years of the Faculty the fortunes of the Dental Society have rather flowed and ebbed in harmony with the overall performance of its parent, the Hong Kong University Students Union. Just at present it has reached a trough. Perhaps there is an inverse relationship to the performance of the Hang Seng Index; this



**Fig. 28** Orientation camp — where teamwork started.

should be investigated. Could there be a research grant in that project, I wonder.

In addition to all that the Dental Society does towards promoting the day-to-day well-being of the student body, it has also involved itself in the community through the Dental Public Health Committee, which has over the years mounted programmes and exhibitions all over Hong Kong (figure 29). Charting the progress of the Faculty from the students' viewpoint, more or less since its inception, has been "The Apollonian". The Dental Society, through its Apollonian subcommittee, has made a unique contribution to the Faculty. To finance this publication, various dental products exhibitions for graduates have been held, and all



**Fig. 29** Health exhibition — serving the community.

students involved in such types of activities, including Faculty Open Days, have acquired financial and managerial skills of great value to them in their future professional career.

It is a constant moan of those staff involved in student affairs in the Faculty that it is always only a very small number of the whole student body which actively involves in the events of the Dental Society, and this is a real pity (and that for what it is worth is a judgemental interjection).

Central to the social life of the Dental Society is the Dental Festival which usually consists of a week of dancing, theatrics, fun and music making in the evenings. In the earlier days and indeed recently resurrected, there were regular high table dinners, with one of those being particularly memorable in that with the wine having been donated by the then Dean and having flowed freely, the table was far from the only thing to be high. An invited speaker was present to speak on Ethics in Dental Practice. Of course he chose to start with the Warning Notice of the Dental Council of Hong Kong which warns specifically of the abuse of alcohol.

Early on, dental students, under the encouragement of some enthusiastic staff members, established themselves as champion rowers. However, coming from a small Faculty, dental students have never really triumphed in inter-faculty competitions such as sports meets, inter-faculty choral competitions and the likes. It has been suggested repeatedly that the Faculty admissions policy should seek out the most talented applicants. It does, but their talents are in cutting crowns, extracting teeth and in supporting each other. It has been noted that dental students of different years interact and assist each other more than students in many faculties in Hong Kong.

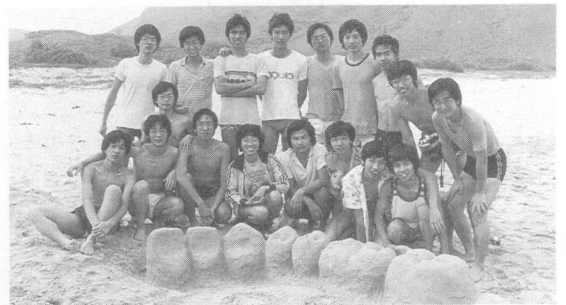
The Dental Faculty, being set off campus in a hospital, without the same sense of community engendered by the satellites around the teaching hospital in the Faculty of Medicine,

has resulted in dental students being less active in university affairs than students of many other faculties. Also they are far too busy. Their business largely keeps them out of mischief, but the potential for mischievousness in many of them is readily apparent.

From the early days the Hong Kong dental students have already taken an international view. A long running student exchange programme with the National University of Singapore has proved, over the years, to be very successful. After some initial hesitancy, have the Hong Kong dental students joined the Asian Pacific Dental Student Association, and Hong Kong was the host of the 17th A.P.D.S.A. Congress in Hong Kong in 1990. Over the years, either through Public Health projects or electives, Hong Kong dental students have had interaction with students from many dental schools in the region. It has been reported that in general they have made good ambassadors for and have reflected well upon this Faculty.

If a student's formal introduction to student life comes through the Orientation Programme, then his or her formal farewell comes at the Graduation Ball a traditional celebration of success which has been held year-by-year in various hotels and clubs around the territory.

The formality of these grand occasions may seem to be a life-time away from the boisterous, free and relaxed Orientation Camp camp-fires (figure 30). In reality, it probably is.



**Fig. 30** Leaving behind dental traits wherever they go.



# THE ALUMNI

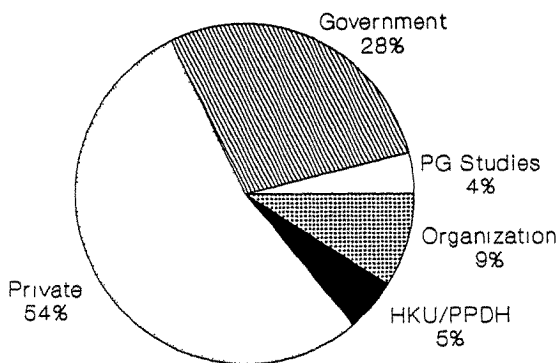
*Contributed by Drs. E.F. Corbet  
and E.C.M. Lo*

The first class of dental students of The University of Hong Kong commenced their undergraduate training in September 1980 and in 1985 sixty-eight of them became the pioneer species of B.D.S. (H.K.) colonising the dental profession of Hong Kong. The Dental Faculty has produced about 480 graduates between 1985 and 1992.

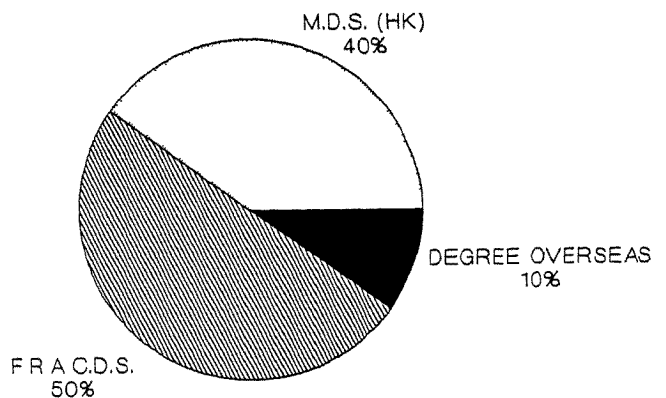
Nearly all of these graduates, about 95%, have stayed in Hong Kong, contributing in various ways to the service of the local community. More than one-half of them are in private practice, among whom about two-thirds are practice owners, either in partnership or on their own, with the remainder working as associate dentists. Many graduates of the University of Hong Kong have established practices in areas which were previously underserved by dental care providers. About a quarter of the graduates have been able to join the government dental service while 9% are employed by vari-

ous other organizations. A small proportion is engaged in full-time postgraduate studies, with a further proportion employed by the Dental Faculty (figure 31). Indeed, at least one member of the full-time staff in each department of the Dental Faculty is a local dental graduate who has obtained a post-graduate qualification.

Many of the locally-trained dentists are very active in pursuing post-graduate studies and various forms of continuous education. At present about 50 local dental graduates have obtained postgraduate qualifications, mostly the Master of Dental Surgery (M.D.S.) degree from this University and the Fellowship of the Royal Australasian College of Dental Surgeons (F.R.A.C.D.S.). Quite a number are currently studying for higher degrees or are under higher training (figure 32). Thus, it can be foreseen, in keeping with local traditions, that the number of local graduates with postgraduate qualifica-



**Fig. 31** Job/Employment Status  
1985-91 Graduates



**Fig. 32** Postgraduate Qualification  
1985-91 Graduates

tion will continue to increase. It remains to be seen how the Hong Kong Academy of Medicine impacts upon this.

The Faculty's graduates have established a H.K.U. Dental Alumni Association. Most of the graduates and full-time teachers of the Fac-

ulty are members. Through its regular publications and various social and academic activities the Alumni Association helps to promote the relationship between the Faculty of Dentistry and its graduates and among the graduates themselves.

*DENTAL GRADUATES*  
*1985 — 1992*





Dental Graduates 1985

## BDS Graduates 1985

CHAN Chi Kwong, Tommy  
CHAN Hing Chung  
CHAN Kim Ho  
CHAN Man, Denis  
CHAN Pik Lim, Monique  
CHAN Sai Kwing  
CHAN Sang Kwai  
CHAN See Ching  
CHAN Tak Ho  
CHAN Tat Man  
CHENG Wan Leung  
CHENG Lap Kei  
CHENG Sun Yuen  
CHEUNG Big Chu, Gloria  
CHEUNG Shun Pan  
CHOW Cheuk Lam  
CHOW Kiang Cheong  
CHOW Tak Kun  
CHU Wen Ying, Rebecca  
CHU Yee Man, Ronnie  
FUNG Yuk Chan, Ivy  
HUI Yuk Lun  
IO Ian  
KWONG Siu Kuen  
LAM Ho  
LAU Wing Kam, Janet  
LAU Yun Wah  
LAW Chun Tao  
LEE Tat Ming  
LEE Yeung Mun  
LEE Yu Tak  
LEUNG Shu Keung, Terence  
LEUNG Yuet Ngor, Francesca  
LIE KEN JIE Ket Phoei, Ronny  
LING Kit Tong  
LING Yee Yung, Terence  
LO Chin Man, Edward  
LO Tak Po  
LUK Wai Chi  
MA Sheung Sze, Nelson  
MAK Wing Yeung  
NG Chi Wa  
NG Yuan Ling  
POON Wing Hong, David  
SAM Shek Ming  
SHIH, Edgar  
SIU Kin Wah  
SO KWAN WING, Siao Chiao  
SO Siu Ping  
TONG Sui Ming, Lily  
TSANG Chor Kwan, Marisa  
TSANG Wai Ming  
TSE Chiu Shing  
TSE Wai Yin, Kenneth  
TSE Wang Doo, Dominic  
TSOI Yuk Lin  
TSUI Hing Chung, Sunny  
WAN Shiu Yung  
WANG Shi Chi, George  
WONG Chi Kong, Walter  
WONG Hing Kuen  
WONG Woon Yee, Ivy  
WU Suk Lai  
YEUNG Kar Hing  
YEUNG Wai Kit, Richie  
YIU Bun Ka  
YUNG Chiu Wah, Sammy  
YUNG Kam Ming, Louisa



Dental Graduates 1986

## BDS Graduates 1986

AU Kwok Yin, Henry  
CHAI Yat Chiu, Johnny  
CHAN Ho Wang, Anthony  
CHAN Kin Wei, Peter  
CHAN Po Yee  
CHAN Wing Kit, Paul  
CHIK Fu Fai  
CHIU Siu Wai  
CHUNG Ting On  
HO Chi Wai  
HUANG Yu Suen, Samuel  
HUI Chi Ming  
HUI Yee Lung  
KOO Kwok Wing, Harry  
Kwok Yu Chiu  
KWONG Share Moon  
LAI Ho Wan, Anthony  
LAM Chung Yin  
LAM Sin Yee, Audrey  
LAM Tin Wai  
LAU Chi Kai, George  
LAU Kin Kwan, Kenny  
LAU Po Sun  
LEE Ho Chi, Dominic  
LEE Kin Man  
LEE Kwok Lun  
LEUNG Siu Fai  
LEUNG Tat Ming  
LEUNG, Theresa  
LEUNG Wai Yuen  
LEUNG Yin Hon, Alexander  
LEUNG Yuen Man, Rose  
LI Ka Lun, Thomas  
LIU Wing Hong  
LO King Man  
LO Lai Hing  
LUI Kwong On, Moses  
LUI Wai Kay, Wilkie  
MA Chun Kai, Raymond  
MAK Yun Lok, Raymond  
MOK Ho Yuen  
NG Kwok Chi  
NG Yeung Yuen  
SHE Wai Keung  
SHUM Wai Shing  
SIU Hung Kwong  
SO Lai Ying, Lisa  
SOONG Hung Hung, Henry  
SOU Son Chio  
SUN Yee Wha, David  
TAM Chi Keung  
TAM Yi Hung  
TANG Lai King, Endarra  
TANG Siu Chuen, Andrew  
TONG Chi Kit, Antonio  
TSANG Wai Kit  
TSUI Fu Fung, Philip  
WAN Kin Cheung  
WONG Chi Man  
WONG Man Hei  
WONG Ping Kei, Paul  
WONG Si Chiu  
WONG Wai Kwong  
WONG Yiu Kai  
WONG Yuk  
WU Kai Shing  
YAO Wai Kei  
YU Cheuk Fai  
YU Wai King  
YUEN Fan Fai, John  
YUEN Kwok Chung  
YUEN Kwok Wah



Dental Graduates 1987

## BDS Graduates 1987

CHAN, Edward  
CHAN Kwok Ming, Benedict  
CHAN Tak Kam  
CHAN Wai Chun, Jimmy  
CHAN Wing Pui  
CHAN York Wah, Teresa  
CHENG Ka Lun  
CHIU Kai Chung  
CHOW Sai Hoi, Paul  
CHUI Kwai Sing  
CHUNG Wai Chung  
FOK Kwong Chi  
FUNG Siu Chung  
FUNG Wai Ping  
FUNG Yuet Ching, Jenny  
HO Chi Kwong  
HO Ka Lok  
HO Yue Chuen, David  
HUNG Hing Tung  
KAN Kwok Hung  
KWAN Ka Hung, Julian  
KWAN Suk Man, Carmen  
KWAN Yuen Ching  
  
LAI Moon Cheung  
LAM Chi Keung, Wallace  
LAM Kam Wing, Gordon  
LAM Ming Wa  
LAU Kwai Yung  
LAU Ming Keung  
LAU Siu Man, Susan  
LAU Yuk Cheung  
LEE Chi Sing, Alex  
LEE Chun Kei  
LEE Chun Lam  
LEE Chung Kin, William  
LEE Kin Man  
LEE, Steven  
LEUNG Chui Yee  
LEUNG Chun Fung, Albert  
LEUNG Kin Chiu, David  
LEUNG Kwok Man  
LEUNG Shuk Fong, Abigail  
LEUNG Wai Keung  
LIU Kwok Wai, Harry  
LO Woon Man  
  
MA Chi Keung, Fergus  
MA Mei Ha  
MAK Kam Chuen  
NG Hung Chun, Corrie  
NG Kwai Sang  
POON Hung Wai  
SO Hon Ching  
SUM Sui Cheung  
TONG Kwai Sing  
TSANG Hing Suen  
TSE Lap Kee  
WONG Cheuk Yin, Cherry  
WONG Chi Man, Vitus  
WONG Ching Min  
WONG Wai Lan, Fanny  
WONG Wan Man  
WONG Wei Chih  
WONG Wing Kit, Ricky  
YAO Ching Yee, Stephen  
YAU Yi Kwong  
YEUNG Kai Yuen  
YIP Shuk Yin



Dental Graduates 1988

## BDS Graduates 1988

CHAN Chun Ti, Albert  
CHAN Kwok Keung  
CHAN Siu Kin, Kenny  
CHAN Sze Kin  
CHAN Wai Kit, Raymond  
CHAN Wo Chi, Francis  
CHAU Man Ling  
CHENG Che Kwong  
CHENG Chi Wing, Kevin  
CHENG Wai Yee, Winnie  
\* CHEONG Wai Mun, Shirley  
CHEUNG Hung Fai  
CHEUNG Loi Ming

CHEUNG Tat Leung  
CHEUNG Yee Ling  
CHOW Hon Shing  
CHOW Kwok Fai  
FOO Tai Chuen  
HO Sai Chun  
HO Wai Mei  
HOU Sze Pui  
KAN Kwok Wing  
KEE Cheung Hon  
KUM Chun Sing  
LAI Chun Shan, Johnson  
LAM Kong Kwai

\* LAM Siu Fei, Lisa  
\* LAM Siu Hei, Mona  
LAM Tak Chiu, Wiley  
LAW Hau Che  
LAW Kwong Ming  
LEE Pak Cheung, Patrick  
LEUNG Chi Kong  
LEUNG Chi Sang  
LEUNG Ho Pan, Luke  
LEUNG Siu Fai  
LEUNG Tuen Lai  
WONG Oi Yin

\*Graduates with Honours





Dental Graduates 1989

## BDS Graduates 1989

CHAN Chi Ho  
CHAN Fung Yee, Vera  
CHAN Hoi To  
CHAN Ka Yuk  
CHAN Sze Wai  
CHAN Wai Tak  
CHEUNG Yip Man  
CHIU Mei Ling, Bonnie  
CHU Chun Hung  
CHU Lai Ping, Christine  
HIN Wai Hung  
HUI, Edward  
HUI Yiu Ming  
KAM Kau Lai, Viola  
KEE Tak Kin, Terry  
KWOK Ching, Eddie  
KWOK Tin Wah  
  
LAM Pok Lai, Anthony  
LAM Tze Kin  
LAU Hau Yan  
LAU Yun Hing  
LEE Fung Bo  
LEE Kai Ming  
LEUNG Kim Fai  
LEUNG Man Kit  
LI Keung  
NG Kai Cheong, Desmond  
NG Lap Shun  
NG Siu Hong, Emil  
NG Wai Sang  
PANG Chak Yan  
SEE Tak Kuen, Peter  
SIN Wai Man, Raymond  
SUN Tak Him  
  
TAM Chun Ming  
TANG Hon Ming  
TANG Kit Ching, Grace  
TONG Ka Ming, John Kevin  
TSANG Chiu Shun, Peter  
TSANG Wai Kit  
TSUI Yuk Ming, Alfred  
WONG Chi Cheong  
WONG Chi Wai  
WONG Chung Shun  
WONG Wai  
WOO Lap Keung  
YANG Cho Ming  
YAO Cho Yan, Freddie  
YAU King Sun  
ZEE Kwan Yat



Dental Graduates 1990

## BDS Graduates 1990

CHAN Chi Lap, Samuel  
CHAN Chun Ming, Calvin  
CHAN Lai Hon  
CHAN Sheung Wing  
CHAN Wai Kwok  
CHECK Wa Ming, Patrick  
CHENG Chi Chung  
CHENG Tze Ling, Susanna  
CHEUNG Leung Kong  
CHEUNG Shui Tak  
CHIN Wan Yee  
CHO Shiu Yin  
CHONG Chi Kong  
CHU Kwok Siu  
HO Sing Fai, Michael  
HSE Mei Yin, Kitty  
IP King Chi  
KWOK Hon Wing  
KWONG Hon Ming  
LAI Tai Wai  
LAI Tak Ming  
LAM Chun Ling  
LAM Leung Ping  
LAM Man Yi  
LAM Ming Fai  
LAM Sui Kuen, Irene  
LAU Chak Fai  
LAU Ming Fai  
LAW Chi Ming  
LEE Chi Hung, Thomas  
LEE Man Ngan  
LEUNG Ka Kui, Carl  
LEUNG Man Sing  
LEUNG Sai Man, Sigmund  
LEUNG Sui Fai  
LI Man Yiu  
LO Siu Wah  
MIN Ching Ping  
MUN Ying Kit  
NG Wai Kuen  
NGAN Mei Ki  
NIP Yuk Yee, Belinda  
POON Siu Leung, Anthony  
SIT Yat Sing  
TAI Sheung Him, Victor  
TAM Kin Yan  
TSANG Yin Ha  
TSE Cheuk Keung  
WAN Yiu Ming  
WONG May Kuen, Alice  
WU Chun Tung  
YAN Wing Wai  
YEUNG Ka Chun  
YEUNG Lai Ping  
YIP Shiu Hang  
YU Sek Ho, Felix  
YUEN Wai Hong, Andy  
YUNG Man Wai, William



Dental Graduates 1991

## BDS Graduates 1991

CHAN Chi Ngon  
CHAN Kei  
CHAN Pui Man  
CHAN Lai King  
CHEN Kam Fai  
CHENG Mei Lin  
CHEUNG Kwok Po  
CHEUNG Wai Ling  
CHIU Wai Kuen  
CHOW Tak Ming  
CHU Chi Ho  
CHUNG Sinn Yu, Josephine  
CHUNG Wing Hung  
FUNG Kin Yue  
HO Chi Tat  
HO Hon Wah, Henry  
HUI Ting Kwong, Wally  
IP Chi Man, Rondy  
KWAN Wai Yee  
LAI Chi Kai  
LAI Wing Fai

LAI Yiu Man  
LAM Siu Yuk  
LAU Chi Wang  
LAU Kwok Yan  
LEE Cheong Ting  
LEE Ching Man  
LEE Chun Leung  
LEE Hon Chung  
LEE Yuk Ching, Erica  
LEUNG Chi Ngai, Stephen  
LIU Kam Wah, Tommy  
LIU Kwong Shing  
LO Chi Tai  
LUK Chun Ki, Luki  
LUK Wing Nin  
MA Hau Chung, Christopher  
MAK Suk Yee  
NG Wai Mau  
NG Yiu Chung  
OR Kwok Kwong

SHUM Kon  
SO Chi Kin  
TAM Hau Tak  
TAM Kai Tai, Carl  
TANG Yu Piu  
TONG Kwok Sum  
TSANG Chi Lok  
WAN Kam Tim  
WONG Fung Ki  
WONG King Yuen  
WONG Kwai Yu  
WONG Miu Yee  
WONG Ying Kit  
WU Bing Chi, Patrick  
YAU Kwok Ming  
YEUNG Chor Ming  
YEUNG Wing Wo  
YIP Ka Wai  
YU Chun  
YU Kin Kuen



Dental Graduates 1992

## BDS Graduates 1992

AU YEUNG Kim Hung, Nelson	LAI Kin On, Edmund	SO Shun On
CHAM Kwong Man	LAU Kwai Ying	TAI Cheuk Bun
CHAN Fat Shung	LAU Moon Ming, Godfrey	TAM Yun Ki, Philip
CHEUNG Chung Ki	LAU Wai Man	TANG Tat Hung
CHEUNG Chi Kai	LEE, David	TANG Tin Hang, Alexander
CHEUNG Heung Wing	LEE Wai Yee, Angela	TANG Yiu Hung
CHONG Lai Hung, Douglas	LEE Yiu Kee, Eric	TO Ngan Fat, Tony
CHONG Lap Yan, Leonard	LEE Yiu Kong	WAN Chung Wa, Richard
CHUEN Kin Nang	LEUNG Heung Wing	WAN Kong Yuk, Annie
FOK Kin Ho	LI Kam Chuen, Andy	WONG Sing Yan, Philip
HO Fu Tak	MAK Wai Kam	WONG Siu Leung
HO Kam Yuen	PANG Siu Kei	WONG Tsz Leung
HO Siu Shan, Edith	POW Ho Nang, Edmond	WOO Mei Sum, Becky
HO Tim Lun	SAM Kim	YU Ngok Fung
HUI Wai Wa	SETO Siu Keung	YUNG Kwei Ling
HUNG Hing Wai	SIT Chai Yuen, Henry	





*THE NEXT DECADE  
AND BEYOND  
Some Prospects in Dentistry*

*Optimizing Adhesion with Mineralized Dental Tissues*

*Conservative Approach to Esthetic Dentistry*

*The Wonderful World of Glass Ionomer Cements*

*Biocompatibility of Dental Materials*

*Esthetic Implant Restorations*

*Chemicals in the Treatment of Periodontal Diseases*



# *OPTIMIZING ADHESION WITH MINERALIZED DENTAL TISSUES*

*A. John Gwinnett, Ph.D., B.D.S.,  
L.D.S.R.C.S., F.A.D.M.,*

*Professor*

*Department of Oral Biology and Pathology  
School of Dental Medicine  
State University of New York at Stony Brook  
New York 11794-8702, USA*

## **Abstract**

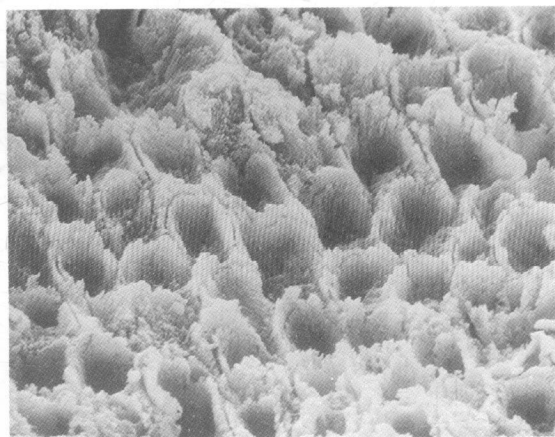
*Adhesive dentistry has provided the clinician with new treatment planning options. The procedure of establishing a bond between mineralized dental tissues and a restoration requires an appreciation for and an understanding of its art and science. The clinical protocol is no more demanding than conventional procedures and involves raising the clinical adhesiveness of the tissue surface. The increase in surface area, and energy and enhancement of tissue porosity following chemical conditioning of the tissue facilitates resin penetration into both enamel and dentin. The resulting hybridization provides strong micromechanical retention for the restoration with predictable clinical results.*

Adhesive dentistry, a concept pioneered by Buonocore,<sup>6</sup> is common place in today's busy clinical practice. It fostered new approaches to treatment, replaced or supplemented conventional procedures often adding a new dimension to the management of difficult cases. Many long-term clinical successes are now documented and while bonding techniques require an appreciation for their art and science, they are no more demanding than conventional procedures if properly understood. There is, presently, a better understanding of factors which contribute to optimal bonding to mineralized dental tissues, specifically enamel and dentin.

In 1955, Buonocore<sup>5</sup> reported a unique, simple clinical observation. By chemically conditioning enamel with phosphoric acid, he was able to durably bond methyl methacrylate (Sevriton) to the labial surfaces of incisor teeth. While methyl methacrylate is not an adhesive, the physico-chemical changes in the enamel promoted an interaction with the resin in its monomeric state prior to its chemical polymerization. In essence, an assembly was created consisting of an integration of resin and tissue. The process can be equated with making a chain. A chain, consisting of a series of links, is only as strong as its weakest link. In dental bonding the weakest potential link resides at the tissue/resin interface and is forged by the consummate skill of the clinician. The purpose of this paper is to present the current understanding of the optimally bonded dental restoration, principally the interface between resin and tissue.

Enamel, under clinical conditions, is covered with a salivary biofilm.<sup>16</sup> This integument forms the base upon which microbial colonies develop to form plaque, all of which must be removed to create the conditions necessary for bonding. The clinical protocol formulated by Buonocore included a thorough dental prophylaxis to remove plaque and calculus. Miura *et al.*<sup>19</sup> elegantly and quantitatively showed the importance of

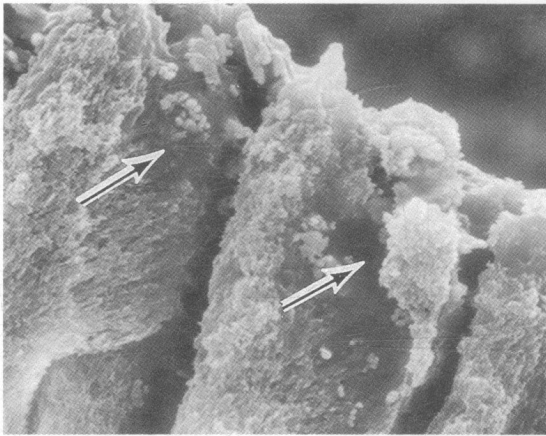
this initial step. Following tooth isolation the enamel is conditioned. Acid conditioners in gel form have replaced the original solutions. While phosphoric acid remains the most popular agent of choice, systems are commercially available which use citric, maleic, oxalic and nitric acids. Conditioning times for phosphoric acid have been reduced<sup>3</sup> from 60 seconds to 15-20 seconds periods of application. Concentrations of acid range from 10-37%. The micromorphological change produced by acid conditioning is well documented.<sup>24</sup> Enamel is naturally a porous tissue and preferential, localized demineralization (conditioning) of the tissue structure enhances the porosity (figure 1) and increases surface area.<sup>9</sup> A variety of structural patterns emerge<sup>24</sup> none of which appear to be preferred for optimal bonding. Surface energy is raised following enamel conditioning<sup>16</sup> which increases the clinical adhesiveness of the tissue. This state **must** be preserved, hence the need to isolate the site from salivary and other contaminants.



**Fig. 1** Typical morphological variation in enamel prism patterns following phosphoric acid conditioning (x 3000).

Application of unfilled resin monomer (bonding agent) to the dried, conditioned enamel results in its infiltration approximately 25 mi-

chrometers into the tissue micropores (figure 2) wherein it polymerizes. The micromechanical entrapment of the resin<sup>14</sup> serves to retain that which resides superficial to the tissue. This bonding mechanism has been referred to as capillary or interdiffusion adhesion.<sup>21</sup> The bonding agent serves as an effective link between tissue and composite resin either as a restorative material or cement.



**Fig. 2** Resin (arrows) occupying porous sites in enamel prisms (x 8000).

While the clinical success of enamel bonding is widely acknowledged, the bonding of restorative materials to dentin has posed a much greater challenge. In the restoration of form and function, there are numerous clinical situations in which enamel and dentin is exposed. It is important that a cavo-surface margin involving dentin/cementum be sealed to prevent ingress of stain, bacteria, bacterial metabolites and their consequent pathology. While several commercially available dentin bonding agents have boasted claims for clinical success based on laboratory studies, clinical trials have proven them disappointing.

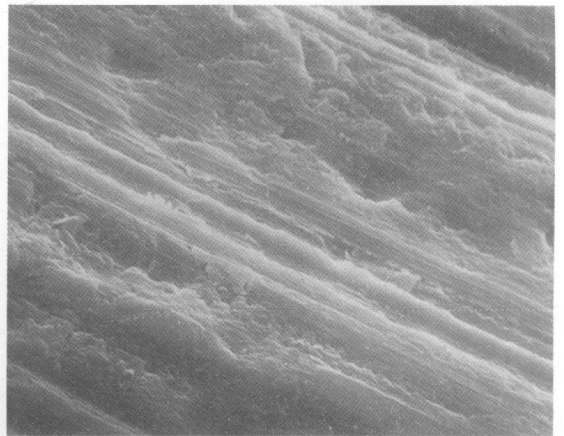
The principle of chemical bridging has frequently been used to develop adhesion to dentin. The idea was first described by Hagger<sup>15</sup> but found to be clinically untenable.<sup>7</sup>

Several conclusions can be drawn from earlier studies. These include:

- (1) the structure and composition of dentin requires special consideration in the bonding equation,
- (2) surface and sub-surface morphology of cut and eroded dentin must be characterized,
- (3) the conditioning of dentin under clinical and laboratory conditions must be understood and reconciled,
- (4) the relationship between resin and tissue must be demonstrated *in vivo* and *in vitro*,
- (5) bond strength must be assessed and
- (6) the integrity of the bond must be challenged to determine its durability.

Dentin and enamel have only one thing in common compositionally, namely an inorganic apatite component. Dentin is a wet, vital tubular structure, less mineralized than enamel and with a matrix of collagen. Fluid moves across the dentin from the pulp and its presence must be considered in the bonding equation.<sup>22</sup>

Cut or abraded dental tissues show an altered surface morphology<sup>8</sup> known as the smear layer (figure 3). The smear layer is comprised of two zones in dentin.<sup>4</sup> The outer zone consists of degraded collagen and apatite particles while the inner zone shows a disordered crystallite



**Fig. 3** Smear layer punctuated with abrasion anomalies (x 3000).

arrangement. Dentinal tubules are commonly occluded with cutting debris. A generation of dentin bonding agents has been based on an interaction with the smear layer but they have proven to be of debatable clinical value with their results being highly equivocal. The smear layer should be viewed as a contaminant limiting access to the underlying unaltered substrate. With few exceptions, most recent formulations remove the smear layer with improved results.

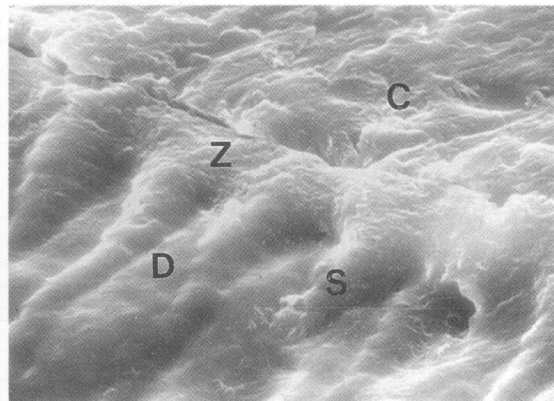
There has been a reluctance to condition dentin in a manner similar to enamel since some<sup>23</sup> have concluded that phosphoric acid, for example, causes unwarranted pulpal pathology. Recently, doubts have been cast on interpretation<sup>25</sup> of the histopathology observed in earlier studies. The role of bacteria and microleakage offer a more plausible explanation for the observations. If a durable, clinical seal can be achieved at the tissue restoration interface, there are **no adverse** pulpal consequences.

Recent reports<sup>12,13</sup> have shown that optimum bond strengths can be achieved when dentin is conditioned with phosphoric or other acids. The conditioning removes the smear layer, opens up the tubules (figure 4) and creates space in the intertubular region. Hydrophilic bonding primers, particularly those containing acetone, penetrate the tissue porosities to create a

micromechanical bond similar to that achieved with enamel.<sup>14</sup> The phenomenon has been referred to as hybridization.<sup>20</sup> The resin penetration (figure 5) into the tissue enhances the surface interaction which occurs between resin and dentin and may contribute to as much as 30% of the overall bond strength.<sup>10</sup> Some dentin bonding systems can now generate bond strengths in excess of 20 MPa which has been cited<sup>2</sup> as necessary to overcome the disruptive forces of polymerization shrinkage. Indeed, some systems bond to dentin with values equal to the cohesive strength of this tissue. This approaches the ideal or optimal bond strength as described in the cohesive plateau theory.<sup>1</sup> Furthermore, acetone containing systems are extremely compatible with the wet characteristics of the dental tissues and the technique of "wet bonding" is proving to be highly successful<sup>18</sup> in which gap free restorations have been achieved *in vivo*.<sup>11</sup> Clinical trials are currently underway to determine the effectiveness of the latest generation of dentin bonding agents. While earlier trials failed to meet the expectations based on laboratory findings, it is evident that improved performance in the laboratory with the newer materials will confidently translate into improvements in clinical performance.



**Fig. 4** Acid conditioned dentin shows widening of tubules (arrow) and enhancement of intertubular porosity (x 3000).



**Fig. 5** Resin infiltration into the intertubular dentin (Z) and tubules (S) links the composite (C) to the dentin (D) (x 3000).

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# CONSERVATIVE APPROACH TO ESTHETIC DENTISTRY

*M. Mike Suzuki, D.D.S., M.S.,  
D.M.D., F.I.C.D., F.A.C.D.,  
Professor and Head*

*Department of Restorative Dentistry  
Faculty of Dentistry, University of Manitoba  
227-780 Bannatyne Avenue  
Winnipeg, Manitoba R3E 0W2, Canada*

## Abstract

*Non-invasive, very conservative treatment for the esthetically compromised dentition are available today for the general practitioners.*

*Microabrasion techniques, bleaching and porcelain veneer restorations all constitute such a treatment and they are relatively simple and uncomplicated.*

*From the results of our own clinical trials and reports from other investigators, important parameters which influence the outcome of the clinical results are discussed.*

While traditional 'drill & fill' dentistry still occupies the major portion of the dental practice today, more and more general practitioners are becoming aware of the need for more conservative, esthetic oriented dentistry.

This is due to the continued decline in the incidence of dental caries and the public awareness of dental well-being as a reflection of a better standard of living. Lesions such as white spots, enamel hypoplasia, fluorosis and tetracycline stained dentitions were heretofore treated by means of full coverage restoration or not treated at all for fear of making the condition worse than before.

Microabrasion techniques, bleaching and porcelain veneer restorations all constitute extremely conservative treatment modalities for such esthetically compromised dentition.

## 1. Bleaching

The effectiveness of bleaching of the discoloured dentition is totally dependent upon the accessibility to the stained tooth structure. By and large, superficial stains such as fluorosis are more easily removed than deep seated intrinsic stain caused by tetracycline because the penetration of free oxygen through the minute interprismatic space of enamel to leach stained dentin is very difficult. Bleaching can be achieved by several methods and they are relatively simple and uncomplicated.

### 1.1 *Office* bleaching: 30 to 35% hydrogen peroxide with heat application

A number of tetracycline stained dentitions were treated in our research project at the University of Western Ontario.<sup>9</sup> The technique requires the use of a heating device which must be carefully controlled in order to prevent pulpal involvement.<sup>1,10</sup>

The following are the guidelines to be followed in order to provide optimum treatment:

- (1) Local anaesthesia is not indicated, for the unimpeded response of the vital pulpal tissue to thermal stimulation is an absolute requirement during treatment.
- (2) Rubber dam isolation of the dentition being bleached is essential so that the soft tissue will be well protected from the caustic superoxol solution (30% hydrogen peroxide).
- (3) Establish working temperature by gradually increasing the temperature of the heating device and identify the so-called sensitivity point. The sensitivity point is the temperature at which the patient just begins to feel sensitivity. Then, the heat should be decreased slightly until no sensation is experienced during the bleaching procedure. This is referred to as the toleration point.
- (4) Each tooth receives a three-minute application of peroxide per appointment and the procedure is repeated at weekly intervals until the treatment is completed.
- (5) Post-operative sensitivity associated with this bleaching procedure is often related to an unacceptable heat level and duration of the application.  
We have treated numerous cases of discoloured dentition by this method and no irreversible pulpal damage has encountered to date.
- (6) Treatment of young individuals, particularly the patient with developing teeth, should require special attention because of the large pulp chamber.

Results of the above procedure varies and the long chairside time and effort placed in each treatment often discourage the operator and the patient. Hence the introduction of the home bleaching procedure was most welcomed and readily accepted by many practitioners.

### 1.2 *Home* bleaching:

Use of bleaching materials delivered in the

form of a mouth guard worn at home has been introduced commercially in early 1989. Since then, many other products have become available and considerable improvements were made as to their effectiveness, easy use and cost.<sup>5</sup> Basically, they are an oxygenating agent, either a hydrogen peroxide or a carbamide peroxide.

- (1) **Hydrogen peroxide:** is delivered in a gel which permits the easy application of the material at home. Products such as Brite Smile (Brite Smile Systems, Inc., Birmingham, Alabama) utilizes a mucoprotectant, which is purported to have a protective action against irritation onto soft tissue. Since the gel is prepared at the dentist's office, the concentration of peroxide can be adjusted depending on what percentage the patient can tolerate. It is usually prepared and dispensed at the 2-3% concentration up to 10%. Our experience with this system has been very positive, however, preparation of the gel with concentrated peroxide requires careful attention and often spills during handling.
- (2) **Carbamide peroxide:** 10 to 15% carbamide peroxide was found to be very effective and constitutes the majority of the commercial products available today. When the carbamide peroxide comes in contact with salivary fluid, it releases the free oxygen equivalent to 2-3% hydrogen peroxide.

Many products today incorporate a thickening agent called Carbopol, which permits the slow release of free oxygen and minimizes the soft tissue irritation. Clinical trials conducted at the University of Manitoba and University of Western Ontario<sup>8</sup> revealed a remarkable whitening effect with Rembrandt Lighten (Den Mat Corp., Santa Maria, California) within 2 to 3 weeks.

Some of the tips for safe application of the home bleaching systems are as follows:

- (1) Thorough examination of the patient prior to the treatment is necessary. Hypersensitivity to peroxide or glycerin and pregnancy all contraindicate treatment.
- (2) All faulty restorations should be replaced or resealed prior to the application of bleaching gel.
- (3) The tray should be fabricated in such a way that it only extends 2 mm beyond the cervix of the teeth to be bleached. This will minimize the soft tissue contact.
- (4) Since each product will vary in chemical composition, it is imperative that the patient follows the manufacturer's directions carefully; further, the patient should be closely monitored by the attending dentist.

There is concern among the profession as to the safety of the use of tooth whiteners. The U.S. Food and Drug Administration<sup>3</sup> has advised the manufacturers that these products are now classified as drugs rather than cosmetics and therefore, should be subjected to the Federal Agency's stringent biological testings before it is marketed freely to the general public.

Their concern suggests that in another context hydrogen peroxide has shown mutagenic potential and may exacerbate the effect of other carcinogens.

With prolonged use, the home bleaching materials may harm periodontal tissue and delay wound healing. Despite the fact that this announcement was made in November, 1991, all of these materials are still available in the North American market.

Independent clinical trials conducted at the New York University<sup>11</sup> and the University of Western Ontario, suggest that there is no adverse gingival tissue response after a six-week observation period. Parameters such as gingival index, sulcular temperature and evaluation of inflammation by means of an enzyme test revealed no difference from the control.

Approximately, 20 to 25% of the patients

who participated showed discomfort such as tooth sensitivity and/or irritation to soft tissue.<sup>6</sup> The incidence of such an effect varies depending on factors such as tray extension, frequency and duration of application, pH of the bleaching agents and other patient variables.

In order to circumvent the possible adverse effect and F.D.A. scrutiny, new in-office bleaching techniques have been advocated. They rely on highly concentrated carbamide peroxide (Quick Start, Den Mat Corp., Santa Maria, California) or light activated 30% hydrogen peroxide (Hi-Lite, Shofu Product, Menlo Park, California).

Both systems allow the practitioner complete control within an office setting and to expedite the whole process. Nonetheless, they still require chairside effort.

## 2. Enamel microabrasion

Many of the discoloration problems are associated with irregularity of the enamel surface. As well, so called 'snow cap lesions' or 'mild enamel hypoplasia' can be conservatively resurfaced by either the microabrasion technique described by Croll<sup>4</sup> or a controlled abrasion technique advocated by the author.<sup>12</sup>

Croll's technique involves the mixture of 18% hydrochloric acid and pumice, which is rubbed against the affected enamel surface. Because the use of a relatively strong acid in certain circumstances is clinically unsafe, a modified enamel abrasion compound (Prema, Premier Dental, Norristown, Pennsylvania) has been developed. The use of this compound on the affected enamel safely removes the unsightly discoloration and excellent clinical results have been reported without any regression.

When there is a modest amount of white lesion or irregular enamel present, an expeditious means of improving the condition is based on the controlled use of micro-fine finishing dia-

monds (Premier Dental, Norristown, Pennsylvania) followed by sequential use of aluminum oxide discs (3M Dental, St. Paul, Minnesota). All can be achieved without the use of local anaesthesia and the result is most satisfactory.

## 3. Porcelain veneers

One of the most exciting developments in the area of esthetic dentistry is the introduction of the porcelain veneer restoration. Glazed porcelain has long been regarded as the most esthetic and biocompatible restorative material. Today, we are able to etch the porcelain with hydrofluoric acid and then bond reliably using a suitable luting resin. The resulting bond resembles the micromechanical bonding of the resin to etched enamel, having the shear bond strength as high as 3500 psi.<sup>7</sup>

A successful porcelain veneer restoration relies on careful preoperative assessment of the patient. Availability of enamel, degree of discoloration and type of occlusion are parameters most important to recognize prior to the treatment.

For tooth preparation, we have always advocated<sup>2</sup> the reduction of labial surface enamel and establishment of definitive chamfer shoulder margins for the following reasons:

- (1) Such a preparation provides adequate space for the porcelain veneer thus minimizing overcontouring.
- (2) It establishes positive seating of the veneer.
- (3) It removes labial surface irregularities and acid resistant enamel.
- (4) It establishes well defined margins to which the veneer can be positively adapted and finished.

The extent of the labial reduction varies depending upon the available enamel thickness however, usually a reduction of about half a millimeter is necessary without exposing den-

tin. The preparation extends cervically to the marginal gingiva and proximally, just short of the contact areas for ease of interproximal finish. Incisally the chamfer preparation should extend to the crest of the incisal edges but not beyond. A bullet nose diamond such as 1/2 DTL is used, followed by an identically shaped carbide bur to establish a smooth labial surface and well defined margins. Such a preparation ensures a well adapted and properly contoured veneer restoration.

When there is a faulty resin restoration present, particularly at the cervical region, it is advisable to replace it with glass ionomer restorative materials prior to preparation. This will provide a much more reliable marginal seal than trying to achieve bonding to the resin restoration. Recession of the gingiva also poses problems and the preparation should preferably terminate on enamel.

Porcelain veneers can be fabricated by one of the following methods:

- (1) Traditional platinum foil adapted to the master die on which the porcelain is condensed and fired.
- (2) A refractory die on which porcelain is directly condensed and fired.
- (3) Castable glass such as Dicor Veneers.
- (4) CAD/CAM produced veneers milled out of block of glass or porcelain.

By far the most common method of fabrication is by means of the refractory die method because of its simplicity, accuracy and ability to

provide optimum esthetic results. The laboratory can fabricate porcelain veneers with a highly glazed surface labially and etched internally by hydrofluoric acid to create the microporosities necessary for bonding.

Bonding is achieved by the process of common protocol, involving etching of the enamel with phosphoric acid, the application of a silane coupling agent to the etched inner porcelain surface and the use of a proper luting resin. During the trial insertion, when the masking of underlying discolouration is impeded by the translucency of the porcelain veneer itself, a further masking effect can be achieved by the use of colour modifiers. The more opaquer that is used however, the more monochromatic the veneer will appear thereby definitely sacrificing esthetic acceptability. Dual cured luting resins are recommended because there is a tremendous reduction of light energy through the porcelain and under cure might result when light cure luting resin is used. The bonded porcelain veneer should be perfectly adapted to the periphery and meticulously finished at the margins. In adjusting occlusion particular attention should be placed on protrusive occlusal contact with opposing teeth which must be equilibrated in order to avoid high stress fracture of one or more veneers.

The porcelain veneer is an extremely conservative, simple yet highly esthetic restoration and our long-term clinical trials demonstrate an excellent retention rate as well as gingival tissue response.

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# *THE WONDERFUL WORLD OF GLASS IONOMER CEMENTS*

*Graham J. Mount AM, B.D.S. (Syd.), D.D.Sc. (Adel.),  
F.R.A.C.D.S., F.I.C.D., F.A.D.I.,  
Visiting Research Fellow  
The University of Adelaide  
North Terrace  
Adelaide, S.A. 5000, Australia*

## **Abstract**

*The glass ionomer cements are a very important part of restorative dentistry because of their ability to adhere to enamel and dentine as well as their fluoride release. Their only limitation up to date has been a lack of fracture strength but this can be compensated by lamination with other materials.*

*There has also been a minor problem in the past because of the potential for water loss and additional water uptake particularly in the restorative aesthetic cements. This has now been overcome with the introduction of the dual cure cements which are resistant to water exchange immediately upon setting.*

*There is now a complete range of cements, all capable of adhesion and fluoride release, for use in most aspects of restorative dentistry. The restorative aesthetic cements rival composite resins for translucency and the physical properties of all types are being constantly improved. Apart from aesthetic restorations they are entirely satisfactory as a luting cement as well as a lining and a base cement. They have also opened the way for a complete review of cavity design for the new carious lesion.*



It is now 17 years since the introduction of the glass ionomer cements and a lot has happened to them in that time. They have evolved into a very sophisticated restorative material with multiple uses and they occupy a very important part of every day dental practice. They are divided into three types with one sub-classification and can be usefully applied for nearly all patients. They also present a wonderful opportunity for the preservation of remaining tooth structure and open the way for a complete revision of the present classification of cavity designs.

The current classification of glass ionomer cements:<sup>1</sup>

Type I— Luting Cement,

for the cementation of crowns and bridges;

Type II.1— Restorative Aesthetic,

auto-cure and dual-cure for aesthetic restorations;

Type II.2 — Reinforced Restorative,

for restoration where strength required but not aesthetics;

Type III — Lining and Base Cement,

auto-cure and dual-cure for use as a dentine substitute and a cavity lining.

The basic chemistry of all four types is essentially similar, the main variation being the speed at which the newly set cement is resistant to water uptake. For the type II.1 restorative aesthetic cements only it is necessary to keep the restoration completely isolated from the oral environment until such time as the ion exchange has progressed to the point where the translucency is already established. This can be achieved by sealing the cement with a very low viscosity, single component, light activated resin enamel bonding agent.<sup>2</sup> Most manufacturers provide a varnish of one type or another but none are as efficient in providing complete isolation as a resin bond such as Ketac Glaze. If this is left in place for at least twenty-four hours the restoration will be almost as translucent as composite resin.

There are now dual cure cements available where an initial set is produced by light activation to be followed later by the usual ionic exchange both within the cement and also with the tooth structure. These cements are resistant to water uptake immediately and therefore do not require a resin seal. They have a translucency equivalent to composite resin and an increase in tensile strength leading to improved adhesion.

The union between glass ionomer cement and tooth structure occurs because the same ionic exchange which occurs in the cement will interact with the enamel and dentine of the tooth.<sup>7</sup> The strength and integrity of this ionic exchange has yet to be measured but it has been shown that the only weak link in the union is the tensile strength of the cement itself. In other words the greater the strength of the cement the better the union.

However to achieve the optimum ionic exchange between the cement and the tooth it is desirable to present the cement with a perfectly clean tooth surface with no contaminants present to interfere. This state can be achieved by conditioning the tooth surface with 10% polyacrylic acid left on the surface for 10 seconds only and then washed off.<sup>8</sup> If the tooth is then kept isolated there will be an optimum ionic interchange with the cement with a relatively perfect union between the two.

The fluoride released from the cement is not part of the matrix system in the set cement so it remains free to leach out of the material long after it has set. The result is a strong release immediately after placement of a restoration with a slow reduction over the first two to three months.<sup>3</sup> From then on the flow will be steady but at a relatively low level. However it has been shown that, following a professional topical application of fluoride, there will again be an uptake of fluoride with an enhanced release for the next month or two until the release settles down again.<sup>4</sup>

With all of the foregoing properties in mind

it can be claimed that the glass ionomer cements are a very valuable substitute for dentine and will provide remaining tooth structure with a considerable resistance to recurrent caries. It has been shown that plaque does not form on the cement, probably because of the fluoride release,<sup>9</sup> and there have been no reports of recurrent caries in relation to restorations. Therefore it is recommended primarily as a dentine substitute and, if handled properly, will open the way to an entirely new class of cavity design in which preservation of remaining tooth structure, particularly enamel, is made possible.

The following applications are recommended for these cements:

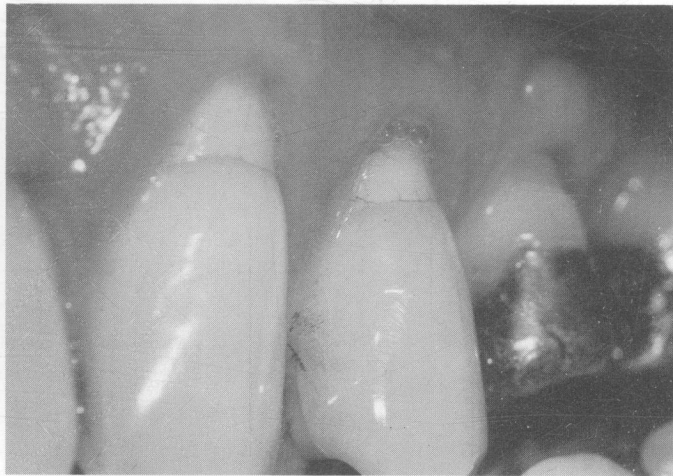
### 1. Luting inlays, crowns and bridges.

Use type I cement with a low powder:liquid ratio, preferably in capsules. The main advantages and reasons for using this cement are the very fine ultimate film thickness available as well as the thixotropic flow properties and the fluoride release. Do not clean the preparation

and remove the smear layer before cementation for fear of opening the dentine tubules and encouraging post-insertion sensitivity. In fact, if the preparation is close to the pulp or sensitivity is anticipated it is desirable to seal the dentine with a re-mineralising agent such as Causten's ITS Solution<sup>1</sup> prior to cementation.

### 2. Aesthetic restoration of erosion and carious lesions.

Any lesion which requires an aesthetic restoration where the ultimate restoration will be supported from undue occlusal load by remaining tooth structure can be restored with glass ionomer cement using the type II.1 restorative aesthetic version (figure 1). The cement should be utilised at the optimum powder:liquid ratio which means that it should be capsulated for preference. The tooth structure should be conditioned with 10% polyacrylic acid for ten seconds and then washed well and dried before placement. Use a suitable matrix to ensure firm positive placement into the cavity and to minimise porosity within the cement.



**Fig. 1** Class V erosion lesions restored with Ketac Fil photographed twelve years after placement. They lack translucency because they were not properly sealed at placement. However they are still sound and clinically acceptable.

The auto-cure version of this type of glass ionomer cement is the only one which remains susceptible to water loss and water uptake in the early hours after placement. Therefore care must be taken to ensure that it is adequately sealed immediately after removal of the matrix. As the matrix is removed the restoration should be flooded with a generous layer of a resin sealant. Any adjustment of the contour can then be undertaken with a sharp blade or slow speed bur and the sealant replaced before the patient is allowed to close the mouth. Once the contour is satisfactory the resin should be light activated thereby sealing the cement for several hours.

The advent of the dual cure type II.1 cements, however, has successfully eliminated the problems of immediate sealing because the light activation brings about resistance to water contamination immediately. This means that these cements can be contoured and polished under air/water spray using very fine diamonds at the same appointment.

All class V cavities should be restored in this manner and, using the dual cure cement, lamination with composite resin is no longer necessary. The shade range is adequate and placement is very simple (figures 2, 3, 4).

Similarly all class III cavities should be restored using the dual cure cement. There may be occasions of difficult access where the use of the auto cure cement is desirable simply because of the difficulty of ensuring complete light activation of the dual cure.

### **3. Restoration of the micro-cavity.**

The advent of a fluoride-releasing cement which adheres to both dentine and enamel has made it possible to consider important modifications to cavity design.<sup>10</sup> In the past it was necessary to remove areas of unaffected tooth structure to ensure adequate restoration of a carious lesion. Now it is possible to remove the caries through very conservative access cavities and at the same time retain good physical

properties in the remaining crown of the tooth. In some circumstances it may be that the cement will act as a dentine substitute only and may require to be reinforced with composite resin or amalgam as an enamel substitute.<sup>6</sup> However, often it will stand alone.

All initial lesions should be considered to be suitable for a micro-cavity design in the first place and the approach should be very conservative. Entry to an occlusal fissure should be made with a very fine tapered diamond point only where there is obviously caries underneath. Access should be extended only as far as the caries dictates. Further fissures can be explored in enamel if there is any doubt about the extent of the caries and the cavity restored with a dual cure cement. If the restoration occupies an extended area of occlusal support it may be wise to laminate it with composite resin as an enamel substitute.

Proximal lesions in posterior teeth can be approached from the occlusal surface using a small tapered diamond bur at intermediate high speed under air/water spray. Begin medial to the marginal ridge and angle down and in towards the lesion. Identify the caries and open within the marginal ridge sufficiently to be able to visually identify the extent of the caries. Use a small round bur at slow speed to remove the caries and determine whether the proximal surface is actually cavitated or not. If it is it will be necessary to clean the margins and if the marginal ridge is thereby weakened a more traditional cavity should be prepared. On many occasions however it will be possible to retain the proximal surface intact and restore the lesion with glass ionomer cement.

It is also possible to restore proximal lesions by approaching from the buccal or lingual direction depending on the actual position of the decay. Again entry is gained using a small tapered diamond bur at intermediate high speed under air/water spray. Mostly this approach will be undertaken in the elderly patient suffering



**Fig. 2**  
Large erosion lesions in teeth #13 and 14 which require restorations.

**Fig. 3**  
The lesions shown in figure 2. They have been cleaned with pumice and water, conditioned with 10% polyacrylic acid for 10 seconds, and the gingival tissue cauterised with trichloroacetic acid to control haemorrhage.



**Fig. 4**  
The lesions shown in figure 2 immediately after restoration with Fuji IILC – a dual cure type II.1 restorative aesthetic cement. Note that the restorations have been contoured and polished under air/water spray immediately after placement.

from root surface caries where there has been a degree of gingival recession. Begin slightly above the lesion and approach in a gingival direction until sufficient access has been gained. Enlarge only sufficiently to provide visual access. Remove caries with round burs retaining, if possible, a sound wall on the opposite side to facilitate the placement of a matrix. Gingival bleeding can be controlled with tri-chlor-acetic acid<sup>6</sup> and the cavity should be conditioned as usual. Generally an auto cure cement is required because these cavities are not suitable for dual cured

cements and the cement should be radiopaque. These restorations normally do not require lamination because they do not present a problem with aesthetics or strength.

The potential for the preservation of sound remaining tooth structure is greatly enhanced with these innovative cavity designs and in the presence of a fluoride releasing adhesive cement the future control of caries takes on a new meaning.

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# *BIOCOMPATIBILITY OF DENTAL MATERIALS*

*Dennis C. Smith, M.Sc., Ph.D., D.Sc., F.R.S.C.,  
Professor and Head  
Department of Biomaterials  
Faculty of Dentistry, University of Toronto  
125 Edward Street  
Toronto, Ontario M5G 1G6, Canada*

## **Abstract**

*In recent years the advent of new preventive, restorative and implant materials has generated an increasing concern for the short and long-term biological effects of new materials. A biocompatible material always undergoes some interaction with the oral tissues. Such interactions may involve physical, chemical, electrochemical and microbiological factors and effects ranging from inflammatory response to hypersensitivity or tumorigenesis. Careful study of the current literature shows there are many reports of biocompatibility problems including both patient-related and occupational hazards for dental personnel. Issues such as mercury in dental amalgam have received wide publicity with respect to the patient whereas there is a greater concern for dental personnel. Current regulations on the sale and use of dental materials provide some assurance of clinical safety and efficacy, however the inadequacies in the current state-of-the-art in biocompatibility testing mean that problems will continue to occur. The clinician must be well informed on the composition of materials placed in the mouth and possible biological sequelae.*



## Introduction

In the last two decades as dental treatment procedures have moved away from dentures towards more sophisticated restorative, aesthetic and preventive techniques so an increasing concern about the short and long-term biological effects of new materials has become more and more evident. Such concerns relate not only to the traditional care for the well being of the patient but also to the health of the dentist and his or her assistants. This situation has become intensified by the development of ecological and environmental concerns so that the population is more aware of such issues such as the infection control problems related to hepatitis and AIDS and also because of the introduction of legislation to regulate the sale and use of dental and other biomaterials and devices and to provide for positive affirmations of safety and efficacy.

The problem of providing reassurance of safety and efficacy has become more complex because of the slow progress in developing adequate biologic as well as physical tests to provide data from which a risk benefit ration can be determined.<sup>10</sup>

## Biocompatibility

Since no material appears to be completely resistant to breakdown by the body a biocompatible material can be considered as one which restores, supplements or improves body function to acceptable levels while at the same time breaking down sufficiently slowly that the normal excretion processes of the body can remove decomposition products without significantly effecting normal physiology.

The concept of a biocompatible "biomaterial" was formerly limited to materials of synthetic origin. The developments of recent years have, however, have involved also the use of natural

tissue composites. Materials used in the oral cavity can be viewed as a special case because of the demanding conditions of the oral environment in relation to other areas of the body.<sup>10</sup> This aspect has been particularly highlighted by developments in the dental implant field where the material may have both buried and exposed regions thus providing even more extreme conditions in which an adverse response may occur than the surgical implant.

## Material-Tissue Interaction

We will consider briefly some general aspects of material and tissue interaction which have a bearing on the total clinical result. The interaction between the tissue and the material (figure 1, table 1) involves a two-way process. The effect of the tissue on the material is well recognized through processes such as solubility, disintegration, colour change and corrosion. The effects of the material on the tissue can also be obvious but there are usually more subtle considerations which may be overlooked.<sup>10</sup>

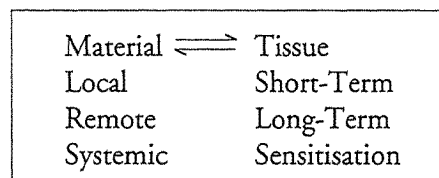


Figure 1

Table 1  
Biological Response

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Metabolic Disturbance  
 Inflammatory Response  
 Immune Response  
 Mutagenesis  
 Carcinogenesis  
 Adaptation

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It is well known that hazardous substances are used with a relative safety in dentistry when their identity is known such as mercury in dental amalgam and strong acids in cements and etching agents. Others have become recognized only more recently, such as, asbestos in periodontal dressings (now abandoned), beryllium in cements and alloys, lead in impression materials and cadmium in silver solders. Less is known about long-term effects of materials used in recent years such as nickel-chromium prosthodontic alloys where nickel, under some circumstances is known to be both a sensitizer and a carcinogen, implant alloys such as cobalt chromium and titanium aluminium vanadium which lead to local and systemic dissolution of metal ions in the tissues, reactive adhesive monomers in bonding agents and radiation-emitting devices such as visible-light curing lamps. Such examples indicate the need for continuous scrutiny by the clinician of the biological effects of materials or devices used in the mouth so that the implications of use of certain ingredients or components may be recognized. The toxic effects of dental materials and related occupational hazards have been reviewed by Hennsten-Petersen and Jacobsen.<sup>5,6</sup>

In addition to toxicity, oncogenic/mutagenic and hypersensitivity effects must also be considered. According to recent reviews, at least 10 metals including Co, Cr, Ni, Pb, and Ti can be considered as chemical carcinogens with another 10 possible. Among the important allergens are Ni and Co. One of the most common hypersensitive sensitivity responses is Ni allergy. Recent U.S. data suggests that a 20% incidence in women and a 4 to 5 % incidence among men may be present in prosthodontic patients (1986). Nickel has also been involved in reports of tumour induction from implant alloys, the induction time being greater than 20 years. Thus the use of Ni-Cr-Be alloys for prosthodontic superstructures is surprising since intraoral corrosion of such alloys has been observed.<sup>12</sup>

**Table 2**  
**Factors Affecting Tissue Response**

- 
1. Surface composition
  2. Physical presence
  3. Chemical action
  4. Tumorigenesis
  5. Microbiological effects
  6. Radiation effects
- 

### **Clinical Factors**

Such considerations highlight the importance of long-term release of even very small amounts of components from a material. The clinically observed material-tissue interaction, however, is not simple or straightforward but may involve the interaction of several physical and chemical factors. Some of the more important are listed in table 2 and may be briefly outlined as follows:

#### *Physical effects*

The surface properties or roughness of a restorative material may result in attrition or abrasion of opposing tooth substance or mucosa or plaque accumulation.

In dental implants stress concentrating around the base of the implant due to adverse loading the design features may result in pressure necrosis. On the other hand, a stiff implant which carries most of the load will result in a "stress-shielding effect" leading to bone loss around the neck region — the so-called "saucerization".

#### *Chemical factors*

1. The direct effect may be a short term reversible inflammatory response such as that of zinc phosphate cement on the pulp or eugenol in soft tissue. If the insult is more severe as with etching acids or slowly setting cements

with low pH,<sup>11</sup> in the long-term necrosis and abscess formation may result.

2. A delayed effect may develop due to the leaching out of ingredients or decomposition of the material. In this case the initial reaction may be slight but builds up with time. Some examples are leaching of reactive monomers or plasticizers from dentin bonding agents and composite materials, of plasticizers from tissue conditioners and of residues from chemical sterilizing agents such as ethylene oxide, hydrolytic decomposition of cyanoacrylate adhesives, the enzymatic breakdown of polymeric, ceramic or metallic implant materials and release of lead following accidental subgingival injection of polysulphide impression material.
3. The release of the ingredients of the material coupled with repetitive exposure to the agent may result in sensitization and a contact dermatitis or stomatitis. There are a variety of examples in the literature related both to metals (for example nickel and cobalt and their alloys, mercury from dental amalgam) and organic materials including activators and impression materials, rubber gloves, orthodontic elastics, temporary crown and bridge materials as well as the essential oils such as eugenol in restorative and periodontal materials and cinnamon in tooth pastes.

#### *Electrochemical factors*

Electrochemical effects (galvanic action) are a special case of chemical activity since there may be a tissue response due to the flow of current as well as to chemical effects of released ions. Such metal ions may diffuse into the local tissues adjacent to the alloy and result in discoloration, breakdown or hypertrophy in the case of the soft tissues.<sup>12</sup>

Lichenoid reactions in the buccal mucosa have been associated with mercury release from dental amalgams<sup>7</sup> and a potential immune re-

sponse. Nickel sensitivity is the most common likely sensitization response and this may be associated with use of nickel based prosthodontic alloys as well as the use of a variety of different wires with stainless steel brackets in orthodontics.

#### *Tumorigenic factors*

The formation of neoplasms may involve a special combination of circumstances. Chemical carcinogenesis results from long-term exposure to continuing small amounts of organic agents such as certain aromatic amines, epoxy compounds and, as indicated earlier, to certain metals (nickel, cobalt). Tumour formation may result with an apparent induction period of 12 to 25 years in humans. It seems also accepted that a physical oncogenic mechanism can exist with similar induction periods related to the size and shape of the material.

#### *Microbiological considerations*

Evidence has been provided showing bacterial contamination of many materials such as alginate impression materials, pumice polishing pastes, copal resin-based cavity varnishes and denture materials. Some materials may allow or facilitate the growth of organisms on the surface such as impression materials, denture linings and periodontal dressings which may facilitate the growth of specific organisms at the wound site. Similarly silicone-based denture linings may facilitate the growth of *Candida*.

The generation of bacterial aerosols may be related to the design and construction of high-speed handpieces and air-polishing devices. Concern has recently been expressed about the transmission of infection by dental handpieces.

Disinfection of impressions by commercial glutaraldehyde compositions produces minimal changes to most materials although the possibility of development of sensitization from

continued exposure to glutaraldehydes has also to be considered. An alternative approach may be to dissolve a chloramine derivative<sup>4</sup> in the mixing water used to cast a stone model which is said to have no deleterious effects on the physical properties of the cast but to effectively disinfect the surfaces of the model.

### *Radiation factors*

There has been considerable controversy about the effect of high-intensity blue light upon the eyes. It is recommended that where excessive exposures (more than 140 seconds in less than 3 hours<sup>3</sup> or total daily exposure between 40 and 100 minutes<sup>9</sup> occurs use of protective eye wear or shields should be used.

Concern has been expressed also in recent years over the use of uranium in dental porcelain to produce ultra-violet light fluorescence so as to give a natural appearance and avoid metamerism. Where uranium is used nowadays material depleted of the radioactive isotope is usually employed.

### **Clinical Implications**

From the foregoing discussion it is evident that the observed tissue response to a material under clinical conditions is a composite of several individual effects and is dependent upon the particular patient. There may seem to be many possibilities but little reported evidence of problems in humans compared to the toxicity data derived from animal tests. A careful study of the literature shows that in fact there are many reports on biocompatibility difficulties with materials, some of which have received considerable emphasis recently.<sup>5,6</sup>

The problem of mercury release from amalgam restorations has prompted many studies which have established that mercury vapour levels are elevated due to the presence of amal-

gams. Scientific scrutiny continues to suggest that the amount of mercury ingested or absorbed is comparable to or less than the average daily intake of mercury from the diet and that the mercury vapour level measured in some studies is considerably higher than the true value.<sup>8</sup> A small proportion of the population is sensitive to mercury and this may present as an immune response or a reaction of buccal mucosa to contact with restorations in a small number of cases.<sup>1,7</sup> Since recent studies continue to show that mercury vapour levels in about 10% of dental offices are elevated above the accepted occupational health limit because of poor mercury hygiene practices there is a greater concern for the dentist and his or her assistants in this area.<sup>2</sup> Recent Swedish studies suggested that elevated levels may be found in the brain and in the pituitary gland of dental personnel and that an increased risk of glioblastoma may exist. Further corroboration of these findings is needed. However it is, in principle, prudent to ensure that sound mercury hygiene and manipulative procedures are carried out in the dental office to avoid this problem.

Clinicians often lack appreciation of biocompatibility problems due partially to ignorance of the precise nature of the materials which are being manipulated and placed into the mouth and partly due to the fact that often there is a delay between cause and effect which obscures the former.

Although current regulations provide some evidence and reassurance of safety and efficacy the inadequacies in the "state of the art" in biocompatibility testing and the multifactorial nature of the oral environment combine to provide situations in which problems will occur. These problems may be compounded, of course, by the idiosyncrasies of the individual patient. For the future we need more extensive work in biological and clinical test methodology and more dissemination of the practical results.

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# *ESTHETIC IMPLANT RESTORATIONS*

*Steven Lewis, D.M.D.,  
Adjunct Assistant Professor  
Department of Removable Prosthodontics  
UCLA School of Dentistry  
10833 Le Conte Avenue, AO-156 CHS  
Los Angeles, CA 90024-1668, USA*

## **Abstract**

*Osseointegration revolutionized the treatment of edentulous patients. For the first time there was a long-term predictable treatment for this patient population restoring them to near normal function. It soon became apparent that the partially edentulous patient population too could benefit from this new treatment modality but it became clear that certain difficulties arose with this group. One main problem was that of esthetics.*

*This presentation discusses the early difficulties with esthetics when treating the partially edentulous patient with osseointegrated implants and traces the development of various implant components designed to resolve the esthetic problems.*

*The UCLA abutment, esthetic titanium abutments, and single tooth abutments will all be discussed as well as the concern over soft tissue esthetics and proper implant placement.*

*The following is an edited revision of the article from Oral and Maxillofacial Surgery Clinics of North America, Vol. 3, No. 4, November 1991.*

## Introduction

When it was introduced, the concept of osseointegration proved to be a revolutionary approach to the treatment of edentulous patients. Fixed bone-anchored restorations provided exceptional function and comfort with predictable long-term success.<sup>1,2</sup> Removable overlay prostheses became popular in the treatment of this patient population as well. For the first time, many restorative dentists and surgeons felt confident in the use of dental implants.

With such success in the edentulous patient population, it soon became desirable to treat partially edentulous patients with this new technology. It was evident, however, that the implant components so useful in the fabrication of restorations for the edentulous patients were not well suited to fixed partial dentures. Esthetic demands and limited interocclusal distance were considerations difficult to resolve with the conventional components. And because partially edentulous patients usually present with less ridge resorption than completely edentulous patients, implant position is often more critical because the implant fixtures and abutment cylinders are closer to the restoration and, therefore, there is less distance to compensate for improper placement.

In the partially edentulous patient, it is necessary to provide restorations that emerge through the soft tissue as natural in appearance as possible. In order to accomplish this, the implant must be in the correct position, and the restorative components must be designed so that the restoration begins subgingivally, creating gradual and natural emergence profiles. Also, the restoration should be in porcelain as it

emerges through the soft tissue in order to achieve maximum esthetics.

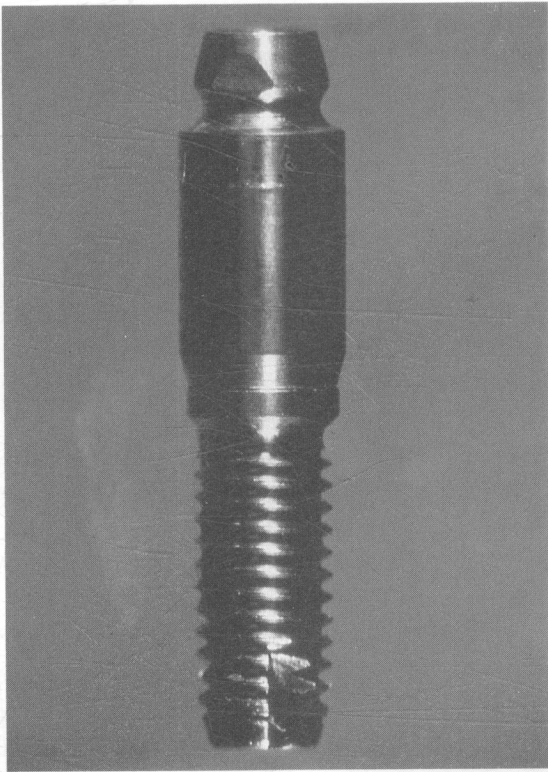
## Conventional Implant Components

The first osseointegrated implant system to gain widespread acceptance was the Brånemark system, the basic components of which are the implant fixture, transmucosal abutment cylinder, and gold-palladium alloy cylinder (figure 1a and b). The titanium implant fixture is placed in a very carefully prepared bony site. During the next four to six months, the implant fixture remains submerged beneath the mucoperiosteum. Once osseointegration has been achieved, a second surgical procedure is performed to expose the implant fixture and place the transmucosal abutment cylinder. This cylinder will sit on top of the implant fixture, connected with the abutment screw, and emerge through the soft tissue. The top of the abutment cylinder now provides the restorative dentist with the base for anchoring the restoration. It is the gold alloy cylinder that becomes part of the restoration and provides the means of attaching the finished restoration to the abutment cylinder. Gold screws hold the restoration.

The Brånemark system is designed so that the gold screws are a weak link. If the restoration does not seat adequately on the abutment cylinders, if there are occlusal discrepancies, or if there is some other type of traumatic incident, the gold screws are designed to break. This design is an attempt to prevent considerable damage to the implant fixture, surrounding bone, and abutment cylinder. Also, knowing the potential for fracture, the components are designed so that the gold screws are readily retrievable if they do fracture.

## The UCLA Abutment

Due to the poor aesthetics of the conventional



**Fig. 1a**  
The major components of the Brånemark implant system include the titanium implant fixture, the transmucosal abutment cylinder on top of the fixture, and the gold alloy cylinder which becomes part of the final restoration. Screws hold the three components.

**Fig. 1b**  
Illustrated is an edentulous fixed bone anchored bridge utilizing the three basic components.





titanium transmucosal abutment cylinder as it emerges through the mucosa, successful aesthetic results were difficult to achieve in the partially edentulous patients. The UCLA abutment was developed as a means of fabricating dental restorations directly on the implant fixtures, eliminating the conventional abutments. Multiple-implant restorations, as well as single-tooth restorations, can be fabricated utilizing this technique in order to improve esthetics and in order to overcome limited interocclusal distance.<sup>3,4</sup>

The UCLA abutment is actually a plastic abutment cylinder designed to fit precisely onto the implant fixture. Some plastic patterns are designed specifically for single-tooth restorations and have hexagonal patterns at the base that engage the hex on top of the implant fixture to prevent rotation. Other plastic patterns are designed for multiple implant restorations and have round bases for ease of seating. Resistance to rotation is not necessary for multiple implant restorations.

To fabricate a UCLA abutment restoration, the working cast must contain implant fixture analogues rather than the usual abutment cylinder brass analogues. Impression copings that fit directly on the osseointegrated implant fixtures are used to generate this type of master cast. With the master casts articulated, fabrication of the final restoration can begin. The appropriate UCLA plastic patterns are positioned, sectioned at the appropriate occlusal level, and incorporated within the wax pattern. The plastic pattern is designed to provide a slight metal collar at the base for structural integrity of both the porcelain and the metal. This one millimeter collar should not present an aesthetic compromise on a properly placed implant fixture.

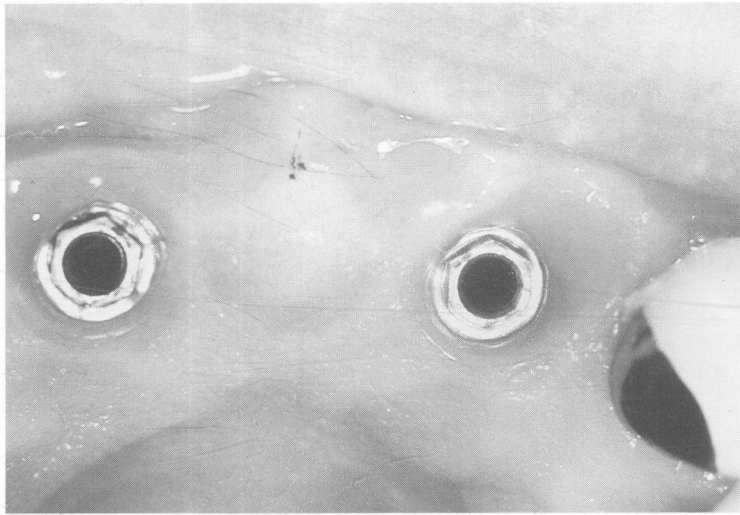
With this technique, the restorations fit directly on the implant fixture near the osseous crest. At this level, it is difficult to determine

whether the finished castings seat properly. Therefore, the patterns are waxed and cast in segments and later assembled with an intraoral solder relation record. For example, if four implants are being used, four separate pattern segments are waxed and cast individually. To ensure a precise fit, each casting is milled prior to the intraoral try-in. The precision of fit can be inspected by connecting each casting to an actual implant fixture and examining the marginal adaptation under a microscope.

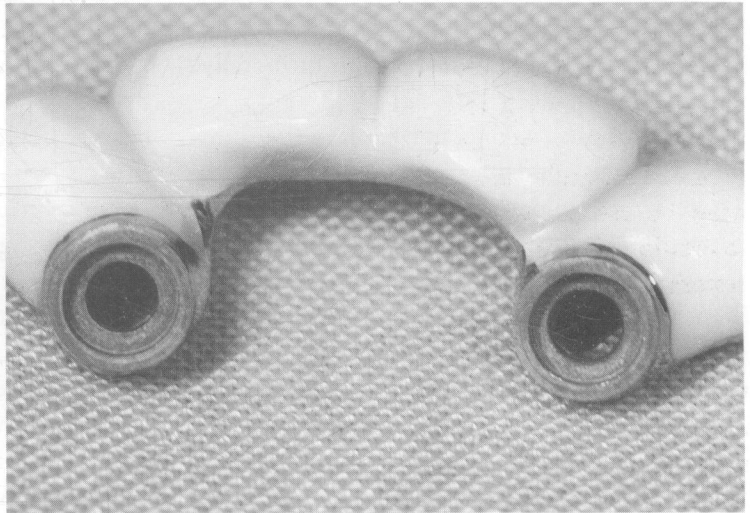
At the try-in appointment, the individual castings are seated. The use of a local anesthetic generally is not advocated to make it easier to determine whether soft tissue is being trapped between the casting and the implant fixture. A solder index is then performed.

The final restorations should have smooth and gradual emergence profiles. When one begins at the level of the implant fixture, there usually is adequate room to develop these natural emergence profiles, which are both esthetic and hygienic. With porcelain placed subgingivally, the restoration appears natural at the gingival margin. In addition, highly glazed porcelain has a tendency to accumulate less plaque at the gingival margin than the machined, unpolished surfaces of the titanium abutment cylinders (figure 2a, b and c).

While the fit of each individual casting is verified under a microscope, once soldered together, if the relationship is incorrect, seating of the restoration will be inadequate. It is often suggested that the most important restorative aspect of fabricating restoration on osseointegrated implants is the fit of the metal substructure. A poorly adapted casting may place inappropriate loads on the retention screws. This could result in loosening of the screws, fracture of the screws, and possibly fracture or loss of the implant fixture. For these reasons, a perfect passive fit is necessary. Verifying the fit of the casting to transmucosal abutment cylinders supragingivally is much easier than check-



(2a)



(2b)



(2c)

Fig. 2a, b and c  
With the UCLA abutment, the restoration will connect directly to the implant fixtures viewed in 2a. The restoration itself does not need to match the hex of the implants for multiple implant restorations (2b). The final implant restoration replaces the four maxillary incisors connecting to implants in the lateral incisor sites (2c).

ing the fit at the level of the osseous crest. The fit cannot be inspected visually, checked adequately with an explorer, or even verified with radiographs, because slight discrepancies are not discernible. If the relation of the implant fixture analogues in the master cast is slightly incorrect, improperly adapted casting may go unnoticed. For this reason, all UCLA abutment restorations on multiple implants must be fabricated in separate segments, one for each implant, and each checked microscopically against an implant fixture analogue to evaluate the individual fit. They are then securely positioned intraorally and indexed for soldering. While this technique should prevent improper seating, it must be remembered that it is not foolproof, and evaluating the final restoration intraorally remains difficult.

This is of special concern because a titanium alloy screw is used to retain the restoration. There is not gold screw, as is used with the conventional components. With the UCLA abutment, unfavorable forces may result in damage to the implant fixture before the titanium screw breaks. The advantages of a fail-safe design of the gold screw are not present.

### **An Esthetic Titanium Abutment**

As mentioned, while the conventional titanium abutment cylinders for the Brånemark system had been well designed biologically and mechanically over many years of research and were adequate for treating the edentulous patient, they did not provide optimum esthetic for the partially edentulous patient. A new titanium abutment cylinder designed to improve esthetic while maintaining the basic biologic and mechanical features of the conventional titanium abutment cylinder has recently been developed by Nobelpharma (Nobelpharma AB, Gothenburg, Sweden). These "EsthetiCone" abutments are pure titanium and fit to the top

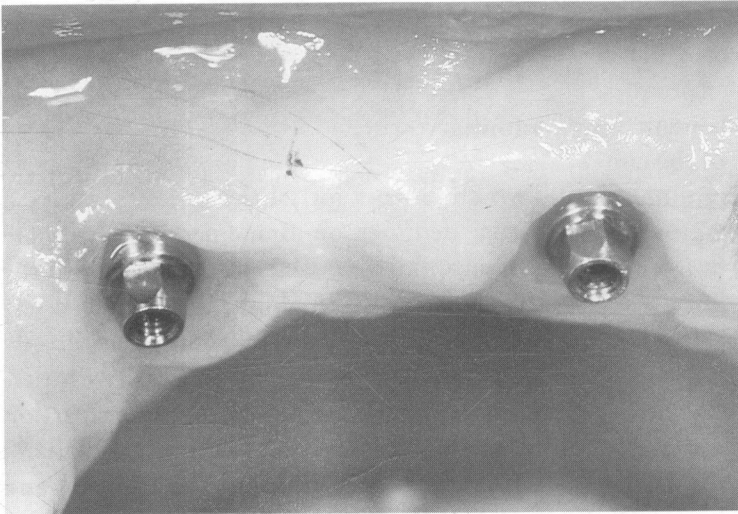
of the implant fixtures, matching the hex of the fixtures. They come in different sizes, corresponding to the height of the collar at the base. There are 1, 2, and 3 mm collar heights.

An advantage of the esthetic titanium abutments compared with the conventional abutments is that they allow the restoration to begin subgingivally. For instance, with the 1 mm esthetic titanium abutment cylinder, the restoration can begin 1 mm above the implant fixture. This compares with 3 mm when the shortest conventional abutment is used. Consequently, because of the increased working distance, a more gradual and natural emergence profile of the restoration can be created.<sup>5</sup>

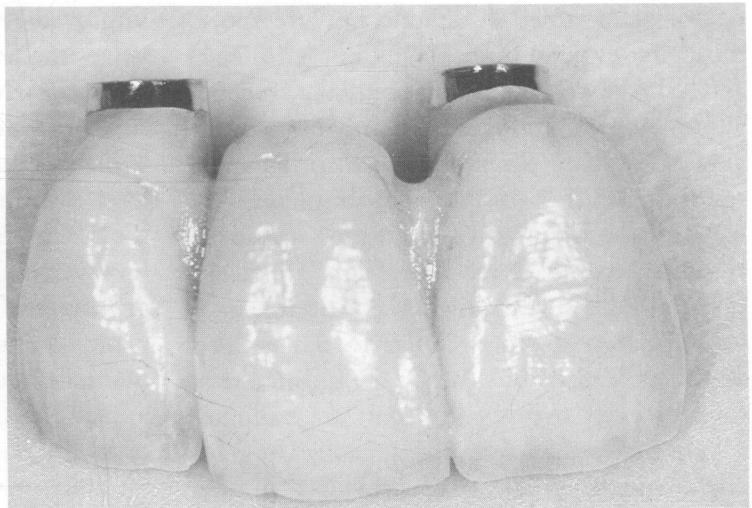
By beginning only 1 mm from the implant fixture the porcelain fused to metal restoration begins subgingivally. The result is a more aesthetic restoration as it emerges through the soft tissue than one on a conventional abutment would be (figure 3a, b and c). Clinically, porcelain appears to accumulate less plaque than machined titanium, giving it another advantage.

The deeper the sulcus, the taller the collar may be. However, it is advisable to have the titanium collar positioned at least 2 to 3 mm below the gingival margin for the best esthetic results. In areas of extremely thin soft tissue, the implant must be adequately countersunk so that the 1 mm abutment collar remains sufficiently subgingival. The same requirements apply when using the UCLA abutment, as these restorations are fabricated with 1 mm of metal at the base for structural integrity as already mentioned.

The restorative procedures for this abutment are similar to the restorative procedures for the conventional abutment cylinders. Once the abutment seating is verified with radiographs, a variety of impression copings, lab analogues, and gold cylinders exist.



(3a)



(3b)



(3c)

Fig. 3a, b and c  
Two esthetic titanium abutments are positioned in the anterior maxillary region (a). The final restoration contains gold cylinders (b) which provide the connection to the abutment cylinders. Gold screws retain the restoration intraorally (c).

The esthetic advantages of improved emergence profiles and porcelain at the gingival margin are the same with both techniques. However, the titanium abutments maintain the biologic and mechanical principles of the conventional abutment, including a titanium-to-titanium machined fit at the level of the implant fixture and a titanium-to-soft tissue interface in the depth of the gingival sulcus, which some claim to be necessary in achieving a biologic seal for long-term clinical success.

The disadvantages of the esthetic titanium abutment are similar to those of the UCLA abutment. Restorations extending subgingivally demonstrate superior esthetic but are more difficult to evaluate for fit. While not as difficult as UCLA abutment restorations, the esthetic abutment restorations are certainly more difficult to evaluate for proper seating than are restorations using conventional abutment. Because of the importance of creating a casting that fits passively, these restorations are fabricated in individual segments, positioned, and soldered in a manner similar to the UCLA abutment restorations. While the finished restoration still may be difficult to evaluate subgingivally, the restoration is retained by gold screws which, as mentioned, provide a fail-safe mechanism.

These screws are likely to loosen or fracture before harm is done to the osseointegration if

the restoration does not seat passively.

## Summary

Two abutments for fabricating esthetic fixed partial dentures on Brånemark implants are currently popular. One method employs the UCLA abutment technique, resulting in a restoration with a cast alloy base connected directly to the implant fixture and retained with titanium alloy screws. By placing the restoration directly to the implant fixture, a gradual and natural emergence profile can be achieved, and porcelain is placed at the gingival margin for improved esthetics. The second technique involves the fabrication of a restoration that fits over esthetic titanium abutments (EsthetiCones). These abutments are designed so that the restoration may begin at a subgingival level, providing the same esthetic advantages as the UCLA abutment. This technique does, however, maintain the biologic and mechanical principles of the conventional Brånemark implant components, including a titanium-to-titanium and machined fit at the top of the implant fixture, a subgingival titanium-to-soft tissue interface, and the fail-safe capabilities of the gold screw. Both techniques, if performed, can provide esthetic restorations with high levels of success.

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# CHEMICALS IN THE TREATMENT OF PERIODONTAL DISEASES

*Per Gjermo, Dr. Odont.,  
Professor  
Department of Periodontology  
Dental Faculty, University of Oslo  
Geitmyrsveien 69/71  
N-0455 Oslo, Norway*

## **Abstract**

*Mechanical treatment of periodontitis is effective in most cases. However, there are cases which respond poorly and where chemotherapy may be appropriate.*

*Topical antibacterials applied supragingivally have no effect upon established periodontitis caused by subgingival plaque. Subgingival application of antibacterial agents have in some studies shown a certain short-term effect upon the inflammatory response. Speculations that some forms of periodontitis may be regarded as specific infections have opened for use of antibiotics in the treatment of such disease entities. The drugs most often recommended are tetracyclines and imidazoles, and there are reports indicating arrest or retardation of further disease progression when applied as an adjunct to conventional mechanical treatment. Recently, local application of antibiotics in slow-release devices has been claimed to be effective in combating periodontitis. Data presented so far have mostly shown reduced inflammation, while the effect upon the progression of the disease is unknown.*

*There seems to be a general agreement that use of antibiotics in some cases of periodontitis is advantageous, but only if it is used as an adjunct to scaling and root planing. Conventional mechanical treatment should always be the first choice.*



## Introduction

There is a world-wide acceptance that antiinfective therapy is effective against periodontitis, and that most forms of periodontitis can be successfully treated by mechanical removal of plaque from the infected root surfaces and maintained through a rigorous regimen of daily oral hygiene.<sup>8</sup> This is an elegant approach to the control of a bacterial disease with minimal risks and side effects or adverse environmental influence, and should be the first choice of treatment.<sup>1,4,19,29</sup> However, there are forms of periodontitis which seem to be refractory to mechanical treatment alone, where use of chemical agents as an adjunct to the mechanical treatment approach may be considered.<sup>9,19,29</sup>

In principle use of agents against destructive periodontitis due to infection may be aimed at modifying the host response pattern or at controlling the bacterial infection. So far, there is no evidence of effects of immunosuppressive or antiinflammatory drugs, vitamins or organ extracts in clinical experiments.<sup>31</sup>

## Rationale

The rationale for use of antimicrobial agents against periodontitis is the etiologic relationship with bacteria. However, more than 300 bacterial species are supposed to have the periodontal pocket as their natural habitat and both the absolute and relative numbers of the microorganisms vary with health and disease. In adult destructive periodontitis the flora is abundant and dominated by anaerobic gram negative rods, while a predominance of gram positive aerobic bacteria and low total numbers are characteristic of a microbiota compatible with health.<sup>16,26</sup> The presently held opinion among researchers is that there is a number of different periodontal diseases with similar clinical fea-

tures,<sup>23</sup> and that the majority is of a non-specific nature and dependent on the total mass of bacteria.

However, there is emerging evidence of bacterial specificity involved in others.<sup>24,25</sup> It is in these latter forms of periodontitis that it is believed that adjunctional drug therapy might improve the outcome of treatment.

## Antibiotics

The use of antibiotics is based on the concept of specificity, and that certain microorganisms need to be eliminated from the flora to prevent further progression of the disease. In this context that would mean that one or some few bacteria are responsible for the actual tissue breakdown. Unfortunately, methods for diagnosis of those specific periodontal diseases which might benefit from antibiotic adjunctive treatment are non-existing or not reliable. Thus, most authors recommend a mechanical approach as the first choice and to resort to antibiotics only in cases which do not respond properly.<sup>1,4,19,29</sup>

A prerequisite for choosing the correct antibiotic is that the target bacteria are known. At present the two bacterial species most strongly associated with clinically discernable forms of periodontitis as localized juvenile periodontitis (LJP) and rapidly progressing periodontitis, and active adult periodontitis are *Actinobacillus actinomycetemcomitans* (Aa) and *Porphyromonas gingivalis* (Pg), respectively. In these cases the clinical diagnosis might be sufficient for choosing the drug,<sup>3</sup> but many authors recommend that microbiological diagnosis and monitoring always should be performed in connection with antibiotic treatment.<sup>7,27</sup>

Although a variety of antibiotics have been used in the treatment of periodontitis, it seems that the recommended drug for infections where Aa is the suspected pathogen is tetracycline,

while metronidazole seems to be preferred against Pg associated periodontitis.<sup>7,19,27</sup> In a recent paper, Slots and Rams<sup>27</sup> summarize the advantages and the disadvantages of using antibiotics in the treatment of periodontal diseases.

## Modes of application

Most research concerning the use of antibiotics in periodontal therapy have been focused on the systemic administration, but also local application has been suggested.<sup>11,29</sup> The advantage of systemic application would be that bacteria within the soft tissues may be affected and also that the drug may eliminate the target bacteria from other reservoirs in the body. On the other hand systemic administration will require high doses to obtain sufficient concentration of the drug at the site of action (the pocket) and thus increase the risk of general side effects.

Local application has been performed in several ways.<sup>20</sup> With slow-release devices and similar systems placed in the pocket much lower total doses of the drug are needed than by the systemic route. However, bacteria in the adjacent tissues and extraoral foci which may constitute possible sources for reinfection will probably not be affected.

## Antimicrobial agents other than antibiotics

Mouthrinses will not affect the subgingival area to any significant extent.<sup>24</sup> However, several antibacterial agents have been introduced subgingivally in order to reduce the bacterial challenge in gingival pockets.<sup>4,20</sup> One difficulty has been to maintain sufficient concentration of the agent over a prolonged period of time by irrigation or placement of a gel. Slow-release devices may have the potential to overcome this problem,<sup>28</sup> but the placement of the devices has to be performed by professionals and is time-

consuming and expensive.

Addy<sup>1</sup> suggested that local application of antimicrobial agents should be restricted to the treatment of local sites which do not respond adequately to mechanical antiinfective therapy. The advantage of local administration is that other agents than antibiotics may be used with less side effects and potential risks.

## Results of clinical studies

There is no evidence in the literature that antibiotic treatment alone will have significant influence upon the development of periodontitis, and even when used in conjunction with mechanical therapy results are not convincing.<sup>4,29</sup>

Clinical reports of the use of systemic antibiotics are many, but most of them are anecdotal or case control studies which do not readily lend themselves to scientific interpretation. However, also a number of controlled clinical trials have recently been published.<sup>2,15,25,30</sup> A common feature is that very few studies of this kind have evaluated long-term effects upon further progression of the disease, but rather studied indicators of severity of inflammation. Since there is no strong association between the degree of inflammation and future progression of the destructive process<sup>6,10</sup> such observations are of limited value. Also, the quality of most studies performed seems to be too poor for safe interpretations.<sup>12</sup> However, the results in general indicate no significant effect of the antibiotic regimens over conventional mechanical debridement.

One reason for the lack of significant effects of adjunctive antibiotic and antimicrobial treatment in clinical studies may be that the efficacy of mechanical treatment is very good in most cases. This notion is corroborated by some studies where the selection of patients have been restricted to well defined clinical characteristics as LJP or cases shown to respond poorly to

mechanical treatment.<sup>17,25,30,32</sup> These studies report additional effects of the adjunctive antibiotic therapy over mechanical treatment alone either on clinical or microbiologic parameters, or both.

A number of clinical studies on the effects of local application of various antibiotic preparations (tetracycline, minocycline, metronidazole, ofloxacin) in periodontal pockets employing various systems for slow release have been published through recent years.<sup>5,13,14</sup> None of these studies were able to demonstrate clinical benefits of the drug treatment over that obtained by scaling and root planing. Also studies selecting sites with difficult access for mechanical debridement as furcation areas failed to show additional effects of local application of tetracycline.<sup>18,21</sup>

Many studies have employed agents other than antibiotics.<sup>20</sup> Recent reports comprise agents as chlorhexidine, stannous fluoride, amine fluoride, and iodine.<sup>22,33</sup> So far these studies have not been able to demonstrate clinical effects in addition to what can be obtained by conventional mechanical therapy.

## Concluding remarks

Although the bacterial etiology in chronic periodontal diseases has been established, it seems that the beneficial effects of the treatment of such diseases by antimicrobial agents are limited to very selected cases. At present there are no scientific basis for recommending particular cases for antimicrobial treatment based on the clinical diagnoses. It is generally recommended always first to perform conventional mechanical treatment including instructions in oral hygiene home-care procedures, scaling and root planing with or without surgical access procedures. In cases with no or poor response to adequate mechanical treatment, the use of systemic antibiotics may be considered. The choice of drug should preferably be made based on clinical features and microbiologic testing. Close monitoring of such treatment in order to avoid serious side effects seems warranted.

Long-term studies on the effect of chemotherapy upon further progression of periodontitis are warranted. Local application of either antibiotics or other antimicrobials in the clinical management of periodontal diseases has so far no support in research, but the principle may have potential for further development and become of value in the future.

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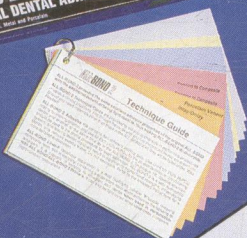


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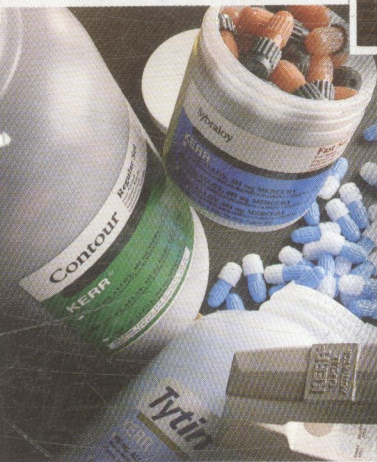
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