

## Abdominal Fascial Closure in Obstetrics: Comparison of Outcome Between Layer and Mass Closure \*

Eziamaka P. Ezenkwele<sup>1</sup>, Uzochukwu. U Aniebue<sup>2</sup>, Cyril. C Ezenyeaku<sup>1</sup>

Department of Obstetrics & Gynaecology, <sup>1</sup>University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu, Nigeria and <sup>2</sup>College of Medicine University of Nigeria Enugu Campus, Nigeria.

### Abstract.

Background: Midline laparotomies are in common use in obstetrics for caesarean section and other obstetric laparotomies. Current challenges in this surgical approach include the best approach to the repair of the abdominal wall incision, the optimal suture material for its fascial repair and poor cosmetic outcome of the scar.

Objective: The study was to compare the outcome of layer and mass closure for midline abdominal incisions following caesarean section.

Methodology: A randomized prospective study was carried out at the Colliery Hospital Enugu between 2001 and 2006. One hundred and six consenting parturients were randomized into layer (52) and mass closure (54) groups. Outcome measures were defined and the patients followed up at six weeks, 6 months and in the next pregnancy. Statistical analysis utilized Chi-square test and p-value of less than 0.05 was regarded as significant.

Results: The mean age of the parturients was 30.0 ± 5.1 years and the majority of parturients were multiparous (65%). The average duration of surgery was significantly shorter in mass closure than layer closure (43.1 vs 53.4 minutes; p < 0.001). There was no statistically significant difference in the duration of hospitalization between the two groups. The incidence of wound sepsis was higher in the mass closure than layer group (5.5% vs 1.9%) but intra-abdominal and peritoneal adhesions were commoner in the layer group. The only case of incisional hernia (1.5cm) was in the mass closure group.

Conclusion: Mass closure reduces operative time, exposure to anaesthesia and is cost effective. It is recommended as a relatively safe method of abdominal fascial closure in caesarean section.

Key Words: Abdominal Fascia, Suturing, Layered Closure, Mass Closure

### Introduction

Midline laparotomies are in common use in obstetrics because they are easy to give, bloodless and give rapid access into the abdomen. Midline laparotomies give adequate exposure for most obstetric operations and are easy to extend. They are particularly useful in fetal distress, repeat caesarean section in women who had prior midline scar and where rupture of the uterus is suspected to have complicated obstructed labour. Transverse abdominal incisions in some of these conditions are unsuitable, give less exposure and have no proven advantage over midline incisions in significantly reducing the occurrence of incisional hernia<sup>1</sup>.

The choice of abdominal fascial closure is often based on the surgeon's preference which usually reflects surgical traditions acquired through apprenticeship while in training and anecdotal

experience. Layer closure is described as the anatomical closure of the abdomen in its various layers while mass closure involves the closure of all layers of the abdominal wall except for the skin in one layer. Mass closure became known as Smead-Jones technique following the independent description of the same method by Smead (1900) and Jones (1914)<sup>2</sup>. Although layer and mass closure techniques have extensively been studied in general surgery, obstetricians are slow at accepting mass closure as an alternative to layer closure in midline laparotomies and caesarean sections. There is consequently a paucity of reported experience of mass closure in literature for obstetric operations.

---

Correspondence: Dr. E.P Ezenkwele, Department of Obstetrics & Gynaecology, University Of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Nigeria.  
E-mail: e\_ezenkwele@yahoo.com

*\*This paper won the Majekodunmi Young Investigators' Award at the 42<sup>nd</sup> Annual Scientific Conference of SOGON in November 2008.*

**Table 1.** Characteristics of the Parturients Studied and Type of Surgery

CHARACTERISTICS	FREQUENCY	%
<b>AGE.</b>		
20 -24	15	14.1
25 -29	27	25.5
30 -34	43	40.6
35 -39	18	17.0
40 and above	3	2.8
<b>PARITY.</b>		
Para 0	31	29.3
Para 1 -4.	65	61.3
Para e 5	10	9.4
<b>BOOKING STATUS.</b>		
Booked	101	95.3
Unbooked	5	4.7
<b>OCCUPATION</b>		
House wives/Petty Trader	74	69.8
Junior Office worker/ Artisan	30	28.3
Senior Civil Servant	2	1.9
<b>MARITAL STATUS</b>		
Married	106	100.0
<b>TYPE OF SURGERY</b>		
Emergency Caesarean Section	47	44.3
Elective Caesarean Section	59	55.7

This study examines the differences between layer and mass closure in caesarean section in a hospital with limited resources. Repeat caesarean section for obstetric indications provided the added advantage of permitting a second look at the abdomen during the study. The occurrence of wound sepsis, wound pain, wound dehiscence, incisional hernia and intra-operative finding at repeat caesarean section were studied and analyzed.

#### Methodology

The Colliery Hospital is a sub-urban hospital in Enugu Nigeria. It was started as a Federal government sponsored occupational hospital to care for coal miners and their families but was subsequently opened up to the general public. It had full maternity services with two consultant obstetricians and medical officers. The study was

cleared by the hospital's ethical committee and carried out between January 2001 and December 2006. Women who needed caesarean section were counseled and written informed consent obtained from them before enrollment. Routine blood tests were done to assess their surgical and anaesthetic fitness. Exclusion criteria included those with chronic cough, asthma, diabetes mellitus, sickle cell disease, cardiac diseases and those who were positive for human immunodeficiency virus. The parturients were assigned to layer or mass closure by balloting using the opaque envelope technique just prior to the operation. All surgeries were done by the same consultant obstetrician as an emergency or elective operation under general anaesthesia. Each parturient was given 500 mg amoxil, 80mg gentamycin and 500mg metronidazol intravenously immediately after induction of anaesthesia. These drugs were

**Table 2:** The Distribution of the Parturients and Type of Surgery into Mass and Layer Closure Groups

CHARACTERISTICS	MASS CLOSURE (n = 54)	(%)	LAYER CLOSURE (n = 52)	(%)
<b>AGE.</b>				
20 -24	6	(11.1)	9	(17.3)
25 -29	18	(33.3)	9	(17.3)
30 -34	21	(38.9)	22	(42.3)
35 -39	8	(14.8)	10	(19.2)
40 and above	1	(1.9)	2	(3.9)
<b>PARITY.</b>				
Para 0	18	(33.3)	13	(25.0)
Para 1 -4.	30	(55.6)	35	(67.3)
Para e 5	6	(11.1)	4	(7.7)
<b>BOOKING STATUS.</b>				
Booked	50	(92.6)	51	(98.1)
Unbooked	4	(7.4)	1	(1.9)
<b>OCCUPATION</b>				
House wives/Petty Trader	40	(74.1)	34	(65.4)
Junior Office worker/ Artisan	13	(24.1)	17	(32.7)
Senior Civil Servant	1	(1.8)	1	(1.9)
<b>TYPE OF SURGERY</b>				
Emergency Caesarean Section	27	(50.0)	20	(38.5)
Elective Caesarean Section	27	(50.0)	32	(61.5)

continued after surgery for seven days.

A subumbilical midline incision of the abdomen was given extending from just below the umbilicus to the pubis. When there was the need to increase the exposure the incision was extended around the umbilicus. The fascia was opened with a knife and the incision continued into the abdomen. Mass closure was with a single loop of continuous non-locking number 2 nylon suture (Nurolon: Ethicon, Inc. NJ) placed 1.0 1.5 cm apart and at least 2cm from the edge of the wound. Skin closure was with mattress suture using number 2/0 nylon. Layer closure utilized chromic catgut for the peritoneum and subcutaneous tissue and number 2 nylon suture for the rectus sheath as continuous non-locking sutures placed 0.5 1.0 cm apart. The skin closure was similar to that of mass closure. No subcutaneous drains were inserted.

Patient's demographic, pre- and post operative haematocrit, duration of surgery including the time of incision to closing the skin, blood transfusion, daily observation for wound infection and duration of hospitalization as well as the outcome of the wound were documented. In the outpatient follow-up clinics the wound was inspected and incisional hernia tested for by instructing the patient to strain while the scar was being palpated. Any palpable defect was regarded as an incisional hernia. Any prulent discharge from the wound was regarded as sepsis even in the absence of a positive bacterial culture result. Tissue reactivity was defined as hyperaemia at the suture site and wound dehiscence as spontaneous suture disruption. Wound dehiscence was superficial when the fascia remained intact and deep if the fascia was disrupted with or without evisceration of the content of the abdomen. Out patient follow-up was at six weeks, six months postpartum and in

**Table 3:** Indications for Caesarean Section and Types of Abdominal Repair

INDICATION	MASS CLOSURE (%) (n = 54)	LAYER CLOSURE (%) (n = 52)	TOTAL (%) (n = 106)
Previous caesarean section	23 (42.6)	20 (38.4)	43 (40.6)
Obstructed labour	7 (13.0)	6 (11.5)	13 (12.3)
Poor progress of labour	5 (9.2)	6 (11.5)	11 (10.4)
Failed induction	4 (7.4)	5 (9.6)	9 (8.5)
Pre- eclampsia	4 (7.4)	3 (5.8)	7 (6.6)
Malpresentation	2 (3.7)	4 (7.7)	6 (5.7)
Multiple pregnancy	3 (5.5)	2 (3.9)	5 (4.7)
Previous myomectomy	-	3 (5.8)	3 (2.8)
Fetal macrosomia	-	3 (5.8)	3 (2.8)
Antepartum haemorrhage	2 (3.7)	-	2 (1.9)
Cord accident	2 (3.7)	-	2 (1.9)
Bad Obstetric History	1 (1.9)	-	1 (0.9)
Fetal distress	1 (1.9)	-	1 (0.9)

the next pregnancy. Following enlistment re-categorization was not done in women who required caesarean section in the subsequent pregnancy.

Data analysis utilized the SPSS version 10 statistical software program and chi-square test was done to test for statistical significance. P-values less than 0.05 were regarded as being statistically significant.

### Results

One hundred and six consenting women who required caesarean section were randomly assigned to layer and mass closure. Table 1 shows the socio-demographic characteristics of the women studied and also the operations done. Most of the parturients (40.6%) were 30-34 years old. Their age ranged from 20 to 41 with a mean of  $30.0 \pm 5.1$  years. The mean parity was  $3.3 \pm 2.5$ . 95.3% of the parturients were booked and 69.8% were house wives and petty traders. Most of the operations were elective caesarean sections. The distribution of parturients and the type of caesarean section into mass closure and layer closure following randomization is shown in Table 2. The groups showed no statistically significant difference.

Table 3 shows the indications for caesarean section in the women studied. Repeat caesarean section (40.6%), obstructed labour (12.3%), and poor progress in labour (10.4%) were the

commonest indications. The outcome of the abdominal closure is shown in Table 4. The mean duration of surgery was  $53.4 \pm 6.6$  minutes for layer closure and  $43.1 \pm 4.7$  minutes in mass closure ( $p < 0.0001$ ). The mean duration of hospitalization was  $7.8 \pm 0.3$  days in mass closure and  $8.6 \pm 0.7$  days in layer closure ( $p = 0.08$ ). Wound sepsis was commoner with mass closure but the only case of superficial wound dehiscence was in layer closure. One woman who had mass closure was noted at six months post partum to have a small incisional hernia of about 1.5cm width which was repaired in her next pregnancy. Table 5 shows the finding in sixteen women who required caesarean sections in their next pregnancies while being followed up. The main complications seen were peritoneal and intra-abdominal adhesions. These adhesions were commoner in layer than mass closure.

### Discussion

The optimal approach to closure of midline abdominal incisions remains contentious. Although several comparisons and meta-analysis have been done no universally accepted technique exists<sup>3</sup>. The quality of any abdominal closure technique has been assessed by the ease and speed in its application, cost-effectiveness and the associated early and late complications<sup>2,4,5</sup>. The single loop mass closure used in this study significantly reduced the intra-operative and consequently the parturients exposure to

**Table 4:** The Types of Fascial Closure and the Outcome.

OUTCOME MEASURE	MASS CLOSURE (%) (n = 54)	LAYER CLOSURE (%) (n = 52)	P-VALUE
<b>DURATION OF SURGERY(min)</b>			
40 - 44	9 (16.7)	1 (1.9)	
45 - 49	37 (68.5)	3 (5.8)	
50 - 54	5 (9.2)	13 (25.0)	
55 - 59	1 (1.9)	10 (19.2)	
60 and above	2 (3.7)	25 (48.1)	< 0.001
Mean Duration	43.1	53.4	
<b>HOSPITALIZATION (days)</b>			
7	2 (3.7)	1 (1.9)	
8	45 (83.3)	50 (96.2)	
9 and above	7 (13.0)	1 (1.9)	0.08
Mean Duration	8.6	7.8	
<b>IMMEDIATE COMPLICATIONS</b>			
Wound sepsis	3 (5.5)	1 (1.9)	
Superficial Dehiscence	0	1 (1.9)	
Vesico vaginal fistula	1 (1.9)	0	
No complication	50 (92.6)	50 (96.2)	Not done
<b>LATE COMPLICATION (at 6 months)</b>			
Incisional Hernia*	53 (98.1)	52 (100.0)	Not done
None			

\*Small hernia of about 1.5cm.

anaesthesia. The number of sutures used for the repair was similarly much less in mass closure than layer closure. This finding was corroborated by Shittu et al in their retrospective analysis of 134 women who had laparotomy for ruptured uterus in Zaria Nigeria<sup>6</sup>. Mass closure in that study was associated with lower cost, speed and greater safety than layer closure. A number of other studies agree with these findings<sup>2,7,8</sup>.

Proponents of layer closure argue that it gives a more anatomical closure of the wound. In a large retrospective study Tocchi et al<sup>9</sup> suggested that mass closure in comparison with layer closure resulted in more cases of wound infection and hernia. Wound sepsis was commoner in the mass closure group than layer closure in this study and the only case of incisional hernia was in the mass closure group. The number of cases involved was however too small to be subjected to statistical analysis. The incisional hernia was small and occurred in the absence of wound infection. It was probably due to mechanical factors or an error in suture placement. Some other studies and meta-analysis suggest that mass closure significantly reduces the incidence of wound

dehiscence and incisional hernia<sup>2,5,10,11</sup>. It may be speculated the wound sepsis seen in mass closure in this study might be due to the high rate of tissue reactivity which occurs when mass closure is done with non absorbable sutures, in particular nylon<sup>2</sup>. This tissue reactivity is not significantly associated with wound dehiscence as the tensile strength of the wound is retained but there is increased rate of wound pain, sinus formation and button hole hernias<sup>2,4</sup>. Some recent studies now suggest the use of slowly absorbed sutures like polydioxanone (PDS) or polypropylene (Prolene) in mass closure<sup>5,7</sup>. Polydioxanone and polypropylene are not always readily available in poor resource centres and were not used in this study. Peritoneal and intra-abdominal adhesions were commoner with layer than mass closure. Peritoneal closure done in both groups is now known to be associated with increased risk of peritoneal adhesions<sup>2</sup>. Its continued use needs to be reconsidered.

The failure of abdominal wound closure increases post operative morbidity as well as the cost of treatment. Mass closure with a single

**Table 5:** Finding at Repeat Caesarean Section in 16 Previously Randomized Women in Their Next Pregnancy

COMPLICATION	MASS CLOSURE (%) (n =4)	LAYER CLOSURE (%) (n = 12)
Minor omental/peritoneal adhesions	1 (25.0)	6 (50.0)
Intra-peritoneal/Gut adhesions	1 (25.0)	2 (16.7)
No complication	2 (50.0)	4 (33.3)

loop monofilament suture (nylon) used in this study is ease to do, cheap and nylon is readily available. Both techniques of abdominal closure used in this study were associated with minimal

post-operative morbidity but mass closure had the added advantage of significantly reducing intra-operative time. Mass closure deserves wider use in obstetric operations.

## References.

- O'Dwyer P.J, Courtney C.A. Factors involved in abdominal wall closure and subsequent incisional hernia. *Surgeon* 2003; 1: 17 22.
- Ceydeli A, Rucinski J, Wise L. Finding the best abdominal closure: An evidence-based review of; the literature. *Curr Surg* 2005; 62: 220 225.
- Knaebel H, Koch M, Sauerland S, Diener M.W, Seller C.M. Interrupted or continuous slowly absorbed sutures Design of a multi-centre randomized trial to evaluate abdominal closure technique INSECT- Trial. *BMC Surgery* 2005; 5: 3 [http://www.biomedcentral.com/14712482/5/3].
- Gabrielli F, Potenza C, Pietro P, Sera F, Masini C, Abeni D. Suture materials and other factors associated with tissue reactivity, infection and wound dehiscence among plastic surgery out patients. *Plast Reconstr Surg* 2001; 107: 38 45.
- Van't R. M, Steyerberg E.W, Nellensteyn J, Bonjer H. J, Jeekel J. Meta-analysis of techniques for closure of midline abdominal incisions. *Br J Surg.* 2002; 89: 1350-1356.
- Shittu OS, Ifenne DI, Ekwempu CC. A simple mass-closure technique compared with layered technique in the closure of high risk abdominal wounds. *West Afr J Med* 1995; 14: 11-14.
- Pearl M.L, Rayburn W.F. Choosing abdominal incision and closure techniques: a review. *J Reprod Med* 2004; 49: 662 670.
- Meunier J.K, Mangan C.E. Running mass closure using looped polydioxanone suture in a high risk population. *J Gynecol Surg* 2003; 19: 157 160.
- Toochi A, Liotta G, Mazzoni G, Lepre L, Costa G, Agostin N, Tomel B, Miccini M, Giuliani A. Layered and mass closure of median laparotomies. *G. Chir* 2000; 21: 463 468.
- Chowdhury S.K, Choudhury S.D. Mass closure versus layer closure of abdominal wound: a prospective clinical study. *J India Med Assoc.* 1994; 92: 229 232.
- Hodgson N.C, Malthaner R.A, Ostbye T. The search for an ideal method of abdominal fascial closure: A meta-analysis. *Ann Surg.* 2000; 231: 436 442.