Selective surgical management of penetrating anterior abdominal wounds at the Angau Memorial Hospital: a prospective study

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SUMMARY

Trauma is a leading cause of admissions to the surgical ward in Papua New Guinea (PNG), accounting for about 35% of cases. Of these, 15% of cases are abdominal injuries, of which 19% are penetrating injuries. Selective surgical management of patients with a low-velocity anterior abdominal wound (AAW) is beneficial in some patients. Aim: To determine if selective surgical management is a viable therapeutic option in PNG. Methods: A non-random prospective study of consecutive cases was done on 60 patients with an AAW based entirely on clinical symptoms and signs. The outcome measures were length of hospital stay, morbidity and mortality. Data were analysed using SPSS 10.0 for Windows and Microsoft Excel. Results: Immediate laparotomy was done on 24 (40%) of cases and 36 (60%) had nonoperative conservative management, of which 6 (17%) failed and went on to have laparotomy on demand. The average hospital stay was 4 days shorter (p = 0.0001) for the nonoperative group, which had significantly fewer complications (p = 0.01). No deaths were recorded in either of the two groups of patients. Conclusion: Selective nonoperative management of stable patients with an AAW with or without omental signs is a safe therapeutic option in PNG.

Introduction

A penetrating abdominal wound that breaches the peritoneum is an indication for exploratory laparotomy. The reason is that in 60% of cases there are definite injuries to solid and hollow viscera amenable to surgical repair. Furthermore there is a high price to pay for missed injuries in terms of serious morbidity and even death. However, in low-velocity injuries such as knife wounds about 5-20% of exploratory laparotomies were negative and the laparotomy was associated with longer hospital stay, significant morbidity and increased costs (1). Leading trauma centres in the world (2-5) have taken bold steps to challenge the status quo. At present it is accepted that nonoperative management of an anterior abdominal wound (AAW) can safely be practised, especially when the patient is haemodynamically stable and without peritonitis.

In Papua New Guinea (PNG) no published data exist and this study was done to see if it is indeed safe to apply nonoperative conservative management of an AAW at the Angau Memorial Hospital in Lae.

Methods

All consecutive patients admitted to the Angau Memorial Hospital in Lae between January 2009 and January 2010 with an AAW and breaches of the peritoneum were recruited into the study. The primary clinical responsibility and adherence to the study protocol rested with the lead investigator (KL) and Senior Specialist Surgeon of the Surgery Unit. Exclusion criteria included injuries to the

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back, chest or pelvis. The anterior abdominal wall is taken to mean, superiorly – the inferior costal margins, laterally – the posterior axillary line, and inferiorly – the inguinal ligament and symphysis pubis. The protocol followed for the management of penetrating anterior abdominal wounds is shown in Figure 1.

**Immediate laparotomy**

All patients with peritonitis or in shock with systolic blood pressure (BP) <90 and pulse rate >120 were operated on after an initial resuscitation with fluid, blood and antibiotics. The antibiotics usually depended on availability but gave an empirical broad cover against enteropathogens including *Bacteroides* species. A midline incision was always employed. Thorough exploration was done and any perforations were repaired. Copious saline washout was done. The closure was done with a single continuous en masse closure with nylon. All drip, suck and drain tubes were in place for postoperative

![Diagram](image)

Figure 1. Protocol for the management of penetrating anterior abdominal wounds in this study.
Local wound exploration

All patients with a positive omental sign, bowel evisceration, local peritonism and equivocal penetration and those who were haemodynamically stable were entered into this arm. The wound was explored under local anaesthesia and may have needed some extension if necessary. Eviscerated viscera were washed with saline and returned to the abdominal cavity. Strict serial clinical examination was done every 2-4 hours for 12 hours. An oral fluid test was done after 12 hours: patient intolerance with abdominal pain and distention meant that the plan was abandoned and the patient was subjected to laparotomy. After 48-72 hours when the patient was stable the wound was repaired and the patient was discharged home.

Imaging studies

Plain X-ray, ultrasonography or an abdominal tap were an adjunct to clinical symptoms and signs, which were the main criteria for allocating patients to either arm.

Statistics

Chi ($\chi^2$)-squared test with Yates correction and Student’s t-test were used for complications and length of hospital stay, respectively.

Consent

Informed consent was obtained from all the subjects as well as relatives. The hospital chief executive officer (CEO) gave written consent as well, in view of the experimental nature of the interventions planned. The hospital did not have a research committee.

Results

The results show that 48 males and 12 females were injured and included in the study. The youngest was aged 3 years, the mean age was 27.5 years, the median 26 and the standard deviation 9.8. Almost half were due to interpersonal violence (45%); others were from domestic violence (38%) and accidental injuries (10%). The commonest weapons were of low-velocity type such as knives, arrows and wooden sticks. There were only 3 gunshot wounds (5%). The 3-year-old child was accidentally pierced with a knife while asleep in a woven string bag.

Table 1 shows the use of clinical signs in decision-making. It shows that 36 cases (60%) were initially managed nonoperatively, of which 6 (17%) converted to laparotomy. This includes 3 negative laparotomies adjudicated on by a junior consultant outside the study protocol. These 3 cases were counted as negative laparotomy. Immediate laparotomy was done in 24 (40%).

Operative findings showed that the small intestines were commonly injured followed by large bowel and spleen. It is interesting that 8 patients (27%) in the operative group had negative findings (Table 2).

The oral fluid test was done on 36 patients,

<table>
<thead>
<tr>
<th>Clinical signs</th>
<th>Nonoperative</th>
<th>Laparotomy on demand</th>
<th>Operative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peritonitis</td>
<td>1</td>
<td>6</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Shock</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Positive omental sign</td>
<td>11</td>
<td>-</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Bowel evisceration</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Local tenderness (peritonism)</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Penetration equivocal</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>6</strong></td>
<td><strong>24</strong></td>
<td><strong>60</strong></td>
</tr>
<tr>
<td>Operative findings</td>
<td>Number</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small bowel</td>
<td>10</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large bowel</td>
<td>4</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spleen</td>
<td>4</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>8</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

of which 8 were positive; 6 of these patients went on to have laparotomy.

The mean length of hospital stay was 3 days for the nonoperative and 7 days for the operative group. There were 2 patients in the nonoperative group who stayed for 6 and 12 days due to wound breakdown and malaria, respectively. However, for the operative group the length of hospital stay (LOHS) ranged from 1 to 15 days with a median of 7 days.

There were 2 deaths from AAWs during the period of the study; however, they had both presented in extremis and died before entry into the study. There were 5 complications in the operative group: 3 due to paralytic ileus, 1 wound infection and 1 case of early adhesive bowel obstruction.

Student’s t-test for the LOHS \( (t = 5.049, \text{df} = 29, p = 0.0001) \) and \( \chi^2 \) test with Yates correction for complications \( (\chi^2 = 5.663, \text{df} = 1, p = 0.01) \) indicated that the differences between the two groups were significant.

### Discussion

We have shown in this study that selective nonoperative management of AAW is a safe therapeutic option. The results have shown a significantly shorter hospital stay, significantly fewer complications and by inference reduced costs to the hospital. Except for the freakish accident involving a 3-year-old child in the sleeping bag we had a comparable age and sex profile in the two groups. In this study we did not use any of the injury severity score systems; however, the patients undergoing the new protocol were accepted on the grounds of their physiologically stable state. Our findings are also in agreement with many similar studies in leading trauma centres of the world (2-5).

However, the criteria are exacting and may impose difficulties on an understaffed surgical unit. The serial observations cannot be delegated to a community health worker (CHW), who may be the only nurse in the ward at night. It is also possible that an omental plug on a perforation may unplug after a patient is discharged. This series is too small to pick up such an event and it would require a large study to demonstrate this possibility.

An unpublished case-control study of 50 patients by Maibon (6) from 2001 to 2005 in Lae also attests to our findings. His study group was based only on a positive omental sign whereas we have broadened the criteria.

Our finding of 27% negative laparotomy is rather high given the controlled situation of the study. Three cases were adjudicated by the junior consultant outside the study protocol. Had it not been for that we would have had a rate of 17% negative laparotomy. Ponifasio et
al. (1) in a retrospective review of abdominal trauma in Port Moresby and Lae showed 7% and 20% negative laparotomy, respectively. This difference may be due to inter-observer differences or because the Port Moresby Unit relied on other adjuncts such as imaging studies. Leppäniemi and Haapiainen (4) have also shown the positive predictive power of clinical signs over imaging studies. It is our view that high rates of negative laparotomies can be reduced by judicious use of clinical signs in decision-making such as the study protocol in Figure 1. Laparoscopy may help; however, Leppäniemi et al. (3) have shown that it is weaker than exploratory laparotomy. There is also a lack of similar studies in poorer developing countries like Papua New Guinea and so we are unable to comment further on this.

Surgical practice in PNG is surgery of trauma, infections, tumours and congenital defects, mostly diseases of poverty. An innovation that is simple, directly applicable and transmissible is worthwhile. We believe that our findings will help surgeons to improve on what they have grown up with without compromising patient safety. Our greatest need yet remains, however, and that is to educate our people to prevent all the reckless and unnecessary acts of violence that plague our hospitals.

ACKNOWLEDGEMENTS

We thank Mr D. Hamilton and Professor D. Watters for their encouragement.

REFERENCES