

To determine the incidence of post-operative deep vein thrombosis
in
general surgical patients of Hospital Universiti Sains Malaysia

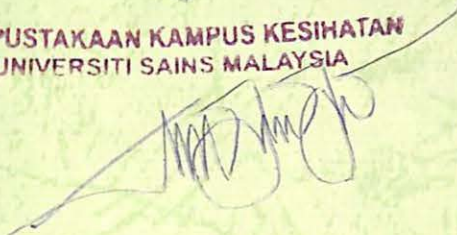
IRPA Research Grant 391 / 9636 / 1036
1.9.1998 – 31.8.2001

Final report on prospective study of 45 patients with no deep vein
thrombosis (DVT) prophylaxis

Myint Tun ¹
Ibrahim Lutfi Shuaib ²
Mahayidin Muhamad ²
Abdul Hamid Mat Sain ¹
Anas Sjahroedin Ressang ¹

Departments of Surgery¹ and Radiology²
Universiti Sains Malaysia
16150 Kubang Kerian
Kelantan





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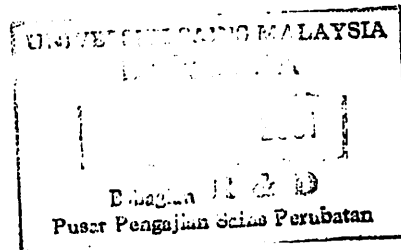
Departments of Surgery¹ and Radiology²
Universiti Sains Malaysia
16150 Kubang Kerian
Kelantan





Universiti Sains Malaysia

Pusat Pengajian Sains Perubatan School of Medical Sciences



28 October 2001

Melalui:

Pengerusi, Jawatankuasa Penyelidikan
Pusat Pengajian Sains Perubatan
16150 Kubang Kerian, Kelantan

Kepada:

Pengerusi
Bahagian Penyelidikan & Pembangunan
Universiti Sains Malaysia
11800 Pulau Pinang

Daripada:

Penyelidik utama
IRPA grant 391/9636/1036
Jangka Pendek

Your Ref: FPP 98/081

Topic of the project: To determine the incidence of post-operative deep vein thrombosis in general surgical patients of Hospital USM. 1.9.1998 – 31.8.2001

LAPORAN AKHIR PROJEK PENYELIDIKAN IRPA JANGKA PENDEK

Dear Sir,

Enclosed herewith are:

1. The filled up form of the Laporan Akhir Projek Penyelidikan R & D Jangka Pendek.
2. Three (3) bounded copies of the final comprehensive report on the research findings.
3. The detail financial statement including the expenditure and balance of account in Bendahari USM Kubang Kerian for you kind reference.

In spite of the technical problems and slow progress as mentioned in previous reports, we have achieved few interesting results from the study. Even though further extension of six months was received till 31.8.2001, one Consultant Radiologist (P/M Dr Ibrahim L S) was on sabbatical leave and the study was terminated since 28.2.2001.

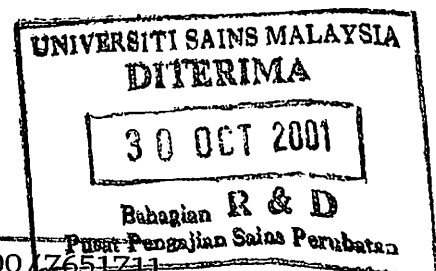
This study was presented in:

1. First Asean Conference on Medical Sciences, 18-21 May 2001, Kota Bharu, Kelantan.
2. 35th Malaysia-Singapore Medical Congress, 22-26 August 2001, Kuala Lumpur.

Paper for publication was sent to the Journal of The Royal College of Surgeons of Edinburgh, Scotland, UK and we are still waiting for the reply from the Editorial Board of RCS Edinburgh. On behalf of all my co-researchers we want to express our thanks for all your kind help and supervision during the whole study period.

Sincerely,

Dr Myint Tun
Main Researcher of the project
Department of Surgery
Pusat Pengajian Sains Perubatan, 16150 Kubang Kerian, Kelantan
E Mail: mtun@kb.usm.my



LAPORAN AKHIR PROJEK PENYELIDIKAN R & D JANGKA PENDEK

A. MAKLUMAT AM

Tajuk Projek: To determine the incidence of post-operative
deep vein thrombosis in general surgical patients
of Hospital Universiti Sains Malaysia.

Tajuk Program: IRPA Jangka Pendek.
USM P. Penang Ref: FPP 98 / 081

Tarikh Mula:1,9,1998.....

Nama Penyelidik Utama: Dr Myint Tun
(berserta No. K/P)

Nama Penyelidik Lain: 1. Dr Ibrahim Lutfi Shuaib
2. Dr Mahayidin Muhamad
3. Dr Abdul Hamid Mat Sain
4. Dr Anas Sjahroedin Ressang

B. PENCAPAIAN PROJEK:

(Sila tandakan / pada kotak yang bersesuaian dan terangkan secara ringkas di dalam ruang di bawah ini. Sekiranya perlu, sila gunakan kertas yang berasingan).

Penemuan asli/peningkatan pengetahuan
.....
Insiden deep vein thrombosis (DVT) selepas
.....
pembedahan ialah 2.2%.
.....
.....
.....

Tahawal!

W. M. M. M.
Tandatangan Pengerusi
Dewan Kuasa Penyelidikan
Pusat Pengajian

PROF. MADYA ZABITI AZHAR MOHD. HUSSIN
Dekan
Pusat Pengajian Sains Perubatan
Universiti Sains Malaysia
16150 Kubang Kerian,
Kelantan. USM R&D/JP 04 - 1

Rekaan atau perkembangan produk baru,
(Sila beri penjelasan/makluman agar mudah
dikomputerkan).

- (1)
"Tiada"
.....
- (2)
.....
- (3)
.....

Mengembangkan proses atau teknik baru,
(Sila beri penjelasan/makluman agar mudah
dikomputerkan).

- (1)
"Tiada"
.....
- (2)
.....
- (3)
.....

Memperbaiki/meningkatkan produk/proses/teknik yang
sedia ada.
(Sila beri penjelasan/makluman agar mudah
dikomputerkan).

- (1) Tidak seperti kajian lain, kami menggunakan
duplex colour ultrasound sebagai alat utama
untuk penyelidikan diikuti dengan ascending
- (2) venografi.
.....
- (3)
.....

C. PEMINDAHAN TEKNOLOGI

Berjaya memindahkan teknologi. " tiada "

Nama Klien: (1)

(Nyatakan nama penerima pemindahan teknologi ini dan (2)

sama ada daripada pihak swasta (3)

ataupun sektor awam)

Berpotensi untuk pemindahan teknologi.
(Nyatakan jenis klien yang mungkin berminat).
" tiada "

.....

.....

.....

.....

.....

D. KOMERSIALISASI

Berjaya dikomersialkan. " tiada "

Nama Klien: (1)

(2)

(3)

Berpotensi untuk dikomersialkan.
(Nyatakan jenis klien yang mungkin berminat).
" tiada "

.....

.....

.....

.....

.....

E. PERKHIDMATAN PERUNDINGAN BERBANGKIT DARIPADA PROJEK (*Klien dan jenis perundingan*)

" tiada "

- (1)
- (2)
- (3)
- (4)

F. PATEN/SIJIL INOVASI UTILITI

(*Nyatakan nombor dan tarikh pendaftaran paten. Sekiranya paten/sijil inovasi utiliti telah dipohon tetapi masih belum didaftarkan, sila berikan nombor dan tarikh fail paten.*)

" tiada "

- (1)
- (2)
- (3)

G. PENERBITAN HASIL DARIPADA PROJEK

(i) LAPORAN/KERTAS PERSIDANGAN ATAU SEMINAR

- (1) Research presentation in PPSP, USM Kubang Kerian, DK 5, Hari Khamis, 2000 (27.4.2000)
- (2) First Asean Conference on Medical Sciences, 18-21 May 2001, Kota Bharu, Kelantan.
- (3) 35th Malaysia-Singapore Medical Congress, 22-26 August 2001, Kuala Lumpur.
- (4)
- (5)

(ii) PENERBITAN SAINTIFIK

(1) Sudah dihantar untuk penerbitan di.....
Jurnal antarabangsa: Journal of the Royal College
of Surgeons of Edinburgh.....

(2)
.....

(3)
.....

(4)
.....

(5)
.....

(6)
.....

(7)
.....

H. HUBUNGAN DENGAN PENYELIDIK LAIN

(Sama ada dengan institusi tempatan ataupun di luar negara)

(1) Mary Mankanjang, Queen Elizabeth Hospital,.....
Kota Kinabalu, Sabah, East Malaysia.
.....

For her study on the incidence of asymptomatic
(2) deep vein thrombosis in moderate and high risk
patients in Queen Elizabeth Hospital, Sabah.....

(3)
.....

(4)
.....

I. SUMBANGAN KEWANGAN DARI PIHAK LUAR

(Nyatakan nama agensi dan nilai atau peralatan yang telah diberi).

" tiada "

- (1)
- (2)
- (3)

J. PELAJAR IJAZAH LANJUTAN

(Nyatakan jumlah yang telah dilatih di dalam bidang berkaitan dan sama ada di peringkat sarjana atau Ph.D).

Nama Pelajar

Sarjana " tiada "

.....

.....

.....

Ph.D " tiada "

.....

.....

.....

K. MAKLUMAT LAIN YANG BERKAITAN

1. Walaupun terpaksa menghadapi masalah teknikal, kami berjaya mencapai keputusan yang menarik. Insiden deep vein thrombosis (DVT) dalam populasi Malaysia selepas pembedahan umum adalah sangat rendah.
 2. Dengan itu profilaksis untuk DVT seperti polisi yang diamalkan sebelum ini harus diteruskan.
- TIDAK MEMBELI APA-APA ALAT KELENGKAPAN.

28.10.2001

Tarikh

Tandatangan

16/7/93

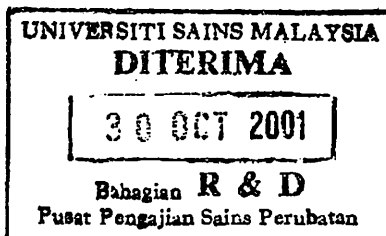


Universiti Sains Malaysia

Pusat Pengajian Sains Perubatan School of Medical Sciences

23 October 2001

Timbalan Bendahari
Cawangan Jabatan Bendahari
Universiti Sains Malaysia
16150 Kubang Kerian



Ref: FPP 98/ 081 Jawatankuasa Penyelidikan, USM Pulau Penang
IRPA grant Ref: 391 / 9636 / 1036

Name of the project: The incidence of post-operative deep vein thrombosis in general surgical patients of Hospital USM.

Dear sir,

This is the final report of my expenditure for the research project which terminated in 31.8.2001.

Total allowance	RM 19,700.00
Amount spent (Detail expenditure enclosed)	RM 8740.00
Balance	RM 10960.00

Sincerely,

Dr Myint Tun
Main researcher IRPA grant on DVT study
Lecturer, Department of Surgery
Universiti Sains Malaysia
16150 Kubang Kerian
Kelantan
E mail: mtun@kb.usm.my

Cc: Ketua Pendaftar, Penyelidikan ✓
Research & Development, USM Pulau Penang

Incidence of post-operative deep vein thrombosis in general surgical patients of Hospital Universiti Sains Malaysia

Total expenditure of the project from 1.9.1998 to 31.8.2001.

Universiti Sains Malaysia IRPA Research Grant 391 / 9636 / 1036

POST-OPERATIVE DEEP VEIN THROMBOSIS STUDY IN HOSPITAL USM Record of Duplex Ultrasound Scan of the legs and ascending venography, Sept 1998 to August 2001

No	Name	HUSM Reg. No	Age & Sex	DUPLEX SCAN		Ascending Venogram RM 300.00	TOTAL COST RM
				First RM 80.00	Second RM 80.00		
1	Tengku Abdul Rahman	B 073647	40 M	5.10.98	12.10.98	Nil	160.00
2	Rozlan Cheleh	B 062789	33 M	14.10.98	Nil	Nil	80.00
3	Mek Ibrahim	A 146600	52 F	25.10.98	4.11.98	Nil	160.00
4	Jah Mat Ali	B 076319	71 F	18.11.98	23.11.98	Nil	160.00
5	Hasnah Lah	B 822258	49 F	7.12.98	14.12.98	Nil	160.00
6	Kelsom Sulaiman	A 211888	76 F	28.12.98	4.1.99	Nil	160.00
7	Sharifah Ibrahim	B 064744	29 F	30.12.98	5.1.99	Nil	160.00
8	Abdul Latif Awang	B 023034	32 M	27.1.99	1.2.99	Nil	160.00
9	Wan Hasmah Wan Abdullah	B 068813	66 F	Nil	7.6.99	8.6.99	380.00
10	Hasmah Abdullah	A 030221	61 F	9.6.99	16.6.99	Nil	160.00
11	Saudah Ahmad	A 104779	61 F	16.6.99	21.6.99	Nil	160.00
12	Mohd Abdul Kadir	A 148673	63 M	28.6.99	5.7.99	Nil	160.00
13	Ho Siew Tuck	A 161245	67 M	7.7.99	Nil	10.7.99	380.00
14	Zainab Ismail	B 087889	43 F	12.7.99	19.7.99	20.7.99	460.00
15	Haji Mohd Haji Abdullah	B 089915	73 M	21.7.99	26.7.99	Nil	160.00
16	Gan Ane Thing	A 211770	71 M	28.7.99	2.8.99	Nil	160.00
17	Che Esa Che Soh	B 084363	72 M	2.8.99	9.8.99	Nil	160.00

POST-OPERATIVE DEEP VEIN THROMBOSIS STUDY IN HOSPITAL USM

Record of Duplex Ultrasound Scan of the legs, Sept 1998 to August 2001

No	Name	HUSM Reg. No	Age & Sex	DUPLEX SCAN: Date		Ascending Venogram RM 300.00	TOTAL COST RM
				First RM 80.00	Second RM 80.00		
18	Mustapha Hamzah	A 016730	54 M	4.8.99	9.8.99	Nil	160.00
19	Mohd Rozi Harun	A 786883	41 M	11.8.99	16.8.99	Nil	160.00
20	Wan Ismail Wan Ibrahim	B 079778	63 M	23.8.99	1.9.99	Nil	160.00
21	Hasnah Hamat	A 853349	40 F	25.8.99	1.9.99	Nil	160.00
22	Osman Salleh	B 096325	42 M	29.9.99	4.10.99	Nil	160.00
23	Wan Zukilfly Wan Mat	B 062901	51 M	5.10.99	13.10.99	Nil	160.00
24	Abdul Rahman Mat Ali	A 808050	75 M	13.10.99	18.10.99	Nil	160.00
25	Wee Kim Leng	A 017541	66 F	20.10.99	25.10.99	Nil	160.00
26	Raja Zainab Raja Deris	A 822764	53 F	27.10.99	3.11.99	Nil	160.00
27	Che Hasnah Idris	A 115740	39 F	13.12.99	20.12.99	Nil	160.00
28	Adnan Ibrahim	B 098253	31 M	15.12.99	20.12.99	Nil	160.00
29	Che Harum Che Ibrahim	B 102360	39 F	27.12.99	3.1.00	Nil	160.00
30	Aini Teh	B 103081	38 F	26.1.00	31.1.00	Nil	160.00
31	Mahadi Ibrahim	B 102463	25 M	26.1.00	31.1.00	Nil	160.00
32	Said Musa	B 104381	59 M	22.2.00	Nil	Nil	80.00
33	Theng Chun Kee	B 099013	67 M	15.2.00	22.2.00	Nil	160.00
34	Aw Mui Liang	B 050246	65 F	23.2.00	29.2.00	Nil	160.00
35	Awang Sa Ismail	B 073629	56 M	6.3.00	Nil	Nil	80.00
36	Zainab Merah	B 105492	56 F	8.3.00	19.3.00	Nil	160.00

POST-OPERATIVE DEEP VEIN THROMBOSIS STUDY IN HOSPITAL USM
Record of Duplex Ultrasound Scan of the legs, Sept 1998 to August 2001

No	Name	HUSM Reg. No	Age & Sex	DUPLEX SCAN: Date		Ascending Venogram RM 300.00	TOTAL COST RM
				First RM 80.00	Second RM 80.00		
37	Mohd Alias Mohd Yusof	B 107245	21 M	21.3.00	Nil	Nil	80.00
38	Nor Asnah binti Arshat	A 845588	45 F	28.3.00	Nil	Nil	80.00
39	Wan Leha Wan Hamat	A 971018	72 F	25.4.00	2.5.00	Nil	160.00
40	Fatimah Che Salleh	A 099629	66 F	13.6.00	Nil	Nil	80.00
41	Zubaidah Mat	A 820109	43 F	14.6.00	20.6.00	Nil	160.00
42	Sharifah Fadzillah	A 817597	46 F	18.7.00	25.7.00	Nil	160.00
43	Wan Nawang Wan Idris	B 112090	78 M	19.7.00	26.7.00	Nil	160.00
44	Sibah Mamat	A 778513	54 F	1.8.00	8.8.00	Nil	160.00
45	Abdul Latif Hitam	B 116183	61 M	2.8.00	9.8.00	Nil	160.00
46	Ramlah Awang	A 915509	67 F	16.8.00	23.8.00	Nil	160.00
47	Zakaria Abdul Rahman	B 117412	69 M	15.8.00	22.8.00	Nil	160.00
48	Mat Din Salleh	B 07972	62 M	13.9.00	Nil	Nil	80.00
49	Nang Mah Long Nik	A 077547	68 M	26.9.00	3.10.00	Nil	160.00
50	Morni Muhamad	A 066107	23 M	27.9.00	4.10.00	Nil	160.00
51	Zainab Yusof	A 025107	66 M	11.10.00	Nil	Nil	80.00
52	Wan Yusof Wan Ahmad	A 179351	76 M	31.10.00	7.11.00	Nil	160.00
53	Che Rashah Che Din	B 084943	47 F	6.2.01	13.2.01	Nil	160.00
54	Atan Rahman	A 850096	41 M	7.2.01	14.2.01	Nil	160.00
Total expense on 54 patients:						RM 8740.00	

**To determine the incidence of post-operative deep vein thrombosis
in
general surgical patients of Hospital Universiti Sains Malaysia**

**IRPA Research Grant 391 / 9636 /1036
1.9.1998 – 31.8.2001**

**Final report on prospective study of 45 patients with no deep vein
thrombosis (DVT) prophylaxis**

**Myint Tun ¹
Ibrahim Lutfi Shuaib ²
Mahayidin Muhamad ²
Abdul Hamid Mat Sain ¹
Anas Sjahroedin Ressang ¹**

**Departments of Surgery¹ and Radiology²
Universiti Sains Malaysia
16150 Kubang Kerian
Kelantan**

CONTENTS

	Page
I. ABSTRACT	1
II. ACKNOWLEDGEMENT	2
III. LIST OF TABLES / GRAPH	
Flow chart for experimental design	9
Figure 1, Age distribution of 45 patients studied	11
Table 1, Name of the operations	12
Table2, Incidence of postoperative deep vein thrombosis in Asian patients	13
IV. INTRODUCTION & STATEMENT OF THE PROBLEM	3
V. LITERATURE REVIEW	
Risk groups to thromboembolism	4
Classification of low, moderate and high risk groups	5
Colour duplex ultrasound	6
VI. OBJECTIVES	7
VII. PATIENTS AND METHOD OF STUDY	8
VIII. RESULTS	11
IX. DISCUSSION	13
X. CONCLUSION	15
XI. REFERENCES	16



ABSTRACT

- Objectives:**
1. To find out the incidence of post-operative deep vein thrombosis (DVT) in our general surgical patients after major surgical procedures.
 2. To find out the subgroups of patients at special risk to post-operative DVT.
 3. To review the policy of withholding routine DVT prophylaxis in Malaysian patients.

Introduction:

Apparent rarity of post-operative DVT and pulmonary embolism in Asian patients was first reported since 1964. Very few literature and clinical studies were done for post-operative DVT in Asian population as well as in Malaysia. Compared to the Western hemisphere, low incidence 2.6% to 15.3% was reported from Japan, Hong Kong, Thailand, Singapore and Malaysian studies. Conflicting results of high incidence in orthopaedic patients was reported in two other Asian studies from Hong Kong and Malaysia.

Materials & Methods:

Hospital based prospective study included general surgical patients 20 years and above who had major abdominal, neck and thoracic surgery. Moderately high risk and very high risk surgical patients to DVT undergoing surgery under general anaesthesia were included. All patients had no prophylaxis against DVT pre or postoperatively. Colour-flow duplex scan (CDS) of the leg was used to as initial evaluation to detect post-operative DVT within 3-7 days after operation. CDS was done independently by two Radiologists blinded to each other. If the first scan is negative, second time repeat CDS was done within the second week. Ascending venography was used to confirm DVT on patients with equivocal or positive results after CDS.

Results:

A total of 54 patients were examined. Nine patients were rejected and 45 patients aged 25-78 years completed the study. One patient (2.2%) had colour duplex scan and venographic evidence of DVT.

Conclusion:

1. The incidence of 2.2% is much lower than the comparable Western studies.
2. As the incidence is low with only one positive result, the risk factors and the subgroup of patients with special risk to DVT could not be determined.
3. The routine practice of withholding DVT prophylaxis in general surgical patients should be continued except in patients with very high risk for post-operative DVT.

The controversies in the incidence of postoperative deep vein thrombosis, the role of DVT prophylaxis in Asian population and the causes of low incidence are discussed.

ACKNOWLEDGEMENTS

This study was supported by the IRPA Short Term Research Grant (No.391/9636/1036).

We are grateful to all the patients for their understanding and cooperation to take part in the study.

Our sincere thanks also go to the nurses of the Department of Radiology for their kind assistance.

INTRODUCTION AND STATEMENT OF THE PROBLEM

Post-operative deep vein thrombosis is believed to be rare in Asians. Apparent rarity of post-operative deep vein thrombosis and pulmonary embolism was first reported by Tinckler in 1964 (1). Very few literature and clinical studies were present regarding this problem in Asian population as well as in Malaysia.

Study on the general surgical patients from 1974 to 1983 revealed a low incidence of postoperative deep vein thrombosis in Malaysia, Hong Kong and Japan (2,3-4).

Conflicting results of high incidence in orthopaedic patients comparable to Western figures were also reported from Hong Kong and Malaysia (5-6).

Occasionally we observed patients with deep vein thrombosis leading to considerable morbidity and mortality in our clinical practice. It is to be questioned that the rarity of post-operative DVT in Asians is actually due to our lack of awareness to this common condition which is the cause of preventable hospital deaths in the Western hemisphere.

This study was carried out in Malaysia with a population of three major ethnic groups as Malay, Chinese and Indians. This well controlled prospective study was done on the post-operative general surgical patients with moderate and high risk to deep vein thrombosis (Table 2). The study was aimed to determine the incidence of post-operative deep vein thrombosis in the general surgical patients of our general population. The risk factors for DVT are well known but unlike the hospitals in the West, the routine protocols for DVT prophylaxis is lacking. This study may partly contribute to the awareness and practice of DVT prophylaxis in selected group of hospital patients.

Routine practice of withholding various DVT prophylactic methods in our surgical patients may need to be reviewed depending upon the knowledge of incidence and risk factor identification.

LITERATURE REVIEW

Silent deep vein thrombosis and consequent fatal pulmonary embolism is still a constant threat to the post-operative patients in developed countries of the Western hemisphere during the 1980s. Autopsy proven pulmonary embolism has continued to be a major cause of death. In a recent study in the United Kingdom, Sandler and Martin found that 9% of patients admitted to a general hospital died and 10% of these deaths (0.9% of all admissions) were due to pulmonary embolism. Most fatal emboli originated from the deep veins of the lower limb (7).

Risk groups for venous thromboembolism

The risk of deep vein thrombosis and embolism in a hospital patient is not only due to the illness, trauma of the operation but also depends on the patient related variables known as the risk factors among the general population (table 1).

Table 1 – Risk factors for thromboembolism (8)
(from Thromboembolic Risk Factors (THRIFT) Consensus Group, 1992)

Patient factors	Disease or surgical procedure
Age	Trauma or surgery especially of pelvis, hip, lower limb
Obesity	
Varicose veins	Malignancy, especially pelvic, abdominal, metastatic
Immobility (bed rest over 4 days)	
Pregnancy	Heart failure
Puerperium	Recent myocardial infarction
High dose oestrogen therapy	Paralysis of lower limb(s)
Previous deep vein thrombosis or pulmonary embolism	Infection
Thrombophilia	Inflammatory bowel disease
Deficiency of antithrombin III, Protein C or Protein S	Nephrotic syndrome
Antiphospholipid antibody or Lupus anticoagulant	Polycythaemia
	Paraproteinaemia
	Paroxysmal nocturnal haemoglobinuria
	Behcet's disease, Homocystinaemia

The risk is higher after the age of 40 years in association with major illness, trauma or surgery and this age is often defined as a higher risk group. Routine DVT prophylaxis to moderate and high risk group of patients is not only life saving but also cost effective in preventing the morbidities of non-fatal thromboembolism which require investigation and treatment (9-10).

Classification of degree of risk to venous thromboembolism in hospital patients was seen in table 2. Since 1975, Kakkar and associates in Kings College trial mentioned that most of the venous thrombi are formed in the soleal plexus of distal leg and 20% extend to the proximal veins (from calf veins to popliteal, femoral and iliac veins) (11).

Table 2 - Incidence of venous thromboembolism in hospital patients according to risk group (modified from Salzman and Hirsh, 1994) (12)

	Deep vein thrombosis	Fatal pulmonary embolism
Low risk groups	< 10%	0.01%
Moderate risk groups	10-40%	0.1 – 1%
High risk groups	40-80%	1-10%

Low risk groups	Minor surgery (<30 min); no risk factor other than age Major surgery (>30 min); age <40 year; no other risk factors* Minor trauma or medical illness
Moderate risk groups	Major general, urological, gynaecological, cardiothoracic, vascular or neurological surgery; age > 40 year or other risk factors* Major medical illness, heart or lung disease or cancer, inflammatory bowel disease. Major trauma or burns Minor surgery, trauma or illness in patients with previous deep vein thrombosis, pulmonary embolism, or thrombophilia
High risk groups	Fracture or major orthopaedic surgery of pelvis, hip or lower limb Major pelvic or abdominal surgery for cancer Major surgery, trauma or illness in patients with previous deep vein thrombosis, pulmonary embolism or thrombophilia Lower limb paralysis (hemiplegia, stroke or paraplegia) Major lower limb amputation

* Table 1

Low incidence of post-operative thromboembolism was reported by autopsy review from Singapore as early as 1968 by Hwang (13). It was further supported by reports as 2.4% and 4.0% respectively from Thailand (14,15).

Three studies were on the general surgical patients where ¹²⁵I labelled fibrinogen was used and the incidence varies from 2.6% to 15.3% (2,3-4).

Conflicting reports with 53.1% incidence of post-operative DVT in Hong Kong Chinese was reported by Mok and associates in 1979 (5) which was further supported by increased incidence of pulmonary embolism in a retrospective study in Hong Kong by Chau and associates in 1991(16). Recently a prospective study in University of Malaya, Kuala Lumpur, reported 62.5% incidence of post-operative DVT similar to that of Western population (6).

As seen in the above review, only two prospective studies were done in Malaysia regarding this problem with the incidence of 12% in general surgical patients (2) and 62.5% in orthopaedic patients (6).

Clinical diagnosis of DVT is nonspecific because none of the signs and symptoms are unique. Disappointingly, up to two thirds of cases of DVT are never suspected clinically (17).

The clinical diagnosis of DVT is notoriously difficult without the use of ascending venography (18). For many years it was the most widely used test and was regarded as the "gold standard" to diagnose deep vein thrombosis. Ascending venography compared to duplex ultrasound is invasive, painful, relatively expensive with potential allergic reaction and radiation exposure. The patient may be unable to be transported to Radiology department; a vein may be unable to cannulate or the patient may have history of a contrast reaction. Not all ascending venograms are interpretable and "poor or non visualization of the deep venous system" is seen in 5% to 15% of cases (19).

Since a few years ago, ultrasound technology with real time imaging using high resolution duplex ultrasound machines appeared for detailed visualisation of DVT. Since 1987 several manufacturers have incorporated software that converts the Doppler signals from moving erythrocytes into a coloured real-time image, so called colour-flow Doppler or colour duplex scan (19).

Colour duplex scan is cheap, noninvasive, painless without exposure to contrast material or radiation compared to ascending venography. Colour duplex scanning is a step forward in venous investigation, enhancing diagnostic performance in venous thrombosis, at a cost that is still reasonable to ascending venography by X ray.

Obvious comparable results to venography by real-time B-mode ultrasound with a sensitivity of 100% and specificity of 99% for proximal deep vein thrombosis was reported by Lensing and his group since 1989 (20).

The results of colour duplex scan with a sensitivity of 98% and specificity of 96% are comparable to ascending venography in diagnosis of DVT including the distal type (calf vein) thrombosis (19-21).

This addition of colour doppler to the gray-scale imaging, colour duplex scan becomes the primary modality or the "new gold standard" for quick recognition of normal and abnormal flow states (22-23).

Colour-flow duplex scan was described as a reliable noninvasive method of choice for initial evaluation for DVT including calf veins where peroneal and posterior tibial veins are involved in majority of cases (23).

Review of literature showed that all previous Asian studies on postoperative deep vein thrombosis used either ¹²⁵I fibrinogen or ascending venography for diagnosis of deep vein thrombosis. No previous Asian studies has used the colour duplex ultrasound scan as an investigational procedure in their studies. Our study used the colour duplex ultrasound as a primary screening procedure followed by confirmation venography on positive and equivocal cases.

OBJECTIVES

- 1. To find out the incidence of post-operative deep vein thrombosis (DVT) in our general surgical patients after major surgical procedures.**
- 2. To find out the subgroups of patients at special risk to post-operative DVT.**
- 3. To review the policy of withholding routine DVT prophylaxis in Malaysian patients after major surgical procedures.**

PATIENTS AND METHOD OF STUDY

This hospital based prospective study included patients 20 years and above who underwent major thoracic, abdominal and neck surgery in the general surgical unit of the Hospital Universiti Sains Malaysia. Most patients studied were included in moderate and high risk for DVT based on the classification of risk factor assessment by Salzman and Hirsh 1994 (Table 2).

All patients did not have any type of DVT prophylaxis and this procedure is not a routine practice in our general surgical unit. The study was approved by the Medical and Ethical Committee of the Hospital Universiti Sains Malaysia.

The HDI 3500 ATL, USA model colour duplex ultrasound machine of the Hospital USM was used for the primary detection of DVT. Ascending venogram was used only in selected patients who had positive or equivocal results with the duplex ultrasound.

The scan was done by two experienced Consultant Radiologists (ILS and MM) blinded to each other's finding. For more accuracy and detection of late onset DVT, second time colour duplex ultrasound scan was done during the second postoperative week. The same two Consultant Radiologists conducted the scans throughout the whole study period 1.9.98 to 31.8.01.

Criteria for inclusion

1. Breast mastectomy.
2. Thoracotomy: Surgery of oesophagus.
3. All laparotomy operations on surgery of intra-abdominal organs including laparoscopic surgery and repair of incisional hernias. This also included midline laparotomies for perforated appendicitis and appendicular abscess. Gridiron appendectomy and repair of inguinal hernia are not included unless patient is in the moderate and high risk DVT group (Table 2).
4. Neck surgery: Thyroidectomy and block dissection of the neck.

Informed consent was obtained from each patient after the nature of the study was explained. A completed protocol of each patient included demographic details, nature of the operation, duration of surgery, type of anaesthesia and risk factors.

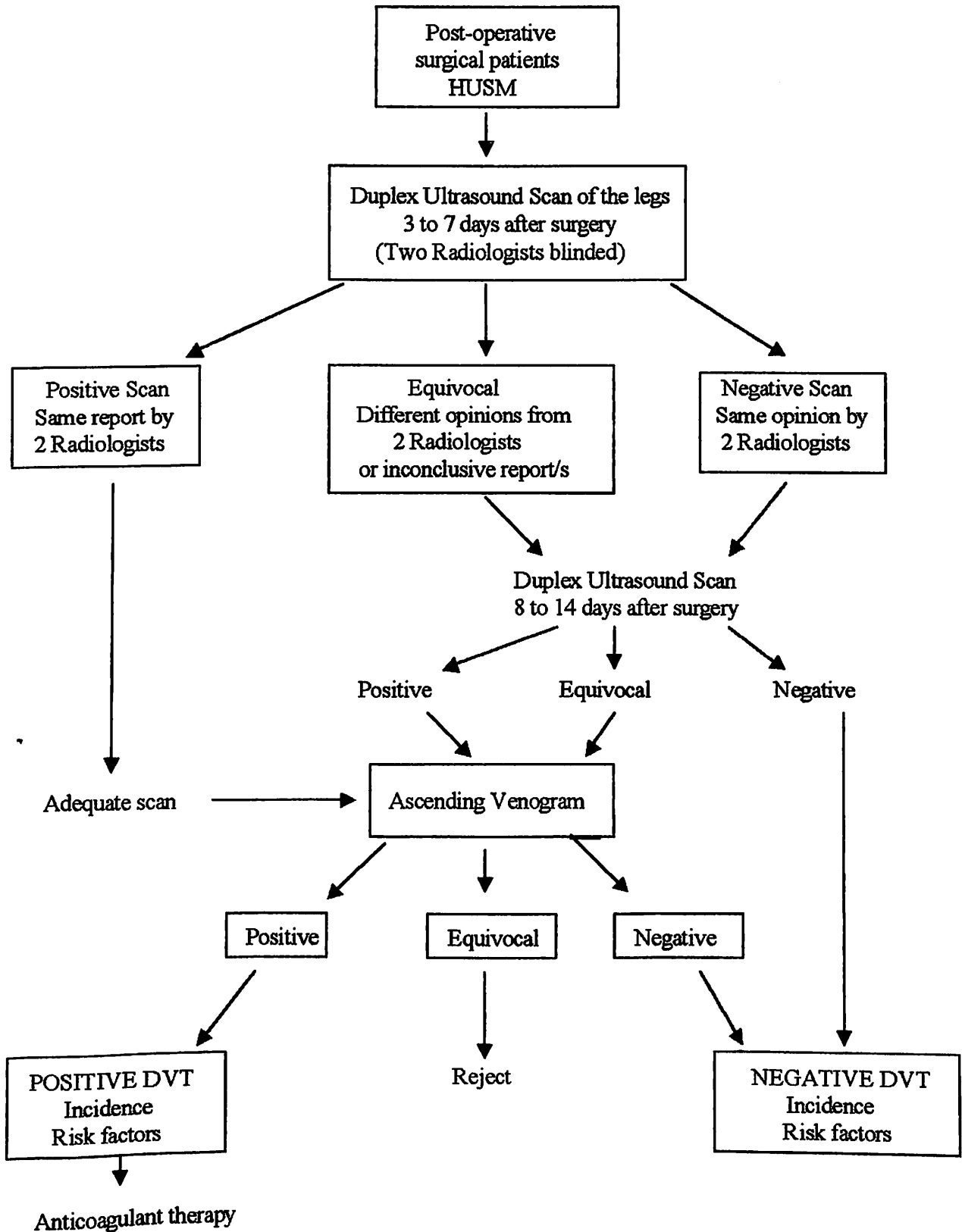
The risk factors include immobility, heart failure, obesity, previous DVT, oestrogen therapy, smoking habit, diabetes mellitus, hypercholesterolaemia and presence of malignancy.

After operation the patients were observed daily for clinical evidence of deep vein thrombosis. It included leg and ankle swelling, Homan's sign, prominent superficial veins, skin discolouration and fever.

On post-operative day 3 to day 7, duplex ultrasound scan of both legs was done by the two Consultant Radiologists blinded to each other's findings. Duplex ultrasound scans with same positive or negative reports by the two Radiologists were regarded as adequate scans. The scan will be regarded as equivocal if the two Radiologists reported different results or any one of them was inconclusive. Urgent ascending venography was arranged for the patient with positive scan and it was interpreted by consensus opinion of the same two Radiologists.

Patients with equivocal scan or negative scan in first colour duplex scan were proceeded to a repeat scan in the second week (day 8 to day 14) of the post-operative period. Bilateral ascending venogram was arranged for patients with positive and the equivocal scans in the second week (Flow chart for experimental design, page 9).

FLOW CHART FOR EXPERIMENTAL DESIGN
 Incidence of deep vein thrombosis in Hospital Universiti Sains Malaysia



Interpretation criteria for Duplex colour ultrasound

Positive scan for deep vein thrombosis (19):

- 1. Increased intraluminal echoes with failure of vascular lumen to collapse under gentle probe pressure.**
- 2. Lack of variation in flow with breathing or lack of phasic Doppler signals.**
- 3. Presence of collaterals and lack of colour to fill up totally in the lumen as additional evidence.**

Negative scan:

Technical failure, criteria problem of positivity or inconclusive report by one or both Radiologists blinded to each other's finding.

Exclusion from the study:

- 1. Patients with first week equivocal and negative scans who could not complete a repeat scan in the second week.**
- 2. Patients examined by only one Radiologist in any of the two sessions.**
- 3. Patients with inconclusive result after ascending venography.**

Ethical issues: Controversy exists regarding the active treatment for silent asymptomatic deep vein thrombosis. Due to the high risk of pulmonary embolism especially in the proximal type of DVT, the active treatment regime including standard anticoagulant therapy was instituted in these patients.

Interpretation of the results:

Positive DVT: Positive venography.

Negative DVT: Negative scan after the second time repeat colour duplex scan or negative evidence of DVT in venography.

Positive or negative DVT in the completed study was interpreted for the incidence of DVT in general surgical patients as compared to other studies.

RESULTS

From September 1998 to February 2001 a total of 54 patients were studied. Nine patients were rejected from the study. Seven patients had not completed the repeat colour duplex scan and two patients were scanned by only one Radiologist (MM) and were regarded as incomplete scans.

45 patients, 23 men and 22 women completed the study. 40 are Malay and 5 are Chinese. The age range is 25-78 year with the mean age of 54.4 year.

Thromboembolic risk factor assessment according to table 2 (Salzman and Hirsh, 1994) on the study group of 45 patients showed 39 (87%) patients in the moderate and high risk groups. 24 (53%) patients are in moderate risk group and 15 (34%) patients are included in the high risk group.

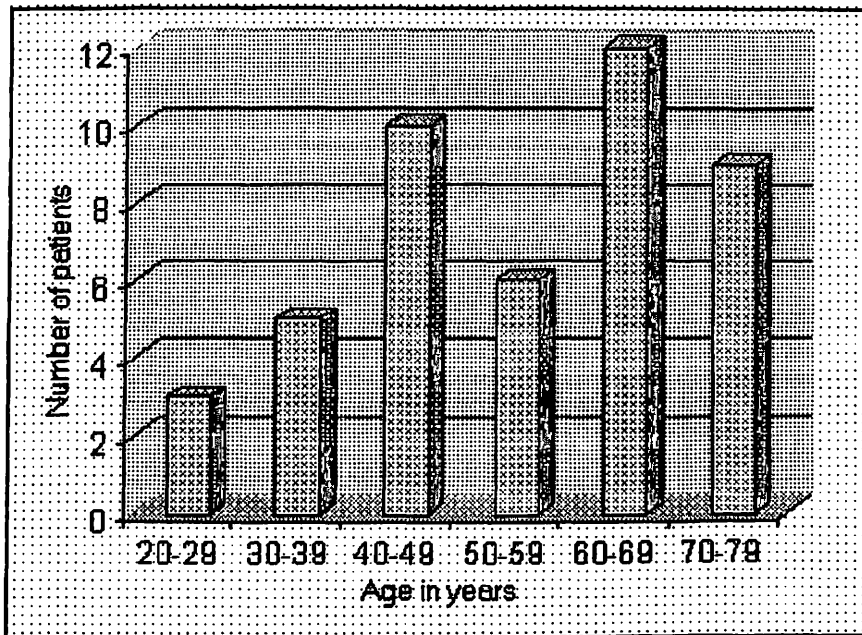


Fig 1. Age distribution of the forty five patients studied.
Majority of patients are in the age bracket of 40 to 79 years.

The nature of operations performed is shown in Table 3. All operations were performed under general anaesthesia and the mean operating time (duration of operation) was 2 hours 35 minutes.

Table 3 OPERATIONS

Operation	No	Benign	Malignancy
Hepatobiliary	5	4	1
Gastrointestinal	14	10	4
Colorectal	8	2	6
Renal and Urology	9	8	1
Hernia	2	2	0
Breast	3	0	3
Adrenal glands	2	1	1
Thyroid gland	2	0	2
Total	45	27	18

In these 45 patients who completed the study, 44 patients had equivocal and negative scan results in first scan 3-7 days after surgery. Only one patient, 67 year old Chinese man with advanced carcinoma of the colon had positive scan result on the third post-operative day. He also developed fever and swelling of the right leg and proceeding bilateral ascending venogram showed deep vein thrombosis in the right peroneal vein. Out of 44 patients who proceeded to the repeat colour duplex scan, 43 were negative and one has equivocal result. Ascending venogram done on the patient with equivocal scan showed negative result for deep vein thrombosis.

The results showed only one patient with post-operative deep vein thrombosis detected by preliminary colour duplex scan followed by ascending venography.

DISCUSSION

This study was done in Hospital Universiti Sains Malaysia, Kelantan State. It is a 700 bedded tertiary referral center for East coast of Malaysia. The State of Kelantan has a population of approximately two millions. Majority of ethnic groups are Malays followed by Chinese, Siamese and Indians as a true representation of Asian population.

Thrombogenesis is a complex process and the incidence of DVT varies in different parts of the world for reasons that are not well understood. Complex pathogenesis of venous thrombosis involves the interaction of acquired risk factors with several genetic predispositions, including antithrombin III, protein C, protein S, heparin cofactor II deficiencies all as a group known as thrombophilias.

Our study on 45 patients with one positive DVT (2.2%) showed low incidence of post-operative DVT among our population.

The result of our study compared to other Asian studies is shown in Table 4.

Table 4: Incidence of post-operative deep vein thrombosis in Asian patients

Author and Country	Year	Postoperative DVT incidence percentage	Type of patients studied	Method of investigation
Cunningham and Yong Malaysia	1974	12.0	Gen.Surg	¹²⁵ I fibrinogen
Chumnijarakij and Poshyachinda, Thailand	1975	2.4	Gynaecology	¹²⁵ I fibrinogen
Mok et al Hong Kong	1979	53.3	Orthopaedic	Ascending venography
Nandi et al Hong Kong	1980	2.6	Gen. Surg	¹²⁵ I fibrinogen
Inada et al Japan	1983	15.3	Gen. Surg	¹²⁵ I fibrinogen
Atichartakarn et al Thailand	1988	4.0	Orthopaedic	Ascending venography
Mitra, Khoo and Ngan Singapore	1989	9.7	Orthopaedic	Ascending venography
Dhillon et al Malaysia	1996	62.5	Orthopaedic	Ascending venography
Tun et al Malaysia	2001	2.2	Gen. Surg	Duplex Ultrasound and Venography

Gen. Surg: General surgical patients

Few studies particularly mentioned for the incidence of post-operative DVT in general surgical patients. Flanc (1968) reported 35.0% in United Kingdom (24). Kakkar (1970) and Maxwell (1981) reported 33.0% and 33.3% respectively in general surgical patients from the Western hemisphere (25-26).

Results of low incidence were reported by three Asian studies on post-operative general surgical patients using ^{125}I fibrinogen technique. The incidence varies from 2.6% to 15.3% (2,3-4). Low incidence of post-operative thromboembolism was reported by autopsy review from Singapore as early as 1968 by Hwang (13). It was further supported by reports from Thailand as 2.4% on gynaecological patients (14) and 4.0% to 9.7% on hip surgery patients (15- 27).

Conflicting reports with high incidence of thromboembolism in Asian patients with 53.1% incidence of post-operative DVT in Hong Kong Chinese (5) was further supported by high incidence of pulmonary embolism in a retrospective study (16). Incidentally both studies in Hong Kong were done on the orthopaedic trauma patients. Recently a prospective study in University of Malaya Medical Centre, Kuala Lumpur, reported 62.5% incidence of post-operative DVT in orthopaedic patients after major surgery on proximal femur and hip and knee replacement (6). Eventhough a low incidence was reported by Cunningham and Yong from the same institution in 1974, their figures showed high incidence of post-operative DVT in a subgroup of patients with malignancy (high risk group, table 2) comparable to Western figures (2).

The cause of difference in incidence of DVT in Afro-Asians compared to Caucasians is still a matter of speculations. Fibrinolytic activity increases 85% in post-operative period and DVT patients were found to have lower activity (28). Fibrinolytic activity in blood is higher in Africans, Indians and Thais than western population (29,30-31). The different low nutritional Asian diet with high carbohydrate low fat may result in change of intestinal bacterial flora activating the production of plasminogen activators from the intestine (32).

Recently a hereditary abnormality in coagulation system characterised by poor anticoagulant response to activated protein C (APC) due to the presence of factor V Leiden was reported (33,34). In a large cohort study on apparently healthy men, the presence of specific point mutation in factor V gene was found to be associated with increased incidence of venous thrombosis (35). Analysis of 3380 chromosomes from 24 populations showed allele frequency of 4.4% in Europeans, higher prevalence 7.0% in Greeks and total absence of this chromosome in South East Asians (36). This may partly explain the rarity of thromboembolic disease in Asian population.

Our study shows a low 2.2 % incidence of post-operative deep vein thrombosis in general surgical patients of Hospital Universiti Sains Malaysia. This study supports the routine practice of withholding DVT prophylaxis in general surgical patients except in highly selected group of patients with high risk to deep vein thrombosis.

CONCLUSION

1. The incidence of 2.2% is much lower than the comparable Western studies. The possible causes of difference from Western studies and low incidence in the Asian patients are discussed.
2. As the incidence is low with only one positive result in this study, the risk factors and the subgroup of patients with special risk to deep vein thrombosis could not be determined.
3. The routine practice of withholding DVT prophylaxis in general surgical patients should be continued except in selected group of patients with high risk for post-operative deep vein thrombosis.

General recommendations for prophylaxis of venous thromboembolism is beyond the scope of our study. This depends upon the nationwide prevalence of thromboembolism in our hospitals. Cost, benefit and effectiveness should be assessed. Identification of patients with very high risk to thromboembolism may be essential. These patients will need DVT prophylaxis according to the degree of risk.

The following is the general recommendations for prophylaxis of thromboembolism from the Thromboembolic Risk Factors (THRIFT) Consensus Group, United Kingdom.

**General recommendations for prophylaxis of thromboembolism
THRIFT Consensus Group, UK, 1992 (8)**

All hospital patients :

- Should be assessed for clinical risk factors and overall risk of thromboembolism
- Should receive prophylaxis, according to degree of risk, at least until discharge

Low risk patients:

- Should be mobilised early

Moderate risk and high risk patients:

- Should receive specific prophylaxis
- Should be mobilised early

Clinicians, units and hospitals:

- Should develop written policies for prophylaxis
- Should include prophylaxis in clinical audit and in patient care plans

Efficacy of prophylactic methods should be assessed in out patients

This study was presented in:

1. First Asean Conference on Medical Sciences, 18-21 May 2001, Kota Bharu, Kelantan.
2. 35th Malaysia-Singapore Congress of Medicine, 22-26 August 2001, Kuala Lumpur.

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POST OPERATIVE DEEP VEIN THROMBOSIS STUDY

Hospital Universiti Sains Malaysia

A. PATIENT BIODATA

Patient Name Race ...Malay, Chinese, Indian, Other
Hosp. RN. Ward/Unit
Age Sex ...Male / Female Surgeon I/C of patient
Address Date of admission
..... Telephone No.
Weight Height

B. PREOPERATIVE DATA

Smoking Habit..... Past H/O Deep Vein Thrombosis Yes / No
Other Medical / Surgical problems
Diabetes Mellitus Hypertension Hypercholesterolaemia
Heart Disease Anticoagulant/ Antiplatelet therapy / Oestrogen therapy.. Yes/No
DIAGNOSIS Malignancy Yes / No

C. OPERATIVE DATA

Date of operation Name of operation
Department Surgeons
Type of anaesthesia GA / Epidural / Spinal / Other Duration of operation
Post operative Diagnosis Histopathology

D. POST OPERATIVE DATA

Signs of DVT: Leg pain ... Yes / No, Swelling ... Yes / No, Fever ... Yes / No
(R) (L) (Both) Increased local temperature in the leg.. Yes / No Homan's sign .(+)/ (-)
Tenderness of calf muscles Yes / No

Post operative complications (others)

Immobility in days Wound infection
Others

Duplex Ultrasound examination of the legs

Date Postoperative day Radiologist 1
Findings:
Interpretation: Positive.....(Proximal/Distal), Negative Equivocal

Date Postoperative day Radiologist 2
Findings:
Interpretation: Positive.....(Proximal/Distal), Negative Equivocal

Ascending venogram of the legs

Date Postoperative day Radiologist
Findings:
Interpretation: Positive..... (Proximal/Distal), Negative Equivocal

Anticoagulant therapy Yes / No If yes, type of treatment regime

Complications of DVT.... Pulmonary embolism
V/Q Scan done... Yes / No

Progress of the patient

Date of discharge

Followup

DVT study

Name of patient:

R/N:

Age:

Sex:

Post-op day:

Name of Radiologist:

Region	Normal		Equivocal		Abnormal		Features		
	R	L	R	L	R	L		R	L
Femoral							Non compressible		
							Collaterals		
							No colour flow		
							No spectral changes with respiration		
							Clot within vein		
Popliteal							Non compressible		
							Collaterals		
							No colour flow		
							No spectral changes with respiration		
							Clot within vein		
Ant. tibial							Non compressible		
							Collaterals		
							No colour flow		
							No spectral changes with respiration		
							Clot within vein		
Post. tibial							Non compressible		
							Collaterals		
							No colour flow		
							No spectral changes with respiration		
							Clot within vein		
Peroneal							Non compressible		
							Collaterals		
							No colour flow		
							No spectral changes with respiration		
							Clot within vein		