

CLOSURE VERSUS NON CLOSURE OF THE SUBCUTANEOUS FAT
LAYER OF 2CM AND MORE TO PREVENT THE INCIDENCE OF
WOUND DISRUPTION: AN OBSERVATIONAL STUDY

by

DR. ANIL G. KRISHNA DASS

Dissertation Submitted in Partial Fulfillment Of
The Requirements For The Degree Of
Master Of Medicine
(Obstetrics and Gynaecology)



UNIVERSITI SAINS MALAYSIA

2005



SENARAI SEMAKAN UNTUK BUKU LAPORAN AKHIR GERAN USM JANGKA PENDEK

NAMA PENYELIDIK UTAMA	: DR. ADIBAH IBRAHIM
NAMA CO-RESEARCHER	: DR. AHMAD AMIR ISMAIL
TAJUK GERAN	: Subcutaneous Stitch Closure Versus Non- closure to Prevent Wound Disruption after Caesarean Section
NO.AKAUN	: 304/PPSP/6131415

**SENARAI SEMAKAN SEMASA PENYERAHAN BUKU LAPORAN AKHIR
(Sila Tandakan (4) Pada Kotak Yang Berkenaan)**

NO.	PERKARA	ADA	TIADA
1.	Borang Laporan Akhir Projek Penyelidikan USM Jangka Pendek	/	
2.	Borang Laporan Hasil Penyelidikan, PPSP	/	
3.	Salinan Menuskrip	/	
4.	Penyata Perbelanjaan (Financial Statement)	/	
5.	Laporan Komprehensif (termasuk kertas persidangan atau seminar dan penerbitan saintifik hasil daripada projek ini)	/	
6.	Surat pemakluman penghantaran Laporan Akhir ke Bhg. Penyelidikan	/	

Nota: * No. 1-5 - Perlu dimasukkan dalam Buku Laporan Akhir
 * No.6 - Hantar terus Kepada Pn. Che Merah Ismail (RCMO) hanya salinan kepada Bhg. R&D, PPSP



LAPORAN AKHIR PROJEK PENYELIDIKAN JANGKA PENDEK
FINAL REPORT OF SHORT TERM RESEARCH PROJECT

Sila kemukakan laporan akhir ini melalui Jawatankuasa Penyelidikan di Pusat Pengajian dan Dekan/Pengarah/Ketua Jabatan kepada Pejabat Pelantar Penyelidikan

1. Nama Ketua Penyelidik: <i>Name of Researcher</i>		DR. ADIBAH IBRAHIM				
<input type="checkbox"/>	Profesor Madya/ <i>Assoc. Prof.</i>	<input checked="" type="checkbox"/>	Dr/ <i>Dr.</i>	<input type="checkbox"/>	Encik/ Puan/ Cik <i>Mr/ Mrs/ Ms</i>	
2. Pusat Tanggungjawab (PTJ): <i>School/Department</i>		PUSAT PENGAJIAN SAINS PERUBATAN				
3. Nama Penyelidik Bersama: <i>Name of Co-Researcher</i>		DR. AHMAD AMIR ISMAIL				
4. Tajuk Projek: <i>Title of Project</i>		Subcutaneous Stitch Closure Versus Non- Closure to Prevent Wound Disruption After Caesarean Section				
5. Ringkasan Penilaian/ <i>Summary of Assessment:</i>		Tidak mencukupi <i>Inadequate</i>		Boleh diterima <i>Accepted</i>	Sangat baik <i>Very Good</i>	
		1	2	3	4 5	
i) Pencapaian objektif projek: <i>Achievement of project objectives</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ii) Kualiti output: <i>Quality of outputs</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii) Kualiti impak: <i>Quality of impacts</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iv) Pemindahan teknologi/potensi pengkomersialan: <i>Technology transfer/commercialization Potential</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
v) Kualiti dan usahasama : <i>Quality and intensity of collaboration</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
i) Penilaian kepentingan secara keseluruhan: <i>Overall assessment of benefits</i>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

6. **Abstrak Penyelidikan**

(Perlu disediakan di antara 100 - 200 perkataan di dalam Bahasa Malaysia dan juga Bahasa Inggeris. Abstrak ini akan dimuatkan dalam Laporan Tahunan Bahagian Penyelidikan & Inovasi sebagai satu cara untuk menyampaikan dapatan projek tuan/puan kepada pihak Universiti & masyarakat luar).

Abstract of Research

(An abstract of between 100 and 200 words must be prepared in Bahasa Malaysia and in English). This abstract will be included in the Annual Report of the Research and Innovation Section at a later date as a means of presenting the project findings of the researcher/s to the University and the community at large)

ABSTRACT (ENGLISH):

Introduction: Wound disruption is a known complication of caesarean section, which may cause additional and unnecessary morbidity to the patients. Its occurrence is influenced by many factors, of which technique of operation is one of the contributing factors. This study was carried out in order to determine whether closure of subcutaneous fat layer measuring 2cm or more will reduce the incidence of post caesarean wound disruption. **Methods:** Patients whose subcutaneous fat thickness of 2cm or more, underwent caesarean section were randomised into closure group and non-closure group. In the closure group, the subcutaneous fat layer was stitched while those in the non-closure group was not stitched. The result of wound healing was observed on the third, tenth and 42nd post-caesarean. **Result:** 120 patients were recruited into the study, with 60 samples were available for each group. There was 1.7 percent of wound disruption occurred on the third day of caesarean section for each arm. Ten percent of wound disruption was noted to occur on the tenth day in the closure group as compared to 35 percent for the non-closure group (p value 0.001). No wound disruption was noted on the 42nd day post caesarean section for closure group, while 3.3 percent was noted for the non-closure group, but not statistically significant. **Conclusion:** Closing the subcutaneous fat tissue measuring 2cm and above for patients undergoing caesarean section may help to reduce the occurrence of wound disruption post caesarean section.

ABSTRAK (BAHASA MALAYSIA)

Pendahuluan: Komplikasi disrupsi luka pembedahan caesarean boleh memberi masalah kepada pesakit. Ia disebabkan oleh pelbagai faktor, di mana teknik pembedahan merupakan salah satu daripada faktor penyepad. Kajian ini dijalankan untuk memastikan samada penutupan tisu lemak di bawah kulit setebal 2cm ke atas boleh mengurangkan insiden disrupsi luka selepas pembedahan caesarean. **Kaedah kajian:** Pesakit-pesakit yang mempunyai tisu lemak di bawah kulit setebal 2cm ke atas dikumpulkan secara rawak ke dalam dua kumpulan, di mana satu kumpulan menjalani penutupan tisu lemak di bawah kulit dan tisu lemak di bawah kulit untuk kumpulan kedua tidak ditutup. Luka pembedahan diperiksa pada hari ketiga, ke-10 dan hari ke-41 selepas pembedahan. **Keputusan kajian:** Seramai 120 orang pesakit telah mengambil bahagian di dalam kajian, di mana setiap kumpulan terdiri daripada 60 pesakit. 1.7% daripada pesakit-pesakit dari setiap kumpulan didapati mempunyai disrupsi luka pada hari ketiga selepas pembedahan. Sepuluh peratus pesakit dari kumpulan tisu lemak ditutup mengalami disrupsi luka pada hari ke-10 berbanding dengan 35% daripada kumpulan tisu lemak tidak ditutup (p value 0.001). Pada hari ke-42, didapati tiada komplikasi luka bagi kumpulan tisu lemak ditutup. Walau bagaimanapun terdapat sebanyak 3.3% pesakit mengalami masalah tersebut bagi kumpulan tisu lemak tidak ditutup. **Kesimpulan:** Penutupan tisu lemak di bawah kulit yang setebal 2cm ke atas untuk pesakit-pesakit yang menjalani pembedahan caesarean mungkin boleh mengurangkan risiko disrupsi luka selepas pembedahan.

7. Sila sediakan laporan teknikal lengkap yang menerangkan keseluruhan projek ini.

[Sila gunakan kertas berasingan]

Applicant are required to prepare a Comprehensive Technical Report explaining the project.

(This report must be appended separately)

Senaraikan kata kunci yang mencerminkan penyelidikan anda:

List the key words that reflects your research:

Bahasa Malaysia

Disrupsi luka
Pembedahan caesarean
Penutupan tisu lemak di bawah kulit

Bahasa Inggeris

Wound disption
Caesarean section
Closure of subcutaneous tissue

5) **Output Dan Faedah Projek**

Output and Benefits of Project

(a) * **Penerbitan Jurnal**

Publication of Journals

*(Sila nyatakan jenis, tajuk, pengarang/editor, tahun terbitan dan di mana telah diterbitkan/diserahkan)
(State type, title, author/editor, publication year and where it has been published/submitted)*

1. Dissertation submitted in Partial Fulfillment of the requirements for the degree of Master of Medicine (Obstetrics and Gynaecology)
2. Presentation at the 17th Malaysian Congress of O&G on 1st - 5th June 2007 at Shangri-La Hotel, Kuala Lumpur.
3. Submitted to Singapore Medical Journal and is currently still under review. Letter of acceptance is as attached.

(b) Faedah-faedah lain seperti perkembangan produk, pengkomersialan produk/pendaftaran paten atau impak kepada dasar dan masyarakat.

State other benefits such as product development, product commercialisation/patent registration or impact on source and society.

The technique of closing the subcutaneous fat tissue layer has been considered as a protocol for those patients whose subcutaneous fat tissue measure 2cm or more going for caesarean section.

* Sila berikan salinan/*Kindly provide copies*

(c) Latihan Sumber Manusia
Training in Human Resources

(i) Pelajar Sarjana
Graduates Students
(Perincikan nama, ijazah dan status)
(Provide names, degrees and status)

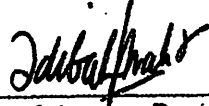
Dr. Anil G Krishna Dass, MBBS, Master of Medicine (Obstetrics and Gynaecology), completed the course and was graduated in June 2007

(ii) Lain-lain:
Others:

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9. Peralatan yang Telah dibeli:
Equipment that has been purchased

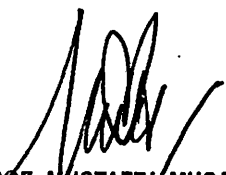
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Tandatangan Penyelidik
Signature of Researcher

11 November 2007
Tarikh
Date

Komen Jawatankuasa Penyelidikan Pusat Pengajian/Pusat
Comments by the Research Committees of Schools/Centres

Laporan diperakui


ASSOC. PROF. MUSTAFFA MUSA
Chairman of Research Committee
School of Medical Sciences
Health Campus
Universiti Sains Malaysia
16150 Kubang Kerian, Kelantan
TANDATANGAN PENERUSI
JAWATANKUASA PENYELIDIKAN
FUSAT PENGAJIAN/PUSAT
Signature of Chairman
[Research Committee of School/Centre]

17/1/08
Tarikh
Date

BORANG LAPORAN HASIL PENYELIDIKAN
PPSP

Tajuk geran: **Subcutaneous Stitch Closure Versus Non- Closure to Prevent Wound Disruption After Caesarean Section**

Penyelidik: **Dr. Adibah Ibrahim/ Dr. Ahmad Amir Ismail/ Dr. Anil G. Krishna Dass**

Jenis geran: **Geran Jangka Pendek Universiti**

Tempoh geran: **2 tahun (1 November 2005- 31 Oktober 2007)**

Jenis laporan: Laporan Kemajuan Alatan di beli Ya:nyatakan.....

Laporan Akhir*: Tidak

OBJEKTIF SPESIFIK KAJIAN (sama spt dalam proposal asal)	SECARA RINGKAS TERANGKAN PENCAPAIAN/HASIL	OBJEKTIF TERCAPAI ATAU TIDAK
1. To test the hypothesis that subcutaneous wound closure for fat thickness of 2cm and above decreases the incidence of wound disruption after caesarean section	120 patients were recruited into the study, with 60 samples were available for each arm. 10% of wound disruption was noted to occur on day 10 post caesarean section in the non- closure group as compared to 35% for the non- closure group (p value 0.001). There was 1.7% of wound disruption occurs on day 3 post caesarean section for each arm. No wound disruption noted on day 12 post caesarean section for non- closure group, while 3.3% was noted for non- closure group, but not statistically significant.	Objective of the study was fully achieved
2.		
3.		
4.		

- *Laporan Akhir perlu disertakan salinan mamuskrip dan surat yang dihantar kepada mana-mana jurnal untuk penerbitan.*

Nama Penyelidik Utama (PI): **DR. ADIBAH IBRAHIM**
Tarikh: 11 November 2007

t.t.:



IBRAHIM
ah
KEMENTERIAN PERUBATAN
MALAYSIA
KUALA LUMPUR, KEMERIAN, KELANTAN.

**SALINAN
MANUSKRIP**

Dr Adibah Ibrahim

From: Singapore Medical Journal [smj@sma.org.sg]
Sent: Sunday, July 01, 2007 11:32 AM
To: dradibah@kck.usm.my
Subject: Submission Confirmation for Closure of the subcutaneous fat tissue layer during caesarean section: Does it really matter?

Dear Dr Ibrahim,

Your submission entitled "Closure of the subcutaneous fat tissue layer during caesarean section: Does it really matter?" has been received by the Singapore Medical Journal.

You will be able to check on the progress of your paper by logging on to Editorial Manager as an author. The URL is <http://singaporemedj.edmgr.com/>.

Username: AIbrahim-578
Your password is: ibrahim425

Your manuscript will be given a reference number once an Editor has been assigned.

Thank you for submitting your work to this journal.

Kind regards,

Editorial Office
Singapore Medical Journal

Closure of the subcutaneous fat tissue layer during caesarean section: Does it really matters?

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ABSTRACT

Introduction: Wound disruption is a known complication of caesarean section, which may cause additional and unnecessary morbidity to the patients. Its occurrence is influenced by many factors, of which technique of operation is one of the contributing factors. This study was carried out in order to determine whether closure of subcutaneous fat layer measuring 2cm or more will reduce the incidence of post caesarean wound disruption. **Methods:** Patients whose subcutaneous fat thickness of 2cm or more, underwent caesarean section were randomised into closure group and non- closure group. In the closure group, the subcutaneous fat layer was stitched while those in the non- closure group was not stitched. The result of wound healing was observed on the third, tenth and 42nd post- caesarean. **Result:** 120 patients were recruited into the study, with 60 samples were available for each group. There was 1.7 percent of wound disruption occurred on the third day of caesarean section for each arm. Ten percent of wound disruption was noted to occur on the tenth day in the closure group as compared to 35 percent for the non- closure group (p value 0.001). No wound disruption was noted on the 42nd day post caesarean section for closure group, while 3.3 percent was noted for the non- closure group, but not statistically significant. **Conclusion:** Closing the subcutaneous fat tissue measuring 2cm and above for patients undergoing caesarean section may help to reduce the occurrence of wound disruption post caesarean section.

Key words: wound disruption, caesarean section, closure of subcutaneous fat tissue layer

Introduction

Wound disruption is one of the common side effects of caesarean section. It may cause endometritis, postpartum haemorrhage and sepsis to the patient and even infertility in long term duration.

Its occurrence is closely related to various factors such as thickness of the abdomen, technique of the operation, presence of associated medical disorders such as diabetes mellitus, anaemia and malnutrition. During closure of the abdominal layers, if only the rectus sheath and the skin are closed without approximating the subcutaneous fat layer, a potential dead space is left in this layer. In the early stages of wound healing, trauma caused to this tissue by instruments and delivery of the foetus can cause increase serous secretions or bleeding into this dead space and therefore leading to collection of pockets of serous fluid or blood, which forms a seroma or haematoma. These pockets of fluid formed can easily become infected, especially in obese patients¹⁻³. Therefore, closure of the subcutaneous tissue layer may reduce the dead space and later reduce the risk of wound disruption post caesarean section.

This study was conducted to determine whether closure of the subcutaneous fat tissue layer will reduce the incidence of wound disruption in post caesarean section patients.

Methodology

This study was a randomized study carried out over a period of 6 months. An ethical approval was obtained prior to the study.

Patients underwent caesarean section whose subcutaneous fat tissue layer of 2cm or more were included into this study. Very ill patients, patients with diabetes mellitus, skin

infection at the incision site, previous history of caesarean section and caesarean section with midline incision were excluded from the study. Patients were then randomised into 2 groups; closure group, whom their subcutaneous fat tissue were closed/ stitched and non- closure group, whom their subcutaneous fat tissue layer were not closed/ stitched.

Patients underwent the caesarean section according to the standard technique. During closure of the abdominal layers, those patients who were in the closure group had their subcutaneous fat tissue layer closed with chromic catgut #1, with continuous suture technique. Those patients who were in the non- closure group had their haemostasis secured either by using diathermy or figure of eight suture technique. The skin was then stitched subcuticularly using polyglycolic acid #3/0 suture for both groups and dressed with sterile bandage. Prophylaxis antibiotic was given for all patients post- operatively.

Wound inspection was done on the third, 10th and 42nd day post- operation, for the presence of wound disruption which consisted of seroma, haematoma, infection or gapping. Appropriate treatment was given for patients with wound disruption.

Results

120 patients were recruited into the study, of which 60 patients were in the closure group and another 60 patients were in the non- closure group. The mean age of the patients was 31.93 years, with 95% of them were Malays. 92.5% of the patients had their caesarean section done at term. The mean gestational age was 38.96 ± 1.647 weeks.

The mean weight of patients was 70.6 ± 9.63 kg. There was no significant difference in the weight of patients between the two groups (p value 0.461). The mean subcuticular

fat thickness was 2.27 ± 0.313 cm. There was no significant difference in the experience or qualification of the surgeon who performed the caesarean section between the two groups (p value 0.207).

Table I showed that there was a significant wound disruption occurred on the tenth day post- operation in the non- closure group (p value less than 0.05). No difference was noted between the two groups during the third and 42nd day of operation.

Types of wound disruption among the patients in both groups are shown in table II. It was noted that most of the disrupted wound occurred in the non- closure group were caused by infection.

Discussion

Being the commonest complication of caesarean section, preventing the occurrence of wound disruption gives a lot of benefit not only to the patients where further immediate and long term complications could be prevented, but also to the hospital where the cost of treatment could be very much reduced.

Most of the studies have proven that the most important risk factor which causes wound disruption is the thickness of the subcuticular fat layer. In our study, we found that closing the subcuticular fat layer of more than 2cm thick reduces the occurrence of wound disruption. This finding is similar with other studies^{1,4-5}.

We also found that most of the wound disruption occurred after the patients were discharged from the hospital (day 10 and 42). There may be several factors for the higher rate of wound disruption during this period. The local confinement culture in this region restricts them from taking bath for the first 7 days. There is also misconception that the wound must be kept dry for a long time. They practice traditional massage and apply heat and various types of ointment on the abdomen for uterine involution and to regain abdominal wall tensility. They are also restricted from taking too much fluid and certain types of food rich in protein and nutrients during this period. Most of the study population is from rural areas and poor socioeconomic group where these beliefs are still strongly adhered to. That might be the postulated reasons why most of wound disruption occurred during those periods. Having said so, further study to look into these postulation should be conducted to prove them.

Though the occurrence of wound disruption may be influenced by the type of caesarean section (emergency versus elective caesarean section) and experience of surgeons, our study did not show that the occurrence of wound disruption was influenced by these two factors. However, bigger sample size may give a different scenario.

From the above finding, we suggest that the subcutaneous fat layer of more than 2cm thick should be stitched during performing caesarean section to prevent wound disruption.

References

1. Naumann, R. W., Hauth, J.C., Owen, J., Hodgkins, P.M. and Lincoln, T. Subcutaneous tissue approximation in relation to wound disruption after caesarean delivery in obese women. *Obstet Gynecol* 1995; 85, 412-6.

2. Kabon B, N.A., Reddy D, Eagon C, Fleshman JW, Sessler DI, Kurz A. Obesity decreases perioperative tissue oxygenation. *Anesthesiology* 2004; 100, 274-80

3. Chung RS, S.M. Kozol R. Effect of wound closure technique on wound infection in morbidly obese: results of a randomized trial. *Obes Surg* 1991; 1, 333- 5.

4. Del Valle, G.O., Coombs, P., Qualls, C. and Curet, L.B. Does closure of camper fascia reduce the incidence of post caesarean superficial wound disruption? *Obstet Gynecol* 1992; 80, 1013-6

5. Cetin, A. and Cetin, M. Superficial wound disruption after caesarean delivery: effect of the depth and closure of subcutaneous tissue. *Int J Gynaecol Obstet* 1997; 57, 17-21.

Table I: Results of wound integrity on the third, 10th and 42nd day post-caesarean section

Variables		Group		P value
		Closure n (%)	Non- closure n (%)	
Day 3	Clean	59 (98.3%)	59 (98.3%)	0.752
	Disrupt	1 (1.7%)	1(1.7%)	
Day 10	Clean	54 (90%)	39 (65%)	0.001
	Disrupt	6 (10%)	21 (35%)	
Day 42	Clean	60 (100%)	58 (96.7%)	0.496
	Disrupt	0 (0%)	2 (3.3%)	

Table II: Types of wound disruption among the patients in both groups

Type	Day 3		Day 10		Day 42	
	Closure n (%)	Non- closure n (%)	Closure n (%)	Non- closure n (%)	Closure n (%)	Non- closure n (%)
Seroma	1 (1.7)	1 (1.7)	4 (6.8)	5 (8.3)	-	2 (3.3)
Haematoma	-	-	1(1.6)	2 (3.3)	-	-
Infection	-	-	1 (1.6)	4 (6.7)	-	-
Gaping and infection	-	-	-	2 (3.3)	-	-
Seroma and infection	-	-	-	8 (13.3)	-	-

UNIVERSITI SAINS MALAYSIA
 JABATAN BENDAHARI
 KUMPULAN WANG PENYELIDIKAN GERAN USM604
 PENYATA PERBELANJAAN SEHINGGA 31 OKTOBER 2007

Jumlah Geran:	RM	9,438.00	Kena Projek: DR ADIBANI HUSAINI
Peruntukan 2005 (Tahun 1)	RM	4,719.00	Tajuk Projek: Simultaneous Switch Closure Versus Non Closure to Prevent Wound Disruption after Coronary Artery Bypass
Peruntukan 2006 (Tahun 2)	RM	4,719.00	
Peruntukan 2007 (Tahun 3)	RM	0.00	Tempoh: 01 Nov 05 - 31 Okt 07 No Akaun: 3011PSP/4111

Kwg	Akaun	PTI	Projek	Donor	Peruntukan Projek	Perbelanjaan Kumpul Hingga Tahun Lalu	Peruntukan Semasa	Tanggungjawab Semasa	Bayaran Tahun Semasa	Belanja Tahun Semasa	Baki Projek
304	11000	PPSP	6131415								
304	14000	PPSP	6131415								
304	15000	PPSP	6131415								
304	21000	PPSP	6131415		1,738.00		1,738.00		2,871.12	2,871.12	1,866.88
304	22000	PPSP	6131415								
304	23000	PPSP	6131415		300.00		300.00				300.00
304	24000	PPSP	6131415								
304	25000	PPSP	6131415								
304	26000	PPSP	6131415		1,000.00		1,000.00				1,000.00
304	27000	PPSP	6131415		1,200.00		1,200.00				1,200.00
304	28000	PPSP	6131415		1,000.00		1,000.00				1,000.00
304	29000	PPSP	6131415		1,200.00		1,200.00		1,145.27	1,145.27	54.73
304	32000	PPSP	6131415								
304	35000	PPSP	6131415								
					9,438.00		9,438.00		4,016.39	4,016.39	5,421.61

LAPORAN

LAPORAN

KOMPREHENSIVE

PROJEK

This project was proposed in March 2005 and approval from the ethical committee was obtained in June 2005. The project was started immediately after that.

Instructions about the project were given to all the medical staffs involved. Consent and data forms were photostated and distributed. Subjects were recruited according to the protocol of the project. The recruitment of patients was completed in May 2006. As the studied area was part of the standard patients' management, all the materials required during the operation was used using the materials provided by the hospital. The data was analysed using SPSS software version 10.0, with the assistance of a statistician from the Community Medicine Department and completed in December 2006.

To improve and broaden the knowledge about the studied area, a conference in Singapore (the 6th Singapore Congress in Obstetrics and Gynaecology) was attended in March 2007. From the conference, various techniques of caesarean section were suggested to reduce the complications of the surgery. Besides, a consensus regarding caesarean section should only be performed based on justified indication was made.

In June 2007, the findings of this paper were presented in the 17th Malaysian Congress of O&G as poster presentation. A copy of the letter of acceptance of the presentation, together with a copy of the abstract of the presented poster is as attached.

The manuscript of the project was prepared soon after the presentation. A copy of the manuscript is as attached. The manuscript was submitted to Singapore Medical

Journal and was accepted for review in July 2007. A copy of the e-mail stating the acceptance of the manuscript is as attached. The result of the review is still pending. Should the manuscript is not accepted by Singapore Journal, my next plan is to submit it to other journal such as International Medical Journal.

The final report of the project was then prepared and submitted. The details of the expanses as well as the milestone of the project are as in Table I and II.

Table I: Details of the grant expenses

Total amount of grant approval		RM 9438.00
Account	Details of expenses	Amount
Vot 21000	Attending conference	RM 2871.12
Vot 29000	Registration fee for conference	RM 1145.27
Total amount of expenses		RM 4016.39
Balance		RM 5421.61



OBSTETRICAL AND GYNAECOLOGICAL SOCIETY OF MALAYSIA

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Dear Dr

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I am pleased to inform you that your paper entitled:-

CLOSURE VERSUS NON CLOSURE OF THE SUBCUTANEOUS FAT LAYER OF 2CM AND MORE TO PREVENT WOUND DISRUPTION: AN OBSERVATIONAL STUDY

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We look forward to seeing you at the Congress.

Yours sincerely

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CLOSURE VERSUS NON CLOSURE OF THE SUBCUTANEOUS FAT LAYER OF 2CM AND MORE TO PREVENT WOUND DISRUPTION: AN OBSERVATIONAL STUDY

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Introduction: Wound disruption is a known complication of caesarean section, which may cause additional and unnecessary morbidity to the patients, be it as a short term or long term effect. Its occurrence is influenced by many factors, of which technique of operation is one of the contributing factors. **Objective:** This study is carried out in order to determine whether closure of subcutaneous fat layer measuring 2cm or more will reduce the incidence of post caesarean wound disruption. **Methodology:** Patients whose subcutaneous fat thickness of 2cm or more, underwent caesarean section were grouped into closure group and non- closure group. In the closure group, the subcutaneous fat layer was stitched while those in the non- closure group were not stitched. The result of wound healing was observed on day 3, 10 and 42 post caesarean section. **Result:** 120 patients were recruited into the study, with 60 samples were available for each arm. 10% of wound disruption was noted to occur on day 10 post caesarean section in the non- closure group as compared to 35% for the non- closure group (p value 0.001). There was 1.7% of wound disruption occurs on day 3 post caesarean section for each arm. No wound disruption noted on day 42 post caesarean section for non- closure group, while 3.3% was noted for the non- closure group, but not statistically significant. **Conclusion:** Closing the subcutaneous fat tissue measuring 2cm and above for patients undergoing caesarean section may help to reduce the occurrence of wound disruption post caesarean section. Closing the subcutaneous fat layer should therefore be done routinely for patients whose subcutaneous fat layer is more than 2cm.

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One of the most challenging part of the masters programme is the dissertation. The challenge begins right from the beginning, from choosing a topic to the presentations, conducting the study, analyzing the results and finally writing it up. It would have been impossible for me to do all these by myself without guidance and help from a few people.

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ABSTRACT

Objective: To see if closing the subcutaneous fat layer will influence the occurrence of post-operative wound disruption.

Methods: An observational cohort study done from 1st April 2005 to 15th September 2005 among 120 patients who underwent caesarean section in HUSM. Patients with a subcutaneous fat layer of 2 centimeters or more were grouped into 2 groups, a closure group and a non-closure group. In the closure group the subcutaneous fat layer was stitched and in the non-closure group it was not. Their wound healing was observed on days 3, 10 to 12 and 42 post caesarean section. Patients with a clean and healthy wound were reported as clean. Wound disruption were those patients who had a seroma formation, haematoma formation, gaping or wound infection.

Results: Most of the wound disruptions were seen on day 10 to 12 post caesarean section. 6 patients in the closure group compared to 21 patients in the non-closure group had wound disruption. The commonest form of wound disruption was seroma formation followed by wound infection. Wound disruption was significantly higher in the non-closure group compared to the closure group.

Conclusion: Suturing of the subcutaneous fat layer in women with a fat thickness of 2 centimeters or more significantly reduces wound disruption.

ABSTRAK

Objektif: Untuk melihat sama ada penutupan lapisan lemak di bawah kulit akan menjejaskan kejadian disrupsi luka selepas pembedahan caesarean.

Kaedah: Satu pengajian 'observational cohort' yang dilakukan dari 1^{hb} April sehingga 15^{hb} September 2005 di antara 120 pesakit yang melalui pembedahan caesarean di HUSM. Pesakit dengan ketebalan lemak di bawah kulit 2 sentimeter ke atas telah dikumpulkan di dalam dua kumpulan, satu kumpulan di mana lapisan lemak di jahit dan satu lagi kumpulan di mana lapisan lemak tidak di jahit. Kesembuhan luka diperhati pada hari ke 3, 10 hingga 12 dan 42 selepas pembedahan caesarean. Pesakit dengan luka yang sihat dan bersih di laporkan sebagai bersih. Disrupsi luka adalah pada mereka yang mempunyai pembentukan 'seroma', darah beku (hematoma), pembukaan pada luka atau jangkitan kuman.

Keputusan: Kebanyakan kejadian disrupsi luka diperhati pada hari ke 10 hingga 12 selepas pembedahan. 6 pesakit di kumpulan penutupan lapisan lemak dan 21 pesakit dalam kumpulan tidak penutupan didapati mendapat disrupsi luka. Pembentukan seroma didapati paling kerap berlaku dan diikuti oleh jangkitan kuman. Disrupsi luka didapati lebih kerap pada pesakit yang lapisan lemaknya tidak dijahit berbanding dengan yang dijahit.

Kesimpulan: Penjahitan lapisan lemak di bawah kulit pada mereka yang mempunyai ketebalan lemak 2 sentimeter dan keatas akan mengurangkan kejadian disrupsi luka.

1. INTRODUCTION TO THE STATE OF KELANTAN

Kelantan, one of the thirteen states in Malaysia is situated in the north-eastern part of Peninsula Malaysia, shares its borders with Thailand in the north, Terengganu in the south and Pahang and Perak in the west. It covers a land of 14 922 square kilometers with a total population of 1 420 140 people in year 2000.

The word 'Kelantan' originates from a Malay word, 'Kilantan', which means lighting, which translates as the 'Land of Light'. Kelantan is known by many endearing names which in sense reflects a rich cultural, historical heritage, scenery of Malay Kampung and idyllic country side.

Among the thirteen states of Malaysia, Kelantan is considered as the capital of Malay cultures and often known as the 'Cultural Haven of Malaysia'. Traditionally, the state is a rice producer, based on the fertile Kelantan delta. Nevertheless a large number of its population is engaged in the fishing industry. The state is also well known for its handicrafts, cloth, silverware and batik, while the tobacco industry is also important. The opening of the East-West Highway, bringing Kelantan into closer contact with the West Coast, promises to accelerate the state's economic development.

Kelantan has been a centre of human activity and settlement since prehistoric times and has existed as a political entity for over a thousand years. Important pre-historic remains of the Stone Age men have been found at Gua Cha (The Cha Caves), Gua

Musang and at other sites of the interior. Kelantan was probably a vassal of Sri Vijaya. The state was converted to Islam during the period of the fifteenth century Malacca and the modern sultanate can trace its origin back to this period.

Kelantan enjoyed a long period of autonomy after the fall of Malacca but nevertheless affected by the relentless pressure of Thailand on the state of Kedah and Pattani. By the beginning of the 19th century, the state was the most populous in the Peninsula but its politics were dominated by the Thais and the Malays of neighbouring state, Terengganu.

Despite the resurgence of autonomy in the middle of the century, by 1900 Kelantan was recognized as a tributary state of Thailand. In 1909, as a result of a treaty signed by Thailand and Britain, the overlordship of Kelantan was assumed by the British and a British Advisor was appointed in Kota Bharu.

Kota Bharu was the site of the first landing by the Japanese troops in 1941. As a result of Japanese rule, Kelantan was again placed under Thailand during the period of war. Kelantan eventually became part of the Federation Of Malaya in 1948.

The state capital, Kota Bharu is located at the bank of the Kelantan river and situated 627 kilometers from the Federal Capital, Kuala Lumpur. Dark lush forest still covers a large proportion of the state particularly to the south-west. The state consists of

ten districts namely Kota Bharu, Bachok, Machang, Tumpat, Pasir Mas, Pasir Puteh, Tanah Merah, Kuala Krai, Gua Musang and Jeli.

Ninety percent of the total population is living in the rural areas. Most of them are farmers and fishermen. The distribution of the population differs from one district to another. Eighty six percent of the population lives in the eight northern districts which contributes twenty six percent of the total land area. These include all districts except Kuala Krai and Gua Musang.

In Kelantan, tourism has excellent potential. Its rich cultural heritage/tradition and beaches makes it one of the most interesting and unique places for a vacation. The favorite past time of the Kelantanese include kite-flying (wau), top spinning (gasing), drum beating (rebana), bird singing (merbok) competitions and shadow plays (wayang kulit). Handicraft such as superb hand painted cloth (batik), cloth woven with silver and gold thread (songket), intricate wood carvings and exquisite silverware, crafted with much skill and imagination that it pays a tribute to the strong culture of this state.

2. THE SCHOOL OF MEDICAL SCIENCES – UNIVERSITI SAINS MALAYSIA

The School of Medical Sciences, Universiti Sains Malaysia is situated on a 72.84 hecter lush green land in Kubang Kerian, a suburb 6 kilometers from Kota Bharu. It is the third medical school in Malaysia and was set up in 1979. It is the first medical school to adopt an innovative, community-oriented curriculum for its medical students.

Its philosophy is to stress the relevance of its curriculum to the needs of the country and the profession and to work towards producing competent practitioners who will be able to identify themselves as part and parcel of the health care system of the country.

It is the first medical school to be set up in the less developed eastern coast of west Malaysia. The school offers a number of undergraduate and postgraduate courses. The master of Obstetrics and Gynaecology course was commenced in 1991.

3. HOSPITAL UNIVERSITI SAINS MALAYSIA (HUSM)

The Hospital Universiti Sains Malaysia (HUSM) is a teaching hospital for the School of Medical Sciences, Universiti Sains Malaysia. Built in 1979 under the Third Malaysia Plan, it is situated in Kubang Kerian. The construction was completed in 1984 and was officially opened by His Royal Highness Al-Sultan of Kelantan on 26th August 1984 with the first patient being admitted on the 21st January 1985 and the first baby born in April 1985.

Besides teaching and research, the University Hospital also provides adequate medical services for the population and also serves as the referral centre for the state and the neighbouring states of the east coast.

4. THE DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY

In the year 2005, the department of Obstetrics and Gynaecology was staffed by 14 consultants and lecturers, twenty four masters students belonging to various batches and ten house officers. The Obstetrics and Gynaecology post graduate programme which was started in 1991 had its first batch of Master of Medicine in Obstetrics and Gynaecology (MMed O&G) in June 1995.

The Obstetrics and Gynaecology clinic is located at the ground level on the left side of the centralized clinic counter, whereas the labour ward and office are located at the first floor. The antenatal and postnatal wards are located at the second floor. The gynaecology ward is located in the main block at level one.

The management unit is divided into four teams, Team A, B, C and D. Team A subspecialises in gynaecology and minimally invasive surgery. The Team B in general obstetrics and gynaecology. Team C subspecialises in infertility and urogynaecology. Team D subspecialises in fetomaternal medicine.

4.1. The Obstetrics and Gynaecology Schedule in HUSM

Table 1: The Obstetrics and Gynaecology Schedule in HUSM

DAY	MORNING	AFTERNOON
Sunday	Antenatal clinic (Team A & B)	Gynaecology clinic (Team A & B)
Monday	Operation (Team B & C) Menopause clinic (Team A) Combined clinic (Team D) Ultrasound	Operation (Team B & C) Molar clinic (Team A) Oncology clinic (Team A) Colposcopy
Tuesday	Antenatal clinic (Team C & D)	Gynaecology clinic (Team C & D)
Wednesday	Operation (Team A & D) Fertility augmentation clinic (Team C)	Operation (Team A & D) Postnatal clinic (Team B)
Thursday	Antenatal Booking Clinic	Departmental presentation -preoperative discussion -interesting case

5. INTRODUCTION TO CAESAREAN SECTION

Caesarean section is defined as an operative procedure to deliver the foetus through an incision in the abdominal and uterine walls (Raimer K.A. et al, 1992). It is the most common major operation performed on women all over the world (Andrew Simm, 2005).

Caesarean section was first performed in the 8th century BC. Caesarean section in the ancient world was a last resort operation to comply with Roman ritual and religious custom and had little to do with saving either mother or child.

During this time, the Roman ruler Numa Pompilius passed a law requiring all women who died in labour to have a post-mortem delivery. This law demanded that when a pregnant woman died she could not be buried until the child had been delivered. Thus the procedure was developed to remove the infant prior to the burial. It later became more customary as a last ditch effort to save the child, depending on circumstances. This law continued throughout the reign of the Roman Emperors, and was known as Lex Caesarea - 'caesus' being the Latin word for 'cut' or 'incision'; a more likely root for the term (UNRV History 2003).

It was not until the sixteenth century that real records of caesarean sections began. The first successful section was done by a swinegelder from Switzerland who performed it on a live woman who survived the operation.

The first recorded caesarean section in the UK was done by Smith, a surgeon from Edinburgh in 1737 but unfortunately both mother and child died. After the arrival of general anaesthesia from Edinburgh in 1851, caesarean sections took off but unfortunately up to the quarter of the 19th century, maternal mortality was excessively high as the uterine wound was left unsutured to allow lochia to escape.

In 1876, Porro described a technique of removing the uterus and ovaries which reduced the maternal mortality rate, but it was not until 1882 that Sanger described the technique of suturing the classical uterine incision using two rows of sutures. The first recorded transverse lower uterine segment caesarean section is credited to Frank in 1906 but in 1911, Munro Kerr first used it in the UK (Chamberlain, 2001).

The evolution of caesarean section during the 20th century as a relatively safe procedure largely because of improved anaesthetic techniques and antiseptic procedures have revolutionized obstetric practice (Chamberlain, 2001).

6. TECHNIQUE FOR PERFORMING CAESAREAN SECTION

Since caesarean sections are the most commonly performed surgery in obstetrics, the technique for performing it is very important. Safety to the mother and cost are the main areas of concern. Various studies on the techniques for performing caesarean section have focused on reducing the operating time, blood loss, wound infection and cost. Surgical techniques vary from surgeon to surgeon, and only a small number of these techniques have been evaluated in randomised controlled trials. Although it is likely that variations in surgical technique will produce relatively modest differences in outcome, the operation is conducted so frequently that any difference in morbidity is likely to have significant cost and community effects.

In this study we will be looking at the effect of one of the techniques of caesarean section, that is closure or non closure of the subcutaneous fat layer on its outcome, that is wound disruption, in areas where the subcutaneous fat thickness is 2 centimeters or more.

Wound disruption is one of the common side effects of caesarean section. In HUSM the incidence of wound infection was found to be 14.2% (Ibrahim, 2004). However, the exact percentage of wound disruption is unknown and it is believed that its incidence is higher than wound infection. To understand the pathophysiology of wound disruption, one must understand the mechanism of wound healing.

7. MECHANISM OF WOUND HEALING

Wound healing is a complex but orderly phenomenon involving a number of well orchestrated process including regeneration of parenchymal cells, migration and proliferation of both parenchymal and connective tissue cells, synthesis of extracellular matrix proteins, remodeling of connective tissue and parenchymal components, and collagenization and acquisition of wound strength.

A clean surgical incision heals by primary union or also known by first intention. The incision causes death of a limited number of epithelial cells and connective tissue cells as well as disruption of epithelial basement membrane continuity. The narrow incisional space immediately fills with clotted blood containing fibrin and blood cells; dehydration of the surface clot forms the well known scab that covers the wound.

Within 24 hours, neutrophils appear at the margins of the incision, moving toward the fibrin clot. The epidermis at its cut edges thickens as a result of mitotic activity of basal cells and within 24 to 48 hours spurs of epithelial cells from the edges both migrate and grow along the cut margins of the dermis, depositing basement membrane components as they move. They fuse in the middle beneath the surface scab, thus producing a continuous but thin epithelial layer.

By day 3, the neutrophils have been largely replaced by macrophages. Granulation tissue progressively invades the incision space. Collagen fibres are now present in the margins of the incision, but at first these are vertically orientated and do not

bridge the incision. Epithelial cell proliferation continues, thickening the epidermal layer.

By day 5, the incisional space is filled with granulation tissue. Neovascularization is maximal. Collagen fibres become more abundant and begin to bridge the incision. The epidermis recovers its normal thickness and differentiation of surface cells yields a mature epidermal architecture with surface keratinization.

During the second week, there is continued accumulation of collagen and proliferation of fibroblasts. The leukocytic infiltrate, oedema and increased vascularity have largely disappeared. At this time, the long process of blanching begins, accomplished by the increased accumulation of collagen within the incisional scar, accompanied by regression of vascular channels.

By the end of the first month, the scar comprises a cellular connective tissue devoid of inflammatory infiltrate, covered now by intact epidermis. The dermal appendages that have been destroyed in the line of the incision are permanently lost. Tensile strength of the wound increases thereafter, but it may take months for the wounded area to obtain its maximal tensile strength (Kumar *et al.*, 1992).

During closure of the abdominal layers, if only the rectus sheath and the skin are closed without approximating the subcutaneous fat layer, a potential dead space is left in this layer. In the early stages of wound healing and trauma caused to this tissue by instruments and delivery of the foetus can cause increase serous secretions or bleeding

into this dead space and therefore leads to collection of pockets of serous fluid or blood which forms a seroma or haematoma. These pockets of fluid formed can easily become infected during surgery as the uterus is often contaminated with vaginal flora. Mechanical stress on the skin incision is increased when the subcutaneous layer is not closed making disruption of the skin incision more likely to occur (Naumann *et al.*, 1995). Furthermore, studies have found that wound and tissue hypoxia are common in obese patients which contributes to the substantial increased risk of infection (Kabon B, 2004). Wound healing is a complex mechanism and therefore there are several factors for it to function optimally.

8. FACTORS AFFECTING WOUND HEALING

The process of wound healing can be affected by many factors, which can be divided into local and systemic factors.

8.1. Local factors

8.1.1. Infection

Infection is the most common local cause for prolonged healing. All wounds are contaminated postoperatively by resident bacterial flora, however clinical infection occurs when a critical number of pathogenic organisms are present. Bacteria prolong healing by activating the alternate complement pathway and detrimentally exaggerating and prolonging the inflammatory phase of wound healing. They also elaborate toxins and proteases that can be damaging to cells. Finally, they compete for oxygen and nutrients in the wound milieu. Lactic acid is produced in this hypoxic state that further stimulates the release of damaging proteolytic enzyme.

Formation of excessive devitalised tissue, increased tension in the wound, hematoma and seromas, foreign bodies in the wound, all these factors predispose for bacterial secondary infection. All these can be avoided by proper surgical techniques.

8.1.2. Surgical technique

The rough handling of tissue or the use of inappropriately bulky instrumentation

can lead to crushed skin edges and subsequent devitalization of tissue, leading to increase in inflammatory reaction and risk of secondary infection with increased scarring.

Wound closed with inappropriately reactive suture material may increase the chances of a foreign body reaction and subsequent infection. Skin sutures tied too tightly may lead to tissue ischaemia and predispose to infection.

8.1.3. Haematoma formation

Excessive bleeding and the formation of a hematoma within the wound not only can mechanically disrupt the wound closure but also can serve as an excellent culture medium for micro-organisms.

8.1.4. Foreign body reaction

A foreign body in the wound serves as an appropriate surface for the activation of the alternate complement pathway and the generation of a prolonged inflammatory response, which interferes with the subsequent stages of wound repairs. Wounds containing foreign materials are characterised by low pH and low PO₂. These factors significantly slow down wound repair.

8.1.5. Tissue ischaemia

Local factors such as foreign bodies, infection or strangulating sutures

significantly slow healing by promoting tissue ischemia. Local hypoxia is detrimental to cellular proliferation, resistance to infection and collagen production. The cumulative effect is delayed healing.

8.1.6. Topical medications and dressings

Occlusive or semioclusive dressings promote faster reepithelization. They may also alter certain aspects of dermal repair. They also provide the moist environment needed for optimal wound repair, they may also help to prevent bacterial invasion and wound infection.

Local medicaments applied to the wound may affect wound repairs. Even the bases in which these agents are compounded may accelerate or diminish the rates of epithelization. Triamcinolone acetonide ointment (0.1%) nitrofurazone, benzoyl peroxidase cream, silver sulfadiazine, neosporin ointment are examples of the drugs that affect epidermal migration.

8.2. Systemic factors

8.2.1. Deficiency states

8.2.1.a. Metabolism: Aberrant carbohydrate and fat metabolism slows wound repair. Glucose may be unavailable or fail to enter cell properly. Insulin may act as a fibroblast

growth factor and its deficiency leads to suppress collagen deposition in the wound.

Negative nitrogen balance and relative protein deficiency may occur after major trauma or during sepsis. Fibroplasia and all aspects of matrix formation are delayed hence wound remodelling is also impaired. Cellular and humoral immune responses are blunted and bacterial phagocytosis and killing are defective. Protein deficiency may lead to an increased propensity for infection.

8.2.1.b. Vitamins: Vitamin A deficiency has been associated with slowed reepithelization, decreased collagen synthesis and stability and an increased susceptibility to infection.

Vitamin C (Ascorbic acid) is an essential cofactor during collagen biosynthesis. In scurvy, the collagen formed is unhydroxylated, relatively unstable and subject to collagenolysis.

Vitamin K deficiency results in a deficiency in the production of vitamin K dependent clotting factors (factors II, VII, IX and X) resulting in bleeding diathesis, haematoma formation and secondary detrimental effects on wound healing.

8.2.1.c. Trace elements and minerals: These are required as cofactors for various enzymes during wound healing. These include zinc, copper, iron, manganese etc. Zinc deficiency however is more important clinically, as it is a constituent of multiple

important metalloenzymes including collagenase and DNA and RNA polymerases. Its deficiency results in impaired immune responses, decreased protein and collagen synthesis, decreased lysyl oxidase activity and interfere with vitamin A transport.

8.2.2. Aging

Physiologic aging diminishes virtually all phases of wound healing. Disease status associated with accelerated aging (such as Werner's syndrome) may be characterized by recalcitrant cutaneous ulcerations and impaired healing.

The mechanism behind the lack of scarring in fetal wounds is unknown, but probably relate to the control of collagen fibrillogenesis. The role of collagen in the fetal wound matrix is controversial. Collagen is deposited in fetal wounds much more rapidly than in adults. Collagen deposition occurred in a normal dermal and mesenchymal pattern in second and early third trimester in fetal lambs. These findings are consistent with the observation that fetal wounds heal faster and without scar formation.

8.2.3. Disease states

Some of the most important diseases leading to impaired wound healing are listed here.

Disease states associated with impaired wound healing:

- Hereditary
- Ehlers-Danlos syndrome, Prolidase deficiency
- Coagulation disorders :Hemophilia, Von Willebrand's disease, Factor XIII

deficiency, Hypofibrinogenemia

- Werner's syndrome
- Vascular disorders
- Congestive heart failure, Atherosclerosis, Vasculitis
- Venous stasis
- Lymphoedema
- Metabolic
- Chronic renal failure
- Diabetes mellitus
- Malnutrition
- Cushing's syndrome
- Hyperthyroidism
- Immunologic deficiency states

Others

- Chronic pulmonary disease
- Chronic liver disease (cirrhosis)
- Malignancy
- Myelofibrosis and other chronic hematologic disorders associated with thrombocytopenia
- Other chronic illness

The immunologic deficiency states may impair healing by predisposing the wound to infection and diminishing the inflammatory phase of wound healing.

8.2.4. Medication

Some of the drugs causing impaired wound healing are:

- Glucocorticoids
- Anticoagulants
- Antineoplastic drugs
- Cyclosporin A
- Colchicine
- Penicillamine
- Zinc sulfate (high doses)
- Beta amino proprionitrile

Better documented are the effects of anticoagulants and glucocorticosteroids. Anticoagulants indirectly interfere with healing by increasing the chances of bleeding and haematoma formation. Corticosteroids in contrast, directly inhibit wound healing. They diminish inflammation, decrease protein and collagen synthesis, decrease epidermal proliferation, interfere with host defense mechanisms and promote the hypercatabolism of existing collagen. In addition they may lead to relative tissue ischaemia by means of their vasoconstrictive properties (Deodhar and Rana, 1997).

9. LITERATURE REVIEW

Various studies have been done to prevent wound disruption after surgery, however none has been done in this country about wound disruption after caesarean section. Four randomized controlled trials have compared suturing of the subcutaneous fat layer with no suturing at caesarean section and out of these two of them randomized women with at least 2 centimeters of subcutaneous fat (Health, 2004). There has also been a number of studies done comparing various methods to prevent wound disruption.

Naumann et al (1995) had done a study where all women undergoing caesarean section, including those with a previous caesarean scar, with a subcutaneous fat layer of 2 centimeters and more were randomized into a closure group and a non closure group. From this study it was found that closure of the subcutaneous fat layer significantly decreases wound disruption especially seroma formation in obese patients. This study is supported by another study done by Cetin and Cetin (1997) who had also randomized patients with a fat layer of 2 centimeters and more. The study by Naumann, is based on an earlier study done by Del Valle et al (1992) who had found a higher incidence of wound disruption in the non closure of subcutaneous fat layer group. Kore et al (2000), in a different scenario where, obese patients with a fat thickness of at least 2.5 centimeters undergoing abdominal hysterectomy had also found that incidence of seroma formation, haematoma and other wound complications were higher in the non closure group. Meta analysis from various studies found that closure of the subcutaneous fat layer significantly decreases wound disruption especially for a fat thickness of 2 centimeters or

more but there was no difference in the risk of wound infection alone (Anderson and Gates, 2004, Chelmow *et al.*, 2004)

However, not all surgeons prefer to close the subcutaneous fat layer and some only close it when they find it to be thick. This was a survey done among members of the RCOG in the United Kingdom where, only 21.3% of them always closed the fat layer (Tully *et al.*, 2002) . The reason for not closing can be backed by studies done. Chelmow D *et al* (2002) found that there was no statistical significance in wound disruption between the closure and non-closure groups. Chung R.S. *et al* (1991) had also proved that there was no advantage of closing the fat layer in the morbidly obese as ultrasound studies of the non-closure group showed no dead spaces.

For wound disruption to occur, there are several risk factors that needs to be ruled out. Risks of wound infection were analysed in one study and it was noticed that subcutaneous tissue thickness was the only significant risk factor for wound infection (Vermillion *et al.*, 2000).

Various studies including multicenter ones were done to identify the risk factors of post caesarean section wound infection. Pelle, Jepsen *et al* (1986) published a multicenter study on wound infection. The overall incidence was 6.6%, 3.8% in elective cases and 7.5% in non-elective cases. Obesity was recognized as a patient related risk factor, while risk factors inherent to the obstetric situation were duration of ruptured membranes prior to surgery and foetal and labour monitoring by intrauterine devices.

Moir-Bussy, Hutton et al in 1984 reported of a multicentre study where the incidence of wound infection was 6.0%. Patients with infected wounds stayed 2.4 days longer in the hospital. Factors associated with wound infection included size of hospital, obesity, time in labour, number of vaginal examinations and various operative procedures. In another prospective study, incidence of wound infection was 9.4%. Elective operations had lower incidence of wound infection, 7.9% compared to 12.3% in emergency caesarean sections. Other factors significantly associated with wound infection were, the number of vaginal examinations done before surgery, duration of operation, vertical skin incision and category of surgeon (Webster, 1988). Risk factors for wound infection following caesarean section, was a prospective study, where wound infection was found to occur in 25.3% of cases. 36% of wound infection was diagnosed following the patients' discharge from hospital. Maternal weight was a highly significant indicator of subsequent wound infection development and antibiotic prophylaxis was found to be the most significant protective factor in reduction of post-operative wound infection (Beattie *et al.*, 1994).

Takoudes T.C. in 2004 reported about the risks of caesarean section wound complications in diabetic gestations. Pregestational type 1 and 2 diabetics were compared with non-diabetics undergoing caesarean section. The overall incidence of 18.4% in diabetics compared to 5.8% in the non diabetics was noted and this proved a 2.5 fold increase of wound complications in diabetics therefore this is the reason why diabetics were excluded in this study.

10. METHODOLOGY

10.1. DESIGN OF STUDY

This study was a non-randomised prospective cohort study which was done in the Department of Obstetrics and Gynaecology of Hospital Universiti Sains Malaysia from 1st April 2005 till 15th September 2005.

10.2. SAMPLE SIZE

The sample size was calculated using the PS software, where the expected incidence of wound disruption in the non closure group of subcutaneous fat layer was 25% and that of the closure group was 5%.

Stipulation:

- 1) P0 (proportion of patients expected to have wound disruption in the non closure group) – 0.25
- 2) P1 (proportion of patients expected to have wound disruption in the closure group) – 0.05
- 3) Power of the study – 80%
- 4) Level of significance – 0.05
- 5) Ratio between the 2 groups – 1