

GINGIVAL AND PERIODONTAL CONDITIONS
AS RELATED TO MENSTRUATION AND
ENDOCRINE DISORDERS IN THE FEMALE.

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An advanced case of periodontoclasia and gingivitis.

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1.

INTRODUCTION

For many years it has been known that imbalance of the endocrine system is a factor in the aetiology of certain periodontal and gingival conditions. In spite of this knowledge, the dental and medical professions have failed to realise fully the possible importance and far reaching effects of slight endocrine imbalance in cases of gingival and periodontal disease.

Before embarking on the present course of research it was noticed that, in some female patients with periodontal disease, the gingival condition varied from visit to visit, being very much worse on certain occasions. On closer investigation this variation was found to be related to their menstrual cycle. Initially, it was considered to be a manifestation of a pituitary or ovarian upset for which some of these patients had been receiving treatment, concurrently with their periodontal treatment. After observing the gingivae of a number of patients who menstruated normally, however, it became obvious that gingival changes took place in most of these patients also; this varied only in degree with those patients/

patients who had an ovarian or pituitary disturbance, which caused a frank imbalance of their endocrine system. Consequently, there appeared to be a relationship between the menstrual cycle and the periodontal disease prevalent in the numerous female patients receiving periodontal treatment.

Many observers have written of the link between puberty and periodontal disease, and several attempts have been made to classify the gingival conditions associated with pregnancy, but there has been little serious investigation of the relationship of the menstrual cycle to periodontal disease. In view of this lack of research an attempt was made to establish whether or not such a relationship existed; thereafter, to aim at a reasonable diagnosis of the periodontal conditions which affect so many women and girls. It might then be possible to prescribe correct treatment, with an understanding of the basic changes which take place in gingival tissue during the menstrual cycle.

It is regrettable that many women accept gingival haemorrhage, and pain, with every 'period'; many more are aware that their gingival condition is worse at some times than at others, but they do not associate this/

this deterioration with their menstrual cycle.

Generally, they are the patients whose gingival condition is invariably worse in the early pro-gestational phase of the cycle and they, therefore, do not associate the condition with menstruation.

Unfortunately, unless energetic treatment is given, these cases deteriorate rapidly with each cycle.

The sexual act has a very marked effect in most cases of periodontal disease in females, causing a decided improvement of the condition in most instances, while in others it causes an exacerbation of the periodontal condition. In untreated cases of mild periodontal disease there is a rapid breakdown as soon as pregnancy occurs.

Few doubt the relationship which such factors as mal-occlusion, and traumatic occlusion, have to the aetiology of periodontal disease. All observant dentists have been impressed by the number of mouths in which these well recognised aetiological factors have been present without any sign of periodontal damage. Very early in this research study, it became clear that the periodontal condition was always much worse in the mouths of women in which there was traumatic occlusion, or mal-occlusion. Moreover, the cyclical/

cyclical changes in the mouth, when obvious clinically, were invariably much more evident around maloccluding teeth, than around teeth in normal occlusion.

When the patient co-operated in establishing correct and thorough oral hygiene, there was no tendency for renewed periodontal breakdown to occur after treatment, except in cases where there was either persistent endocrine imbalance or gross traumatic occlusion. If such co-operation were not received, the condition generally reappeared within two or three menstrual cycles.

HISTORICAL NOTE.

From time immemorial, man has been subject to disease and suffering, and the origin of medicine and dentistry is to be found in the natural instinct of man to alleviate pain, and to free the body from the ravages of disease. Man and animals alike, when ill, instinctively choose their foods, extract foreign bodies, seek the solace of cooling waters and the damp earth, and expose their bodies to the healing rays of the sun.

The origin of the art of dentistry is obscure, although ancient writers refer to the practice of dentistry as being coeval with the birth of medicine. Many people may believe that it is unimportant to know how dentistry began, or how it progressed through the ages, but a profession which ignores or misinterprets its past experiences shuts the door to progress, and repeats the same mistakes time and time again.

Relics of the past, revealed by archaeological surveys, have yielded much rich information; particularly valuable have been the skeletal and mummified remains of prehistoric and ancient man, ancient manuscripts, and early works of art. After exhaustive/

exhaustive survey they have revealed that diseases, to which modern man is subject, were active then also. The manuscripts supply information of the modes of treatment⁽¹⁾ practised in ancient times, and show that many of these diseases were treated in a manner basically similar to that employed until the advent of antibiotics. From them we have definite proof that surgery was practised; they show that the operation of trephining was performed, and that dislocations and fractures were treated.⁽²⁾ That oral disease, too, received attention is evident from the earliest records of medical writings.⁽³⁾

Reference to the historical background of periodontal disease is enlightening, not merely from academic interest, but also in that it shows its existence in prehistoric times⁽⁴⁾ and, moreover, that many of the more advanced ancients were definitely aware of it.⁽⁵⁾ Periodontal disease is one of the most common problems of modern dental practice, so it is a sobering thought that after 3,000 to 4,000 years this problem still exists and that, even with the progress of recent years, we are still a long way from understanding, and controlling it completely.

The/

7.

The earliest references to diseases of the gums are found in the Egyptian medical papyri. One of the most important is the PAPYRUS EBERS, which is thought to be a compilation of medical writings covering the period between 3700 to 1550 B.C.

In chapter LXXXIX there are remedies for diseases of the gums: "To expel growth of purulency in the gums: fruit of sycamore/, beans/, honey/, malachite/, yellow ochre/, are ground, pounded together and applied to the tooth."

"Another to fasten a tooth: frankincense/, yellow ochre/, malachite/, are pounded together and applied to the tooth."

"Another to expel eating on the gums (ulcerative stomatitis?) and make the flesh grow; cows' milk/, fresh dates/, manna/,^(it) remains during the night in the dew, rinse the mouth for nine (days),"⁽³⁾ This latter remedy was likely to be effective in cases of vitamin C deficiency. Malachite green has strong bacteriostatic properties and when combined with the mild astringent properties of the other ingredients probably would alleviate certain gingival conditions.

Sir Armand Ruffer, who made extensive surveys of Egyptian/

8.

Egyptian mummies, says: "Already in several papers I have drawn attention to the bad state of the teeth of ancient Egyptians." Later in his book he states that: "Chronic suppurative periodontitis was a common disease in ancient Egypt, and the most frequent cause of the loss of teeth." (6)

There is no evidence that the ancient Egyptians used operative treatment to cure periodontal disease, although they were sorely afflicted by the condition, but many remedies to strengthen the attachment of the teeth, and cures for diseases of the gums, are found in the Ebers papyrus.

From evidence collected in Phoenician graves, periodontal disease was a common complaint. (7) Whereas the ancient Egyptians merely used medical remedies in their attempts to cure the condition, the Phoenicians went a step further, and ingeniously splinted several teeth together with gold wire, using sound teeth as supports. (8) Several of these splinting appliances have been discovered, and the date assigned to them is the 5th century B.C. It is interesting that the Egyptians who were so aware of cosmetic appearance apparently/

apparently made no effort to save teeth loosened by periodontal disease or even to replace missing teeth. It is difficult to reconcile this with the fact that they were in very close contact with the Phoenicians who were versed in the arts of splinting loosened teeth and replacing missing teeth.

In the works of Hippocrates (460-c370 B.C.) on the diseases of women the following passage is to be found:-

"When a woman's mouth smells and her gums are black and unhealthy, one burns, separately, the head of a hare, and three mice, after having taken out the intestines of two of them (not, however, the liver or the kidneys); one pounds in a stone mortar some marble or whitestone, and passes it through a sieve; one then mixes equal parts of these ingredients and with this mixture one rubs the teeth and the interior of the mouth; afterward one rubs them again with greasy wool and one washes the mouth with water. One soaks the dirty wool in honey and with it one rubs the teeth and gums inside and outside. One pounds dill and ani-seeds, two oboles of myrrh; one immerses these substances in half a cotyl of pure white wine; one then rinses the mouth with it, holding it in the mouth for some time; this is to be done frequently and the mouth to be rinsed with the said preparation fasting and after every meal. It is an excellent thing to take small quantities/

quantities of food of a very sustaining nature. The medicament described above cleans the teeth and gives them a sweet smell. It is known under the name of Indian medicament." (9).

If modern woman could be brought to accept this somewhat unpalatable prescription she in all probability would be astonished by its efficacy. The stimulation of the gums by massage, the astringent action of the myrrh and white wine, and the stimulant effect of the dill and aniseed would all tend to be beneficial in most cases of gingivitis.

Elsewhere in his works, Hippocrates recommends bleeding and the use of Egyptian alum for the treatment of painful and swollen gums. In a passage concerning protracted leucorrhœa he says:-

"One should ask women who have been troubled for some time with a white flux whether they suffer from headache, pains in the kidneys and in the lower part of the belly, as well as setting on edge of the teeth, dimming of the sight, singing in the ears." (10)

There is evidence, in the books of Hippocrates, that the ancient Greeks did make some effort to treat inflamed gums and loose teeth. Their treatment/

treatment consisted of chewing remedies which would promote the flow of saliva, and also cautery "which drives out the moisture"⁽¹¹⁾ in the parts to which it is applied, thus strengthening the teeth.

Hippocrates and his fellow Greeks were obviously aware of the beneficial effects of gingival stimulation and cautery in cases of gingival disease.

Aulus Cornelius Celsus gives an accurate account of medical and dental knowledge in ancient Rome.

Celsus, in chapter XII of his 7th book, speaks of the looseness of the teeth caused by the weakness of their roots, or by the flaccidity of the gums, and says that in these cases it is necessary to touch the gums lightly with a red-hot iron, then to smear them with honey, and wash them with mulse, and later, to strengthen them by means of astringent substances.⁽¹²⁾ Thus the use of cautery in periodontal disease is not so very modern!

For soft and bleeding gums the Romans also advocated freeing the teeth from tartar, and afterwards the gums were rubbed with alum and myrtle, followed by astringent liquids.⁽¹²⁾

Pierre Fauchard in the 18th century, when speaking/

speaking of diseases of the gums, says:-

"Most pregnant women are sufferers in the same way. Menstruation has ceased and the mass of blood remains charged with superfluities which were previously discharged by this means. From this it happens that these superfluities are deposited on the teeth or on the gums, and that such women suffer more in pregnancy than at any other time, and we see that they are often thus afflicted for the same reason when they cease to menstruate."(13)

He recommended careful **s**caling of the teeth in periodontal disease, and the use of astringent mouth washes; in cases in which the teeth were very loose he used splints to support them.

At this point it is of interest to note a case reported by Willich⁽⁸⁾ towards the end of the 18th century. A woman of forty years had borne two children without ever menstruating. Following the extraction of a tooth she had suffered from alveolar haemorrhage and the haemorrhage recurred regularly each month over a period of eight years thereafter. It is worthy of reflection as to whether this was a case of what is now known as 'vicarious menstruation'.

There was, however, little real advance in knowledge of the aetiology of periodontal disease from
400 B.C./

400 B.C. until the 19th century, when there was a change in the trend of thought, in so far as many of the more thoughtful and enquiring minds of the period tended towards the belief expressed by Chapin A. Harris (1840), when he said that "severe systemic diseases so vitiated the supporting tissues of the teeth that the slightest cause of local irritation gives rise to an afflux of blood to, and stasis of this fluid in the capillaries."(14)

Nevertheless, it must be said that treatment of the disease today is basically similar to that prescribed in the time of Hippocrates. Calculus is removed, soft spongy gingival tissue is eliminated and good oral hygiene is established, and the use of astringent dentifrices and mouthwashes is advocated.

Since 1900, however, there has been a steady increase in the number of dentists and scientists whose major interest has been in the periodontal field. The names of such men as Fish, Gottlieb, Box, and Ziskin, to mention but a few, will be remembered with gratitude by all who seek to find the/

the answer to the problem of periodontal disease.
Their observations and researches have done much to
lay a solid foundation on which to base further
investigations.

"Our knowledge is the amassed thought
and experience of innumerable minds."

Ralph Waldo Emerson.

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SCHEME OF STUDY

A series of 250 cases of gingival and periodontal disease in women was examined, and treated. In addition 19 cases of known endocrine imbalance, with associated gingival and periodontal conditions, were examined and treated while, from patients with apparently normal gingivae, normal tissue was obtained and examined.

The ages of these patients ranged from 12 years to 58 years.

Examination and treatment of all cases recorded in this work were undertaken in the Glasgow Dental Hospital and School, the Department of Endocrinology of Glasgow Royal Infirmary, and in the Department of Gynaecology of Glasgow Royal Infirmary.

In every case a thorough investigation was made, which included visual, instrumental, and radiological examination. The degrees of gingival and periodontal damage were noted. In cases of traumatic occlusion and other abnormal features, such as the presence of additional teeth or absence of teeth, the occlusion was registered and study models prepared. The depths of/

of the gingival sulci and pockets of every patient were registered before treatment, and recorded at regular intervals thereafter. A case history was taken from each patient, and all associated physiological and pathological conditions listed.

A record of each case was obtained by means of photography. An attempt was made to portray the cyclical gingival changes, which are obvious in many women, but this was not successful in most instances, as the colour film available was not sufficiently sensitive to record the delicate colour changes and, in many cases, the clinically obvious oedema, was not gross enough to be easily apparent on film. In some instances, the film did record the gingival changes, and a number of these photographs have been included in this thesis.

The work of other investigators was studied, some of their methods were put into practice, and a record was made of the results obtained. Thus, a true comparison was made between these previous results and the original research, which is described later. In this way, too, the patients treated in the early stages of the present research benefited from/

from the application of treatment which had undergone satisfactory clinical tests.

All tissue removed from patients in the course of treatment was placed immediately in a suitable fixative and prepared for histological and histochemical examination. A note was made of the day in the menstrual cycle on which the tissue was removed. The findings were recorded after microscopical examination. A history was taken also of the particular menstrual cycle in which the tissue was removed. In most instances gingivectomies were carried out on three visits, at different stages of the menstrual cycle.

Following gingivectomies the tissues were packed with strips of cotton wool impregnated with zinc oxide and oil of cloves. When the packs were removed seven days after gingivectomy, a record was made of the appearance of the gingival tissue, and the presence or absence of gingival discomfort following the operation. If pain had been experienced, efforts were made to ascertain whether this had been mild, or severe, localised or widespread. A note was made, also/

also, of the time required in the different phases of the menstrual cycle for complete healing to take place, following gingivectomy.

In as many cases as possible, the patient was given a chart, and asked to note her temperature on wakening each day; the chart was used for correlating the histological and histochemical findings with the proliferative and progestational phases of the cycle.

Wherever possible a periodic check was made on the cases treated up to the time of writing and, where there were signs of relapse, every effort was made to discover the reason for it. Where there was candour and co-operation from the patient, the cause was

readily apparent in most cases and an attempt was made to control it.

Where a case was treated in co-operation with the patient's medical adviser all relative data was used.

Some cases of Simmond's disease were treated and, with the co-operation of the Department of Endocrinology, an investigation was made of the tissue before and at every stage of replacement therapy. In some cases, when artificial menstruation was induced, special histopathological/

histopathological investigation was made of the effect on the gingivae.

The dental rehabilitation of all patients was executed in the shortest possible time. Fillings, extractions, and the fitting of any necessary prosthetic appliances were carried out as expeditiously as possible.

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Fig. 1 Normal gingivae in a young adult showing linear demarcation between attached gingivae and the darker areolar mucosa.

THE NORMAL CLINICAL AND MICROSCOPIC FEATURES
OF THE GINGIVAE AND PERIODONTAL MEMBRANE.

In order to understand the aetiology of periodontal diseases and the pathological involvement of the various structures, it is essential to be familiar with the normal structures of the marginal gingivae, the gingival sulcus, the epithelial attachment of the teeth, the periodontal membrane, the alveolar bone, and their inter-relationship one to the other. Destruction of the periodontal tissues frequently has its origin in the gingival sulcus and the marginal gingivae and leads to the formation of deep gingival pockets. It will be appreciated, therefore, that the speedy reduction of gingival pockets is the primary objective in treatment.

The gingiva is defined as that part of the oral mucous membrane which covers the alveolar processes of the jaws, and surrounds the necks of the teeth. It consists of the marginal, papillary and dental attachment tissues. The marginal or unattached gingiva is the free margin of the gum which serves as a collar extending along the cervical level of the teeth, and is/

THE NORMAL GINGIVAL AND PERIOPHARYNGEAL TISSUES
OF THE GINGIVA AND PERIOPHARYNGEAL MEMBRANE

In order to study the structure of the gingiva, a section of the gingiva was stained with hematoxylin and eosin. The gingiva is a stratified squamous epithelium. The surface is covered by a thick, keratinized layer (A). Below this is a layer of granular cells (B). The next layer is the prickle cell layer (C), which consists of several layers of large, polygonal cells. The deepest layer is the basal cell layer (D), which consists of a single layer of small, cuboidal cells. The basal cell layer is the source of new cells that migrate upwards to replace the cells that are shed from the surface.

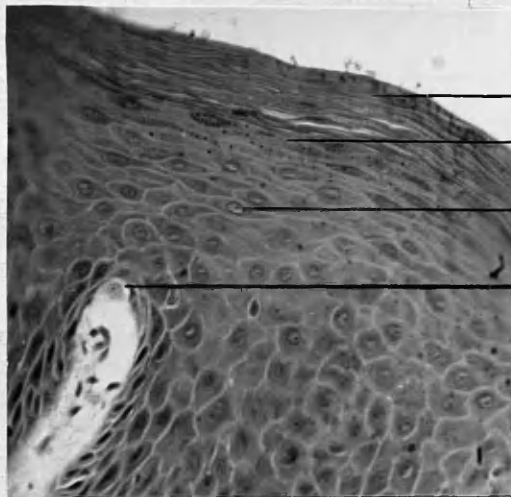


Fig. 2 Photomicrograph of gingival epithelium.

- A. Stratum corneum
- B. Stratum granulosum
- C. Prickle cell layer
- D. Basal cell layer

The gingiva is a stratified squamous epithelium. The surface is covered by a thick, keratinized layer (A). Below this is a layer of granular cells (B). The next layer is the prickle cell layer (C), which consists of several layers of large, polygonal cells. The deepest layer is the basal cell layer (D), which consists of a single layer of small, cuboidal cells. The basal cell layer is the source of new cells that migrate upwards to replace the cells that are shed from the surface.

is separated from them by the gingival sulcus. It is often demarcated from the adjacent attached gingiva by a shallow line or depression, called the free gingival groove. The interdental papilla is the portion of the gingiva which fills the interproximal space between two adjacent teeth, and extends to the contact point of adjacent teeth. The attached gingivae are firmly bound to the underlying alveolar bone and cementum by collagen fibres and extend from the marginal gingivae to the oral mucosa.

When normal, the gingivae are pale pink in colour, resilient, and firmly bound to the alveolar bone. The surface is stippled, and there is an abrupt line of demarcation called the muco-gingival junction where it joins the oral mucosa which is red and glossy, and is only loosely attached to the underlying tissues. (Vide Fig. 1).

The gingivae consist of a surface covering of stratified squamous epithelium, and an underlying connective tissue stroma. Figure 2 shows how the epithelium may be divided into the following:-

- A. A Cuboidal basal cell layer.
- B. A multi-layered prickle cell portion, consisting of polygonal cells/



A
B
C
D
E
F
G

Fig. 3 Photomicrograph of gingival epithelium and connective tissue.

- A. Stratum corneum of gingival epithelium.
- B. Stratum granulosum.
- C. Prickle cell layer.
- D. Basal cell layer of gingival epithelium.
- E. Papillary portion of connective tissue.
- F. Lamina propria.
- G. Submucosa.

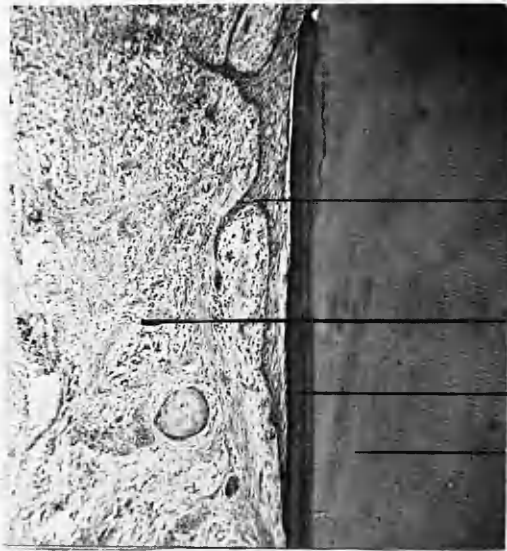
cells with prominent inter-cellular bridges.

- C. A granular layer, which may be two or three cells thick and consists of flattened cells with basophilic keratohyline granules in the cytoplasm and shrunken hyperchromic nuclei.
- D. The stratum corneum or surface layer, consisting of flattened acidophilic strands devoid of nuclei.

The junction between the epithelium and the lamina propria of the gingival connective tissue is consolidated by the development of high, closely arranged and irregular papillae. The lamina propria is densely collagenous, and contains some elastic fibres. (Vide Fig. 3). This may be divided into two portions, viz:-

1. A papillary layer, which is immediately below the epithelium, consisting of papillary projections which interdigitate with downward epithelial pegs.
2. A reticular layer which is contiguous with the fibrous connective tissue submucosa which in turn blends with the periosteum of the alveolar bone.

The epithelial attachment is that portion of the gingivae which is in direct contact with the surfaces of the teeth. It normally extends from the bottom of/



A.

Connective tissue

Cementum

Dentine

Fig. 4 Photomicrograph of the epithelial attachment at A.



A.

B.

Fig. 5 Photomicrograph of the epithelial attachment and gingival sulcus.

A. Epithelial lining of the gingival sulcus.

B. Epithelial attachment on cementum.

of the gingival sulcus towards the amelo-cemental junction, and often beyond it. The boundary between the epithelial attachment and the underlying connective tissue is smooth and not interrupted by connective tissue papillae. (Vide Fig. 4).

The gingival sulcus is the shallow groove or depression which results from the separation at the gingival crest of the epithelial attachment from the enamel surface. It is, therefore, bounded on one side by the tooth and on the other by the epithelium of the free margin of the gingivae (Vide Fig. 5).

To compensate for occlusal wear the eruptive movement of the teeth continues throughout life.⁽¹⁾ As eruption progresses, the base of the epithelial attachment moves in an apical direction down from the crown on to the root. This changing relationship of the epithelial attachment to the tooth permits the establishment of four stages of passive eruption (Vide Fig. 6).

The periodontal membrane is the connective tissue which surrounds the root of the tooth and connects it with the bony wall of the alveolar process. It is continuous with the connective tissue of the gingivae, retaining/

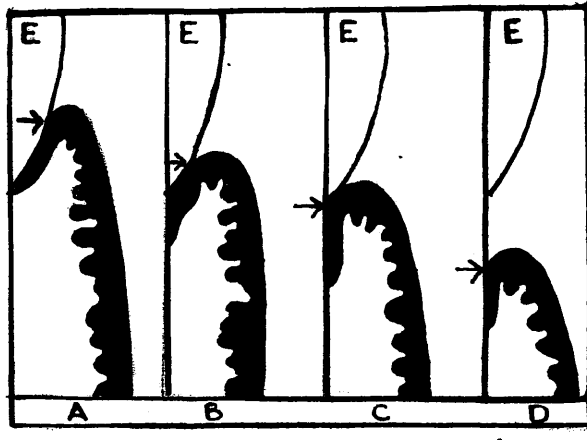


Fig. 6 Diagrammatic representation of the four stages of passive eruption according to Gottlieb. The base of the gingival sulcus is denoted by the arrow.

- A. The base of the gingival sulcus and the epithelial attachment are on the enamel (E).
- B. The base of the gingival sulcus is on the enamel, and the epithelial attachment is on the root.
- C. The base of the gingival sulcus is on the enamel-cementum junction, and the entire epithelial attachment is on the root.
- D. The base of the gingival sulcus and the epithelial attachment are on the root.

retaining the gingivae in close proximity to the surface of the tooth.

The structural elements of the periodontal membrane include bundles of connective tissue fibres, connective tissue cells, epithelial cells, blood vessels, lymphatics and nerves. The most important elements are the "principal fibres" of the periodontal membrane which are arranged in bundles, and arise from the cementum, and are attached at their termination to the supporting and investing bony tissues of the tooth.

The "principal fibres" are arranged in groups, some of which extend into the gingivae, while others extend between adjacent teeth. The majority of the fibres lie between the teeth and the bone. The distribution of the "principal fibres" of the periodontal membrane was originally classified by Black⁽²⁾ as follows:-

1. The free gingival group, the fibres of which pass from the cementum occlusally to support the gingivae.
2. The transeptal group, passing from the cementum of one tooth to the cementum of the adjacent tooth, thereby, supporting the interproximal gingiva./

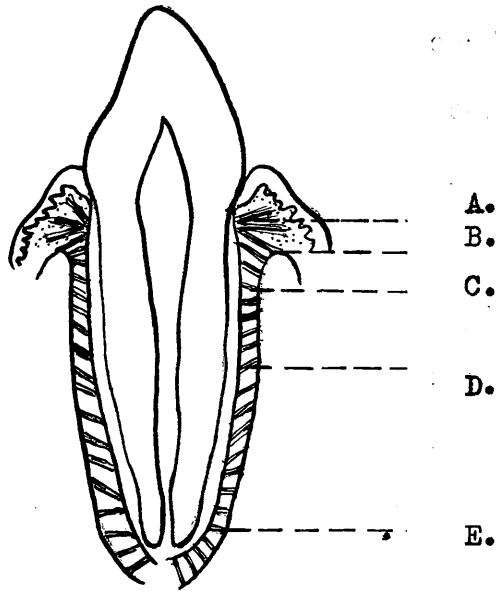


Fig. 7

Diagrammatic representation of the arrangement of the principal fibres of the periodontal membrane.

- A. Free gingival group
- B. Alveolar crest group
- C. Horizontal group
- D. Oblique group
- E. Apical group

gingiva.

3. The alveolar crest group, passing from the cementum to the crest of the alveolar process.
4. The horizontal group, in the occlusal third of the alveolar portion passes at right angles to the axis of the tooth, from the cementum to the alveolar bone.
5. The oblique group, in the apical two-thirds of the alveolar portion inclining occlusally as the fibres pass from the cementum to the bone.
6. The apical group, radiating from the apex of the root to the bone around the apical space (Vide Fig.7).

The arrangement of the fibres in the different groups is well adapted to sustain the tooth against all normal forces to which it is subjected.⁽³⁾ The principal fibres, taken as a whole, may be regarded as a ligament,⁽⁴⁾ by which the tooth is attached to the alveolar bone. Its function is, primarily, to transform pressure exerted upon the tooth into traction on cementum and bone.

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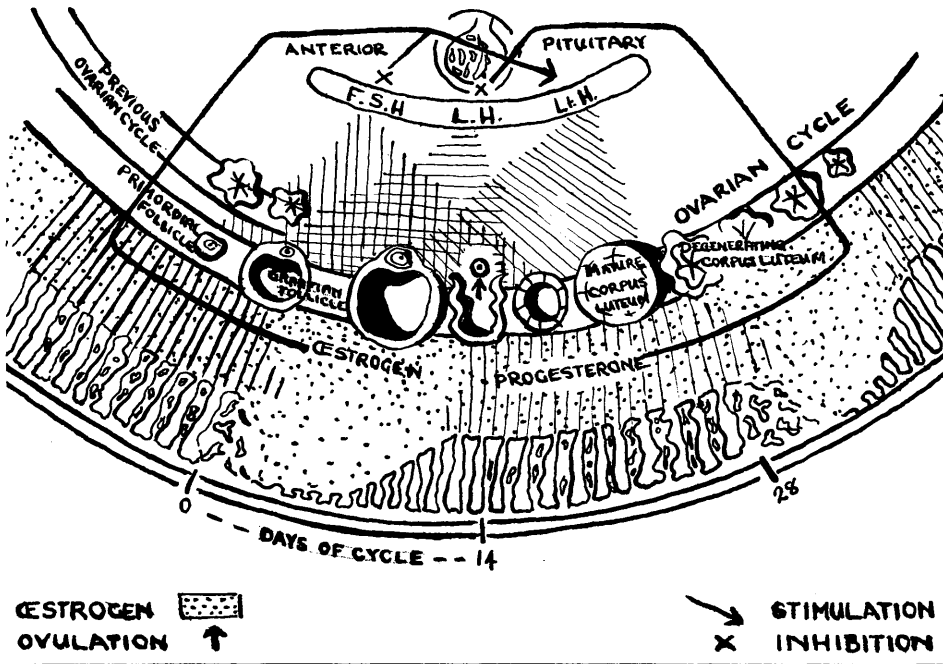


Fig. 8 A diagrammatic representation of the hormone control of the menstrual cycle (based on Bishops' (2) interpretation.)

THE MECHANISM OF THE MENSTRUAL CYCLE.

Owing to the similarity of changes in endometrial and oral tissues during the menstrual cycle it is necessary to describe the mechanism of the latter at this stage.

The menstrual cycle depends upon a sequence of events occurring concurrently but at two different levels, ovarian and pituitary. Other activities of an endocrine, nervous or psychic nature may influence the cycle at either of these levels. Thus, the thyroid and adrenal cortex may affect ovarian activity directly, or indirectly, through their effect on the anterior pituitary gland.⁽¹⁾ According to Bishop⁽²⁾ there is evidence that the action of ovarian hormones upon the vessels of the uterus is similar to that exerted by acetyl choline; thus the autonomic nervous system may play a part in initiating uterine bleeding. The menstrual cycle may be halted, delayed, or started prematurely by impulses from the higher centres through the hypothalamic - pituitary pathway.

The Ovarian Cycle.

The primordial follicles constitute the essential components of the ovaries, and are to be found just below its surface. Each month, from puberty to the menopause, one of these follicles undergoes a process of development which has widespread effects. Initially the follicle sinks deeper into the ovary, and expands. At this stage it consists of a lining membrane, the *membrana granulosa*, in which the ovum, surrounded by granulosa cells, is embedded as a sessile protrusion into the cavity. This structure is the Graafian follicle, which under the stimulus of minimal quantities of luteinising hormone and an increasing quantity of follicle stimulating hormone (F.S.H.), fills with fluid containing the follicular hormone, oestradiol. This is secreted into the blood stream, where it exerts its influence on the breasts, the uterus, the vagina and the pituitary gland. In the liver, and during the process of its excretion in the urine, the hormone undergoes changes which render it less potent.

As the follicle develops, more fluid exudes into it,/

it, and the pressure within rises. The ovarian substance, which separates it from the surface, necroses and the follicle ruptures. This process is known as ovulation. Ovulation usually occurs between the thirteenth to the seventeenth day of the menstrual cycle, but it may occur earlier or later.⁽³⁾ The ovum is thus extruded into the abdominal cavity and, owing to the close proximity of the fimbriae of the Fallopian tubes to the ovary, the ovum is almost always directed into one of the Fallopian tubes.

After ovulation the lining membrane of the follicle collapses and the cavity is filled with organising blood clot. The membrana granulosa proliferates and differentiates and, with thecal connective tissue cells, grows into and replaces the blood clot, thus forming the corpus luteum. The cells of the corpus luteum secrete a hormone known as progesterone, which brings about changes in the endometrium to enable the ovum, if fertilised, to become embedded in the uterus. If pregnancy does not occur, the corpus luteum persists until just before the onset of the next menstrual period when it begins to degenerate. Therefore, after ovulation, /

ovulation, the main events of the sex cycle are controlled by progesterone, and although oestrogens continue to be secreted by the ovary, they are partially inactivated by progesterone.⁽²⁾ If pregnancy occurs, the corpus luteum continues to grow for several months, and begins to degenerate at about the sixth month.

The Endometrial Cycle.

The body of the uterus consists of a serous outer coat with a thick muscular middle coat, and an inner lining of mucous membrane or endometrium which undergoes characteristic changes during the menstrual cycle.

The menstrual cycle may be divided into three stages:-

1. The proliferative stage begins about the fifth or sixth day, when the damage resulting from the menstrual period has been fully repaired. Initially, the endometrium is thin and consists of a ciliated columnar epithelium dipping down into the loose stroma to form simple tubular glands. During the next eight days or so (i.e. 6th - 14th day) the mucosa thickens, /

thickens, becomes more vascular, and the glands become dilated in the deeper part.

2. The pre-menstrual or progestational stage begins about the fifteenth day and lasts until the end of the cycle (i.e. 15th - 28th day). During this stage the endometrium becomes progressively thicker and the glands are distended with mucous. The stroma cells proliferate and enlarge and become densely packed. The blood vessels are congested, and exudation of clear and blood stained fluid occurs.

3. The menstrual stage or menstruation (1st - 4th or 5th day) is characterised by bleeding and shedding of the superficial part of the endometrium, leaving the basal layer intact. The mechanism of menstruation is obscure. It is suggested that the spiral arteries, supplying the superficial one-third of the mucosa, close down. Owing to the resulting ischaemia the related region of the mucosa undergoes necrosis, and the walls of the contained capillaries are weakened. When the spasm passes away, and the circulation is restored, the blood leaks from the damaged capillary walls into the stroma, under the superficial/

superficial epithelium and into the lumina of the glands. The necrotic endometrium, together with exuded blood and mucus, is cast off into the lumen of the uterus and passes to the exterior.

The Pituitary Cycle.

The anterior lobe of the pituitary gland secretes a gonadotrophic complex of hormones. The popular conception of the relationship between this complex of hormones and the ovaries is as follows:- The follicle-stimulating hormone stimulates development of the ovaries, but is unable to stimulate the secretion of oestrogen or to produce ripening of the Graafian follicles unless small amounts of luteinising hormone (i.e. interstitial cell stimulating hormone) are present. Through the synergistic action of the follicle-stimulating hormone and the luteinising hormone, the conversion of a primordial follicle to a Graafian follicle, and the secretion of oestrogen is effected. Oestrogen stimulates the further secretion of the luteinising hormone and, as oestrogen production increases, it inhibits the secretion of follicle-stimulating hormone. Luteinis-

ing/

Luteinising hormone brings about ovulation and the formation of the corpus luteum. A third hormone, the lactogenic hormone of the anterior lobe, is also secreted as a result of the action of oestrogen. It stimulates the corpus luteum to secrete progesterone, and is known in this connection as the Luteotrophic hormone. After ovulation the level of oestrogen gradually declines because of the destruction of the follicle, and because of the fall in the production of follicle stimulating hormone. The inhibitory effect of oestrogen on the follicle-stimulating hormone is thus removed and, therefore, the secretion of the latter is increased. The amount of luteinising hormone is diminished partly through the fall in the level of oestrogen and partly because of the rise in the level of progesterone, which exerts an inhibitory effect on its secretion. The corpus luteum, therefore, degenerates, and the cycle is repeated.

- (1) Spence, A.W. (1953) Clinical Endocrinology. London, Cassel & Co.Ltd.
- (2) Bishop, P.M.F. (1951) Gynaecological Endocrinology. Edinburgh, E. & S. Livingstone Ltd.
- (3) Wright, S. (1952) Applied Physiology London, Oxford University Press.

TABLE 1

Table of Aetiological Factors in Periodontal Disease.

A = Local Factors

- | | |
|------------------------------------|---|
| 1. <u>Overfunction</u> | (a) Excessive stress on teeth |
| | (b) Insufficient periodontal support |
| 2. <u>Underfunction</u> | (a) Premature wear (naturally or artificially produced) |
| | (b) Non-occlusion |
| | (c) Indolent mastication |
| 3. <u>Abnormal habits</u> | (a) Unilateral mastication |
| | (b) Abnormal biting habits |
| 4. <u>Abnormal anatomy</u> | (a) Overcrowding of the teeth |
| | (b) Overclosure in the anterior part of the mouth |
| 5. <u>Calculus</u> | |
| 6. <u>Food impaction</u> | |
| 7. <u>Mechanical irritants</u> | (a) Cavity margins |
| | (b) Overhanging fillings |
| | (c) Orthodontic appliances and partial dentures |
| 8. <u>Chemical irritants</u> | |
| 9. <u>Mouthbreathing</u> | |
| 10. <u>Improper tooth brushing</u> | |

B = Systemic Factors

- | | |
|----------------------------------|------------------------|
| 1. <u>Faulty Nutrition</u> | (a) Vitamin deficiency |
| | (b) Mineral deficiency |
| 2. <u>Endocrine Disturbances</u> | |
| 3. <u>Pregnancy</u> | |
| 4. <u>Blood dyscrasias</u> | |
| 5. <u>Allergies</u> | |
| 6. <u>Metallic poisonings</u> | |
| 7. <u>Psychosomatic factors</u> | |

A CLASSIFICATION AND SUMMARY OF THE
AETIOLOGICAL FACTORS OF GINGIVAL
AND PERIODONTAL DISEASE. .

Periodontal disease is a comprehensive term referring to all the disease processes to which the periodontium is subject. Clinically these processes may be divided into two groups: (1) Gingival disease. (2) Destructive periodontal disease.

In almost all instances the first stage of periodontal disease is an inflammatory change in the marginal gingivae, characterised by ulceration of the base of the gingival sulcus. If the condition is not arrested at this stage, the ulceration progresses, with destruction of the connective tissue and of the gingival fibres of the periodontal membrane. When this occurs the gum margin is no longer firmly attached to the teeth, and the clinical appearance is that of loose, inflamed gingivae, which may be detached from the surface of the teeth and bleed readily when explored with a blunt probe. As the condition progresses the alveolar bone in the vicinity of the inflammatory/

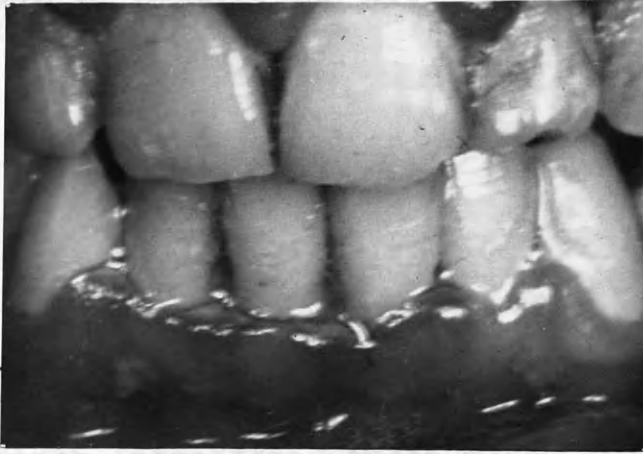


Fig. 9 A case of acute ulcerative gingivitis.
(note the loss of the interdental papillae.)



Fig. 10 A case of chronic marginal gingivitis.
(note the swollen interdental papillae and the inflammation of the marginal gingivae.)

inflammatory process is resorbed. The disease then is confined no longer to the gingivae and, consequently, is described as destructive periodontal disease, or pyorrhoea simplex. The clinical appearance at this stage is usually one of lessened gingival inflammation and bleeding, but pockets of varying depth may be explored with a blunt probe. The ultimate result is the loss of the teeth if these conditions are left untreated.

The two main divisions of periodontal disease, namely gingival disease and destructive periodontal disease may be sub-divided further as follows:

1. Traumatic Gingivitis. This condition may be caused by laceration of the gingival margins by a very hard toothbrush, or by tearing of the tissue by some hard, sharp body in the food.

2. Acute Ulcerative Gingivitis. This condition is also known as Vincent's disease. It generally starts in the gum margins, and may extend to the cheeks, palate or pharynx. If the condition is untreated, or improperly treated, it may become chronic and may finally develop into chronic destructive periodontitis.



Fig. 11 A case of chronic hypertrophic gingivitis.
 (note the grossly enlarged interdental papillae.)



Fig. 12 A case of chronic destructive periodontitis.
 (note the loss of the interdental papillae.)

3. Chronic Marginal Gingivitis. In this condition the gum margins are swollen and red, and they bleed readily. If the disease is left untreated, pockets form and the case progresses to one of chronic destructive periodontitis. Fish⁽¹⁾ mentions a subacute type of marginal gingivitis which is very common in young people, especially women. His description of it is similar to that given for the chronic form, but he says the condition, if untreated, develops into a pyorrhoea often of the "profunda" type, which means that the pockets are very deep on one aspect of a tooth, and not nearly so deep around the rest of the tooth.

4. Chronic Hypertrophic Gingivitis. This condition is very common at puberty, especially in patients who are so-called "mouth breathers". The interdental papillae become swollen and red masses, which may become so enlarged that the whole gingival margin is involved in the hypertrophic process.

5. Chronic Destructive Periodontitis. If inflammatory conditions of the gingivae are untreated chronic/



Fig. 13A A case of diffuse alveolar atrophy.
 (note the lack of inflammation of the papillae and marginal gingivae.)



Fig. 13B Radiographs of the case of diffuse alveolar atrophy shown in Fig. 13A.
 (note the generalised bone loss.)

chronic destructive periodontitis will result. The periodontal fibres gradually disintegrate and the gingival sulcus is found to be deeper than it normally should be when explored with a blunt probe. The sulcus is then called a "periodontal pocket".

6. Diffuse Alveolar Atrophy or Periodontosis.

This type of chronic periodontal destruction originates in the periodontal tissue rather than in the gingivae. The aetiology of the condition is recognised to be of a systemic nature.⁽²⁾ It is a degenerative, non-inflammatory destruction of the periodontal tissues, characterised by migration and loosening of the teeth.

7. Senile Alveolar Resorption. This condition is almost always found in old age, as the name implies, if the teeth and periodontal tissues have survived. The cementum at the necks of the teeth is usually uniformly exposed all round, and the gum margins are still firmly attached to the cementum.

When considering the aetiology of periodontal disease it should be recognised that it is extremely doubtful if any single factor could, by itself, produce the destruction of the periodontium. Rather

a/



Fig. 14 A case of senile alveolar resorption.

(note the even exposure of cementum around all the teeth.)

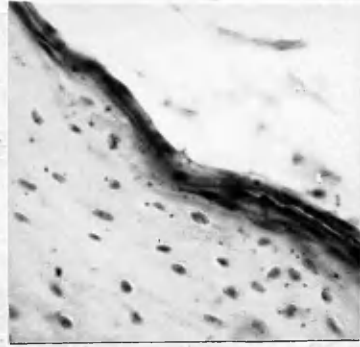
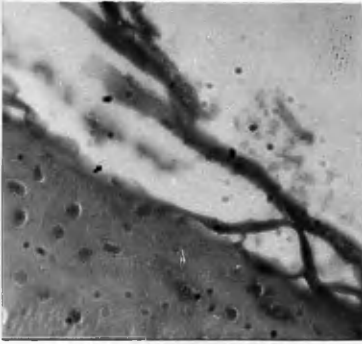
if the periodontal condition is not too advanced. The cementum at the neck of the tooth is usually uniformly exposed all round, and the gum recession still firmly attached to the cementum.

When considering the relation of periodontal disease it should be recalled that it is especially harmful if any a self-cleaning action, and since the destruction of the periodontal

a combination of factors which lower the tissue resistance and act upon this weakened tissue is necessary to produce disturbances of the periodontium. This is the reason for failure in the constant search for a single factor as the cause of periodontal disease. Treatment directed at factors which are thought to be causing the disease, but which are actually only contributing towards it, have been responsible for the many failures in handling this condition.

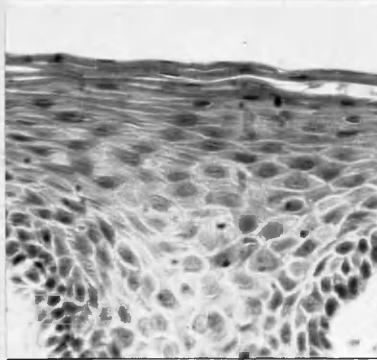
It is hoped to show, however, in the present investigation that the tissue changes which take place during the menstrual cycle, while not the sole aetiological factor, yet constitute the main contributing agent leading to periodontal disease in the female.

- (1) Fish, W.E. (1946) Paradontal Disease. London, Eyre & Spottiswoode Ltd.
- (2) Glickman, I. (1953) Clinical Periodontology. Philadelphia, W.B. Saunders Co.



A. Shows the splitting of the keratin which leaves the surface of the gingival epithelium devoid of keratin on the 1st day of menstruation.

B. Shows a well keratinised surface on the 8th day of the same menstrual cycle.



C. Shows the keratin splitting on the 22nd day of the same cycle.

Fig. 15, Photomicrographs of the gingival epithelium from Miss J.H. (Note the splitting of the keratin starting in the progestational phase as shown in C and completed at menstruation as shown in A.) Mag.x 60.

RESULTS

The gingival tissue from 250 female patients with normal cycles, was examined microscopically. This tissue was obtained in different phases of the menstrual cycle. As a result of this examination a distinct microscopical pattern of cyclical changes became apparent; these will be described in the following paragraphs.

Changes in the Cornified Surface Layer -
of the Gingival Epithelium

The first change to be considered was that of the cornified surface layer of the gingival epithelium. In the menstrual phase (i.e. 1st - 4th or 5th day) the keratinised layer was either non-existent or very thin. After the proliferative phase (6th - 13th day) had been established for a few days the keratin, in most of the sections examined, was quite thick; in those sections of tissue taken in the early part of this phase (i.e. 6th - 7th day) the keratin was often thin. In the early part of the progestational phase, from the 14th to the 20th days, the keratin remained intact, but as this/

TABLE 2

	<u>Keratin Thick</u>	<u>Keratin Very Thin or Non-existent</u>	<u>Keratin Splitting</u>
1st - 5th days of menstrual cycle	1.2%	96.4%	2.4%
6th - 13th days of menstrual cycle	90.9%	8.3%	.8%
14th - 20th days of menstrual cycle	81.6%	3.9%	14.5%
21st - 30th days of menstrual cycle	7.4%	45.8%	46.8%

The degree of keratinisation of the gingival tissue taken from 250 female patients with menstrual cycles which ranged from 28 - 30 days.

this phase progressed, (i.e. from the 20th day to the end of the cycle) there were signs of the keratin splitting to leave a thin layer on the surface of the epithelium or, as happened in many cases, the keratin appeared to separate from the stratum granulosum completely (Vide Fig. 15.). The detailed results of this examination are to be found in table form in Table 2.

Changes in the Basal Cell Layer of the Gingival Epithelium

The degree of activity of the basal cell layer of the gingival epithelium was found to form a pattern of change during the menstrual cycle. During the menstrual phase the basal cell layer was comparatively inactive; very few mitotic figures were to be found in this phase. In the proliferative phase there was a progressive increase in the number of mitotic figures found in the basal cell layer. The period of greatest activity in this layer, however, was between the 14th and 20th days of the menstrual cycle. Later in the progestational phase the activity of the basal cell layer decreased until, at the end of the cycle, the degree/

TABLE 3

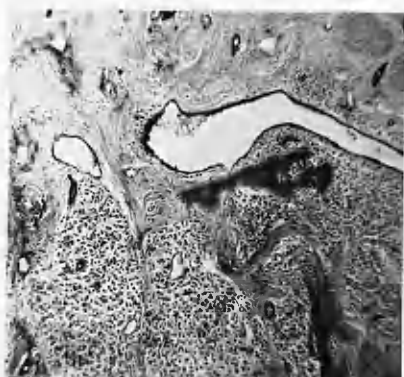
	<u>Inactive Basal cell layer</u>	<u>Active Basal cell layer</u>	<u>Very Active Basal cell layer</u>
1st - 5th days of menstrual cycle	93.9%	5.4%	.7%
6th - 13th days of menstrual cycle	7.2%	82.1%	10.7%
14th - 20th days of menstrual cycle	.5%	70.8%	28.7%
21st - 30th days of menstrual cycle	46.9%	51.8%	1.3%

The activity of the gingival basal cell layer in the 250 female patients shown in Table 2.

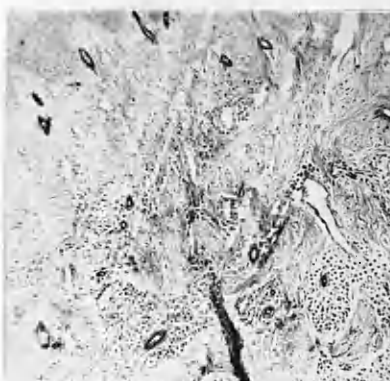
degree of activity was comparable with that of the menstrual phase. The degree of activity of the basal cell layer given in Table 3 showing inactive, active and very active phases is based on the number of mitotic figures counted in the haemalum and eosin stained sections. 1 to 5 mitotic figures in a section was considered inactive, 5 to 15 active, and above 15 figures was considered very active. In the inactive group the average number of mitotic figures was 4.8, in the active group the average number was 8.33, and in the very active group it was 15.6. The results of this investigation are given in table form in Table 3.

Connective Tissue Stroma

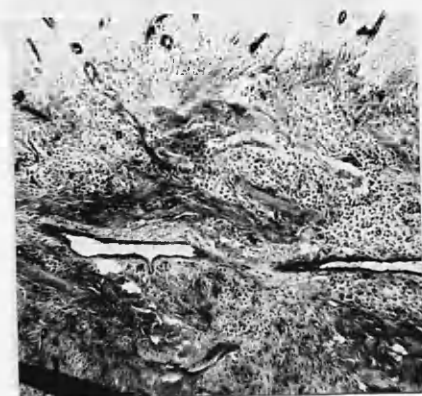
The effect which the menstrual cycle had on the connective tissue was more difficult to assess. There appeared to be a tendency towards oedematous change during the late proggestational phase; for the first three days of menstruation, this change was obvious clinically in the majority of patients, but it was more difficult to demonstrate histologically, and requires further investigation. Two changes in the connective tissue stroma which were very obvious were/



A. Gingival tissue from Mrs. S. Aged 33, on 2nd day of a menstrual cycle. Mag. x 60

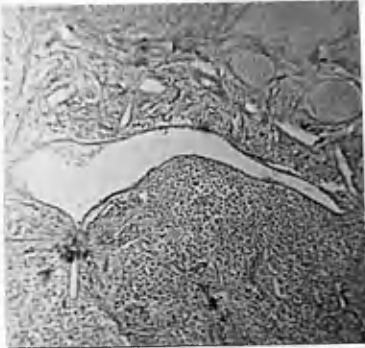


B. Gingival tissue from Mrs. S. on the 9th day of the same cycle. Mag. x 60



C. Gingival tissue from Mrs. S. on 21st day of the same cycle. Mag. x 60

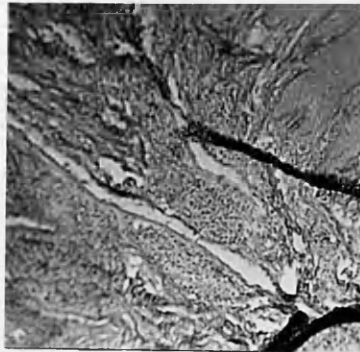
Fig. 16 Photomicrographs of gingival tissue stained for alkaline phosphatase by Gomori's method. (Note the increase in alkaline phosphatase in C.)



A. Gingival tissue from Mrs. S. on 2nd day of the menstrual cycle. Mag. x 60



B. Gingival tissue from Mrs S. on the 9th day of the same cycle. Mag. x 60



C. Gingival tissue from Mrs. S. on the 21st day of the same cycle. Mag. x 60

Fig. 17 Photomicrographs of gingival tissue stained for Glycogen by the periodic acid Schiff method. (Note the increase in polysaccharides which parallels the concentration of alkaline phosphatase in Fig. 16 C.)



A. Gingival tissue from Miss A. on the 5th day of a menstrual cycle. Mag. X 60

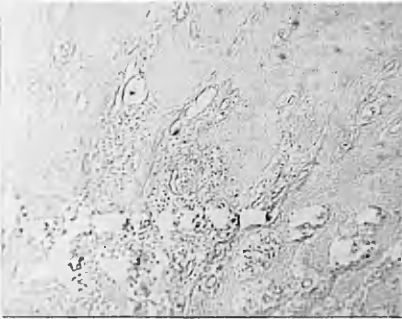


B. Gingival tissue from Miss A. on the 12th day of the same cycle. Mag. X 60

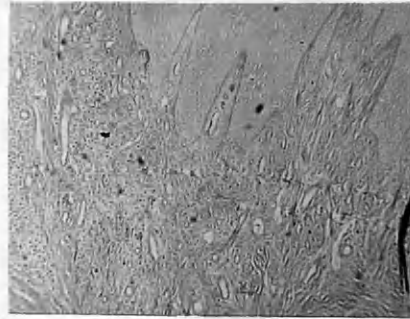


C. Gingival tissue from Miss A. on the 27th day of the same cycle. Mag. X 60

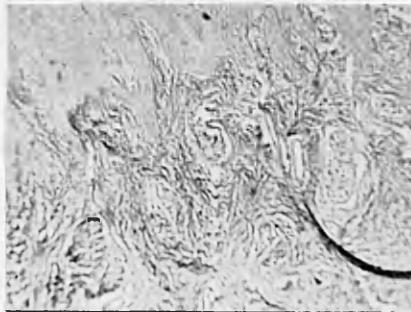
Fig. 18 Photomicrographs of gingival tissue stained for alkaline phosphatase by Gomori's method. (Note the increase in alkaline phosphatase from the end of menstruation as shown in A. to the late progestational phase as shown in C.)



A. Gingival tissue from Miss A. on the 5th day of a menstrual cycle. Mag. x 60



B. Gingival tissue from Miss A. on the 12th day of the same cycle. Mag. x 60



C. Gingival tissue from Miss A. on the 27th day of the same cycle. Mag. x 60

Fig. 19 Photomicrographs of gingival tissue stained for Glycogen by the periodic acid Schiff method. (Note the increase in glycogen from the end of menstruation as shown in A. to the late progestational phase as shown in C.)

were the progressive vascularisation of the gingivae, and also the increased concentration of polysaccharides in the connective tissue and in the basement membrane; this happened in the majority of cases between the 12th and 20th days after the first day of menstruation, and occurred at the same time as the rise in basal temperature which indicated ovulation. A series of photomicrographs showing the progressive vascularisation of the gingivae and the increasing concentration of polysaccharides are given in Figs. 16 - 19.

Capillary Changes in Gingival Tissues during the Menstrual Cycle

The cyclical capillary changes were as follows: In the menstrual phase of the cycle, particularly in the first three or four days the capillaries in the gingiva were numerous, and many of them were distended. During the early part of the proliferative phase there were comparatively few capillaries to be seen. However, about the 11th day of this phase the capillary blood vessels became more numerous. The increase in numbers of capillaries was most obvious about the 12th - 15th days of the menstrual cycle, and occurred at the same time/

TABLE 4

	<u>Capillaries few in number</u>	<u>Capillaries numerous</u>	<u>Capillaries numerous & dilated</u>
1st - 5th days of menstrual cycle	-	9.09%	90.91%
6th - 10th days of menstrual cycle	85.71%	14.28%	-
11th - 13th days of menstrual cycle	-	66.6%	33.3%
14th - 20th days of menstrual cycle	-	62.5%	37.5%
21st - 28th days of menstrual cycle	-	26.6%	73.4%

This Table shows the state of the capillaries in the gingival tissue taken from 21 female patients in a menstrual cycle in which their basal temperature charts indicated that they had ovulated.

TABLE 5

	<u>Capillaries few in number</u>	<u>Capillaries numerous</u>	<u>Capillaries numerous & dilated</u>
1st - 5th days of menstrual cycle	10%	10%	80%
6th - 10th days of menstrual cycle	83.3%	16.6%	-
11th - 13th days of menstrual cycle	85.7%	14.2%	-
14th - 20th days of menstrual cycle	100%	-	-
21st - 28th days of menstrual cycle	25%	66.6%	8.3%

This Table shows the state of the capillaries in the gingival tissue taken from 12 female patients in a menstrual cycle in which their basal temperature charts indicated that they had not ovulated.

time as other signs, such as the rise in basal temperature, which indicated ovulation. The vascularisation continued throughout the progestational phase, many of the capillaries becoming dilated toward the end of the cycle. Clinically this was seen as a progression from a pink appearance of the gingivae and the oral mucosa in the proliferative phase of the menstrual cycle, to the congested red appearance in the progestational and menstrual phases.

Table 4 shows this capillary change during the cycle. The statistics in Table 4 were compiled from the results of the histological examination of gingival tissue taken from 21 female patients throughout a menstrual cycle in which their basal temperature charts indicated that they had ovulated.

For comparison Table 5 has been inserted to show the lack of cyclical gingival capillary change in patients who had not ovulated. The increase in gingival capillaries did not occur until menstruation in those patients whose basal temperature charts failed to show any change indicating ovulation.

Tables 4 and 5 should be studied in conjunction with/

TABLE 6

	<u>Capillaries</u> <u>few in number</u>	<u>Capillaries</u> <u>numerous</u>	<u>Capillaries</u> <u>numerous & dilated</u>
1st - 5th days of menstrual cycle	1.6%	8.8%	89.4%
6th - 10th days of menstrual cycle	83.3%	13.8%	2.7%
11th - 13th days of menstrual cycle	4.7%	61.9%	35.9%
14th - 20th days of menstrual cycle	3.7%	59.8%	36.4%
21st - 28th days of menstrual cycle	1.2%	25.4%	73.3%

This Table shows the state of the capillaries in the gingival tissue of the 250 female patients at various stages of the menstrual cycle.

with table 6 which is the result of histological examination of the gingival tissue for capillary change throughout the menstrual cycles of 250 patients.

A comparison of the statistics, for the state of the capillaries throughout the cycle, is significant. It shows the progressive increase of capillaries from the late proliferative phase with an increase in the number of dilated capillaries throughout the progestational phase to the menstrual phase of the cycle.

The Incidence of Pain and the
Rate of Healing
associated with the Menstrual Cycle

During the course of this research it was discovered that the incidence of pain and the rate of healing following gingivectomy varied during the menstrual cycle. When the gingivectomy was carried out in the menstrual or proliferative phases of the cycle very few of the patients had any discomfort, and healing was rapid. When, however, the gingivectomy was performed in the progestational phase of the cycle most/

TABLE 7

	<u>Group 1</u> <u>1st-4th</u> <u>days</u>	<u>Group 2</u> <u>5-14th</u> <u>days</u>	<u>Group 3</u> <u>15-19th</u> <u>days</u>	<u>Group 4</u> <u>20-26th</u> <u>days</u>	<u>Group 5</u> <u>27-28th</u> <u>days</u>
% of cases with no pain follow- ing gingivectomy	83.6%	84.2%	18.1%	3.3%	77.6%
% of cases with slight discomfort following gingi- vectomy	12.7%	13.6%	27.5%	15.3%	13.8%
% of cases with marked pain follow- ing gingivectomy	3.15%	1.8%	54.5%	81.3%	8.4%

The above results are from 183 cases of periodontal disease in females whose menstrual cycles lasted 28 days in the cycles in which the gingivectomies were performed. The results are in 5 groups and under each group heading are the days in the cycle on which the gingivectomies were performed.

most of the patients had discomfort, and healing was much slower. The period during which the most severe discomfort occurred was from the 19th to the 26th days of the menstrual cycle. Healing following gingivectomy during those 7 days was very slow in all cases.

The results in Tables 7 and 8 were assessed in the following manner. Patients were divided into five groups.

- Group 1 Gingivectomy performed during
 MENSTRUATION.
- Group 2 Gingivectomy performed during
 PROLIFERATIVE PHASE.
- Group 3 Gingivectomy performed during EARLY
 PROGESTATIONAL PHASE.
- Group 4 Gingivectomy performed during LATE
 PROGESTATIONAL PHASE.
- Group 5 Gingivectomy performed during PRE-
 MENSTRUAL PHASE.

Pain was considered on three levels.

1. Patients who had NO PAIN.
2. Patients who had SLIGHT PAIN (this usually
 lasting 48 to 72 hours after gingivectomy).
3. Patients who had MARKED PAIN (this usually
 lasting throughout the 7 days following
 gingivectomy).

Healing./

TABLE 8

	<u>Group 1</u> <u>1st-4th</u> <u>days</u>	<u>Group 2</u> <u>5-14th</u> <u>days</u>	<u>Group 3</u> <u>15-19th</u> <u>days</u>	<u>Group 4</u> <u>20-26th</u> <u>days</u>	<u>Group 5</u> <u>27-28th</u> <u>days</u>
% of cases with good result and rapid healing following gingivectomy	65.2%	76.3%	13.7%	4.6%	39.2%
% of cases with poor initial result but rapid healing following gingivectomy	31.9%	21.8%	25%	14.6%	56.9%
% of cases with poor result and slow healing following gingivectomy	2.1%	1.8%	61.2%	80.6%	3.8%

The above results are from the same 183 cases as in Table 7. The results are in 5 groups and under each group heading are the days in the cycle on which the gingivectomies were performed.

Healing. The rate of healing was based on the time taken for clinically complete healing to take place after the zinc oxide and oil of cloves packs were removed. When pain was absent and the tissues no longer bled on palpation, and were of a firm consistency and pale pink in colour, healing was considered to be complete. When healing occurred from 2 to 3 weeks after gingivectomy the process was considered to be rapid. When it took more than 3 weeks to heal it was considered to be slow. Actually in 95% of the cases in which healing was slow, the time taken for clinically complete healing to occur was between 4 and 6 weeks.

In the group of 183 cases described in Tables 8 and 9, there were 4 patients whose temperature charts suggested that they had not ovulated. This finding was supported by histological examination of the gingival tissue which showed no cyclical change. In all 4 cases healing was rapid and pain was absent following gingivectomy.

There were eighteen patients, however, whose temperature charts indicated that ovulation had occurred./

occurred. In these cases histological examination of the gingival tissue showed a marked cyclical change from the appearance typical of the proliferative phase to that indicative of the progestational phase. None of these eighteen patients had pain when gingivectomy was carried out in the proliferative phase; one had marked pain in the menstrual phase; all had pain in the progestational phase and the healing in this phase was much slower in all cases.

Diabetes Mellitus

Four female patients with diabetes mellitus were treated for their paradontal condition. All showed exaggerated gingival tissue changes in response to the menstrual cycle. The periodontal condition in each case was extremely bad, there being considerable bone loss, and deep periodontal pocket formation around all the teeth. The 4 cases responded satisfactorily to periodontal treatment initially, although in 2 cases where patients failed to co-operate in post-operative treatment there was a relapse within one cycle.

Case 1. Mrs. -- Age 29, Cycle 5/28. Diabetes Mellitus diagnosed and controlled from the age of 7/

occurred. In these cases histological examination of the gingival tissue in the reparative phase from the upper and lower anterior teeth indicated that the gingiva of these teeth was carried out in the reparative phase; all had pain in the gingiva in this phase and the healing in this phase was much slower in all cases.



A.



B.

Fig. 20 Periodontal disease in a female patient suffering from diabetes mellitus.

- A. Gingivae as they appeared before periodontal treatment.
- B. Gingivae as they appeared 10 months after periodontal treatment.

Case 1. Mrs. J. G. -- Age 58. Diabetes Mellitus diagnosed and controlled from the age of 35.

7 years. One pregnancy at the age of 22 years. Paradontal condition very bad. Full dentition, of which every tooth was mobile. Bone loss extensive. No calculus. Patient had been aware of poor gingival condition for 6-7 years, and had known that the gingival condition was much worse throughout menstruation and for a period of ten days before it occurred.

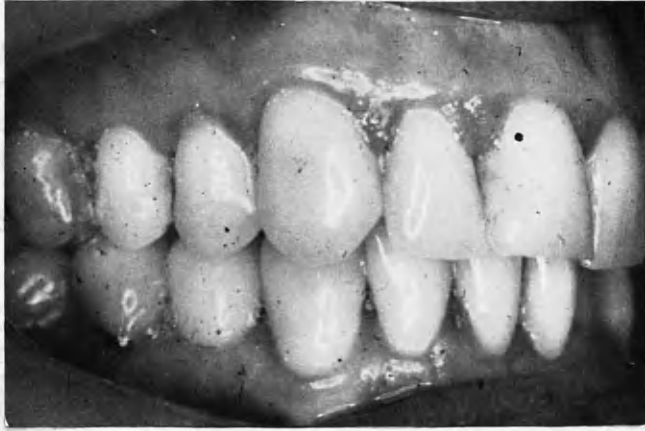
Case 2. Mrs. -- Age 40, Cycle 6/28. Diabetes Mellitus diagnosed and controlled from the age of 36. Twice pregnant, 14 and 9 years previously. Full dentition with exception of 8/ and 87. All anterior teeth in both jaws were mobile. Extensive bone loss around all teeth. Slight calculus formation behind lower anterior teeth. Patient had been aware of the paradontal condition from the time of her first pregnancy, when she had received paradontal treatment. In the last five years the paradontal condition had been progressively worse, and the patient had complained of painful bleeding gingivae for two days before menstruation and for the duration of the period.

Case 3. Mrs. -- Age 30, Cycle 7/30 & 7/42. Alternate Cycles. Diabetes Mellitus diagnosed and controlled from the age of 15 years. No children. Patient unaware of paradontal condition although gingival recession and tooth mobility were marked. Bone loss extensive around all existing teeth.

Case 4. Miss -- Age 27, Cycle 3/25. Diabetes Mellitus diagnosed and controlled from the age of 18 years. Very extensive bone loss around all teeth. Patient had been aware of the paradontal condition for 4-5 years. Gingival condition worse 48 hours before menstruation and for the duration of the period.

Thyrotoxicosis

Three/



A.



B.

Fig. 21 A case of periodontal disease associated with polymenorrhoea which accompanied the recurrence of thyrotoxicosis in this patient.

- A. The gingivae shortly after recurrence of the thyrotoxicosis.
- B. The gingivae after the thyrotoxicosis had been controlled by medical treatment.

Three female patients with thyrotoxicosis were treated for their periodontal condition, after the thyroid condition had been controlled medically in two cases and surgically in one. They all responded to periodontal treatment although the surgical patient became thyrotoxic again a year after gingivectomy had been performed. During that year her gingival and periodontal condition was excellent; when the thyrotoxic condition recurred it was accompanied by polymenorrhoea; she menstruated every fourteen days, the bleeding lasting eight days; four weeks after the polymenorrhoea started she reported back with congested, red and bleeding gums. The congestion was so great and the gums so tender that she could not use the interdental stimulators; she had great difficulty in brushing her teeth because of the sensitivity of the gingivae (Vide Fig. 21.). Palliative treatment was instituted, and as her thryoid condition was gradually controlled, and her menstrual cycle returned to normal, so did the gingival condition improve. The patient then proceeded abroad and observations could not be continued.

A/

A second patient whose thyroid hyperfunction had been controlled by medical treatment, relapsed at the end of the second month of pregnancy. The gingival and periodontal condition, which had been very bad, responded to periodontal treatment and then relapsed when the thyrotoxicosis recurred. The periodontal destruction was so gross after the pregnancy that it was decided to extract the teeth. The third patient responded to treatment which was successful.

Case 1. Miss -- Age 26, Cycle 4/28.

Thyrotoxicosis diagnosed when patient was aged 20 years. Thyroidectomy was performed one year later. Patient had been aware of her paradontal condition for 4-5 years. Bone loss extensive with mobility of some of the teeth. Gingival discomfort and haemorrhage worse 3-4 days before menstruation and for the duration of the period. Treatment successful for 1 year, then relapsed with recurrence of thyrotoxicosis.

Case 2. Mrs. -- Age 30, Cycle 6/28.

Thyrotoxicosis diagnosed and treated from the age of 28 years. Patient had been aware of her paradontal condition for four to five years. Bone loss extensive with mobility of all teeth. Treatment successful until the 2nd month of her third pregnancy, when the thyroid condition recurred, and the paradontal condition relapsed. The bone destruction was so marked that the operator was reluctant to advise further treatment.

Case 3./

Case 3. Mrs. -- Age 21, Cycle 7-9/35.

Thyrotoxicosis diagnosed and treated with methylthiouracil when patient was aged 17 years. One pregnancy when patient was aged 20 years. Patient reassessed by medical specialist after pregnancy; a thyroidectomy was suggested. Gingival condition poor but bone loss slight. Gingival pain and haemorrhage marked four days before menstruation for five to six days of period. Treatment successful.

Hypopituitarism (Anterior Lobe)

Three cases of post-partum necrosis of the anterior lobe of the pituitary gland were observed. Gingival tissue was obtained from two of them. A feature in cases of this type is the early loss of teeth due to a rapid destruction of the gingival and periodontal tissues. All three cases had lost most of their teeth. It was noticed, however, that the gingivae around the remaining teeth were congested and the epithelium appeared thin and glossy before hormonal replacement therapy was instituted. Loss of alveolar bone was considerable in each case. When the patients had received thyroid and deoxycortone acetate there was a marked improvement in the gingivae and they lost the congested, glossy appearance. The most dramatic change occurred in all three cases after they had received methyl/



Fig. 22 Photomicrograph of gingival tissue in a case of hypopituitarism when the effect of hormonal replacement therapy had diminished.



Fig. 23 Photomicrograph of the gingival tissue from the case on Fig. 22, after hormonal replacement therapy had been recommenced.

methyl testosterone for two weeks; the gingivae then became thick, coral pink and in one case stippled, (stippling of the gingivae is normal in healthy young mouths). As the effect of the deoxycortone acetate and methyl testosterone wore off, the gingivae once more became congested.

Case 1. Mrs. -- Age 35. Treated as a case of post-partum necrosis of the anterior pituitary gland from shortly after pregnancy 10 years before. Six months after the birth she had all the teeth in her upper jaw and all the molar teeth in the lower jaw removed because of 'pyorrhoea'. The gingivae around the remaining teeth in the lower anterior region appeared oedematous and hyperaemic, and bled very easily. Bone loss was considerable. Treatment was clinically successful and the patient declined to attend merely for observation.

Case 2. Mrs. -- Age 34. Diagnosed as a case of partial post-partum necrosis following the birth of her second child when she was 32 years of age. She complained of regular oral ulceration every 4 weeks between the age of 32 and 34 years. Her paradontal condition was very poor, but the gingivae improved markedly on the administration of oestrogen and progesterone. During the successful course of treatment the patient stopped attending and could not be traced.

Case 3. Mrs. -- Age 26. Diagnosed and treated as a case of post-partum necrosis of the anterior pituitary gland shortly after the birth of her first child at the age of 24 years. The patient, after the birth, had most of her teeth extracted because of her paradontal condition. The gingivae around all her remaining teeth bled easily and were oedematous and hyperaemic. The alveolar/

alveolar bone loss was very considerable. This patient was not treated for her **paradontal** condition, but the clinical changes in the gingivae were observed during hormonal replacement therapy.

Menorrhagia

Two cases of menorrhagia (**hypermenorrhoea**) were treated. The paradontal condition of both patients was very bad, the periodontal pockets being deep and the loss of alveolar bone **considerable**. Neither case responded to periodontal treatment. One case, whose menorrhagia was considered by her medical practitioner to be caused by emotional strain, was treated after the menorrhagia had improved. In this case the gingival and periodontal condition was satisfactory for a period of eleven months, but the menorrhagia started again and the gingivae became swollen, hyperaemic and tender with the first menstrual period in which it recurred; the menstrual bleeding lasted for eleven days. The gingivae remained swollen and hyperaemic after the menstrual period had stopped. Thereafter, the gingivae 'came down' 48 hours before every menstrual period, according to the patient; actually, /

actually, the interdental papillae on the palatal and lingual aspects became swollen, hyperaemic and very tender. This hyperaemia and tenderness lasted as long as the menstrual bleeding, which varied from eight days in some cycles to fourteen days in others. From the end of the menstrual bleeding till 48 hours before the next period, the gingivae and papillae bled easily and were slightly enlarged and flabby, although they were not tender on palpation or brushing. To determine whether periodontal treatment would be possible, two of the interdental papillae were removed on the fourteenth day of one cycle. When the zinc oxide packs were removed on the twenty-first day the tissue appeared to be in a reasonably healthy state.

The patient was asked to return twenty-four hours before the next menstrual period was due. She returned twelve hours before menstruation began and gave a history of being able to brush and stimulate the treated area with relative comfort 48 hours after the packs had been removed. On the evening previous to her visit, however, (i.e. 24 hours before menstruation) all the gingivae had become tender and swollen/

swollen, including the recently treated area. On examination, this area was swollen, inflamed and tender on palpation with a blunt probe, although less swollen and inflamed than the adjacent untreated papillae. Packs of cotton strips impregnated with zinc oxide and oil of cloves were inserted into the two treated interdental spaces. These packs were removed when menstruation had ceased, and the treated interdental papillae appeared to be reasonably healthy. At the end of the cycle there was a repetition of the inflammatory condition experienced during the previous cycle. This time the tissue did not respond to the treatment. In fact it proliferated around the packs which had to be removed on the sixth day of menstrual bleeding. This patient was aware that the gingival condition improved greatly when her menorrhagia stopped, and her gingival condition became very obvious again when the heavy, prolonged and sometimes frequent periods recurred.

Case 1. Mrs. -- Age 27, Cycle 7-14/21 and 10-14/28. Menorrhagia diagnosed at the age of 24 years. When patient lived with her husband menstruation lasted 7 to 14 days and occurred every 21 to 28 days. When she lived apart from him her cycle changed to 4-5/28 and was moderate in quantity. The medical practitioner suggested that the menorrhagia was due to emotional strain. The paradontal condition was poor, and bone loss considerable. During the periods of menorrhagia all/

all the teeth were mobile and during the periods of normal menstruation the teeth were firmly attached in their sockets. The patient had been aware for several years of her gingivae bleeding 7-10 days before menstruation and for the duration of the period. The gums were also painful and swollen during this phase. Several unsuccessful attempts at periodontal treatment were made.

Case 2. Mrs. -- Age 20, Cycle 7-14/28.

Menstruation lasted 7-14 days and occurred every 28 days. The patient explained that prior to her marriage two years previously her "period" lasted for four days and occurred every 28 days. The patient complained of gingival pain and congestion and an increased tendency for gingival bleeding 6-7 days before menstruation and for the duration of the period. She had first noticed the gingival pain and congestion shortly after her marriage at the age of 18 years. Treatment unsuccessful.

Ovarian Infantilism

Ovarian infantilism is a condition in which there is failure of development of the secondary sexual characteristics as a result of primary ovarian deficiency occurring before puberty. The condition may or may not be associated with diminished statural growth.

Two cases of amenorrhoea due to ovarian infantilism were treated for their paradontal condition. The gingivae were reasonably healthy in both cases until the/

TABLE 9

Day in Cycle	16	17	18	19	20	21	22	23	24	25	26	27	28
Number of Patients	1	1	16	2	10	3	1	2	1	2	1	0	0

Table 9 shows day of onset of oral ulceration in relation to the menstrual cycle (survey of 40 patients with a 28 day cycle.)

TABLE 10

Day in Cycle	18	19	20	21	22	23	24	25	26	27	28	29	30
Number of Patients	0	0	2	0	0	6	3	2	1	0	4	0	0

Table 10 shows day of onset of oral ulceration in relation to the menstrual cycle (survey of 18 patients with a 30 day cycle.)

the patients received hormonal treatment for the amenorrhoea. Both cases had severe gingivitis following the administration of progesterone.

Oral Ulceration of a Cyclical Nature

In the course of this investigation it became apparent that by far the greater number of female patients, who suffered from oral ulceration, developed these ulcers in the progestational phase of the menstrual cycle.

Of the 250 patients examined, no less than 75 suffered from oral ulceration associated with the menstrual cycle. Only 5 of the 75 patients suffered from oral ulceration in every cycle, and of these 5 only 1 had an associated vaginal ulceration. Of the remainder, 38 patients had oral ulcers in every second to fourth cycle, and 32 patients had the ulcers in occasional cycles.

In two cases the ulceration occurred 24-48 hours after menstruation had started. In the remaining 73 cases the ulcers appeared in the progestational phase of the cycle. This is shown in detail in Tables 9 and/

and 10.

When a patient gave a history of oral ulceration a careful check was made on the cycles in which these ulcers appeared and the stage in the cycle in which they were first noticed was duly recorded. In some cases this was checked over a period of 24-30 months.

It was noticed very early in the investigation that almost all patients who gave a history of oral ulceration had ulcers on the mucosa adjacent to the zinc oxide and oil of cloves packs, during the proggestational phase; and that the ulcers appeared at one fixed time in the cycle, namely if the packs were inserted on say, the 14th day of the cycle and the patient usually had her ulcers on the 20th day, then on the 19th or 20th day a crop of ulcers appeared on the mucosa adjacent to the packs. This ulceration did not occur in these patients during the proliferative or menstrual phases of the cycle.

Six patients volunteered to have small areas packed at different stages of the cycle, and when this was done the ulcers appeared on the tissue adjacent to the packs in the proggestational phase only.

It/

It was discovered that most of these patients were sensitive to mild irritants such as oil of cloves, vinegar, or even mustard when the irritant was applied during the progestational phase of the cycle. Ulcers appeared either at the site of application or adjacent to it.

Desquamative Gingivitis

Five patients with desquamative gingivitis and stomatitis were treated. Four of these patients had reached or passed the menopause, the fifth being a woman of 38 who had had a total hysterectomy performed when she was aged 37.

In each case the desquamative stomatitis was controlled initially by massaging oestrogen ointment into the desquamated area and by an oral intake of vitamins B1 and C. The teeth were thoroughly scaled and polished and the cavities filled. A gingivectomy was then performed to eliminate all paradental pockets. When the packs were removed the patient was instructed to massage the oestrogen ointment into the interdental spaces. On completion of healing, usually eight weeks/



Fig. 24 A case of desquamative stomatitis. (Note the dark glossy appearance of the gingivae and the area of tissue denuded of epithelium in the upper canine region.)

In each case the desquamative stomatitis was controlled initially by massaging oestrogen ointment into the desquamated area and by an oral intake of vitamin B₁ and C. The teeth were thoroughly scaled and polished and the cavities filled. A gingivectomy was then performed to eliminate all parodontal pockets. When the packs were removed the patient was instructed to massage the oestrogen ointment into the interdental spaces. On completion of healing, usually eight weeks,

weeks after gingivectomy, the oestrogen ointment and the vitamins B1 and C. were discontinued. All five cases responded to this treatment and up to date there have been no relapses.

DISCUSSION

The purpose of this research was first to establish whether there was a change in the gingivae during the phases of the menstrual cycle and, if so, to attempt to establish whether that change was related to the periodontal disease which is prevalent in women; secondly, if this cyclical change were found to exist in gingival tissue, to incorporate the acquired knowledge in the treatment of periodontal disease in women, consequent on a fuller understanding of the underlying basic changes in gingival tissue. The discussion of the results of the investigation will be divided, therefore, into two parts. The first part will be concerned with the gingival changes which take place during the normal menstrual cycle and those occurring in endocrine disorders which may influence the ovarian cycle. The second part of the discussion will deal with the actual treatment of periodontal disease in women.

DISCUSSION/

DISCUSSION OF GINGIVAL CHANGES
DURING THE NORMAL MENSTRUAL CYCLE

Epithelial Changes in the Gingivae
during the Normal Menstrual Cycle

The first of these changes to be considered is that of the gingival epithelium which shows distinct changes throughout the different phases of the menstrual cycle. The changes are recorded in the results, earlier in the text, and are not confined merely to the inflamed crest of the papillae.

During the menstrual phase of the cycle it was found that the basal cell layer of the epithelium was inactive when the keratin was thin. There was thickening of keratin in the proliferative phase when the basal cell layer became active. This activity and keratin thickening increased, reaching their peak towards the middle of the cycle. The keratin showed signs of splitting and the activity of the basal cell layer decreased steadily in the progestational phase.

Menstrual Phase/

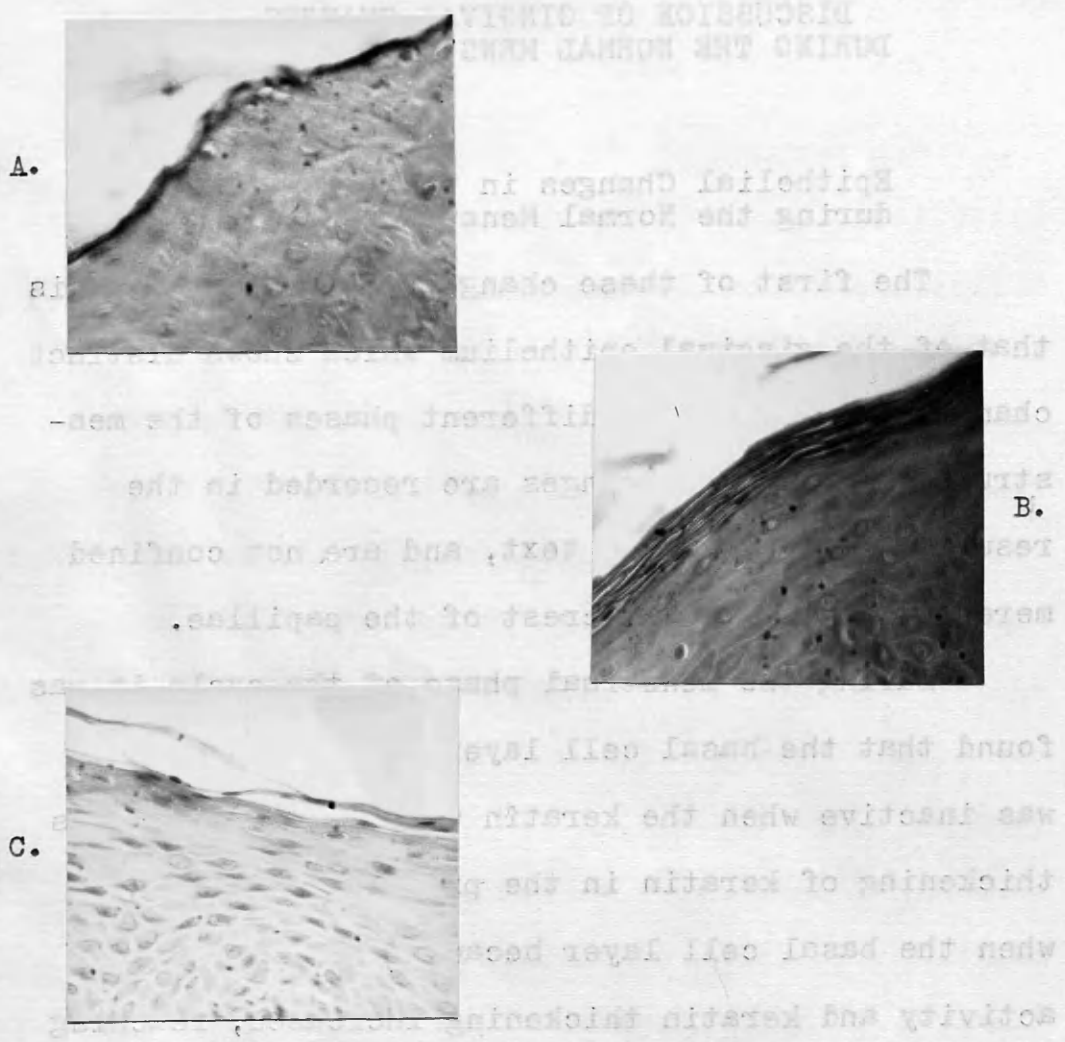


Fig. 25 Shows the surface layers of the gingival epithelium taken from Miss J.B. in the course of one cycle. Mag.x 60.

- A. Shows the very thin layer of keratin on the 3rd day of menstruation.
- B. Shows a well keratinised layer on the 10th day of the menstrual cycle.
- C. Shows the keratin splitting on the 25th day of the menstrual cycle.

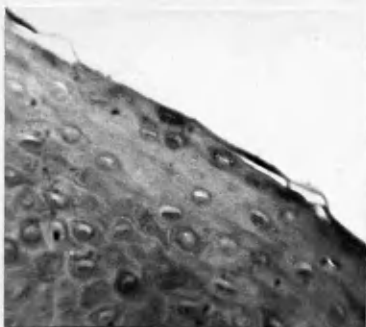
Menstrual Phase

It will be noted from Table 2 that in 96.4% of cases the keratin was very thin or non-existent in the menstrual phase of the cycle, while in 2.4% of the cases it was splitting and in only 1.2% was the keratin intact.

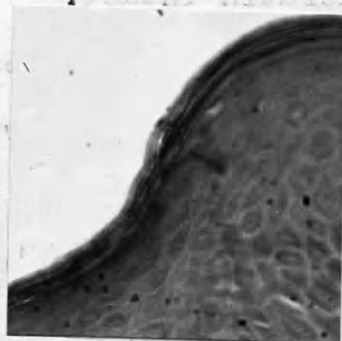
Table 3, which describes the activity of the basal cell layer, shows that the germinative layer of the epithelium was inactive in 93.9% of cases during this same phase of the cycle. It will be seen, therefore, that there was also a marked decrease in activity of the germinative layer of the epithelium in the menstrual phase of the cycle when the keratin had been shed or was very thin (Vide Figs. 25A and 26A). The lack of keratin and decline in activity of the basal cell layer in the menstrual phase was merely a continuation of a process which appeared just after the middle of the cycle. The process progressed from then until the proliferative phase of the following cycle, when the basal cell layer again became active and the keratin regenerated.

Proliferative Phase/

A.



B.



C.

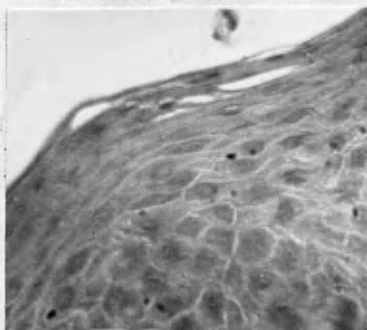


Fig. 26 Shows the surface layers of the gingival epithelium taken from Miss M.C. in the course of one cycle. Mag. x 60.

- A. Shows the almost complete lack of keratin on the 3rd day of menstruation.
- B. Shows a well keratinised surface layer on the 12th day of the menstrual cycle.
- C. Shows the keratin beginning to split on the 20th day of the menstrual cycle.

Proliferative Phase

The basal cell layer of the gingival epithelium became increasingly active during the proliferative phase of the menstrual cycle. At the same time the layer of cornified cells on the surface thickened rapidly (Vide Figs. 25B and 26B). This continued until, by the middle of the menstrual cycle, all the sections exhibited a well cornified surface layer with the exception of the inflamed tissue at the crest of the papillae.

Progestational Phase

The peak of activity of the basal cell layer was reached between the 14th and 20th days of the cycle, when the cornified surface layer was showing signs of splitting in 14.5% of cases (Vide Figs. 25C and 26C). In 81.6% of cases this layer was still thick, however. After the 20th day of the menstrual cycle there was a rapid decrease in the activity of the basal cells and a rapid increase in the number of cases exhibiting splitting or thinning of the keratinised or cornified surface layer./

	<u>Endometrial</u> <u>Basal Cell</u> <u>Layer</u>	<u>Keratin</u> <u>of</u> <u>Gingivae</u>	<u>Basal Cell Layer</u> <u>of</u> <u>Gingivae</u>
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Menstrual Phase of Cycle	Inactive	Thin or Non-existent	Inactive
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Proliferative Phase of Cycle	Very Active	Thickening	Very Active
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Progesterational Phase of Cycle	Inactive	Thick but Splitting	Inactive
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A comparison of the state of activity in the basal cell layers of the endometrial epithelium and the gingival epithelium, and the state of the keratin during the various phases of the menstrual cycle.

The state of activity in the basal cell layers of the endometrial epithelium and the gingival epithelium, and the state of the keratin during the various phases of the menstrual cycle, is compared in the following table. The endometrial basal cell layer is very active during the proliferative phase of the menstrual cycle, and the keratin is thin or non-existent. During the progesterational phase, the endometrial basal cell layer is inactive, and the keratin is thick but splitting. The gingival basal cell layer is very active during the proliferative phase of the menstrual cycle, and the keratin is very active.

layer. The cyclical changes in the cornified surface layer of the epithelium are shown in Figures 25 and 26.

This changing activity of the basal cell layer follows the pattern of the activity change of the epithelium of the endometrium in which many mitotic figures are seen during the proliferative phase of the cycle while mitotic figures are absent in the progestational phase (Vide Table 11). Proliferative changes in the endometrium are associated with secretion of the follicular or oestrogenic hormone, whereas endometrial changes in the progestational phase of the cycle are due to the continued action of the oestrogenic hormone supplemented by the action of the progesterone hormone of the corpus luteum.⁽²⁾ It would appear, therefore, that the basal cell layer of the gingival epithelium is influenced by the secretion of oestrogen in the proliferative phase and by the combined action of oestrogen and progesterone in the progestational phase of the menstrual cycle as shown in Table 11. It should be stated at this point that, /

that, when a patient's temperature chart indicated that she had not ovulated, the basal cell layer of the gingival epithelium remained evenly active in the second half of the cycle.

Possible Aetiology of Cyclic Changes in Gingival Epithelium

Ziskin injected oestrogen into monkeys and also into women and discovered that the action on gingival tissue in both was similar; on histological examination he found that "where keratin is found normally on the surface of the alveolar gingivae, this layer was improved". He also stated, "Inflammatory reactions in the sub-epithelial layer were either reduced to a minimum or entirely absent". In addition there was "hyperplasia of the prickle cell layer of the epithelium", whereas the effect was entirely different when an extract of pregnancy urine (Prolan) was injected, the changes then being of a degenerative nature. Clinical examination revealed that "these gums became inflamed and the interdental papillae oedematous and prone to bleeding". Also "microscopically,/"

"microscopically, examination disclosed reduction in surface keratin, and cellular deterioration with slight hyperplasia of the prickle cell layer. In the subepithelial layer, evidences of inflammatory reaction were generally seen".⁽³⁾ The urine of pregnant women contains large quantities of a gonadotrophin with mainly luteinising properties similar to those of luteinising hormone, which controls the second half of the menstrual cycle. Smears of vaginal epithelium taken in the proliferative phase of the menstrual cycle reveal a progressively increasing number of cornified cells which, Weiner et al⁽⁴⁾ and Maximow⁽⁵⁾ state, reflects a rise in oestrogen production.

In the proliferative phase of the cycle, therefore, it would appear to be the oestrogen which influences the basal cell layer causing increased activity and increased thickness of the cornified cells on the surface. Ziskin does not state at which stage in the menstrual cycle he injected the various hormones but it is interesting to note that, when he injected the extract of pregnancy urine and presumably aggravated/

microscopically, appearing bluish, granular in
 surface keratin, and called parakeratin. It
 slight hyperplasia of the prickle cell layer. In
 the superficial layer, evidence of inflammatory
 reaction were generally seen. The main of
 present was...
 keratinocytes...
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 trophs the...
 of vaginal...
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 ing number...
 and Maximo...
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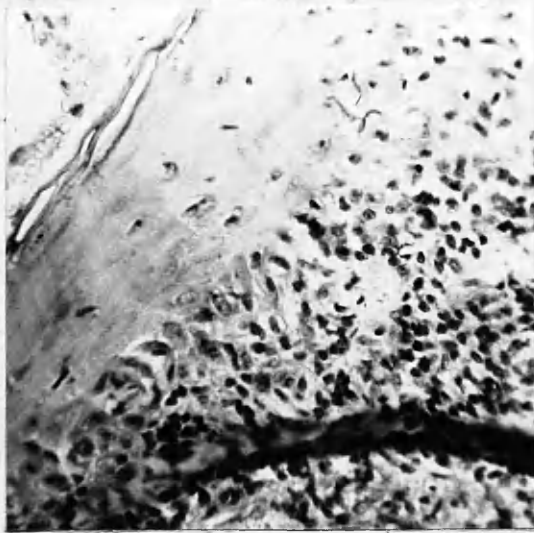


Fig. 27. Photomicrograph of gingival tissue taken from a patient suffering from chronic desquamative gingivitis. (Note the thin prickle cell layer and the inactive basal cell layer. Mag. x 300)

activity and increased thickness of the cornified
 cells on the surface. Keratin does not stain at which
 stage in the menstrual cycle he injected the various
 hormones but it is interesting to note that, when he
 injected the extract of pregnancy urine and presumably
 appeared

aggravated an existing progestational state, or produced an artificial state, the changes in the gingival epithelium were similar to those changes found in the present investigation; there was loss of keratin and decreased activity in the epithelium in the progestational period.

In cases of chronic desquamative stomatitis which commonly occur in women who have reached the menopause or in other oestrogen deprivation conditions, histological study of the oral epithelium reveals an inactive basal cell layer, a thin prickle cell layer with both intra and extra cellular oedema, and diminished keratinisation⁽⁶⁾ (Vide Fig. 27). When oestrogen is administered to these patients, either locally or systemically, the oral epithelial picture changes to show an active basal cell layer, a thickened prickle cell layer, and a well keratinised surface.

In those cases of untreated Simmond's disease, oral examination revealed the signs of chronic desquamative stomatitis, and histological examination of gingival biopsy material confirmed this fact.

(Vide Fig. 28)/

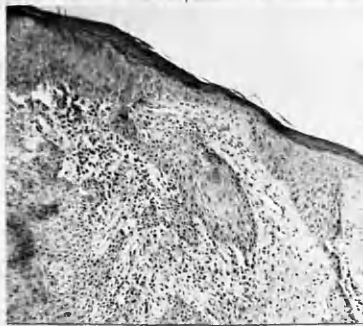


Fig. 28 Gingival tissue from a case of Simmond's disease before treatment shows thin, disorganised and inactive epithelium. Mag.x 60

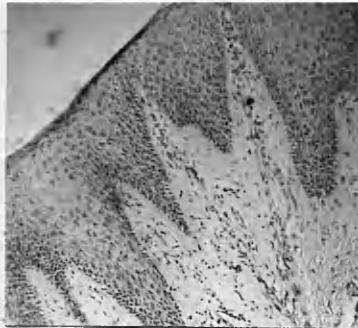


Fig. 29 : Gingival tissue from the same case after 4 weeks treatment with deoxycortone acetate shows thickening of the epithelial layer. Mag.x.60.



Fig. 30 Gingival tissue from this case after 6 weeks treatment with deoxycortone acetate and 2 weeks with testosterone shows thickened epithelium with a well keratinised surface layer. Mag.x 60.

(Vide Fig. 28). When these cases were treated with cortisone, the gross signs of desquamation disappeared, and microscopically there were signs of an increase in activity of the basal cell layer (Vide Fig. 29). When oestrogen or testosterone was administered all signs of chronic desquamative stomatitis and gingivitis disappeared, and the histological picture was one of a very active basal cell layer, thick prickle cell layer and a keratinised surface layer (Vide Fig. 30). As the effects of the oestrogen or testosterone wore off after cessation of treatment there was a progressive regression to the clinical and microscopical picture of a desquamative condition, which responded again to the administration of either of the hormones.

Ziskin's experiments, in conjunction with the effect of oestrogen therapy in cases of menopausal desquamative stomatitis and the effect of oestrogen on the oral epithelium in cases of Simmond's disease, all tend to confirm the fact that oestrogen has a stimulating action on the basal cell layer of gingival epithelium and also stimulates the formation of/

of keratin. Conversely, the lack of oestrogen has the opposite effect, i.e. the basal cell layer becomes comparatively inactive and the surface keratin diminished. In the progestational phase of the cycle when the oestrogen is rendered partially inactive by progesterone according to Bishop⁽⁷⁾ there is also a drop in activity in the basal cell layer of the gingival epithelium and a thinning or shedding of the keratin.

Vascular Changes in the Gingivae during the Normal Menstrual Cycle

There are cyclic vascular changes in the gingivae of all females who menstruate normally, which are obvious both clinically and microscopically. These changes show an increasing vascularisation of the tissue from the late proliferative phase up to, and including menstruation. In all females with normal menstrual cycles and normal or nearly normal gingivae, this change may be described as follows:

- (a) In the proliferative phase of the cycle the gingivae are pink or light red in colour.
- (b) Throughout the progestational Phase/

phase of the cycle the gingivae become increasingly red until menstruation commences when the gum margins and the papillae will bleed easily on slight pressure even if there is slight gingivitis.

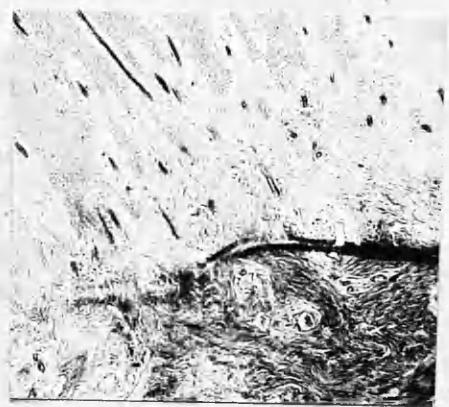
- (c) When gingivitis is present these changes are present but less obvious except during menstruation. Then the gingivae become more obviously red and bleed easily and, in many of the cases examined, blood oozed from the gingivae from 24 hours before menstruation and throughout the menstrual period.

It was found that Gormori's method for demonstrating alkaline phosphatase was the clearest method for demonstrating blood vessels, as alkaline phosphatase appears in fair quantities in the endothelial cells and the tissues in their immediate neighbourhood, neatly silhouetting the blood vessels.

The results relating to capillary changes are given in chapter 7. Examination of histological sections of female gingivae showed that the blood vessels in the gingivae seemed to contract 24-48 hours after menstruation ceased; in other words the vessels were not obvious during this phase and were/



A.



B.



C.

Fig. 31 Shows the progressive vascularisation of the gingival tissue during a menstrual cycle of Miss M.S. The patient's temperature chart indicated that she had ovulated in this cycle. Mag.x 60.

- A. Shows few capillaries on the 7th day of the cycle (proliferative phase)
- B. Shows an increasing number of capillaries, some of which are engaged, on the 15th day of the cycle (two days after the rise in basal temperature-indicating ovulation.)
- C. Shows numerous capillaries, many of which are engaged, on the 1st day of menstruation in this cycle.

were difficult to demonstrate. As the proliferative phase progressed toward ovulation, the blood vessels became more numerous, until at ovulation they were very numerous and many were engorged. These vessels remained numerous throughout the progestational phase. An increasing number of vessels became dilated and engorged in the 24 hours immediately prior to menstruation and throughout the period (Vide Fig. 31).

The progressive vascularisation of the gingival tissue during the proliferative phase of the cycle, and the engorgement of many vessels during the progestational phase, followed the pattern of the blood vessel changes in the endometrium according to Kerr⁽¹⁾ and Wright⁽²⁾. Those vascular endometrial changes show a progressive vascularisation in the proliferative phase with engorgement or congestion in the progestational phase.

In the 24 hours before menstruation and throughout its course the clinical appearance of the gingivae was one of extreme hyperaemia in most instances. Generally, slight pressure on the gingivae/

gingivae was sufficient to cause bleeding when gingivitis was present. If the gingivae were unaffected by inflammation they still showed hyperaemia in the menstrual phase but did not bleed easily.

In an investigation into the rhythmic changes in the skin capillaries and their relation to the menstrual cycle Brewer⁽⁸⁾ found that, "During the few days prior to and on the first day of menstruation capillary haemorrhage is produced with relatively greater ease than during the remainder of the cycle".

Landesman et al.⁽⁹⁾ in an examination of the bulbar conjunctival vascular bed during the menstrual cycles of 15 women state,

"During menstruation the arterioles are constricted and attenuated with very prominent vasomotion. The flow of blood in the venules and capillaries is slow and granular, and the capillary bed is ischaemic.

From day 3 of menstruation to about the time of ovulation, there is a progressive increase of vascularity in all vessels. Blood flow is faster and vasomotion, granularity, and ischaemia/

ischaemia recede or are absent.

At the time of ovulation, in some instances, there is an increase in vasomotion in the arterioles with some slight ischaemia and granularity in the capillaries and venules.

From about ovulation to the week prior to menstruation there is a general engorgement and dilatation of all vessels. Blood flow is fast while granularity and vasomotion are minimal.

During the week prior to menses, vasomotion reappears, granularity increases and blood flow slows, but the vessels remain dilated and engorged.

Immediately prior to menstruation a vasoconstriction of the arterioles takes place which usually continues for 48 hours following the onset of menses."

In cycles which were apparently anovular, histological examination of the gingival tissue showed a fairly even degree of activity in the basal cell layer of the epithelium, no splitting of the cornified layer, and no increase in number of blood vessels throughout the cycle except at the beginning of menstruation when there was an apparent/

apparent increase in the numbers of blood vessels to be seen. Clinically this appeared as a slight hyperaemia which is definitely less marked in comparison with the hyperaemia which occurred in the gingival tissue in cycles in which the patient had apparently ovulated.

An interesting phenomenon was noted in certain patients who complained of dysmenorrhoea of a severe cramping nature. The oral mucosa and the gingivae became very pale for as long as the dysmenorrhoea lasted; in some cases the gingivae were painful during the period of ischaemia. Microscopically the blood vessels, though numerous, were not engorged, yet in the progestational phase of the cycle many of them had been engorged. Later, on the third or fourth day of menstruation, after the dysmenorrhoea had disappeared, many engorged vessels were to be seen, whereas two to three days before, not one engorged vessel was apparent. This paleness of the oral tissue sometimes affected both upper and lower jaws simultaneously and sometimes only one section of one jaw for/



Fig. 32 Photomicrographs of gingival tissue from Miss J.S.

- A. Shows the numerous blood vessels, none of which is engorged, on the 1st day of menstruation. The tissue was removed during the period of gingival ischaemia associated with dysmenorrhoea in this case. Mag.x 60.
- B. Shows the numerous blood vessels, many of which are engorged, on the 3rd day of menstruation in the same cycle. Mag.x 60.

for a few hours and then another quadrant for a few hours (Vide Fig. 32).

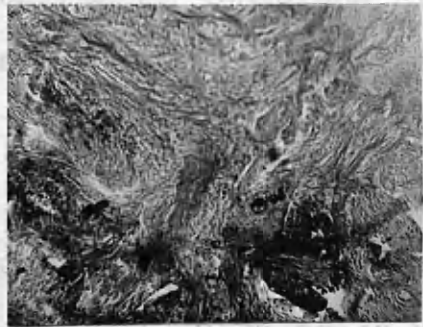
It has been suggested by Moir⁽¹⁰⁾ that the pain of dysmenorrhoea was caused by the spasm of uterine muscle causing an ischaemia and resultant pain analogous to that of angina pectoris or intermittent claudication. Muscle contraction, however, cannot account for the gingival ischaemia unless this spasm were to take place in the facial muscles but the patients did not show any signs of this being the case. In his explanation of the mechanism of menstruation, Wright⁽²⁾ suggests that the spiral arteries in the endometrium close down and, owing to the resulting ischaemia, the related region of the mucosa undergoes necrosis and the walls of the capillaries are weakened. Menstruation starts when this spasm passes. It is suggested in this thesis that the factor which causes the spiral arteries of the endometrium to close may be sufficiently dominant in certain cases of dysmenorrhoea to effect a similar ischaemia in the gingivae and oral mucosa.

Changes/

A.



B.



C.



Fig. 33 Shows the change in concentration of alkaline phosphatase in gingival tissue during the menstrual cycle. Mag. x 60.

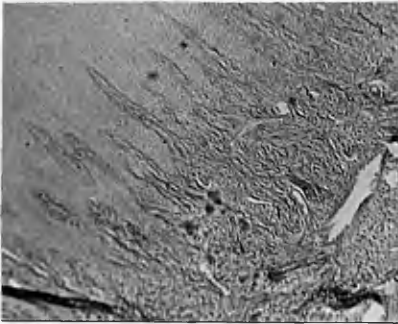
- A. Shows very little alkaline phosphatase on the 4th Day of menstruation.
- B. Shows an increasing concentration of alkaline phosphatase on the 11th day of this cycle.
- C. Shows an even greater concentration of alkaline phosphatase on the 18th day of the same cycle.

Changes in the Connective Tissue Stroma
of the Gingivae
during the Normal Menstrual Cycle

Certain changes in the concentrations of alkaline phosphatase and polysaccharides were noted in gingival tissue during the menstrual cycle. The phosphatase was found around the capillaries in increasing concentration as the proliferative phase progressed. During the progestational phase the concentration of alkaline phosphatase appeared to decrease until very little of this substance could be demonstrated during menstruation. No alkaline phosphatase was demonstrated in the epithelium but, during the proliferative phase, an increasing concentration of it was noted in inflamed areas, while a marked diminishing of this concentration was obvious during the progestational phase (Vide Fig. 33).

A corresponding increase in concentration of polysaccharide in the gingival connective tissue was noted during the proliferative phase until about the time of ovulation when the basement membrane appeared histologically as if drawn in ink (Vide Fig. 34). The concentration of polysaccharides/

A.



B.



C.

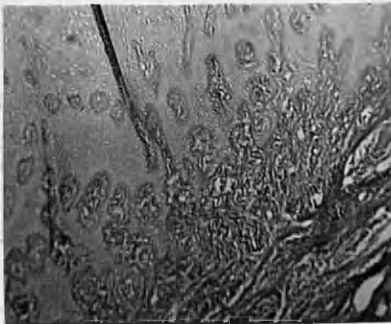


Fig. 34 - These photomicrographs are of the same tissue as in Figure 33, and are stained for polysaccharides by the P.A.S. method. They show the increase in polysaccharides in the connective tissue during the menstrual cycle. Mag. x 60.

- A. Shows decreased polysaccharides on the 4th day of menstruation.
- B. Shows increased polysaccharides on the 11th day of the cycle.
- C. Shows this increase being maintained on the 18th day of the cycle.

polysaccharides dropped away in the progestational phase. Some Glycogen was demonstrated in the epithelial cells, particularly above inflamed areas in the connective tissue of the gingivae (Vide Fig.35).

A report by Arzac and Blanchet⁽¹¹⁾ showed somewhat similar findings in the human endometrium.

"It was found that the amount of alkaline phosphatase demonstrable in the endometrium increases during the proliferative oestrogen phase of the menstrual cycle, whereas it decreases during the progestational phase and disappears during menstruation. It is abundant in the endometrium of patients with gynaecological disorders associated with hypothyroidism. With the silver techniques used, Glycogen could be histochemically demonstrated not only during the progestational phase but also during the proliferative phase; and in hypoplastic as well as in hyperplastic oestrogenic specimens. The results with these proceedings agree in a general way with the quantitative biochemical data so far reported in the literature available to us."

The Incidence of Pain and the Rate of Healing associated with the Menstrual Cycle

As has already been mentioned in chapter 7 it was discovered that it was more propitious to perform/



Fig. 35 Photomicrograph of gingival tissue showing glycogen in the epithelial cells above an inflamed area of the connective tissue. Mag. x 60.

perform gingivectomy at certain stages of the menstrual cycle and, conversely, that it was better to refrain from gingivectomy at other stages.

A study of the results relating to the incidence of pain and the rate of healing following gingivectomy reveals that, during the menstrual and proliferative phases of the cycle, pain was minimal and post gingivectomy healing rapid. As the progestational phase progressed, however, the incidence of pain increased and post gingivectomy healing became very much slower.

When gingival tissue was removed in the progestational phase of one cycle and again in the menstrual or early proliferative phase of the next cycle, the discrepancy in the rate of healing was particularly noticeable. It was found that healing was completed following gingivectomy in the menstrual and proliferative phases of one cycle before healing following gingivectomy in the progestational phase of the previous cycle, if the patient had ovulated in that previous cycle. The exceptions/

exceptions to this phenomenon were always found in cases in which the previous cycle had been an anovular one; then the tissue healed in the normal phase pattern.

A gingivectomy performed during the menstrual phase of the cycle usually showed oedematous and hyperaemic change in the tissue when the dressings (or packs) were removed seven days after the operation. The oedema and hyperaemia disappeared rapidly within 24-48 hours after the packs were removed, and usually within another seven to ten days the teeth could be brushed and the interdental papillae stimulated without discomfort or haemorrhage. Contrary to expectation no ill effects were recorded following gingivectomy during menstruation, although a slightly increased tendency to profuse bleeding was noted in a few cases.

When gingivectomy was carried out in the early part of the proliferative phase of a cycle, initial healing was generally complete by the time the zinc oxide packs were removed. In many instances it was almost as if no surgery had been performed, as the/

the tissue underlying the packs was so healthy in appearance. Healing was always most rapid in this phase, and pain or discomfort of any type was most unusual. When gingivectomy was performed in the last 48 hours of the proliferative phase, healing was less rapid than in the earlier part of this phase. The incidence of pain increased and the rate of healing slowed progressively throughout the progestational phase. In very many cases reasonable healing did not take place until the second proliferative phase following gingivectomy if the latter were performed in the last week of the cycle, excluding the 24 hours before menstruation.

A possible explanation of the difference in rate of healing and the varying pain incidence during the cycle is that in the proliferative phase of the cycle there is an increased activity of the basal cell layer of the epithelium which regenerates and covers the cut surface rapidly. On the contrary, in the progestational phase the activity of the epithelium is decreasing progressively and so the reparative properties of the epithelium are reduced/

reduced considerably. A parallel variation of activity may affect the connective tissue of the gingivae and, consequently, hasten or retard healing. It is clear that further research is required to elucidate this phenomenon, however.

Early in the research it was thought that the possible explanation for the lack of pain during the proliferative phase, and the increasing discomfort in the progestational phase, was to be found in the lack of oedema in the latter and the marked oedema in the former. It was thought that the oedema of the tissue being confined by the packs or dressing could conceivably cause pain by pressure. That explanation, however, was ruled out when it was noticed that, when gingivectomy was performed in the menstrual phase, clinical oedema was much more profound than that which was noticed following treatment in the progestational phase. Pain due to faulty packing technique can be ruled out because, with few exceptions, there was little or no discomfort in the proliferative phase and, in most cases, pain was experienced in the/

the progestational phase.

In the group of 183 cases from which the results of this particular aspect of the investigation were compiled, there were four patients whose temperature charts indicated that they had not ovulated. Histological examination of the gingival tissue in these four cases showed none of the usual signs of a progestational phase. Not one of these four patients had pain following gingivectomy but, in each case, at least one of the gingivectomies was performed during the last fourteen days of the cycle. Moreover, healing was rapid in every instance. In the remaining 179 cases histological examination of the gingival tissue showed the changes which usually take place in the progestational phase. The temperature charts of eighteen of the 179 cases indicated that the patient had ovulated.

It is interesting to note that many of these patients complained of pain when using interdental stimulators in the late progestational phase of every cycle after gingivectomy. These same patients were/

were quite unaware of any discomfort associated with stimulation at any other stage in the cycle except in the seventh to second days before menstruation and for the first 24-48 hours of the period.

Pain in the progestational phase may be due to sensitivity of the gingival nerve endings, but further investigation is required.

Oral Ulceration of a Cyclical Nature

Out of the 250 patients treated in the course of the present research 75 suffered from oral ulceration. In 73 of the 75 cases oral ulceration occurred in the progestational phase of the cycle; in the remaining two cases the ulcers appeared 24-48 hours after menstruation had started. In two cases suffering from ulcers in every cycle each patient had two outbreaks of ulcers in every progestational phase (premenstrual - 14th - 28th days of cycle). In both patients the ulcers began in the middle of the cycle and lasted for 7-8 days; more ulcers appeared 2-3 days before menstruation./

menstruation.

In the present reaearch only one case had associated vaginal and oral ulceration. This patient had been subject to oral and vaginal ulceration in every menstrual cycle from the menarche. For the first year of her married life she was completely free from ulceration. Some emotional friction, however, had arisen about the end of that year and the ulcers re-
curred and, until the time of writing, the patient had been afflicted with associated oral and vaginal ulcers 3-4 days before menstruation in every cycle.

The majority of cases of cyclic oral ulceration did not have ulcers in every cycle but followed a more or less definite pattern, in that ulcers appeared in every second, third or, in a few cases, every fourth cycle. Although it was noted in all cases with a history of oral ulceration that ulcers occurred when an irritant was applied to the mucosa in the progestational phase. It was interesting to observe that no ulcers resulted/



Fig. 36 Shows a case of acute ulcerative gingivitis associated with emotional stress.

A. Shows the acute ulceration on the 25th day of the menstrual cycle. Achromycin was applied to the ulcerated areas.

B. Shows the tissue 6 days later on the 3rd day of menstruation, when the emotional stress had been relieved.

resulted from an application of the same irritant during the proliferative phase (5th - 14th days of cycle). In a number of cases ulcers appeared in cycles during which emotional stress was present. This was particularly noticeable in female students with a history of ulcers appearing in every third cycle. Those patients, if subjected to the stress of academic examinations, invariably had a severe crop of ulcers in the isolated cycle in which the tension had occurred, although that cycle normally would have been ulcer-free.

Apart from the foregoing cases some patients, with no previous history of oral ulceration, were afflicted with a condition similar to acute Vincent's ulcerative gingivitis with associated ulceration of the oral mucosa (Vide Fig. 36). In each of these cases there was a history of severe emotional stress in the cycle in which the ulcers occurred, or in the latter part of the previous cycle. The severity of this ulcerative condition was most marked from the middle of the cycle until the onset of menstruation, when the pain/

pain and ulceration faded away to recur in the progestational phase of the cycle. In every case the recurrent ulcerative gingivitis and oral ulceration appeared in the progestational phase of every cycle until the emotional stress was relieved. If the stress lasted over a long period the acutely painful condition subsided and the gingivae merely became swollen, red and slightly painful in the progestational phase. These cases were impossible to treat while the emotional stress existed. The acute condition could be ameliorated by local treatment in most instances but, once the condition had become chronic, paradontal treatment failed in every case where the emotional stress was unrelieved. Once the stress no longer existed the gingivae responded in a normal fashion to periodontal treatment. It must also be stated that removal of the emotional stress is followed remarkably quickly by healthy conditions of the gingival mucosa.

The most common emotional stress encountered/

encountered was of a sexual nature, next in frequency being stress associated with the patient's work.

As a point of interest, a similar form of acute ulceration was examined in a number of males. here, too, there was invariably a history of emotional stress. The estimation of 17-ketosteroids was carried out for two students who were afflicted with large painful ulcers on the mucosa and painful bleeding gingivae during academic examinations. The excretion of 17-ketosteroids was high, although within normal limits in both cases (normal urinary excretion of androgens and 17-ketosteroids in adult males is 8-32mgs/24 hours).⁽²¹⁾ In one case it was 28mgs/24 hours and in the other it was 25mgs/24 hours.

Spence⁽²¹⁾ states that: "In the male the testis hormone, testosterone, is broken down in the body and excreted in the urine as less active (or inactive) compounds, the 17-ketosteroids, and that some of these substances are derived from the adrenal cortex."

In/

In both sexes this ulcerative condition took two forms, the milder being one in which the gingivae were merely oedematous, hyperaemic and uncomfortable, with one or two extremely painful ulcers on the cheeks, lips or tongue. This form could develop into the acute condition which resembled acute Vincent's ulcerative gingivitis, accompanied by many ulcers on the mucosa. The acute form could arise suddenly, with little warning. One day the mouth would feel raw and burning, and next day the acute condition would be present. The condition was similar to Vincent's acute ulcerative gingivitis in appearance only. In the greater majority of cases the organisms (Vincent's spirochaete and fusiform bacillus) said to be responsible for Vincent's ulcerative gingivitis, were not demonstrable. On the contrary, often in female patients, when the ulcerative condition recurred in the pro-gestational phase of a second cycle, Vincent's organisms could frequently be demonstrated in the interdental spaces, but not in the ulcers on the cheeks and lips. In male patients Vincent's organisms/

organisms could often be demonstrated after the acute condition had been present for a week or longer.

In male patients the condition usually lasted in the acute form for a longer period than it did in the female. In the female, as has been stated already, the acute stage usually subsided after menstruation started and then became acute again in the next progestational phase; in the male the acute phase lasted for from two to three weeks, gradually subsiding to a chronic state for as long as the emotional stress lasted.

Moulton et al,⁽²²⁾ in their investigation of the emotional factors in periodontal disease, state that all six treated cases of acute necrotising gingivitis (acute ulcerative gingivitis) were precipitated by an acute anxiety state arising from conflict "about dependency and/or sexual needs." A further 16 cases of chronic periodontitis had a background of longstanding, less acute conflict, mainly involving dependency needs. Burket⁽²³⁾ suggests that the element of fatigue and emotional stress must also play a causative role in the aetiology/

aetiology of acute necrotising gingivitis. Beube,⁽²⁴⁾ Thoma⁽²⁵⁾ and Stones⁽²⁶⁾ all suggest a dietary factor as a possible predisposing cause in the aetiology of this condition.

Two cases of acute ulcerative gingivitis in the present research were treated with vitamin B complex, vitamin C, and saline mouth washes; both patients gave a history of recent emotional stress, and both responded rapidly to treatment.

It is probable that no single factor is responsible for acute ulcerative gingivitis, and that, if the resistance of the tissue is lowered by dietary deficiency, the additional factor of emotional stress is enough to tip the balance by causing hormonal imbalance with a reflected interference in local cell metabolism.

Referring to the cyclical form of oral ulceration Thoma⁽²⁷⁾ says: "There is also marked dysmenorrhoea and often a severe vaginal pruritis" and suggests that the aetiological factor is some disturbance of ovulation. In the present investigation 85% of cases troubled with oral ulcers complained/

complained of dysmenorrhoea; ulceration in the remaining 15% of cases was mild by comparison. Certainly Bishop⁽²⁸⁾ states that: "It is firmly established that spasmodic dysmenorrhoea is always associated with ovulatory cycles and is almost certainly due to the effect of progesterone on the uterine muscle." Ziserman,⁽²⁹⁾ Jones,⁽³⁰⁾ and Rappworth⁽³¹⁾ all report cases of cyclical ulceration of the oral mucosa and suggest that hormonal imbalance is the possible aetiological factor. Jones and Rappworth found that Oestrogen and chorionic gonadotrophin (a substance with luteinising properties similar to luteinising hormone) were effective in the treatment of the condition, but only in the cycles in which the hormones were administered. As soon as treatment was discontinued the ulcers reappeared in the pro-gestational phase. Since oestrogen and chorionic gonadotrophin are effective in treating these ulcers, it is probable that Thoma is correct in his suggestion that the aetiological factor is a disturbance of ovulation, as either of these hormones would/

would help in the maturation and luteinization of the ovarian follicle. In support of this statement is the fact that in this investigation all patients who complained of regular cyclical oral ulcers had prolonged and heavy menstrual bleeding, which Smith and Smith⁽¹⁹⁾ state is due to an abnormality of luteal activity.

Ulcers of the oral mucosa could be precipitated by the local application of irritants in the pro-gestational phase only. The administration of oestrogen was effective in the treatment of oral ulceration presumably by supplementing the patient's natural oestrogen and, thereby, bringing about a hormonal balance. It was noted also that patients, who suffered from oral ulceration, had no ulcers after the second month of pregnancy until some time after parturition. It is interesting to note that chorionic gonadotrophin reaches maximal concentration about the 50th or 60th days of pregnancy and, as its production declines, the production of oestrogen rises according to Spence.⁽³²⁾ It would appear, therefore, that some imbalance of oestrogen and progesterone/

progesterone has the direct effect on the cells of the oral mucosa of interfering with their metabolism, thereby making the cells more susceptible to chemical or mechanical trauma; on the other hand the effect of the imbalance may be indirect by causing a further imbalance of the endocrine system and thus depriving the cells of the oral and vaginal mucosa of some substance essential to their metabolism, making them more susceptible to trauma.

Desquamative Gingivitis and Stomatitis

All five cases of desquamative gingivitis had an associated desquamative condition affecting the neighbouring oral mucosa. Three of the patients gave a history of the desquamative condition arising in the gingivae and then spreading to the oral mucosa of the cheek or palate.

The first step in the treatment of this condition was the massaging of oestrogen cream into the desquamated area. The massage was carried out by the patient, who was instructed to perform this routine after every meal. When the discomfort from the/
the/



Fig. 37 A case of desquamative gingivitis before treatment. (Note the hyperaemia of the mucosa, and the slight oedema of the interdental papillae.)



Fig. 38 The same case as is shown in Figure 37 after treatment. (Note the hyperaemia has subsided.)

the desquamative gingivitis had abated, the teeth were thoroughly scaled and polished. This was usually 10-14 days after commencement of treatment. The massage with oestrogen cream was continued, and all periodontal pockets were eliminated by gingivectomy after a further 14 days. Immediately after the zinc oxide and oil of cloves dressings were removed (Vide page 121) the patients were instructed to massage the oestrogen cream into the interdental tissues with stimulators. The application of oestrogen was discontinued in every case eight weeks after commencement of treatment. Treatment was successful in all five cases, and to date there has been no recurrence of the desquamative condition in any of the five patients.

The clinical picture in these cases of desquamative gingivitis was one of intense hyperaemia of the affected area with slightly swollen interdental papillae (Vide Fig. 37). Very little pressure on the affected area was sufficient to cause extreme pain and bleeding. Every patient complained of difficulty in eating. Salty, spicy or/



Fig. 39 A photomicrograph of the tissue before treatment in the case of desquamative gingivitis shown in Figure 37. (Note the thin prickle cell layer of the epithelium, the blunted rete pegs and the heavy infiltration of the connective tissue by leucocytes.) Mag.x 60.

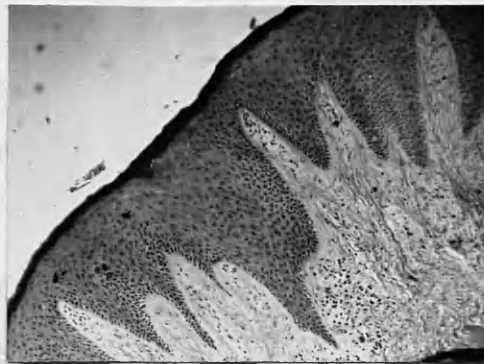


Fig. 40 A photomicrograph of the tissue after treatment. (Note the thickening of the prickle cell layer of the epithelium, the normal rete pegs, and the normal appearance of the connective tissue.) Mag.x 60.

or hot foods caused extreme pain, and even exposure to the air was painful, when the mouth was open.

Microscopically there was an increased prominence of the capillaries; the basal cell layer was inactive; the prickle cell layer was thin; the normal rete pegs of the epithelium were absent or blunted; the connective tissue was heavily infiltrated by leucocytes (Vide Fig. 39).

After treatment with oestrogen cream the clinical picture changed. The hyperaemia subsided. Any type of food was tolerated, and all discomfort rapidly disappeared (Vide Fig. 38).

Following treatment the microscopical appearance was one of increased activity of the basal cell layer. There was thickening of the prickle cell layer; normal rete pegs appeared; there was no leucocytic infiltration of the connective tissue (Vide Fig. 40).

According to Ziskin and Zegarelli⁽³³⁾ the probable site of origin of chronic desquamative gingivitis is in the papillary layer of the gingival connective/

connective tissue. They say "the initial microscopical features are increased prominence of the capillary bed, scattered foci of inflammation, and small subepithelial vesicles. The oedema and inflammation become progressively worse, and cause a pressure atrophy of the basal cell layer of the epithelium."

Engel et al⁽³⁴⁾ noted changes in the gingivae in desquamative gingivitis, which suggest that the connective tissue rather than the epithelium is the site of origin of the basic changes in this condition. They also state:

"The gingiva and oral mucous membrane are influenced by the sex hormones. During menstruation and pregnancy it is not uncommon for the gingival tissues to become swollen and oedematous. The severe alteration of the ground substance in desquamative gingivitis may involve an extension of the same process in which the connective tissue cells have a heightened reactivity to changes in sex hormone level."

According to Richman and Abarbanel⁽³⁵⁾ the gingival mucosa may be affected by the diminution of ovarian activity which occurs in the menopause so as to produce the basic pathological changes responsible/

responsible for the desquamative condition. They also say that the changes in the oral cavity in this condition are similar to the atrophic changes which occur in the vaginal mucosa. Microscopically the gingival change is one of atrophy of the basal and prickle cell layers of the gingival epithelium. A gingivo-stomatitis is not an uncommon feature of the menopause and of other oestrogen deprivation conditions. This statement appears to be especially true in relation to edentulous patients, a number of whom were treated for this condition. It is significant to note that there was no recurrence of the desquamative condition after all sources of irritation, such as rough tooth surfaces and periodontal pockets, had been removed and stimulation of the gingival epithelium had promoted a thickened epithelial covering.

The fact that the gingivae benefited from the application of oestrogen in an oestrogen deprivation state suggests that a lack of this hormone may be a factor in the aetiology of desquamative gingivitis. Another factor in the aetiology of the condition would/

would appear to be any local source of irritation.

The fact remains, however, that these two causes are not the only factors in the aetiology of this condition; otherwise every woman at the menopause, or suffering from any other condition in which there was an oestrogen deficiency, would be afflicted with a desquamative gingivo-stomatitis. Therefore, some other factor or factors must contribute to the aetiology of the condition in these cases in which it does occur.

GINGIVAL TISSUE CHANGES IN WOMEN WITH ENDOCRINE DISORDERS

Diabetes Mellitus

Four female patients suffering from diabetes mellitus were treated for their periodontal condition which was very bad in all four cases. An exaggerated response of the gingival tissue in the progestational and menstrual phases of the cycle occurred in all cases.

Three of these patients were aware of their paradontal condition, and particularly aware of the fact that the gingivae bled easily and became tender/

tender and swollen before and during menstruation. The fourth patient stated that she was unaware of her paradontal condition although her teeth were loose, and although it was obvious she had deep periodontal pockets packed with food debris and the gingivae were inflamed and swollen. In all four cases clinical examination of the gingivae during several menstrual cycles before and after treatment revealed obvious changes in the pro-gestational phase which persisted during menstruation. In two cases temperature charts were kept by the patients and, in several cycles, 24 hours before the rise in temperature indicating ovulation, the gingivae became swollen, hyper-aemic, and in one case tender. The congestion lasted for about 48 hours and then subsided. This condition, however, returned ten days before menstruation in one case, and two days before in the other, and in both patients discomfort, bleeding and congestion lasted for the duration of menstruation. Throughout the proliferative phase in all four cases the gingivae, although inflamed before/

tender and swollen before and during menstruation. The fourth patient stated that she was unaware of her periodontal condition although her teeth were loose, and although it was obvious she had deep periodontal pockets packed with food debris and



Fig. 41 Shows polypoid proliferation of the marginal gingivae of both upper central incisors in a case of diabetes mellitus.

In all the gingivae four cases of during severe treatment re- gestational situation. kept by the ovulation, the acidic, and in one case tender. The congestion lasted for about 48 hours and then subsided. This condition, however, returned ten days before menstruation in one case, and two days before in the other, and in both patients discolored, bleed- ing and congestion lasted for the duration of menstruation. Throughout the proliferative phase in all four cases the gingivae, although inflamed before

before treatment, were not congested.

In all four cases there was much destruction of alveolar bone, and most of the teeth were loose. In two cases there was a fair amount of proliferation of the gingivae around many of the teeth; one patient exhibited a polypoid proliferation which had its source in the free margin of the gingivae (Vide Fig. 41). This type of proliferation is described by Miller⁽¹²⁾ in his discussion of the gingival changes in diabetes mellitus. All four cases responded to periodontal treatment, although they had to be extremely thorough with the after-care of the gingivae. This was made very clear when two of the cases failed to co-operate in post operative treatment; within one menstrual cycle the interdental tissue proliferated in a most dramatic fashion and the papillae became tender, swollen and very hyperaemic.

There is no unanimity of opinion as to the exact relationship between diabetes mellitus and the occurrence of periodontal disease. Williams⁽¹³⁾ used/

used the terms "diabetic stomatitis" and "diabetic periodontoclasia", and Hirschfeld⁽¹⁴⁾ talks about "sessile or pedunculated gingival polyps", and "polypoid gingival proliferations". These descriptive terms have all been employed to describe oral changes which are either caused by, or are at least intimately associated with, diabetes mellitus. Boenheim⁽¹⁶⁾ and Badanes⁽¹⁷⁾ recognise no particular relationship between periodontal disease and diabetes, and state that, when the two conditions occur simultaneously, this is due to coincidence.

Hyperthyroidism

As has been stated in the results, three cases of hyperthyroidism were treated; the paradontal treatment was successful in one case only. In the other two cases the treatment was successful for as long as the hyperthyroidism was controlled but the paradontal condition relapsed when the hyperthyroidism recurred.

In one case the relapse of the paradontal condition/



A.



B.



C.

Fig. 42 Shows the recurrence of periodontal disease in a young woman suffering from hyperthyroidism.

- A. Shows the gingivae after initial treatment.
- B. Shows the gingivae 24 hours before menstruation after the hyperthyroidism had recurred.
- C. Shows the gingivae on the 1st day of menstruation after the hyperthyroidism had been controlled by medical treatment. (Note that the gingivae are much less inflamed and oedematous in C than in B.)

condition was associated with polymenorrhoea which accompanied the recurrence of the hyperthyroidism. In the 48 hours before the first menstrual period, after the initial signs of hyperthyroidism had reappeared, the patient noticed that her gingivae became congested, swollen and tender; this state lasted for the duration of the period (8 days). The congestion and pain subsided slightly in the six day interval before the next menstrual period; then the congestion and pain once again became very marked. As the patient's thyroid condition was controlled and her menstrual cycle became normal again, so did the gingival condition improve (Vide Fig. 42). The paradontal condition was treated once more when the thyroid condition had returned to normal. The gingivae have remained very healthy indeed for the past ten months.

A second patient, whose hyperthyroid condition had been controlled by medical treatment, became thyrotoxic again towards the end of the second month of her third pregnancy. The periodontal condition which had been very bad, responded to treatment/

treatment and then relapsed when the hyperthyroidism recurred. The teeth were extracted.

The third patient with hyperthyroidism was treated for her periodontal condition after her thyroid condition had been controlled by medical treatment. Throughout the latter stages of her hyperthyroidism when it was being controlled by methylthiouracil this patient complained of painful, bleeding gingivae on the last four days of the progestational phase of most menstrual cycles; the discomfort lasted for the duration of the period. When treatment with methylthiouracil was discontinued, the degree of gingival pain experienced in the late progestational phase was diminished. Periodontal treatment was carried out with reasonable success despite the patient's poor oral hygiene.

It is difficult to assess the association between hyperthyroid conditions and gingivitis from the small number of hyperthyroid cases which were found in Glasgow Dental Hospital.

Out of nine female patients who were receiving treatment/

treatment at the endocrine clinic for their hyperthyroid condition, the gingival condition of three was excellent; in another four cases there was a generalised gingivitis; the remaining two patients suffered from a severe paradontal condition of which they had been aware before the manifestation of the hyperthyroid condition. Six out of nine cases suffered from paradontal disease. No deductions can be made from so few cases. Nor can any assessment of paradontal treatment be given as permission was not granted to treat the gum condition.

Hypopituitarism (Anterior Lobe)

Out of six cases of hypopituitarism examined only three had retained a few of their natural teeth; these three patients had lost most of the other teeth within a year of the occurrence of the post partum necrosis of the anterior lobe.

The remaining three cases had lost all remaining natural teeth within 18 months of the hypopituitarism occurring. The reason for the loss of teeth/

teeth in every case was "pyorrhoea" or "bad gums".

One case of hypopituitarism was diagnosed as being an incomplete destruction of the anterior lobe of the pituitary gland. When the pituitary condition was first diagnosed, shortly after the birth of the patient's child, the patient complained of oral ulceration which occurred every four weeks for a period of two years. The ulceration lasted for 4-7 days and then healed. In every month, for a period of three months, oestrogen was given for two weeks and then oestrogen and progesterone were given together for a further two weeks and the process repeated. In the first month of this treatment the ulcers appeared, but they were less numerous. In the succeeding two months the ulcers did not appear at all. When the administration of oestrogen and progesterone was discontinued the oral ulceration reappeared every four weeks.

Schour⁽¹⁸⁾ described some of the microscopic changes in the periodontal tissues of experimental animals with artificially induced hypopituitarism. The/



A.



B.



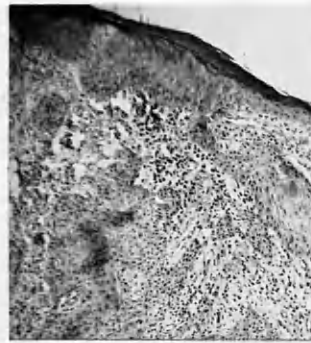
C.

Fig. 43 Shows the change in the appearance of the gingivae during hormonal replacement therapy in a woman suffering from hypopituitarism.

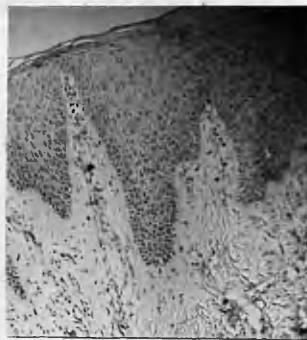
- A. Shows the gingivae in the lower anterior region before replacement therapy.
- B. Shows the gingivae after deoxycortone acetate had been given to the patient for 3 weeks.
- C. Shows the gingivae 2 weeks later when she had received testosterone for a fortnight. (Note that the gingivae are less inflamed and oedematous in B than in A and the improvement in C.)

The vascularity of the periodontal membrane was reduced; the marrow spaces often were reduced in size and the marrow was fibrous. There was resorption of alveolar bone in animals with a short post-operative life. The epithelial attachment in the region of the cemento-enamel junction was often atrophic or absent.

In the three non-edentulous cases of hypopituitarism which were observed, the gingivae were glossy, congested and oedematous before hormonal replacement treatment. After deoxycortone acetate and thyroid had been administered for 2-3 weeks there was a marked improvement in the appearance of the gingivae; they were less congested and the oedema was less obvious. The most dramatic change occurred when testosterone had been administered for two weeks; the gingivae then lost the glossy appearance, and the oedema and congestion disappeared (Vide Fig. 43). As the effect of the deoxycortone acetate and the testosterone diminished, the gingivae once more became glossy, congested and oedematous. The effect/



A.



B.



C.

Fig. 44 Photomicrographs of the gingival tissue taken from the patient whose photographs appear in Fig. 38. 43

- A. Before hormonal replacement therapy. (Note the thin epithelial covering with atrophic basal and prickle cell layer.)
- B. After 3 weeks treatment with deoxycortone acetate and thyroid. (Note the thickened epithelial layer and the marked decrease in inflammatory cell infiltration.)
- C. Two weeks later after treatment with testosterone and deoxycortone acetate. (Note that the epithelial layers are thicker than in B.)

effect of oestrogen in place of testosterone was less dramatic, although the effect on the gingivae was similar after oestrogen had been administered for 3-5 weeks.

The microscopical appearance of the gingivae before hormonal treatment showed a thin epithelial covering and an inactive basal cell layer. There was intracellular oedema throughout the epithelium. The connective tissue stroma was infiltrated with inflammatory cells, and contained many engorged blood vessels. After treatment with testosterone the epithelium became thicker and the basal cell layer active, while the intracellular oedema disappeared; in the connective tissue the inflammatory cell infiltration subsided (Vide Fig. 44).

It is believed that successful paradontal treatment can be carried out in similar cases of hypopituitarism for as long as the hormonal replacement therapy is maintained. When the effect of the deoxycortone acetate and testosterone implants wore off, the periodontal condition relapsed, but recovered remarkably when hormonal replacement/



A.



B.



C.

Fig. 45 A case of recurrence of periodontal disease associated with menorrhagia.

- A. Gingivae before treatment
- B. Gingivae as they appeared for 11 months when patient menstruated normally.
- C. Gingivae after recurrence of periodontal disease associated with the return of the menorrhagia.

replacement therapy was resumed.

Menorrhagia

Paradontal treatment in the two cases of menorrhagia or hypermenorrhoea was completely unsuccessful. In both instances the patients were aware of painful bleeding gingivae before and during menstruation.

In one case the paradontal condition was treated successfully over a period of eleven months during which time the patient's menstrual cycles were normal. The paradontal disease, however, recurred with the menorrhagia, and further attempts at treatment were completely unsuccessful. It was noted, however, both by the patient and the operator, that the gingival condition improved when the menstrual cycles were normal and that the gingival condition recurred when the menorrhagia returned. (Vide Fig. 45).

In the other case the periodontal treatment was unsuccessful throughout. The gingivae were painful for 6-7 weeks after gingivectomy and healing was/

was slow. In fact, the patient was no better off after treatment than she had been before.

Both patients co-operated over a long period of time but the results were most disheartening for all concerned.

The clinical appearance was similar in both cases. The gingivae were enlarged, and slightly hyperaemic in the proliferative phase of the cycle but the gums were not painful during **this** phase. In the late progestational phase the gingivae became hyperaemic, swollen and painful. The pain, swelling and marked hyperaemia lasted throughout menstruation.

The microscopical picture was similar in both cases. Gingival tissue taken on the seventh day of the cycle in one case and on the ninth day in the other, showed a normal increase in the activity of the basal cell layer, but the blood vessels were more **numerous** than was normal for this period. In the progestational phase the only apparent difference from the normal progestational microscopic appearance of the gingivae was a greater number of engorged vessels/

vessels than usual; and the basal cell layer of the epithelium remained active over a longer period.

Smith and Smith⁽¹⁹⁾ make the following claims:

- (1) The important factor in many cases of functional uterine bleeding is an abnormality of luteal activity which is bound up with the metabolism of oestradiol and oestrone.
- (2) The oxidation products of oestradiol and oestrone stimulate the secretion of the pituitary factors necessary for the maturation and luteinization of the ovarian follicle; and progesterone in turn inhibits the formation of these products by promoting the conversion of oestradiol and oestrone into oestriol, thereby causing regression of the corpus luteum.
- (3) If the corpus luteum does not receive optimal stimulation, it will fail to suppress sufficiently the oxidation of oestradiol and oestrone and, therefore, will continue to receive some stimulation.
- (4) The result of this is incomplete regression of the corpus luteum and partial and prolonged breakdown of the endometrium. Bleeding, therefore, is prolonged.

Supporting this view is the observation that in menorrhagia, the degradation product of progesterone, pregnanediol continues to be excreted after the onset of menstruation according to McKelvey⁽²⁰⁾. If the foregoing observations are correct they would account for/

for the continuing activity of the gingival basal cell layer in the late progestational phase in cases of menorrhagia, and also for the prolonged gingival discomfort and bleeding.

In normal menstrual cycles gingival discomfort usually arose in the later progestational phase and disappeared shortly after menstruation started whereas, in both cases of menorrhagia, the discomfort persisted throughout menstruation.

Ovarian Infantilism

In the two cases observed of ovarian infantilism the paradontal condition was good until the patients received treatment for the amenorrhoea associated with the ovarian condition. The administration of oestrogen had no apparent effect on the gingivae. Later in the treatment, however, progesterone was administered and in each case the gingivae became very hyperaemic and grossly oedematous on the second administration. This hyperaemia and oedema did not subside when the progesterone was discontinued but lasted for 4-5 weeks after the cyclical/

cyclical administration of the hormone had been stopped. The gingivitis which had resulted from this treatment persisted and a possible explanation of this persistent gingivitis was periodontal pocket formation which had developed during hormonal treatment.



Fig. 46 A case of periodontal disease before treatment



Fig. 47 The case shown in Fig. 46 photographed 12 months after treatment.

DISCUSSION OF TREATMENT OF PERIODONTAL DISEASE IN WOMEN

The discussion of the treatment of periodontal disease in women will be divided into four sections, as follows: Treatment of the disease in women with normal menstrual cycles; treatment of the disease during pregnancy; treatment of the disease at the menopause; and finally, treatment of the disease in disorders of the endocrine system.

Treatment of Periodontal Disease in Women with Normal Menstrual Cycles

The treatment of periodontal disease in women was basically similar to the treatment of the disease in men. All diseased gingival tissue was removed and correct oral hygiene established (Vide Figs. 46 and 47).

Throughout the present research the first stage in the treatment of periodontal disease was to establish correct oral hygiene. All deposits of supra gingival calculus were then removed. This was/

was followed by gingivectomy, which was performed in each of the three phases of the menstrual cycle.

The gingivectomy technique was as follows:

- (1) The pocket depth and the level of epithelial attachment were measured and marked on the gingival mucosa
- (2) The marks on the gingival mucosa were used as a guide for the incision which was then made.
- (3) The cut tissue was removed and placed in a histological fixative.
- (4) The site of operation was cleansed.
- (5) Strings of cotton wool, impregnated with a zinc oxide and oil of cloves paste, were inserted between and around the teeth in the area of gingivectomy.
- (6) One week later the zinc oxide and oil of cloves packs were removed and the patient instructed to commence tooth brushing and interdental stimulation.

It was essential to have the patients' complete co-operation throughout the post operative phase of treatment. The use of interdental stimulators had to be constant, otherwise within one or two cycles there was recurrence of the disease. This recurrence was always most apparent in the late proggestational/

progestational phase (14th-28th day) of the first or second cycle after interdental stimulation had been discontinued. The papillae became hyperaemic, swollen, and sometimes tender. In many instances the patient at once restarted interdental stimulation, but found that many of the papillae remained enlarged. These enlarged papillae became tender before and during menstruation in every cycle. When the problem was tackled before the proliferation became marked the condition could be restored to normal in many cases without surgical treatment. The treatment in these cases was to pack strips of cotton wool, impregnated with zinc oxide and oil of cloves, into the interdental spaces which were affected by proliferation of the papillae. These packs were left in place for a week. When they were removed, the patient was instructed to recommence the use of the interdental stimulators.

It was noted that the recurrence of periodontal disease was more rapid in women than in men. In post operative treatment the need for interdental stimulation/



Fig. 48 The gingivae of Miss J.N. as they appeared during the progestational phase of the cycle. (21st day of menstrual cycle) before treatment.



A.



B.

Fig. 49 Shows in A the gingivae of Miss J.N. as they appeared on the 1st day of menstruation before treatment, and in B the gingivae on the 1st day of menstruation 5 months after gingivectomy.

stimulation was impressed more easily on female patients than on males, since the average woman patient suffered a recurrence of the disease within one or two cycles after cessation of interdental stimulation, while in the male it was many months before any breakdown of the gingivae became obvious.

It should be noted that the earliest signs of recurrence of periodontal disease were always seen in the progestational and menstrual phases of the cycle, when the basal cell layer of the gingival epithelium was inactive and the cornified layer was splitting. Bleeding from the gingivae was most common at this stage in the cycle, when the capillaries were numerous and engorged (Vide Figs. 48 and 49).

It was found that overcrowding of the teeth was no obstacle to treatment if the patient were thorough in toothbrushing and interdental stimulation (Vide Fig. 50). It became apparent, however, that these cases did have more rapid and profound recurrence associated with the progestational/



Fig. 50A Shows a case of gingivitis associated with overcrowding of the teeth.



Fig. 50B Shows the same case 6 months after treatment.

progestational and menstrual phases of the cycle where there was any lapse in the post-operative care of the gingivae. A probable cause of this ease of relapse was food impaction, which is recognised as being an aetiological factor in periodontal disease. The most obvious cyclical changes were found in cases with overcrowding of teeth and associated food impaction, traumatic occlusion, interproximal caries, or overhanging fillings. In women whose gingivae showed only slight clinical changes during the cycle, there was always a profound change in the gingival tissue in areas affected by trauma (Vide Fig. 48).

Imperfect toothbrushing produced in the average female patient a marginal gingivitis which, for many cycles, was most obvious immediately before and during menstruation, thereafter becoming a constant feature especially marked during the progestational and menstrual phases of the cycle. Male patients, however, with an imperfect brushing technique showed only slight signs of marginal gingivitis after many months.

Finally, /

Finally, the best post-gingivectomy results were always obtained when the operation was performed in the proliferative phase of the menstrual cycle. Rapid healing and a minimum of discomfort were features of this phase of the cycle. Healing was always slow and discomfort almost always experienced when gingivectomy was performed in the progestational (premenstrual) phase. Healing was rapid and discomfort minimal during menstruation itself. Although Glickman⁽³⁶⁾ and others say that pronounced bleeding may occur in this phase no unusual haemorrhage followed gingivectomy in any of the cases treated during this phase throughout this research. Certainly bleeding at the time of operation was often more marked, but not excessively so, nor was there any case of post-operative haemorrhage. It should be stated at this point that only a few interdental papillae were removed at one visit if a gingivectomy was performed during menstruation.

Treatment of Periodontal Disease
in Pregnant Women

During/



Fig. 51. A case of periodontal disease before treatment in a patient in her 3rd month of pregnancy.



Fig. 52. The case shown in Fig. 51 photographed at the end of the 6th month of pregnancy (3 months after gingivectomy).

During pregnancy gingival changes were most marked in the first two to three months, and then again from the end of the sixth month till parturition. It was noted that, if even slight gingivitis existed before pregnancy, there was generally a rapid degenerative change in the gingivae soon after conception. They became very hyperaemic and oedematous, and bled easily. This gingival change progressed until the end of the second to third months; for the next two to three months there was little change. During the sixth month gingival haemorrhage and proliferation of the papillae very often became features of the oral condition.

Periodontal treatment could be performed with least discomfort to the patient when it was postponed until the third or preferably the fourth month of pregnancy. Healing was more rapid and the possibility of recurrence of the periodontal disease less likely at this stage also (Vide Figs. 51 and 52). Healing was slow and discomfort was normally found following gingivectomy in the first two/

two and the last three months of pregnancy.

Treatment of Periodontal Disease at the Menopause

Treatment of periodontal disease at the beginning of the menopause was more difficult than treatment after the menopause had been established for some time.

It was essential to stimulate the epithelium of the gingivae with oestrogen both before and after periodontal treatment; it was important also to ensure the absence of rough surfaces on the teeth. When the patients co-operated with correct and thorough oral hygiene, periodontal treatment was successful.

The warning that the painful desquamative gingivitis was likely to recur if co-operation were not complete, was sufficient in all cases to ensure complete co-operation. In every case the patient was delighted to gain relief from the desquamative symptoms and had no desire to have them recur.

Although post-operative healing following gingivectomy was slow in patients whose menopause had/

had been established for some time, no great difficulty was experienced in gaining the cooperation of these older women. They were thorough in performing oral hygiene and, consequently, periodontal treatment was successful in the majority of cases.

Treatment of Periodontal Disease
in Disorders of the Endocrine
System in Women

In every case where the endocrine disorder was treated and controlled by the patient's physician, periodontal treatment was successful. Any recurrence of the endocrine disorder brought about a recurrence of the periodontal disease. The recurrence of the periodontal disease generally was associated with the menstrual cycle, during which very marked gingival changes took place in the premenstrual phase.

Only palliative periodontal treatment was performed in these cases because, until the basic endocrine disorder was controlled, treatment of periodontal disease associated with the disorder was unsuccessful.

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CONCLUSIONS

Certain conclusions have been reached following the investigations which have been undertaken.

The activity of the basal cell layer of the gingival epithelium varies during the menstrual cycle, being reduced in the progestational and menstrual phases. This activity appears to be influenced by oestrogen which stimulates the basal cell layer to activity in the proliferative phase.

The cornified surface layer of the gingival epithelium varies during the menstrual cycle. There is an increase in this layer during the proliferative phase, and splitting and shedding of the cornified layer during the progestational and menstrual phases of the cycle.

The blood vessels of the gingival connective tissue are difficult to demonstrate in the early proliferative phase, but become more numerous in the latter part of this phase. In the progestational and menstrual phases of the cycle the vessels are very numerous and many are engorged.

It/

It is more propitious to perform gingivectomy in the menstrual or proliferative phases of the cycle, as in these phases healing is rapid and post-operative discomfort is unlikely to be experienced. On the contrary, gingivectomy performed during the progestational phase is generally followed by pain and slow healing.

There are histochemical changes in the connective tissue stroma of the gingivae during the menstrual cycle. The concentration of alkaline phosphatase and polysaccharides increase during the proliferative phase and then decrease during the progestational phase of the cycle. These changes are similar to changes found in the human endometrium.

In women suffering from diabetes mellitus the gingival tissues showed an exaggerated response to the menstrual cycle. This response was most noticeable at ovulation, and in the late progestational phase when the gingivae became very swollen, hyperaemic and in some cases tender. The periodontal condition can be successfully treated if the complete post-operative/

post-operative co-operation is obtained from the patient.

In cases of hyperthyroidism it is difficult to treat the periodontal condition until the basic endocrine disorder is controlled. This appears to be especially true in patients whose menstrual cycles are affected by the hyperthyroidism.

Women who suffer from hypopituitarism usually have advanced periodontal disease, which can be treated for as long as the hormonal replacement therapy is maintained.

The periodontal treatment of cases of menorrhagia is difficult, if not impossible, as long as the hypermenorrhoea is uncontrolled.

Oral ulceration of a cyclical nature occurs in about 30% of females. Ulceration in every cycle occurs only in a small number of patients (Two patients in the 250 cases recorded in this thesis suffered from oral ulceration in every cycle.) In practically every case recorded, the ulcers appeared in the progestational phase of the/

the cycle. There appears to be a relationship between emotional stress and an acute form of this cyclical oral ulceration. Patients who suffer from oral ulceration generally do not have any ulceration after the second month of pregnancy, but the ulceration recurs shortly after the child is born.

Periodontal conditions associated with menopausal desquamative gingivitis respond to treatment after oestrogen has been given to stimulate the gingival epithelium to activity provided all sources of potential irritation are eliminated.

Periodontal treatment is successful in cases where there are obvious cyclical changes in the gingivae, although it is certainly easier to maintain a successful result in cases where the cyclical gingival changes are not obvious.

Finally, it has been shown that various changes occur in the gingivae in women during normal menstrual cycles. These cyclical changes in the gingivae are always most obvious around malpositioned teeth/

teeth, and in gingival tissue which has been traumatised.

Further research is necessary to establish the precise effect that these cyclical changes have in causing periodontal disease. It is hoped that the present research will pave the way for the further investigation of this problem of periodontal disease in women. It should be emphasised that emotional strain, sexual or otherwise in nature, has a marked injurious effect upon the female gingivae.

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APPENDIX

(A Summary of 100 Cases)

SUMMARY OF 100 CASES.

(1) Miss E.G., age 19. Menarche 11, Cycle 5/28.

Gingivae became congested and bled easily 6-7 days before menstruation, and for 4-5 days after onset of period. The congestion was particularly bad in lower left and right third and second molar areas, these areas being very tender for a week before and a full week after menstruation. Patient complained of oral ulceration which appeared 7-9 days before menstruation in many cycles. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene fairly good. Treatment successful, although patient aware of discomfort when using the stimulators a week before and a week after menstruation.

(2) Mrs. M.P., age 19. Menarche 14. Cycle 4-5/28.

Gingivae became congested and bled easily during the 48 hours following the 12th day of the cycle and again 4 days before menstruation, the congestion lasting for the 4-5 days of the period. No oral ulceration, acne or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(3)/

(3) Mrs. M.B., age 23. Menarche 13. Cycle 4/21.

Gingivae became very congested and bled easily 2 days before menstruation, this lasting until the 4th day of the period; the congestion and bleeding accompanied by some discomfort were noticed during the 48 hours following the 10th day of three cycles. For those 48 hours of the three cycles the patient had a vaginal discharge, her temperature chart having shown a rise of 2 degrees on the 10th day. Two days before menstruation in every cycle the patient suffered from nasal congestion accompanied by bleeding; this congestion disappeared rapidly as soon as the period started. Acne on the face, back and shoulders appeared 2-3 days before menstruation. No oral ulceration associated with the menstrual cycle. Oral hygiene good. Treatment successful, although the patient still aware of discomfort when using the stimulators just before and during menstruation.

(4) Miss H.Z., age 23. Menarche 17. Cycle 3-4/30.

Gingivae became very congested 3-4 days before menstruation, this lasting with only slight bleeding until 4 days after the period started. Acne on the face/

face, chest and back appeared 3-4 days before menstruation in most cycles. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful although patient still complains of discomfort when using the stimulators 4-5 days before menstruation and for 4-5 days after onset of period.

(5) Mrs. G.B., age 26. Menarche 15. Cycle 6/28.

Gingivae became congested, painful and bled easily 2-3 days before menstruation, and for the 6 days of the period, the patient having been aware of this for 3-4 years. She also noticed that this congestion and discomfort of the gums before and during a period disappeared a month or two after she was married, but reappeared toward the end of the second year of marriage, when a certain tension was introduced into the marital state. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful although patient aware of discomfort when using the stimulators just before and during menstruation./

menstruation.

(6) Miss J.A., age 23. Menarche 13. Cycle 6/28.

Gingivae became congested and bled easily 24 hours before menstruation and for the first 3-4 days of the period.

Acne on face and shoulders appeared 24 hours before menstruation. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(7) Miss L.R., age 21. Menarche 13. Cycle 5-6/28.

Gingivae became congested and painful 2 days before and remained thus for the first 3-4 days of menstruation. Acne appeared on back and chest 2-3 days before every menstrual period. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(8) Miss F.W., age 17. Menarche 13. Cycle 5/28.

Gingivae bled easily 2 days before and for the duration of menstrual period. Acne appeared on face, chest and shoulders 2 days before every period. Oral ulceration on occasion, the ulceration appearing 2-3 days before menstruation. No nasal congestion associated with the menstrual cycle. Oral hygiene fair./

fair. Treatment successful for ten months at which point patient stopped using the interdental stimulators. Within one cycle congestion and tenderness of the gums returned two days before menstruation. Patient once more commenced use of stimulators but again relinquished this form of treatment at the end of the following menstrual cycle because it was found to be "too painful" to stimulate the gingivae during her period. There has been no recurrence, however, of the gingival condition since second course of treatment.

(9) Miss M.P., age 18. Menarche 15. Cycle 5/28.

Gingival congestion and bleeding started 7 days before almost every menstrual period and lasted until the 4th or 5th day of menstruation. Acne appeared on the face and chest one week before menstruation in the cycles in which the patient was aware of the gingival congestion. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene had been poor, but improved greatly before treatment. Treatment successful.

(10) Miss P.A., age 27. Menarche 13. Cycle 3-4/28.

Gingivae/

Gingivae became congested and painful 2-3 days before every menstrual period, the discomfort lasting until 2nd day of menstruation and the congestion until the 4th day. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful.

(11) Miss L.H., age 20. Menarche 15. Cycle 4-6/28.

Gingival bleeding very obvious 3-4 days before most menstrual periods, the bleeding lasting until the 6th day of menstruation. Acne on face, chest and shoulders appeared 3-4 days before most periods. Oral ulceration frequently appeared 6-7 days before menstruation. No nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(12) Mrs. J. McI., age 21. Menarche 13. Cycle 7-9/35.

One pregnancy at the age of 19. After pregnancy gingivae became congested, painful and bled easily 4-5 days before most menstrual periods, the pain lasting for 3-4 days after onset of menstruation, and the congestion and bleeding for the whole period. Acne appeared on the face and chest 4 days before every period/

period in the cycles in which the gingivae became congested. No nasal congestion or oral ulceration associated with the menstrual cycle. Oral hygiene quite good. Treatment successful, although the patient is still aware of, especially when using the interdental stimulators, some discomfort 4-5 days before and for at least 4 days after onset of menstruation.

(13) Miss G.G., age 23. Menarche 11. Cycle 4-5/28.

Gingivae became congested and bled easily 24-48 hours before most menstrual periods, this lasting until the 4th or 5th day of menstruation. Oral ulceration and acne appeared one week before menstruation every 3rd or 4th cycle. No nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful.

(14) Miss E.B., age 23. Menarche 13. Cycle 2/28.

Gingivae bled easily 4-5 days before most menstrual periods, the bleeding lasting 3-4 days after onset of menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful but patient, when/

when using stimulators about 7 days before most menstrual periods, is still aware of some gingival congestion and tenderness.

(15) Miss I.R., Age 18. Menarche 13. Cycle 4-5/28.

Gingivae became congested and bled easily 2 days before and for the 4-5 days of menstruation. Acne appeared on face and chest 2-3 days before most menstrual periods. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(16) Miss M.B., age 23. Menarche 13. Cycle 8/28.

Gingivae became congested and bled easily 24-48 hours before menstruation, this lasting for the 8 days of the period. Oral ulceration occasionally appeared 10 days before onset of menstruation. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene not good but improved before treatment. Treatment successful.

(17) Mrs. M.S., age 31. Menarche 16. Cycle 5/28.

Gingivae became congested and bled easily 2-3 days before and for the 5 days of menstruation. Acne appeared on back and shoulders 2-3 days before most menstrual/

menstrual periods. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(18) Miss E. Mc., age 22. Menarche 13. Cycle 6/28.

One pregnancy at age of 20 during which patient had painful, bleeding gingivae. Since then patient aware of gingival bleeding 7-8 days before menstruation, and for the first 2-3 days of the period. Acne on face and chest 7-8 days before menstruation in most cycles. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful, although gingivae still become congested and tender on the 13th and 14th days of most cycles.

(19) Miss M.P., age 17. Menarche 13. Cycle 4-5/28.

Gingival congestion and bleeding appeared 48 hours before most menstrual periods and lasted for the 4-5 days of menstruation. Acne and nasal congestion also present from 48 hours before onset of period. Occasional oral ulceration. Oral hygiene good. Treatment successful.

(20) Miss B.L., age 19. Menarche 14. Cycle 4-5/21 and 4-5/35 in alternate cycles. Gingivae became congested/

congested and bled easily 2-3 days before menstruation in both the 21 and 35 cycles, the bleeding lasting for the 4-5 days of the period. Acne was present on face and shoulders 2-3 days before menstruation in most cycles. Frequent oral ulceration in the 10 days before menstruation; this occurred especially after certain foods had been eaten. No nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(21) Miss G.V., age 22. Menarche 15. Cycle 3-4/28.

Gingivae became congested, painful and bled easily 7-10 days before most menstrual periods. The pain ceased on the 1st day of menstruation, but the congestion and bleeding lasted for the 3-4 days of the period. Acne appeared on face, chest and shoulders 7 days before most menstrual periods. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful, although patient is still aware of some discomfort when using the interdental stimulators 7-10 days before most menstrual periods.

(22) Mrs. K.D., age 26. Menarche 13. Cycle 1/28.

Patient had been aware, for several years, of congestion/

congestion and bleeding, in association with the menstrual cycle. The congestion appeared 3-4 days before menstruation and lasted for 2-3 days after onset of period. During her first pregnancy, at the age of 20, the patient had a great amount of gingival discomfort and bleeding. No acne associated with the menstrual cycle, but frequent oral ulceration which appeared 7-10 days before menstruation. Oral hygiene good. Treatment was interrupted by a second pregnancy during the early months of which the patient was hospitalised. The portion of the gingivae which had been treated remained healthy until the end of the 3rd month which was point at which treatment ceased while the untreated gingival tissue became very congested and painful.

(23) Miss J.K., age 21. Menarche 13. Cycle 4/28.

Gingivae became congested and bled easily 3-4 days before most menstrual periods, this lasting for the 4 days of menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(24) Miss P. McK., age 19. Menarche 13. Cycle 3/28.

Gingivae/

Gingivae became congested and bled easily 5-6 days before menstruation, this lasting until the 3rd day of the period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle.

Oral hygiene good. Treatment successful.

(25) Miss G.M., age 26. Menarche 12. Cycle 4/28.

Gingivae became congested and tender from the 12th to the 13th day of cycle and again for the 7 days before menstruation. Oral ulceration and nasal congestion appeared simultaneously 7-10 days before onset of menstruation in every 3rd and 4th cycle.

No acne associated with the menstrual cycle. Oral hygiene very good. Treatment successful, although patient still complains of tenderness when using the interdental stimulators at those stages in the cycle when congestion of gingivae was present prior to treatment.

(26) Mrs. J.B., age 28. Menarche 13. Cycle 6-7/27.

Gingivae became congested 7 days before menstruation and remained thus throughout period. It had been noticed before treatment that the gingivae became congested and bled very easily on the 12th day of the cycle/

cycle, this congestion lasting until the 13th day and then rapidly subsiding. Concurrent with the gingival congestion the patient had a vaginal discharge. Acne on back and shoulders appeared in most cycles 7 days before menstruation. No oral ulceration or nasal congestion associated with the menstrual cycle.

Patient had had two pregnancies, during which gingivae had bled easily, the bleeding in the latter pregnancy being particularly obvious at the beginning and the end. Oral hygiene good. Treatment successful.

(27) Miss J.H., age 18. Menarche 12. Cycle 6-7/30.

Gingivae became congested 3-4 days before menstruation; the congestion became very obvious and the gingivae bled easily immediately menstruation started, this lasting for 5-6 days. There was obvious congestion and bleeding during the 48 hours following the 14th day in most cycles; this was associated with a vaginal discharge which also lasted for 48 hours.

Acne and oral ulceration appeared simultaneously 2-3 days before menstruation in every 3rd cycle. Oral hygiene poor but had improved greatly before treatment. Treatment successful, although patient is aware/

aware of slight discomfort, and "tightness" when using the interdental stimulators about the 13th, 14th and 15th days of the cycle, and again 24 hours before menstruation and for about 6 days after onset of the period.

(28) Miss U.B., age 26. Menarche 15. Cycle 3/26.

Gingival bleeding started ten days before menstruation and lasted for the first 4-5 days of every period. The gingival bleeding first noticed at the age of 21. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful.

(29) Miss E.D., age 19. Menarche 14. Cycle 5/28.

Gingival bleeding started 7 days before and lasted until the 2nd or 3rd day of every menstrual period. Acne on face and shoulders appeared 7 days before menstruation in every cycle. No nasal congestion or ulcers associated with the menstrual cycle. Oral hygiene poor. Treatment successful.

(30) Mrs. M.A., age 27. Menarche 13. Cycle 6-7/28.

Gingival bleeding and acne started with menstruation and lasted for 5-7 days in every cycle. No pregnancy.
No/

No nasal congestion or oral ulceration associated with the menstrual cycle. Oral hygiene very good. Treatment successful.

(31) Mrs. J.B., age 30. Menarche 13. Cycle 4/21.

Gingival bleeding started 2 days before and lasted until the 4th or 5th day of every menstrual period. Five pregnancies. Occasional oral ulceration which occurred on the 19th to 20th days of the cycle. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(32) Miss C.McI., age 17. Menarche 13. Cycle 3/28.

Gingival bleeding and acne on face and chest both appeared 7 days before and lasted until the 3rd day of every menstrual period. Oral ulceration appeared in every 3rd or 4th cycle about 6-7 days before menstruation. No nasal congestion associated with the menstrual cycle. Oral hygiene excellent. Treatment successful.

(33) Miss E.W., age 18. Menarche 14. Cycle 4-6/28.

Gingival bleeding started 7 days before and lasted until the 4th or 5th day of every menstrual period.

Acne/

Acne on the face, arms and chest appeared on the 6th day before and lasted until the 4th or 5th day of every period. No nasal congestion or ulcers associated with the menstrual cycle. Oral hygiene poor. Treatment successful.

(34) Miss M.C., age 26. Menarche 11 Cycle 6/26.

The gingivae became painful and bled spontaneously from the 1st day of menstruation until the 5th or 6th day of every period. There was nasal congestion with occasional nasal bleeding during this time.

Acne on the face, chest and arms appeared on the 2nd day of every menstrual period and persisted for about 7 days. The patient had occasional oral ulceration - the ulcers when they occurred appeared 2-3 days before menstruation. Oral hygiene excellent. Treatment successful.

(35) Miss K.B., age 20. Menarche 13. Cycle 6/30.

Gingival bleeding and acne on face and chest appeared on the 1st day and lasted until the 6th - 7th day of every menstrual period. No nasal congestion or oral ulceration associated with the menstrual cycle.

Oral hygiene fair. Treatment successful for several months/

months and then the periodontal condition recurred.

(36) Miss E.R., age 36. Menarche 16. Cycle 4/30.

Gingival bleeding started 2 days before and lasted until the 5th day of every menstrual period. Patient also noticed that the gingivae were inclined to bleed readily for 2-3 days from the 13th day of the cycle. No nasal congestion, oral ulceration or acne associated with the menstrual cycle. Treatment successful.

(37) Miss G.J., age 22. Menarche 13. Cycle 4-5/30.

Gingival bleeding started 5 days before and lasted until the 4th or 5th day of every menstrual period. Oral ulceration appeared 5 days before menstruation on alternate cycles. No acne or nasal congestion associated with the menstrual cycle. Treatment successful.

(38) Miss A.D., age 18. Menarche 15. Cycle 4/30.

Gingival bleeding started 1 day before menstruation and lasted until the 4th or 5th day of every cycle. No acne, nasal congestion or oral ulceration associated with the menstrual cycle. Treatment successful.

(39) Miss S. McF., age 20. Menarche 12. Cycle 6-7/30.

Gingival bleeding started on the 1st day of every menstrual period and lasted for 6-7 days. The gingivae/

gingivae were tender during this stage and felt 'tight' according to patient's description. No acne, nasal congestion or oral ulceration associated with the menstrual cycle. Treatment successful for 18 months, then paradontal condition recurred.

(40) Miss S.F., age 17. Menarche 12. Cycle 4-5/28.

Gingival bleeding started 2 days before and lasted until the 4th or 5th day of every menstrual period. No oral ulceration, nasal congestion or acne associated with the menstrual cycle. Treatment successful.

(41) Mrs. M.D., age 24. Menarche 14. Cycle 3/26.

Gingival bleeding and acne on face appeared 2 days before every menstrual period and lasted until the 3rd or 4th day of every new cycle. One pregnancy during which the gums bled easily and were sometimes painful. No oral ulceration or nasal congestion associated with the menstrual cycle. Treatment successful.

(42) Miss A.C., age 25. Menarche 11. Cycle 7/26.

Gingival bleeding started 1 day before and lasted for the 7 days of every menstrual period. Oral ulceration occasionally appeared 4-5 days before menstruation/

menstruation. No acne or nasal congestion associated with the menstrual cycle. Treatment successful.

(43) Miss E.C., age 31. Menarche 13. Cycle 4-5/26.

Gingival bleeding started 4-5 days before menstruation and lasted until the 5th day of every cycle.

Occasional acne on face and arms appeared 4-5 days before each menstrual period. No nasal congestion or oral ulceration associated with the menstrual cycle. Treatment successful.

(44) Miss A.B., age 20. Menarche 11. Cycle 2/28

and 7/21 on alternate cycles. Gingival bleeding and nasal congestion started 24-48 hours before and lasted throughout every menstrual period. Acne on face and arms appeared 7 days before menstruation and disappeared just after each menstrual period started.

No oral ulceration associated with the menstrual cycle. Treatment successful.

(45) Mrs. J.G., age 33. Menarche 14. Cycle 4/28.

Gingival bleeding started 24-48 hours before menstruation and lasted until the 5th day of each new cycle. One pregnancy when patient was aged 21. No gingival disturbance remembered. No acne, oral ulceration or nasal/

nasal congestion associated with the menstrual cycle. Treatment successful.

(46) Miss J.D., age 20. Menarche 12. Cycle 3-5/30.

No gingival bleeding associated with menstruation but, after gingivectomy, patient complained of discomfort when using the interdental stimulators 4-5 days before menstruation. This lasted until the 2nd or 3rd day of the period. No acne, nasal congestion or oral ulceration associated with the menstrual cycle.

Treatment successful.

(47) Miss E.I., age 24. Menarche 12. Cycle 3-4/30.

Gingival bleeding much more obvious 6-7 days before menstruation. The congestion of the gingivae generally subsided on the 2nd day of the new cycle. Acne on the face and chest, and occasional oral ulceration appeared 6-8 days before menstruation. No nasal congestion associated with the menstrual cycle. Treatment successful.

(48) Miss M.C., age 26. Menarche 16. Cycle 6/28.

Gingivae became congested and were inclined to bleed 3-5 days before menstruation - this lasted until the 3rd or 4th day of the new cycle. No oral ulceration, nasal/

nasal congestion or acne associated with the menstrual cycle. Treatment successful.

(49) Miss R.H., age 24. Menarche 11. Cycle 2/28.

Patient aware 10-12 days before menstruation of tender, bleeding gums which lasted until the 1st day of the period in most cycles. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Treatment successful initially. This patient decided that use of interdental stimulators was unnecessary after gingivectomy. In the cycle after discontinuing interdental stimulation she once more became aware of her gums being tender and inclined to bleed from the 16th day of the cycle. There was no recurrence of these symptoms after continued use of the stimulators.

(50) Miss N. McC., age 23. Menarche 14. Cycle 4/28.

Gingivae congested 24-48 hours before and for 2-3 days after commencement of each menstrual period. No oral ulceration, acne or nasal congestion associated with the menstrual cycle. Oral hygiene poor. Condition responded to treatment but recurred after 14 months when patient's oral hygiene lapsed. The/

The gingival congestion reappeared at the same time in the cycle as it had before treatment.

(51) Miss J.A., age 20. Menarche 12. Cycle 4-5/28.

Gingivae were congested and bled easily for 2-3 days from the 11th day after the 1st day of menstruation and for the first 3-4 days of menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene fair. Condition responded to treatment but recurred after 8 months when patient discontinued the use of interdental stimulators. Since the second course of treatment the condition has been satisfactory.

(52) Mrs. L.N., age 25. Menarche 11. Cycle 5/24.

Gingivae congested and bled easily for 6-7 days before every menstrual period; this ceased during the first 24-48 hours of menstruation and reappeared on the 3rd and 4th day of menstruation. Patient had severe dysmenorrhea during the first 24-48 hours of every menstrual period. No pregnancy. Acne in every cycle 7 days before menstruation. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Condition responded/

responded to treatment; no recurrence.

(53) Miss N.C., age 26. Menarche 18. Cycle irregular 4/14 - 4-5/40. Gingivae bled 4-5 days before every menstrual period and for the first 2-3 days of menstruation. Acne appeared on face, chest and arms one week before every period. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene fair. Condition responded satisfactorily.

(54) Miss M.F., age 25. Menarche 14 Cycle 5/28. Gingivae became congested and bled easily 3 days before every menstrual period; this lasted until the 4th or 5th day of menstruation. Acne appeared 3 days before every period. No nasal congestion or oral ulceration. Oral hygiene good. Treatment successful.

(55) Miss A.R., age 24. Menarche 13. Cycle 6/28. Gingivae bled readily during menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(56) Mrs. M.C., age 40. Menarche 15. Cycle 5-6/30. Gingival/

Gingival bleeding and discomfort first noticed during first pregnancy when patient aged 26. Gingival condition was treated successfully at that time and then recurred during patient's second pregnancy when she was aged 32. The gingivae bled easily and became tender 3-4 days before each menstrual period; this lasted until the 2nd or 3rd day of menstruation. Patient also complained of nasal congestion 2 days before every period; this lasted until the 1st or 2nd day of menstruation. No oral ulceration or acne associated with the menstrual cycle. Oral hygiene good. Treatment successful. No recurrence after $2\frac{1}{2}$ years although the patient still notices that in some cycles the gingivae become slightly hyperaemic for a few days before and during menstruation; some discomfort is felt when using the interdental stimulators at this time in those cycles.

(57) Miss S.B., age 23. Menarche 16 Cycle 5/30

Gingivae became congested and bled easily 6-7 days before menstruation and for the first 2 days after the/

the period had started. Acne appeared on face and shoulders 7 days before every period. No oral ulceration or nasal congestion. Oral hygiene good. Treatment successful.

(58) Miss O.P., age 21. Menarche 12. Cycle 6-7/28.

Gingivae became congested and bled very easily 2-3 days before menstruation. This lasted throughout every period. Acne on face and chest 2 days before each alternate period. Occasionally oral ulceration is present and when it occurs the ulceration appears 2-3 days before menstruation. Oral hygiene poor. Treatment was successful for 7 months, but recurred when patient's oral hygiene deteriorated again.

(59) Miss J.B., age 23. Menarche 14. Cycle 5-7/30

Gingivae congested 7 days before every menstrual period. The congestion lasted for 4-5 days after menstruation had started; there was no gingival bleeding. No acne, oral ulceration or nasal congestion. Oral hygiene very good. Treatment successful.

(60) Miss M.D., age 19. Menarche 13. Cycle 5/30.

Gingivae were painful and bled easily 2-3 days before every period; this lasted until the 5th day of menstruation./

menstruation. There was some congestion and tenderness of the gums on the 12th and 13th days of almost every cycle. Patient complained of oral ulceration 2-3 days before every period and around the 13th day of almost every cycle. No acne or nasal congestion. Oral hygiene good. Treatment successful.

(61) Miss M.K., age 23. Menarche 14. Cycle 6/30.

Gingivae became swollen and painful 7 days before most menstrual periods; this condition lasted until the 5th or 6th day of menstruation. In all the cycles in which the gingivae became swollen the patient stated that she had oral ulceration. She had noticed that in many cycles about the 5th day the gingivae were swollen and tender for about 48 hours. Acne appeared on face and chest about a week before most menstrual periods. No nasal congestion. , Oral hygiene good. Treatment successful.

(62) Miss I.P., age 22. Menarche 14. Cycle 4/30.

Gingivae bled easily 4-5 days before and for the 4 days of menstruation in most cycles. No acne, nasal/

nasal congestion or oral ulceration associated with the menstrual cycle. Oral hygiene very good. Treatment successful for 11 months. The patient then stopped using the interdental stimulators and within 2 cycles the gingival bleeding had recurred. The condition was treated again. No recurrence.

(63) Miss G.McG., age 24. Menarche 13. Cycle 5/30.

Gingival condition very bad from 7 days before every menstrual period to the 5th day of menstruation. Patient noticed the gums congested and tender in the middle of many cycles. Acne on face and shoulders one week before periods. No oral ulceration or nasal congestion. Oral hygiene good. Treatment successful.

(64) Mrs. J.B., age 29. Menarche 14. Cycle 5/28.

Patient is a diabetic. Gingival change during menstrual cycle very obvious. The gingivae became congested and tender for 48 hours in the middle of every cycle. This reappeared 7 days before every menstrual period and lasted for 4-5 days after menstruation had started. Acne 4-5 days before every menstrual period. No oral ulceration or nasal congestion/

congestion. Oral hygiene good. Treatment successful, although patient was still aware of slight congestion and tenderness when using the interdental stimulators in the middle of the cycle and just before and during menstruation.

(65) Miss G.H., age 18. Menarche 14. Cycle 5/30.

Gingival bleeding most obvious 7 days before menstruation and for the first 48 hours after the period had started. Acne on the face, shoulders and chest 7 days before menstruation. No oral ulceration or nasal congestion. Oral hygiene good. Treatment successful.

(66) Mrs. M.B., age 22. Menarche 12. Cycle 5/28.

Gingivae became congested and bled very easily 3-4 days before every menstrual period and for the 5 days of menstruation. Patient complained of nasal congestion and occasional nasal bleeding 2-3 days before every period. No acne or oral ulceration. Oral hygiene good. Treatment successful.

(67) Mrs. S.D., age 23. Menarche 13. Cycle 4-5/28.

Gingivae became congested and bled easily 2 days before and for 5 days after menstruation started. Acne appeared 2 days before every menstrual period.

No/

No oral ulceration or nasal congestion. Twice pregnant; gingivae very troublesome during both. Oral hygiene good. Treatment successful.

(68) Miss A.H., age 24. Menarche 14. Cycle 6-7/30.

Gingivae became swollen, tender and bled readily 24 hours before menstruation and throughout the 7 days of the menstrual period. No acne, oral ulceration or nasal congestion. Oral hygiene good. Treatment successful.

(69) Miss C.B., age 21. Menarche 13. Cycle 5/28.

Gingival congestion and bleeding appeared 48 hours before menstruation and lasted for the 5 days of the period. No oral ulceration, nasal congestion or acne associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(70) Miss J.G., age 22. Menarche 13. Cycle 5/28.

No gingival bleeding associated with the menstrual cycle, although the gingivae became congested 24-48 hours before menstruation; this lasting for the 5 days of the period, while the congestion was also noticed during the 48 hours starting on the 13th day of many cycles. No oral ulceration, acne or nasal congestion associated/

associated with the menstrual cycle. Oral hygiene very good. Treatment successful, although patient now aware of some discomfort when using the stimulators during the 48 hours in the middle of the cycle and again just before and during menstruation.

(71) Miss E.M., age 20. Menarche 14. Cycle 4/28.

Gingivae bled easily from the 18th or 19th day of most menstrual cycles until the 2nd or 3rd day after onset of menstruation. Oral ulceration and acute ulcerative gingivitis appeared simultaneously 10 days before menstruation in two consecutive cycles.

Patient recalled having had a similar condition about 12 months before. No nasal congestion or acne associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(72) Miss P.T., age 17. Menarche 13. Cycle 5/28.

Gingivae became congested and bled easily 3-4 days before and for the duration of menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene fairly good. Treatment successful.

(73)/

(73) Mrs. E. McA., age 25. Menarche 12. Cycle 5/30.

Gingivae became congested and tender 4-5 days before menstruation and remained thus for the 4 days of the period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene very good. Treatment successful, although patient aware of discomfort before and during menstruation when using the interdental stimulators.

(74) Miss I.C., age 22. Menarche 12. Cycle 5-6/28.

Gingivae became congested and bled easily 6-7 days before menstruation and for the duration of the period. The congestion and bleeding appeared in most cycles for the 48 hours following the 12th day. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(75) Miss J.N., age 18. Menarche 13. Cycle 6/30.

Gingivae became very congested and bled easily 2-3 days before menstruation and for the duration of the period. The congestion and bleeding were present in most cycles for 48 hours from the 13th day. Acne appeared on face and back ~~2-3~~ days before menstruation in/

in most cycles. No nasal congestion or oral ulceration associated with the menstrual cycle.

Oral hygiene good. Treatment successful.

(76) Miss J. McC., age 24. Menarche 13. Cycle 7/28

Gingivae became congested and bled very easily 5-6 days before menstruation and for the duration of the period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful, although patient aware of discomfort during the 5-6 days before and for the first few days of menstruation when using the interdental stimulators.

(77) Miss E.H. age 25. Menarche 11 Cycle 3/28.

Gingivae became congested and bled easily 7-10 days before menstruation and for the duration of the period. Oral ulceration and acute ulcerative gingivitis occurred in two consecutive cycles 10 days before menstruation. Patient has noticed since that oral ulceration and painful congested gingivae occur 10 days before menstruation in every third cycle. Nasal congestion appears 2-3 days before menstruation and disappears as soon as the period starts/

starts. No acne associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(78) Miss M.M., age 21. Menarche 12. Cycle 4-5/21.

Gingivae became very congested and bled easily 2-3 days before menstruation and for the duration of the period. Acne appeared on face, chest and shoulders 2-3 days before menstruation in most cycles. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene was poor, but improved before treatment. Treatment successful, although patient aware of some congestion and tenderness of the gingivae before and during menstruation.

(79) Mrs. A.McD., age 26. Menarche 11. Cycle 6/21.

Gingivae did not bleed but became congested 2 days before menstruation and for the duration of the period. At the age of 20 patient had one pregnancy towards the end of which she was aware of her gums being 'sore and spongy'. During lactation, which lasted 6 months, the patient stated that all her teeth were very loose. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(80)/

(80) Miss H.J., age 17. Menarche 13. Cycle 3/28.

Gingivae became congested and bled easily 2-3 days before menstruation and for the 3 days of the period. Nasal congestion appeared in most cycles 2-3 days before menstruation and disappeared a few hours after the period had started. No acne or oral ulceration associated with the menstrual cycle. Oral hygiene good. Treatment successful, although patient aware of some tenderness of the gingivae when using the stimulators just before and during menstruation.

(81) Miss H.T., age 19. Menarche 14. Cycle 4/28.

Gingivae became very congested and bled easily 2-3 days before menstruation and for the duration of the period. No oral ulceration, nasal congestion or acne associated with the menstrual cycle. Oral hygiene poor, but improved before treatment. Treatment successful, although patient still aware of slight gingival congestion before and during menstruation.

(82) Miss N.N., age 21. Menarche 14. Cycle 4-5/28.

Gingivae became congested, tender and bled easily 3 days before menstruation and for the duration of the period. Acne appeared on face, chest and shoulders 3 days before/

before menstruation, while oral ulceration appeared at the same time in every 3rd or 4th cycle. No nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful, although patient still aware of the gingivae being tender when brushing and stimulating during the 3 days before menstruation and for 4-5 days after onset of period.

(83) Mrs. M.W., age 21. Menarche 11. Cycle 7/28
Gingivae did not bleed but became congested and painful 3-4 days before menstruation and for 4-5 days after onset of the period. No oral ulceration, acne or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful although patient aware of gingival tenderness before and during menstruation even after treatment.

(84) Mrs. W.G., age 30. Menarche 12. Cycle 6-7/28.
Gingivae became very congested 5-6 days before menstruation and for the duration of the period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Patient has had three pregnancies experiencing during the last two painful, bleeding/

bleeding gingivae. Oral hygiene good. Treatment successful.

(85) Miss P.C., age 30. Menarche 14. Cycle 7/28.

Controlled diabetic. Gingivae became congested and bled easily 2-3 days before menstruation and for the duration of the period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(86) Miss G.M., age 24. Menarche 16. Cycle 5-6/28.

Gingivae did not bleed but became congested and painful 24-48 hours before menstruation and for the duration of the period. Acne occasionally on face appeared 24-48 hours before menstruation. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(87) Miss C.McR., age 21. Menarche 13. Cycle 3/28.

Gingivae became very congested and bled easily 3-4 days before menstruation; this lasted for 4-8 days after the period started. Nasal congestion occasionally appeared 2-3 days before menstruation and disappeared 24-48 hours after period started. No oral ulceration or acne associated with the menstrual cycle. Oral hygiene/

hygiene fairly good. Treatment successful.

(88) Miss K.R., age 27. Menarche 12. Cycle 3/24.

Gingivae became congested 4-5 days before menstruation; they did not bleed. The congestion lasted for 3-4 days after the period started. Oral ulceration appeared infrequently 6 days before menstruation. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene was poor, but improved before treatment, Treatment successful for 7 months at which point the patient decided that oral hygiene and interdental stimulation were no longer necessary. Within two cycles the gingivae became congested and bled easily during the 4-5 days before menstruation and for 4 days after the period had started. The condition was treated again successfully.

(89) Miss M.B., age 20. Menarche 15. Cycle 4-5/28

Gingivae became congested and bled easily 7 days before menstruation, this condition lasting for 5 days after onset of period. Oral ulceration appeared 9-10 days before menstruation in occasional cycles. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(90)/

(90) Mrs. S.G., age 28. Menarche 13. Cycle 5/25.

Gingivae became congested 3-4 days before menstruation and this lasted throughout the 5 days of the period.

Patient spent 10 months in a concentration camp; for 9 of these months she was given oestrogen.

Immediately after her release from the camp she had her first period for 9 months. During the period of ammenorrhoea she had no gingival bleeding, but shortly after her release the gingival bleeding started again. Twice pregnant, and during both the gingivae bled very easily. No oral ulceration, nasal congestion or acne associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(91) Mrs. M.S., age 27. Menarche 15. Cycle 5/28

Gingivae became congested and bled easily during the 5-6 days before menstruation, this lasting for the 5 days of the period. Frequent oral ulceration 6-7 days before menstruation. No acne or nasal congestion associated with the menstrual cycle.

Oral hygiene good. Treatment successful.

(92) Miss M.M., age 28. Menarche 11. Cycle 5/28

Gingivae became congested, swollen and painful, and bled/

bled easily during the 10 days before menstruation and for the first 3-4 days of the period. Acne appeared 1 week before menstruation in most cycles. No oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(93) Miss S.P., age 21. Menarche 13. Cycle 3/28.

Gingivae became congested and bled easily 3-4 days before menstruation, this lasting for 3-4 days after onset of period. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene poor, but had improved before treatment. Treatment successful.

(94) Miss K. McL., age 22. Menarche 13. Cycle 6/28

First noticed gingival congestion, tenderness and bleeding before and during menstruation, 8-9 months before treatment. Gingivae became congested and tender 6-7 days before menstruation, this lasting for the 6 days of the period. Oral ulceration and herpes on the lower lip appeared 7 days before menstruation in 2-3 consecutive menstrual cycles with an interval of 4-5 cycles in which there was neither ulceration/

ulceration or herpes. The patient noticed that the gingival condition was more painful, and the bleeding more obvious in the cycles in which the ulceration and herpes appeared. Acne on the chest and shoulders appeared 10 days before menstruation in the same cycles as the oral ulceration and herpes. Oral hygiene very good. Treatment successful.

(95) Miss N.B., age 20. Menarche 14. Cycle 4/30

Gingivae became very congested and bled easily 10 days before menstruation, this lasting for 4 days after the onset of period. For 2-3 consecutive cycles the patient had oral ulceration accompanied by very painful gingivae during the 10 days before menstruation. There were 2 cycles during which there was no ulceration but gingival congestion, and, then the process was repeated. After treatment this condition of oral ulceration accompanied by very painful gingivae was repeated several times, and after each occasion interdental spaces had to be packed to reduce the congestion. For the past 10 months, however, there has been no repetition of cycles of this type. No acne or nasal congestion associated/

associated with the menstrual cycle. Oral hygiene good.

(96) Miss M.H., age 19. Menarche 14. Cycle 5/28
Gingivae became congested and bled easily for 2-3 days in the middle of most cycles. Congestion and bleeding were present also during the 24-48 hours before and for the 5 days of menstruation. No nasal congestion, acne or oral ulceration associated with the menstrual cycle. Oral hygiene had been poor but improved greatly 3-4 months before treatment. Treatment successful.

(97) Mrs. A.A., age 27. Menarche 15. Cycle 7/28
Gingivae became congested and painful and bled easily 7 days before menstruation and for the duration of the period. This had been noticed since pregnancy at the age of 24. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful for 11 months after which there was a recurrence of the paradontal condition associated with the menorrhagia which was diagnosed, by her physician, as being due to emotional strain. Up to date all further attempts to clear up the/
the/

the paradontal condition have failed.

(98) Miss K.W., age 18. Menarche 15. Cycle 5/28.

Gingivae became very congested and painful and bled easily 4-5 days before menstruation, and for the duration of the period. The pain disappeared within the first 24 hours of menstruation. No acne, oral ulceration or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful.

(99) Miss A.H., age 22. Menarche 12. Cycle 7/28.

Gingivae became congested and painful, and bled easily 7 days before menstruation. Those symptoms disappeared, however, for the 48 hours following the onset of menstruation; during those 48 hours the patient habitually suffered from severe dysmenorrhoea and the gingivae and oral mucosa became very pale. The gingival congestion returned on the 3rd day of the period, and lasted until the 6th-7th day of the period. Oral ulceration appeared 7-10 days before menstruation in every 3rd or 4th cycle. No acne or nasal congestion associated with the menstrual cycle. Oral hygiene good. Treatment successful, although patient aware of discomfort when using the stimulators/

stimulators 7 days before menstruation and for 6-7 days after onset of period.

(100) Miss J.F., age 21. Menarche 14. Cycle 3-4/28

Gingivae became congested and bled easily 7 days before menstruation and for the duration of the period. Nasal congestion and acne on face and chest appeared simultaneously 7 days before menstruation in occasional cycles; it was noticed that the gingival congestion was particularly bad in these cycles. When acne and nasal congestion were present they usually were accompanied by oral ulceration. Oral ulceration which was totally absent when there was no acne or nasal congestion, appeared 10 days before menstruation. Oral hygiene good. Treatment successful.

GINGIVAL AND PERIODONTAL CONDITIONS
AS RELATED TO MENSTRUATION AND
ENDOCRINE DISORDERS IN THE FEMALE.

JOHN FINDLAY, L.D.S.

SUMMARY

An introductory note is followed by a short discourse on the history of periodontal disease, with particular emphasis on the conditions which are discussed in the treatise.

The normal clinical and microscopical features of the gingiva and periodontal membrane are summarised and illustrated.

A summary of the mechanism of the menstrual cycle is given, this being followed by a classification and summary of the aetiological factors of periodontal disease.

The results of the research are given. These are based on the observations noted during the examination and treatment of 250 female patients for periodontal disease. Also taken into account are the microscopical findings of the examination of gingival tissue removed from these patients at various stages in their menstrual cycles. The results of observations were noted after the examination and treatment of nineteen cases of known endocrine disorders./

disorders.

A discussion is included. This part of the thesis is presented in two main sections. The first section deals with the gingival changes which occur during the normal menstrual cycle, and also the gingival changes which take place in endocrine disorders which may influence the ovarian cycle. The changes which occur in the basal cell layer of the gingival epithelium are illustrated and discussed as are the changes which take place in the cornified surface layer of the gingival epithelium. A similar account is given of the blood vessel changes which take place in the gingival connective tissue during the menstrual cycle. It is shown that these changes are similar to the changes which take place in the endometrium and the epithelium of the vagina. Periodontal disease in cases of known endocrine imbalance is discussed and illustrated, and it is recorded that recurrence of periodontal disease in many of these cases is associated with recurrence of the endocrine imbalance reflected in the ovarian cycle.

The/

The rate of healing and discomfort following gingivectomy is discussed, and it is shown that rapid healing and little post-operative discomfort can be expected in the proliferative phase, but slow healing and much discomfort follow gingivectomy in the progestational phase of the cycle. Oral ulceration of a cyclical nature is shown to be associated with irritation of the mucosa in the progestational phase of the cycle, while oral ulceration of a more acute nature, apparently associated with emotional stress is discussed. Desquamative gingivitis at the menopause is considered.

The second section of the discussion is devoted to the treatment of periodontal disease during the normal menstrual cycle, during pregnancy, at the menopause, and in disorders of the endocrine system. It is stated that, when the complete co-operation of the patient is obtained, periodontal treatment is successful even when the cyclical gingival changes are very obvious. Periodontal treatment in pregnancy is best performed after/

after the second month and before the end of the sixth month of pregnancy since healing is rapid and discomfort minimal during this period of four months. It is considered that periodontal treatment in cases of desquamative gingivitis can be successful when the patient co-operates and all sources of irritation are removed, and the epithelium stimulated to activity with oestrogen. In cases of medically controlled endocrine disorders, periodontal treatment is possible.

A summary of the case histories of 100 patients has been included as an appendix.

A bibliography appears at the end of each chapter of the treatise.