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Midline versus Pfannenstiel incision scars in repeat caesarean sections

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1. INTRODUCTION

1.1. Types of incision

It is a commonly held belief that repeat caesarean section through a low vertical scar provides easier access and fewer complications than an operation through a previous Pfannenstiel incision. The two most frequently used abdominal skin incisions for caesarean section are a subumbilical midline (up and down/vertical, **Figure 1.1**) and Pfannenstiel (low transverse/suprapubic, **Figure 1.2**). The description of these techniques is well described in most good surgical texts such as Te Linde's Operative Gynaecology.[1] and well described in a recent Cochrane systematic review by Mathai and Hofmeyr. [2] The use of either incision is surgeon dependent and motivated by a variety of indications, situations and often the surgeon's level of expertise. Traditionally caesarean sections were performed by a midline vertical skin incision from pubic symphysis to umbilicus. The rectus muscle and peritoneum are then incised in the relatively avascular midline. Advantages are suggested to be speed, ability to extend the incision upwards and it being the incision of choice if local anaesthesia is to be used.

In 1900 Pfannenstiel described his traditional method of low transverse incision for caesarean section. The skin incision is a low transverse type, gently upward curving, following the natural skin fold and located two finger breadths above the pubic symphysis. The incision is then continued with sharp scalpel dissection through subcutaneous tissue to the rectus sheath, which is then incised either side of the midline. After exposing the rectus sheath, the incision is extended transversely with heavy curved Mayo scissors. The upper and lower sheath margins are then grasped with a Kocher toothed clamp, to elevate and provide tension on the tissue.

The underlying muscle is then separated by blunt or sharp dissection from the fascia, ensuring haemostasis of the perforating vessels. The rectus muscles are separated bluntly, before the peritoneum is entered sharply in the midline exposing the uterus. In the event of limited exposure or greater access being required, the Maylard or Cherney muscle releasing modifications may be used. The Maylard technique is the dividing of one or both rectus abdominus muscle bodies, taking care for the underlying artery. The Cherney procedure is the release of the tendinous attachment of the muscle as low as possible on the os pubis.

Another incision type has been found to be superior to both of these[2]. The Misgav-Ladach method for caesarean section, as described by Holmgren, Sjöholm and Stark,[3] is based on the Joel-Cohen incision originally introduced for hysterectomy. This is a straight transverse incision somewhat higher than the Pfannenstiel incision. This method is restrictive in the use of sharp instruments, preferring manual manipulation. There is a quicker recovery period, and less use of post-operative antibiotics and analgesics. There is also a shorter anaesthetic and working time for the operative team. As this incision type has not been accepted into daily practice and little data on repeated caesarean section is available, it will not be included in this discussion.

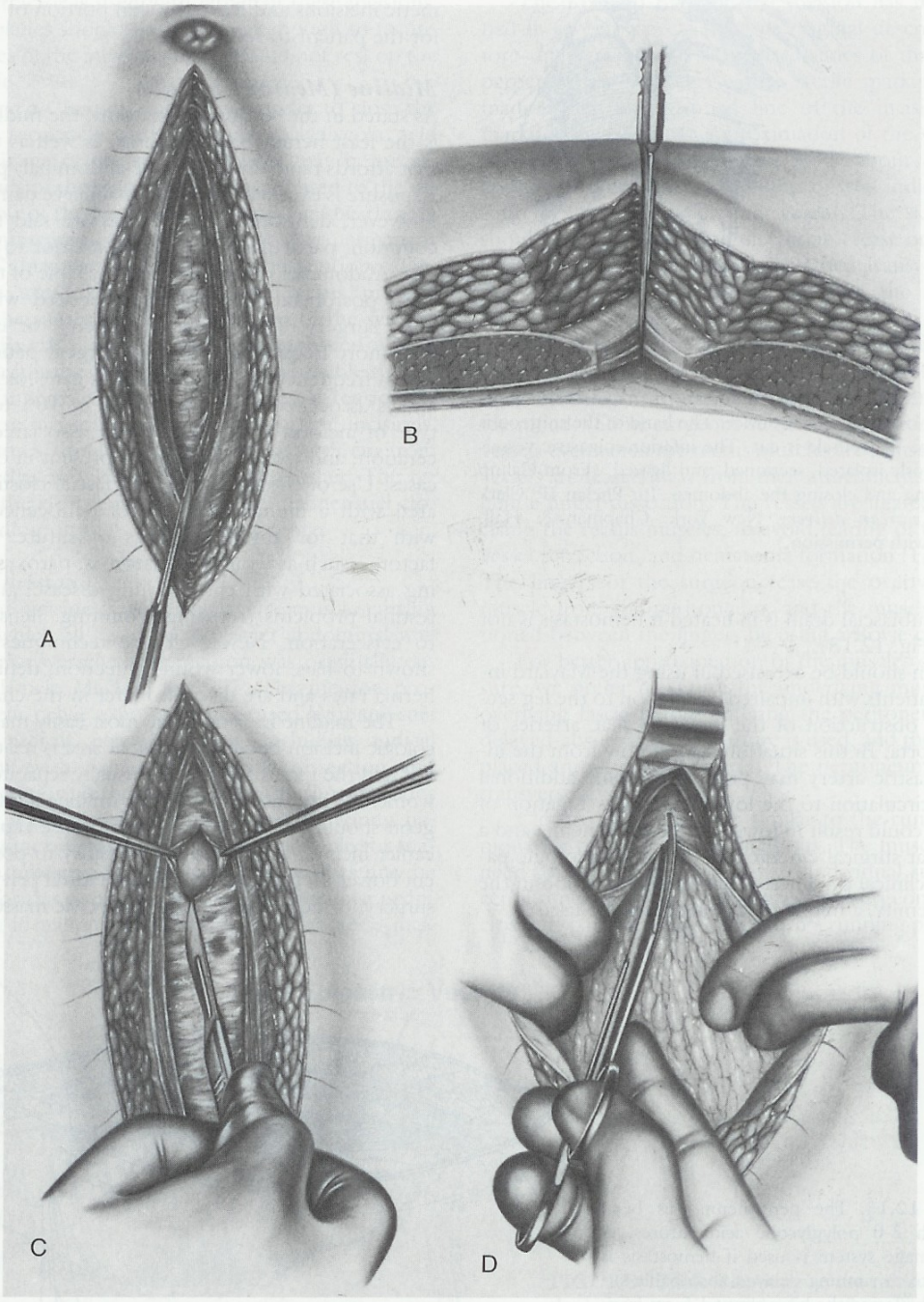


FIGURE 12.14. **A:** Cutting of linea alba in low midline incision with scalpel. **B:** Cross section of abdominal wall showing skin, subcutaneous fat, anterior and posterior rectus sheaths, and underlying peritoneum. **C:** Opening of peritoneum with knife, and demonstration of small bowel protruding into peritoneal opening. **D:** Enlargement of peritoneal opening to the region of the umbilicus with Mayo scissors.

Figure 1 SUMI: Subumbilical Midline Incision

Rock JA, Jones HW. Te Lindes's Operative Gynaecology 9th Ed. Philadelphia: Lippincott Williams and Wilkins,2003. [1]

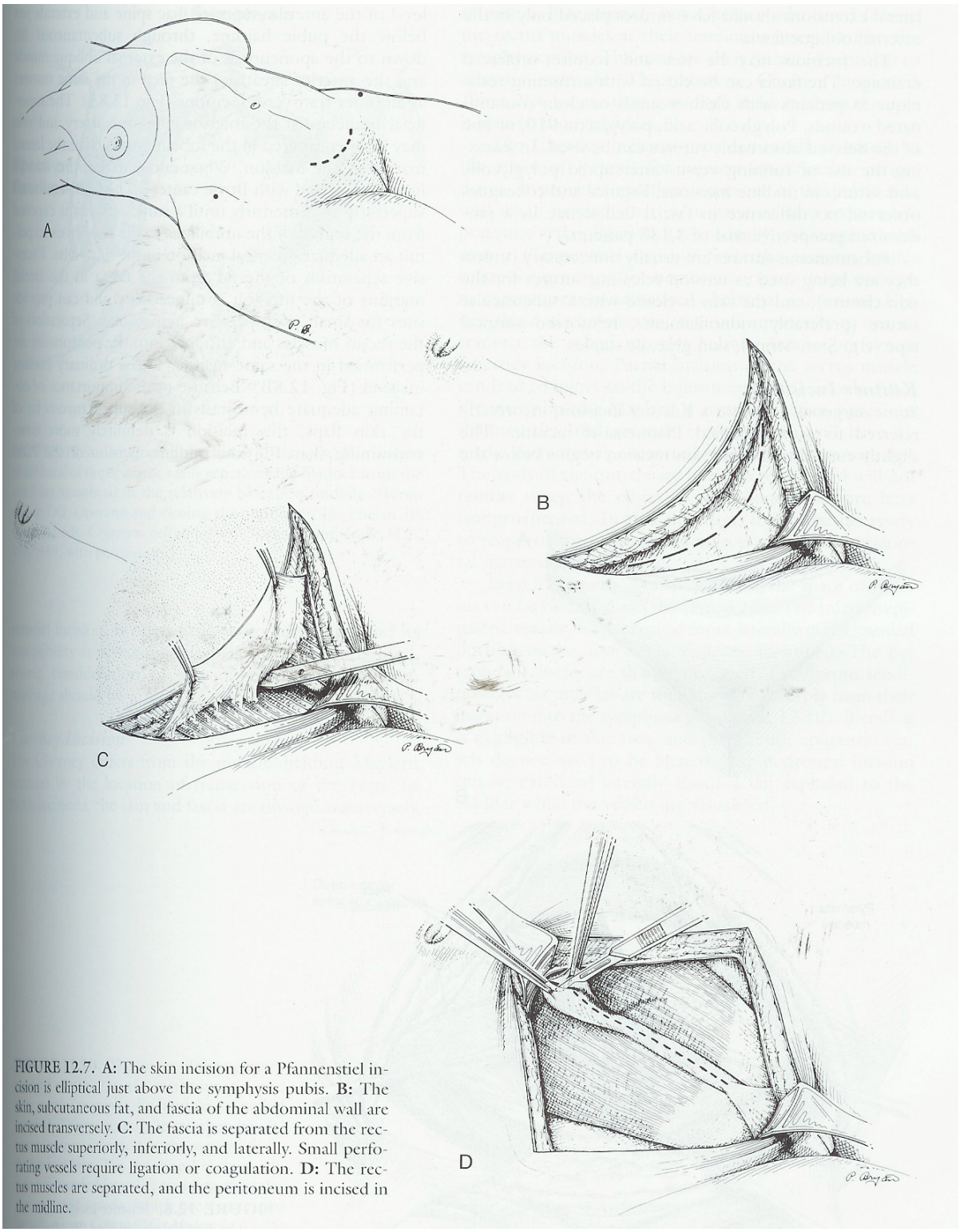


FIGURE 12.7. **A:** The skin incision for a Pfannenstiel incision is elliptical just above the symphysis pubis. **B:** The skin, subcutaneous fat, and fascia of the abdominal wall are incised transversely. **C:** The fascia is separated from the rectus muscle superiorly, inferiorly, and laterally. Small perforating vessels require ligation or coagulation. **D:** The rectus muscles are separated, and the peritoneum is incised in the midline.

Figure 2 Pfannenstiel Incision

Rock JA, Jones HW. Te Lindes's Operative Gynaecology 9th Ed. Philadelphia: Lippincott Williams and Wilkins,2003. [1]

1.2. Current guidelines and preferences

In a study by Tully et al [4] in the United Kingdom, a postal questionnaire was sent to all Members and Fellows of the Royal College of Obstetricians and Gynaecologists (RCOG) resident in the United Kingdom. Information was requested about surgical techniques for elective and emergency caesarean sections. About 78.7% of the members and fellows responded to the questionnaire. A range of incisional techniques was used. There was wide variation in surgical techniques, but Pfannenstiel abdominal entry was used by more than 80% of obstetricians for elective caesarean section.

In the United Kingdom, the National Institute for Clinical Excellence (NICE).[5] have noted that vertical incisions for caesarean section are uncommon, occurring in less than 1% of operations and have largely been replaced by transverse incisions. The guidelines suggest that caesarean section should be performed using a transverse incision because this is associated with less postoperative pain and an improved cosmetic effect compared with a midline incision. They suggest that the transverse incision of choice should use the advantages mentioned of the Joel-Cohen incision (straight incision, 3 cm above the symphysis pubis, bluntly opening subsequent tissue layers and if necessary extended with scissors and not a knife). This is associated with shorter operating times and reduced postoperative febrile morbidity. Concern is only mentioned about research being needed to assess the effect of the various surgical techniques on future surgery such as repeat caesarean section.

While the global trend is towards transverse incisions, vertical incisions are still commonly performed in developing countries. A popular South African manual for district hospitals, authored by Breen,[6] recommends vertical incision, ‘especially for repeat caesarean section’.

From a South African point of view, with a large number of deliveries performed in public sector hospitals, a large motivator for an initial midline incision is that it may be easier to perform and teach. Also, faster entry is gained to the abdominal cavity and better access is available, thus making this technique more acceptable for trainees, junior staff and rural practitioners. In the National Guidelines for Maternity Care in South Africa[7], a handbook published by the Department of Health to assist precisely this group of doctors, several indications for midline incisions are given. These include increased risk of intraoperative haemorrhage such as in a case of antepartum haemorrhage, severe pre-eclampsia or expected difficult delivery, and prolonged labour or rupture of membranes which could lead to an increased risk of postoperative infection.

South African patient and clinician preferences were recently evaluated by Rwakyendela and Buchmann.[8] In a descriptive study undertaken in three state hospitals in Johannesburg, 400 patients were interviewed in a cohort in which 38% of women had vertical cesarean section incisions. The authors found that a majority of women would have chosen transverse incisions if given the choice, thus favouring the cosmetically more acceptable Pfannenstiel type. Clinicians who were interviewed followed the trend towards the Pfannenstiel incision for elective cesarean section delivery (96%) and marginally preferred a midline approach for emergency cesarean section (51%).

1.3. Complications associated with incision types

Local discussion about abdominal skin incisions for caesarean section and their complications is frequent among obstetricians in the Johannesburg public and academic hospitals.

Pfannenstiel incisions are sometimes avoided as they supposedly produce more fibrosis, more adhesions and a higher bladder perforation risk in subsequent caesarean sections. The corollary to this is the perception that the vertical incision may be weaker or prone to dehiscence. The comparison of either type was last evaluated by Haeri [9] in Cape Town in 1976, in a randomized study of 100 transverse and 100 vertical incisions. The author reported an 8 minute longer duration in operating time in transverse incisions, with an increase in midline wound breakdown and sepsis if the cases were performed as emergencies. This may be confounded by the lack of prophylactic antibiotic administration intra-operatively in that era of surgery. Patients were not evaluated on previous caesarean section scarring or followed into their subsequent pregnancies.

Gross [10] reviewed the benefits of a low transverse incision in obese women, finding that Pfannenstiel incisions were associated with less post operative pain and earlier ambulation. This not only improved short-term well-being, but avoids atelectasis and thromboembolism. A more secure closure, less adipose tissue to incise and a better cosmetic effect were also noted. The adverse effects included more wound infection and restriction of access to the infant and the upper abdomen.

Wall et al [11] in New York, USA, reviewed a large series of hospital records (n=239) of obese women with a body mass index (BMI) of greater than 35, having had a primary caesarean delivery. Their findings confirm the commonly held notions and conventional teaching that severely obese parturients have a high incidence of wound complications. The data indicated that a vertical incision was associated with a higher rate of wound complications than a

transverse incision. These complications were defined as seroma, haematoma, cellulitis and purulent wound discharge that led to wound opening.

These findings are explained by a study evaluating the risk factors in abdominal wall sepsis. Vermillion et al [12] in South Carolina, USA prospectively measured the maximum vertical depths of subcutaneous incisions of 140 women who had deliveries by caesarean section. The surgical technique for closure was standardized and drains were not used. Thickness of subcutaneous tissue appeared to be the only significant risk factor associated with abdominal wound infection after caesarean delivery.

A Nigerian surgical department study on hernia formation by Adesunkanmi and Faleyimu [13] showed that the incidence of incisional hernia was influenced by the type of incision. Of the 701 patients who had a caesarean section in the study period, 22 (3.1%) developed an incisional hernia, all of whom had midline incisions. Those who developed incisional hernias also suffered other postoperative complications and had longer hospital stays. The age and parity of the patients, and the indications for caesarean section, did not influence the incidence of incisional hernia in that study.

Hendrix et al [14] attempted to determine whether there was a difference in the frequency of fascial dehiscence between midline vertical lower abdominal and Pfannenstiel incisions among women undergoing obstetric and gynaecologic operations. In Detroit, USA, a case control study on 48 cases of fascial dehiscence in 6 years that complicated 17995 major operations (8950 cesarean section deliveries and 9405 gynaecological procedures) was undertaken. The

authors could not provide data to support the belief that Pfannenstiel incisions are stronger than lower abdominal vertical incisions and thereby reduce the risk for fascial dehiscence. Wound infection was the most important risk factor for fascial dehiscence among women who underwent major obstetric and gynaecological operations.

The NICE guidelines [5] provide a different view on the problem of midline weakness, relating it more to closure technique than type. They quote a meta-analysis of randomised control trials (RCTs) comparing mass versus layered closure of midline incisions in general surgical patients. The mass closure technique is where all the layers of the abdominal wall excluding skin are treated as one and sutured in a running continuous fashion as opposed to suturing each layer separately, specifically the peritoneum and musculoaponeurotic layers in the layered closure (a practice currently rarely performed). This meta-analysis found that incisional hernias and dehiscence were less common with mass closures.

Suture material and techniques in closure at caesarean section are poorly understood and the current Cochrane review by Alderdice et al[15] states that **"**There is currently no conclusive evidence about how the skin should be closed after caesarean section. Questions regarding the best techniques and materials for closure of caesarean section and the associated incidence of infection, local reaction, analgesia requirement and long term cosmetic appearance remain unanswered."

Abdominal wall closure was evaluated in a Cochrane review by Anderson and Gates[16]. They were unable to state if any abdominal wall or rectus sheath closure was superior to another.

The subcutaneous fat may be left to heal, but closing the layer may reduce the risk of haematoma and seroma formation.

The aspect of complications relating to the delivery being an emergency or an elective caesarean section, was investigated by Allen et al[17] in a Canadian population based study of over eighteen thousand patients. They showed that maternal morbidity was increased in caesarean sections in labouring women (emergency) as opposed to elective caesarean sections in non-labouring patients. The results concur with a five year Finnish birth and hospital discharge registry study of 110 717 patients by Pallasmaa et al[18]. They found an increased incidence in severe maternal morbidity (deep venous thromboembolism, amniotic fluid embolism, major puerperal infection, severe haemorrhage, uterine rupture and inversion and events requiring operative intervention after delivery) in emergency compared to elective caesarean section.

1.4. Intra-abdominal adhesions after caesarean section

Adhesion formation with either incision type or peritoneal closure remains a contentious issue. Current consensus is towards non-closure of the visceral and parietal peritoneum as seen in various review articles, [19-21] of RCTs pertaining to facets of caesarean section surgical technique. The NICE guidelines[5] recommend the same. A small Austrian retrospective study by Nather et al [20] reviewed 30 patients who had their primary and repeat caesarean sections in the same institution. They reviewed the difference between initially closed and unclosed peritoneum evaluated at repeat caesarean section. Closure or non-closure of the peritoneum at primary caesarean section did not affect the development of intra-abdominal adhesions at

repeat operation. To confound these broader reviews and guidelines, a recent record review by Hamel[21], of 403 repeat caesarean sections analysed the initial and repeat caesarean section notes of 62 patients that were available and found that closing the peritoneum at primary caesarean section significantly decreased extensive adhesions at repeat caesarean section. There was also a significant difference in the amount of adhesions between closing the rectus muscle and non-closure. Speculating that adhesions result from an open peritoneal cavity exposed to the subfascial space, the authors surmise that the decrease in formation of adhesions following closing the rectus muscle may be due to the parietal peritoneal apposition, because of its proximity to the rectus muscle. Although only a small study, it goes to show that all is not clear in repeat surgery and more research needs to be done.

With increased adhesion formation comes an increased risk of hollow viscus perforation at subsequent surgery, as described by Phipps et al[22] in a case control study undertaken in Washington, USA, which analysed the occurrence of bladder perforations as the primary end point. In 14757 caesarean section deliveries they had 42 perforations and showed that patients with a previous scar had an almost fourfold increased risk for bladder perforation.

A very recent article by Salim et al [23] in Haifa, Israel has brought a new perspective on abdominal scarring and adhesion formation. Although not comparing incision types and scarring, they attempted to use external scar characteristics to predict the incidence and severity of intra-abdominal adhesion formation. The authors enrolled 107 women with repeat caesarean sections into this trial, dividing them into raised, flat and depressed scars. Of these 57% were found to have had no adhesions, 16% had filmy adhesions, and 27% had dense

adhesions. A depressed abdominal scar from a previous caesarean delivery thus correlated well with the incidence and severity of intra-abdominal adhesions when comparing external caesarean section scar appearance.

1.5. Incision type and repeat caesarean section

A thorough search of the medical literature, and consultation with colleagues, did not reveal any research that has addressed repeat caesarean section in terms of incision type. Do the advantages of either approach at primary caesarean section apply equally at repeat operation? For example, if studies could show that a vertical primary incision was followed by easier and less complicated surgery at repeat operation than transverse incision, this would provide some evidence for considering primary vertical incision in certain circumstances. A major obstetric reference work - 'High Risk Pregnancy'[24]- granted this problem a single line saying that evidence is lacking at present. One local text book simply advises that a repeat operation should be done through the same incision as the previous operation.[25]

2. MATERIALS AND METHODS

2.1 Problem Statement and Objectives

There is a need for research to determine if, in a patient with a previous caesarean section, the vertical or Pfannenstiel incision is associated with more complications. This would help

surgeons to either provide patients with a cosmetically and structurally sound wound or real evidence as to why they need to tolerate a more unsightly scar and risk of herniation.

The objectives of this study were, therefore:

- To establish if there is a difference in time taken from incision to delivery of the baby between previous subumbilical midline and previous Pfannenstiel incisions.

-To establish if there is a difference in overall operation time between previous subumbilical midline and previous Pfannenstiel incisions.

-To establish if there is a difference in adhesions found on entry between previous subumbilical midline and previous Pfannenstiel incisions.

- To establish if intra-operative complications are affected by incision type between previous subumbilical midline and previous Pfannenstiel incisions.

2.2. Methods

This was a cross-sectional analytic study comparing surgical findings in women at repeat caesarean section. The study population was all women having repeat caesarean sections at Chris Hani Baragwanath Maternity Hospital and Johannesburg Hospital, both teaching and

tertiary referral institutions attached to the University of the Witwatersrand. These hospitals provide registrar training. Chris Hani Baragwanath Hospital delivers approximately 20 000 women annually, with a caesarean section rate of 27%, and Johannesburg Hospital delivers about 6 000 women annually, with a 40% caesarean section rate.

Data collection was by retrospective review of patients' clinical notes taken during routine repeat caesarean section. It was hoped that the operation notes in the case-files would provide adequate data to provide the necessary information to answer the research questions as stated above. Note-keeping was however erratic, with large inconsistencies in level of detail provided. This has been noted in the literature as a problem by Nicopoullos et al,[26] whose audit showed important omissions in a high percentage of operative delivery notes, with less than 80% of case notes documenting incision time and type, surgical findings of note, type of uterine incision, the presenting part and complete sutures used. There was also considerable confusion about the use of the terminology for level of urgency of non-elective caesarean sections.

It was therefore decided that only the author's own operations would be used for this study, as he was in the habit of making detailed and consistent notes on surgical findings, especially the presence and severity of adhesions. The sample was thus the retrospective review of a consecutive series of the author's own caesarean sections for women with previous operations. Inclusion criteria were any patients with a previous subumbilical midline or Pfannenstiel incision presenting for an emergency or elective caesarean section at the two hospitals.

In personal communication with Dr David Wiseman of the International Adhesions Society, it was clarified that there is no true grading for adhesions. He did however give a coarse grading scheme, Grade 1 being filmy adhesions easily removed with blunt dissection, Grade 2 being firmer adhesions readily responding to scissor dissection, and Grade 3 requiring aggressive sharp dissection. With this grading in mind the author interpreted the notes, with coding of severe adhesions corresponding with a grade 3 adhesion. Comparing SUMI and Pfannenstiel incisions, there seemed to be no obvious difference in these types of adhesions encountered inside the abdomen.

All patients in the study had their repeat incision performed in the same way as the initial scar. There were no specific exclusion criteria as it was a retrospective record review. Data entered from the files included age, parity, indication for previous caesarean section, indication for current caesarean section, clinical and surgical findings, including adhesions, and complications. Start time, baby delivery time, and operation end time were reliably recorded both in theatre registers and anaesthetic charts. Where there was disagreement in time entries, the anaesthetic chart was accepted as the correct time. The study was undertaken during registrar rotations between the hospitals during 2003 and 2004.

2.3. Data Analysis

Data captured from these records was entered on a data sheet (**Appendix 1**) to allow data collection from records at irregular times, and the variables given numerical values, to aid computer capturing. No patient identifying data was included in the capturing. Data was logged and processed with the statistical program Epi Info 6, comparing means and

frequencies. Comparisons of continuous variables by Student's T-test, or the Mann-Whitney test where applicable, were done. Comparisons of frequencies by Chi-squared test or Fischer's exact test were done were applicable. A P-value of less than 0.05 was accepted as indicating statistical significance.

2.4. Ethics

An application for ethical clearance for this study was made to the Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand and was granted 17/11/03 no R14/49 Haacke (**Appendix 2)**.The protocol was also presented to the post graduate committee for use as a research report for the M.Med (O+G) and accepted. Permission to use patient records was granted by the hospital clinical executives and the obstetrics clinical heads of department, of Chris Hani Baragwanath and Johannesburg General Hospital.

2.5. Funding

The cost of the research was borne by the author. No external funding was offered or available.

3. RESULTS

The records of 121 patients were reviewed. Comparison was made of variables between the subumbilical midline incision (SUMI) and Pfannenstiel group. The distribution between the two groups was similar, with 64 subumbilical (53%) and 57 Pfannenstiel (47%) incisions. Of the cases reviewed, 64 were operated on at Chris Hani Baragwanath Maternity Hospital (53%) and 57 at Johannesburg Hospital (47%).

Table 3.1 Obstetric and demographic data of women undergoing repeat caesarean section comparing Subumbilical midline to Pfannenstiel incision

Variable	Subumbilical Midline Incision	Pfannenstiel Incision	Significance
	N = 64	N = 57	P Value
Age (Mean±SD)	30.6 years (±5.1)	28.6 years (±5.7)	0.039
Parity*	1 (1-5)	1 (1-5)	0.70
One previous caesarean	49 (77%)	47 (82%)	0.42
Gestational age*	39 (27-42)	39 (30-42)	0.96
Emergency caesarean section	53 (83%)	51 (89%)	0.29
Sterilisation done	20 (31%)	18 (32%)	0.97

***Medians and ranges indicated**

As seen in Table 3.1, the difference in age of the patients was statistically significant, with the SUMI group having a mean age of 30.6 (± 5.1), compared to 28.6 (± 5.6) in the Pfannenstiel group, with a students T test giving a P value of 0.039. Comparing the time of day of the surgery, 83 (69%) of patients had their operations between 07h00 and 19h00 and 38 (31%) between 19h00 and 07h00, with no statistical significance as regards incision type. Parity ranged from one to five in both groups.

The number of women having one, as opposed to two or more, previous caesareans, did not differ significantly between the previous SUMI and Pfannenstiel groups (77% v. 82%). Gestational age, compared by incision type, showed a very similar spread with a median gestation of 39 weeks for SUMI (range 27-42) and 39 weeks for Pfannenstiel (range 30-42). Emergency caesarean section rates were similar in the SUMI and Pfannenstiel groups (83% v. 85%).Bilateral tubal ligation was performed similarly evenly between the groups (31% for SUMI and 32% for Pfannenstiel incisions)

Table 3.2 Intraoperative findings at repeat caesarean section, comparing Subumbilical midline to Pfannenstiel incisions.

Variable	Subumbilical Midline Incision	Pfannenstiel Incision	Significance
	N = 64	N = 57	P Value
Time from incision to delivery (Minutes)*	4.0 (2-16)	5.5 (3-9)	<0.0001
Time from incision to end of surgery (Minutes)*	32.4 (27-150)	34.5 (23-105)	0.13
Old scar excised	55 (86%)	17 (30%)	<0.0001

Severe adhesions in anterior abdominal wall	23 (36%)	29 (51%)	0.10
Severe adhesions to bladder	9 (14%)	9 (16%)	0.79
Severe adhesions to Corpus Uteri	5 (8%)	9 (16%)	0.17

***Medians and ranges indicated**

The median time taken from start of operation to delivery of the infant showed a significant advantage in the SUMI group as seen in **Table 3.2**, SUMI taking a median time of four minutes (Range 2-16) compared to five and a half minutes (Range 3-9) for the Pfannenstiel group (P<0.0001).When total operating time was taken into account, comparing both groups, the median times were: SUMI 32.4 minutes (range 27-150) and Pfannenstiel 34.6 minutes (23-105), with a P value of 0.13.

Excision of the previous skin scar was performed in 86% of previous SUMI and in 30% of previous Pfannenstiel incisions (P<0.0001). Scar excision was associated with a shorter incision to delivery time (median 4.4, range 2.7-11.1) than incision through the scar (median 5.4, range 2.0-16.0; P=0.013 [Mann-Whitney test]).

Severe adhesions on the anterior abdominal wall were less frequent with SUMIs (36%) than with Pfannenstiel incisions (51%; P=0.10). Severe bladder adhesions occurred with similar frequency in the two groups (14% and 16% with SUMI and Pfannenstiel incisions respectively). Severe adhesions to the corpus uteri were less common in SUMI (8%) than in previous Pfannenstiel incisions (16%; P = 0.17). All cases in both groups had a previous transverse lower segment uterine incision.

Table 3.3 shows the breakdown of indications for the present repeat caesarean section compared by incision type and **Table 3.4** shows indications for the previous caesarean sections. These are grouped and compared by incision type.

Table 3.3 Indications for caesarean section according to incision type.

Indication	**Subumbilical Midline Incision**	**Pfannenstiel**
	N=64	N=57
1: No Progress	19	21
2: Fetal Distress	17	12
3: Two Previous Caesarean sections	11	9
4: Breech	3	3
5: PIH	3	5

6: Other	11	7

Table 3.4 Indication for previous caesarean section compared to incision type.

Previous indication	**Subumbilical Midline Incision**	**Pfannenstiel**
	N=64	N=57
1: No Progress	30	24
2: Fetal Distress	7	4
3: Breech	6	7
4: PIH	2	5
5: Two Previous Caesarean sections	0	0
6: Other	6	9
7. Unknown	13	8

Severe adhesions were more frequent when there was more than one previous caesarean section, as shown in **Table 3.5** Abdominal wall adhesions occurred in 72% of cases who had more than one previous operation, compared with 35% of cases who had only one previous caesarean section (P=0.001). Adhesions to the uterus were also more frequent in the more than one previous caesarean section group (24% v. 8%; P=0.029).

Table 3.5 Frequency of severe adhesions in women with one previous caesarean section and in women with more than one previous caesarean section.

Type of severe adhesion	**One previous caesarean section**	**More than one previous caesarean section**	**Significance**
	N = 96	N = 25	P Value

Abdominal wall	34 (35%)	18 (72%)	0.001
Bladder	12 (13%)	6 (24%)	0.15
Uterus	8 (8%)	6 (24%)	0.029

Some serious surgical complications were encountered. In a woman with a previous Pfannenstiel incision, the bladder was found to be morbidly adherent to the uterus and was torn open during delivery of the fetal head. Another patient with a Pfannenstiel incision had severe omental adhesions to the uterine scar and uterus. Rather more complications were noted in women with previous subumbilical incisions. In one woman, the bladder was found to be encased in anterior abdominal wall scar tissue and was accidentally opened during dissection. In another patient the full anterior surface of the uterus was found to be fused to the entire length of the abdominal wall scar. Another woman with a SUMI had the uterus encased in bowel, with ileocolic adhesions covering the right fundus, and the sigmoid colon adherent from the posterior uterine surface up to the left fundus and down the left broad ligament. One patient with a SUMI also had the uterus rotated 90 degrees due to severe pillar adhesions (Thick columnar scar tissue bridges between uterus and anterior abdominal wall). There were also three patients with severe omental adhesions to the uterus and anterior abdominal wall.

4. DISCUSSION

The results presented give a good set of data that goes some way to answer the research questions. The two groups seem evenly matched in potentially confounding variables such as the place of surgery, time of surgery, parity, number of previous caesarean sections, emergency or not, and sterilization done. The age difference of the patients in the two groups, with older patients more likely to have had a SUMI, may possibly be attributed to the fact that there has been a steady change in practice, with younger patients having more Pfannenstiel incisions. This may suggest that presently a patient is more likely to have a Pfannenstiel than in earlier years. Delivery time taken was shown to be significantly shorter in the SUMI group. This, combined with a higher incidence of scar excision in the subumbilical midline incision,

should go to prove that the delivery time may actually be even faster if an unsightly scar were not removed in an emergency. This is based on the fact that although unrecorded so far, it technically takes longer to excise a large scar than to make a single incision through it. On reviewing the notes it was shown that there were no fixed criteria for excision of old scars, but these were usually noted as large or unsightly.

Total operating time seemed to be no different, which is difficult to explain as in the SUMI group the access is faster and visualization supposedly better. It is possible that closure in the Pfannenstiel operation is easier and more rapid, in view of less tension on the rectus sheath and abdominal wall. The trend to greater frequency of severe adhesions in the anterior abdominal wall in the Pfannenstiel group supports the assumption that the scar is more fibrotic and difficult to dissect. This also might help to explain the longer entry or delivery time in the same group. An interesting finding is that scar excision was associated with a reduced incision to delivery time of a minute. This may be due to improved surgical exposure.

These indications for the current caesarean section and for the previous operations, as shown in **Tables 3.3** and **3.4**, indicate that there was an even spread between the two groups. These also represent a similar profile to that found in daily practice and thus prove to be a representative population. Not surprisingly, severe adhesions were more frequent in women with more than one previous operation.

Controlling the variables was not possible as the data was gleaned from records and the data was only as good as the clinicians' entries. One can only rely on the staff integrity at operation

and the knowledge that they would be as accurate as possible for medicolegal reasons. As this was not a randomized control trial, bias will be present and cannot be avoided. It is recognized that the type of initial caesarean incision scar made is not random. Certain indications, clinical or logistical, may have made a certain incision a better option and also alter scar adhesions found at subsequent operation. An example of this might be a patient having had a caesarean section for chorioamnionitis in a case of preterm rupture of membranes. The surgeon may more likely have performed a midline incision, knowing that the patient may have a poorly formed lower segment and may need a classical uterine incision. She would have a higher risk of post partum sepsis and would likely have worse adhesions and scar formation, independent of the type of incision, at the next operation.

Severe complications found were dramatically more in the SUMI group (seven to two). These can unfortunately not be solely ascribed to the incision type, but may possibly have been modified by factors such as mentioned in the scenario above. These complications noted usually required skilled dissection and in some cases general surgical experience, which would negate the advantage mentioned that repeat SUMI is easier in less skilled or junior hands. The results of this study, being based on a series of caesarean sections performed by a single experienced surgeon, who has done more than 2000 caesarean sections, may not be generalisable to other settings, especially where very inexperienced practitioners are forced to perform repeat caesarean sections.

5. CONCLUSIONS

This study, although not having the power of a prospective trial, goes some way to address a topic about which very little is written in the literature.

Our incision type is often guided by empirical thinking or personal opinion. In these days of evidence based medicine, studies on these vague areas must be encouraged and pursued. Although this local study is too small to make sweeping recommendations it certainly has helped to bring some facts to the fore that may influence practitioners' actions or ways of thinking. The facts presented here unfortunately would still have little bearing on the initial incision type, as the initial practitioner is rarely thinking of the problems of the repeat caesarean section. The primary incision type would depend on the presenting clinical scenario, level of skill, support and local practice.

What it does show is that with someone adequately trained in both techniques there is a faster entry in the previous SUMI group, but not a shortened total operation time. Very little difference is noted in adhesions found inside the abdomen, but there is probably a tougher abdominal wall scar to cut through in a Pfannenstiel type entry. The advantages in the previous SUMI group should be weighed up against a potential body of severe complications encountered in this series. Thus the initial decision on incision type is still in the hands of the first surgeon who must balance possible intra operative functionality with the patient's need for a cosmetically acceptable scar.

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