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

Eziamaka P. Ezenkwele 1, Uzochukwu U Aniebue 2, Cyril C Ezenyeaku 3
Department of Obstetrics & Gynaecology, 1University of Nigeria Teaching Hospital Ituku-Ozalla, Enugu, Nigeria and 2College 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 assess into the abdomen. Midline laparotomies give adequate exposure for most obstetric operations and are ease 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 1.

The choice of abdominal fascial closure is often based on the surgeons 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 abdominal incision 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) 1. 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 42nd Annual Scientific Conference of SOGON in November 2008.
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, cardiacl 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, 80 mg gentamycin and 500 mg metronidazol intravenously immediately after induction of anaesthesia. These drugs were provided the added advantage of permitting a second look at the abdomen during the study.

Table 1: Characteristics of the Parturients Studied and Type of Surgery

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

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

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

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 evacuation of the content of the abdomen. Out patient follow-up was at six weeks, six months postpartum and in continued after surgery for seven days.
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 ± 5.1 years. The mean parity was 
3.3 ± 2.5. 95.3% of the parturients were booked 
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-
analyse have been done, no universally accepted 
technique exists. 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. 
The single loop mass closure used in this study 
significantly reduced the intra-operative and 
consequently the parturients exposure to 
anaesthesia. The number of sutures used for the 
repair was significantly 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. 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.

Proponents of layer closure argue that it gives a 
more anatomical closure of the wound. In a large 
retrospective study, Tocchi et al suggested that 
layer closure in comparison with mass closure 
results in more cases of wound infection and 
hernia. Wound sepsis was commoner with mass closure 
but the only case of superficial wound 
healings was in layer closure. One woman who had 
mass closure was noted at six months 
who had mass closure was noted at six months 
past 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.

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 ± 6.6 minutes for 
layer closure and 43.1 ± 4.7 minutes in mass 
closure (p < 0.0001). The mean duration of 
hospitalization was 7.8 ± 0.3 days in mass closure 
and 8.6 ± 0.7 days in layer closure (p = 0.08). Wound 
sepsis was commoner with mass closure but the 
only case of superficial wound wound 
healings was in layer closure. One woman who had 
mass closure was noted at six months 
who had mass closure was noted at six months 
past 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-
analyse have been done, no universally accepted 
technique exists. 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. 
The single loop mass closure used in this study 
significantly reduced the intra-operative and 
consequently the parturients exposure to 
dehiscence and incisional hernia. It may be 
spelulated that 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 
picicular nylon. 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. Some 
recent studies now suggest the use of slowly 
suture materials such as polydioxanone, PDS 
and polypropylene (Prolene) in mass closure. 

Proponents of layer closure argue that it gives a 
more anatomical closure of the wound. In a large 
retrospective study, Tocchi et al suggested that 
layer closure in comparison with mass closure 
results 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 
ocurred 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 
anaesthesia. The number of sutures used for the 
repair was significantly 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. 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.

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

<table>
<thead>
<tr>
<th>OUTCOME MEASURE</th>
<th>MASS CLOSURE (%)</th>
<th>LAYER CLOSURE (%)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DURATION OF SURGERY (min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 - 44</td>
<td>9 (16.7)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>45 - 49</td>
<td>37 (68.5)</td>
<td>3 (5.8)</td>
<td></td>
</tr>
<tr>
<td>50 - 54</td>
<td>5 (9.2)</td>
<td>13 (25.0)</td>
<td></td>
</tr>
<tr>
<td>55 - 59</td>
<td>1 (1.9)</td>
<td>10 (19.2)</td>
<td></td>
</tr>
<tr>
<td>60 and above</td>
<td>2 (3.7)</td>
<td>25 (48.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>MEAN DURATION</td>
<td>43.1 ± 53.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOSPITALIZATION (days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2 (3.7)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>45 (83.3)</td>
<td>50 (96.2)</td>
<td>0.08</td>
</tr>
<tr>
<td>9 and above</td>
<td>7 (13.0)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>MEAN DURATION</td>
<td>8.6 ± 7.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMMEDIATE COMPLICATIONS

<table>
<thead>
<tr>
<th>COMPLICATION</th>
<th>MASS CLOSURE (%)</th>
<th>LAYER CLOSURE (%)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound sepsis</td>
<td>3 (5.5)</td>
<td>1 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Superficial Dehiscence</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Vesico-vaginal Fistula</td>
<td>1 (1.9)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>No complication</td>
<td>50 (92.6)</td>
<td>50 (96.2)</td>
<td>Not done</td>
</tr>
</tbody>
</table>

LATE COMPLICATION (at 6 months)

<table>
<thead>
<tr>
<th>COMPLICATION</th>
<th>MASS CLOSURE (%)</th>
<th>LAYER CLOSURE (%)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisional Hernia*</td>
<td>1 (1.9)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>52 (98.1)</td>
<td>52 (100.0)</td>
<td>Not done</td>
</tr>
</tbody>
</table>

*Small hernia of about 1.5cm.
loop monofilament suture (nylon) used in this study is easy 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.