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The spectrum of injuries resulting from abdominal stab wounds with isolated omental evisceration: A South African experience

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ABSTRACT

Introduction: The spectrum of injury associated with anterior abdominal stab wounds (SWs) is well established. The literature in the specific setting of isolated omental evisceration is limited.
Materials and methods: We reviewed our experience of 244 consecutive patients with established indications for laparotomy over an eight year period at a major trauma centre in South Africa.
Results: Of the 244 patients (93% male, mean age: 27 years), 224 (92) underwent immediate laparotomy (IL). Twenty were initially observed and eventually required a laparotomy (delayed laparotomy, DL). The mean time from injury to decision for laparotomy was <3 h in 92% (224/244), <6 h in 6% (14/244), <12 h 2% (4/244) and <18 h in 1% (2/244). Ninety-eight per cent (238/244) of laparotomies were positive and 96% of the positive laparotomies (229/238) were considered therapeutic. The mostly commonly injured organ encountered on laparotomy were small bowel, stomach and colon.
Conclusions: The most commonly injures encountered are intestinal and gastric. Clinicians must remain vigilant as injuries may be subtle.

Introduction

Selective non-operative management (SNOM) of abdominal stab wounds (SWs) has been practised for over three decades in South Africa. There is a considerable body of literature describing the spectrum of injury for SWs, but in the specific setting of associated isolated omental evisceration, the spectrum of organ injury were less well described. We reviewed our experience on laparotomy performed for this specific group of patients.

Materials and methods

Clinical setting

This was a retrospective, observational study that focused on a specific pre-defined population of patients who sustained abdominal SW with isolated omental evisceration. The study was based at the Pietermaritzburg Metropolitan Trauma Service (PMTS), Pietermaritzburg, South Africa. The PMTS provides definitive trauma to the city of Pietermaritzburg, the capital of KwaZulu Natal (KZN) province. PMTS is the largest academic trauma centre in western KZN and is the tertiary trauma referral centre covering a total catchment population of over three million. Each year, approximately 4000 trauma cases are admitted to the PMTS with over half of these due to penetrating trauma. This is directly related to the high incidence of inter-personal violence, gang related activities and serious crime throughout the province. The proportion of penetrating trauma is relatively high in comparison to many centres in Western Europe and the volume managed is comparable to similar sized centres in the United States.[1,2] The PMTS maintains a formal regional trauma registry. All patients who present to our trauma centre are prospectively entered into the database, and the information includes details regarding injury mechanism, operative intervention, patient progress and clinical outcomes. Ethics approval for the maintenance of this registry for both clinical care

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and research has been formally endorsed by the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu Natal (UKZN). Where applicable, formal consent from patients for the use of clinical photographs pertaining to this study has been obtained.

Current management protocol

Any patient who sustains an abdominal SW with omental evisceration is assessed immediately upon arrival at our trauma centre. Initial assessment is based on the *Advanced Trauma Life Support* (*ATLS*©) principles.[4] Further comprehensive assessment is then conducted that includes an appropriate history, physical examination, routine laboratory tests (full blood count, urea and electrolytes) and urinalysis. Frank peritonitis and/or haemodynamic instability are considered as absolute indications for laparotomy and patients are expedited to the operating room. Those in whom abdominal examination is regarded as unreliable (e.g concurrent severe head trauma or severe intoxication) are also subjected to laparotomy. In all cases who required immediate surgery, the eviscerated omentum is covered with a clear dressing and the patient is transferred to the operating room immediately.

Those who do not have any indication for immediate laparotomy are managed as follows: Firstly, the protruding omentum is ligated (e.g. 3/0 PDS) and amputated. The ligated proximal portion is then reduced back into the abdominal cavity. The fascial defect can be extended sufficiently to allow reduction of the ligated portion. The wound is thoroughly irrigated with antiseptics and the fascial defect is closed under direct vision with non-absorbable sutures (e.g. 2/0 Prolene). The skin is lightly opposed with several interrupted non-absorbable sutures (e.g. 2/0 Prolene). This is performed under local anaesthetics in the resuscitation room. Tetanus toxoid is given where appropriate but prophylactic antibiotics are not given routinely. The patients are then admitted to the general trauma ward for active clinical observation. These patients are kept strictly nil by mouth, with intravenous fluid and specifically, two hourly vital signs are recorded (including temperature, heart rate, and blood pressure). Regular repeated physical examination, preferably by the same trauma surgeon (or the senior registrar) is performed to determine any change to patient's clinical status. Those who exhibit (or subsequently develop) signs of sepsis (new onset pyrexia, trending rise in leucocytosis, persistent tachycardia, increasing tenderness away from site of injury (despite maximal analgesia), peritonitis, gastrointestinal intolerance (on feed resumption) or any unexplained clinical deterioration, at the discretion of the trauma surgeon, will proceed to laparotomy. All patients are actively observed for up to a period of 48 h. At present, most literature on SNOM of abdominal SWs suggested minimal benefit for observation beyond 48 h.[3] Thereafter, if the patient's clinical status remains well throughout the observation period, they are discharged home from the general trauma ward with advice to return if they deteriorate after discharge. We do not perform computed tomography (CT) for abdominal SWs. The management protocol is summarised in Fig. 1.

The study

A retrospective review was conducted on all patients who presented with abdominal SW and isolated omental evisceration who underwent laparotomy over the 8 year period from January 2010 to January 2018. For the purpose of this study, only SWs to the anterior abdomen were considered. The boundary of the anterior abdomen was defined by the costal margin superiorly, the inguinal ligaments and pubic symphysis inferiorly and the anterior axillary line laterally.[4] All patients who presented with organ evisceration (e.g. small bowel), with or without omental evisceration underwent mandatory laparotomy and were excluded from this study. All patients with concurrent injuries to the chest, head and neck, and limbs were also excluded.

Those patients who underwent laparotomy were either those with established indications (the 'immediate laparotomy' group) or those or who subsequently developed indications during the observation period (the 'delayed laparotomy' group). The time from initial assessment to establishing the need for laparotomy was further classified according to the following time scale: < 3 h, 6 h, 12 h, 18 h, 24 h. Patients with an immediate indication for laparotomy were classed under time period < 3hrs. Operative findings were classified as either positive or negative. A *positive laparotomy* denotes any organ injury found intra-operatively as a direct result of the SW. A *negative laparotomy* was one where there were no injuries identified. Positive laparotomies were further subdivided into therapeutic or non-therapeutic. A positive '*therapeutic*' *laparotomy* was defined as identifying significant organ injuries which required operative repair. Failure to repair these injuries will result in an adverse outcome. A positive '*non-therapeutic*' *laparotomy* was identifying an injury which did not require operative repair and if undetected would have been unlikely to result in significant morbidity. These include minor splenic or liver lacerations, non-bleeding small serosal or mesenteric injuries. The injury findings were classified as either single organ or multiple organ injuries. The spectrum of injuries was classified according to the frequency of the injury, the individual organ involved and the operative procedure performed. *Primary repair* denotes simple closure of defects. *Organ sparing procedures* involve either simple packing or application of haemostatic agents. At our institution, a corrugated rubber drain is routinely placed in the lesser sac following distal pancreatectomy (or alone as the definitive procedure) to allow external drainage.

Statistical analysis

All relevant data were extracted and initially summarised onto an EXCEL © spread sheet for review. Non-parametric (asymmetrical) data were descriptively described. All statistical analysis was performed using SPSS version 19 (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.).

Results

Demographics

A total of 405 patients over the 8 year study period were included. Ninety-one percent (368/405) were male and the mean age was 27 years. Two hundred and twenty-four patients (55%) required immediate laparotomy. The remaining 181 patients did not have indications for immediate laparotomy and were observed clinically. Of these, 20 (11%) eventually required a laparotomy (delayed laparotomy). Of the total 244 who underwent laparotomy, the time from injury to decision for laparotomy were <3 h in 92% (224/244), <6 h in 6% (14/244), <12 h 2% (4/244) and <18 h in 1% (2/244). This is summarised in Fig. 2.

Laparotomy findings

Of the total of 244 patients who underwent laparotomy, 98% (238/244) were positive and the remaining 2% (6/244) were negative. Of the 224 positive laparotomies, 96% (229/238) were considered therapeutic and the remaining 4% (9/238) were non-therapeutic. The laparotomy findings of the 244 patients was summarised in Fig. 3.

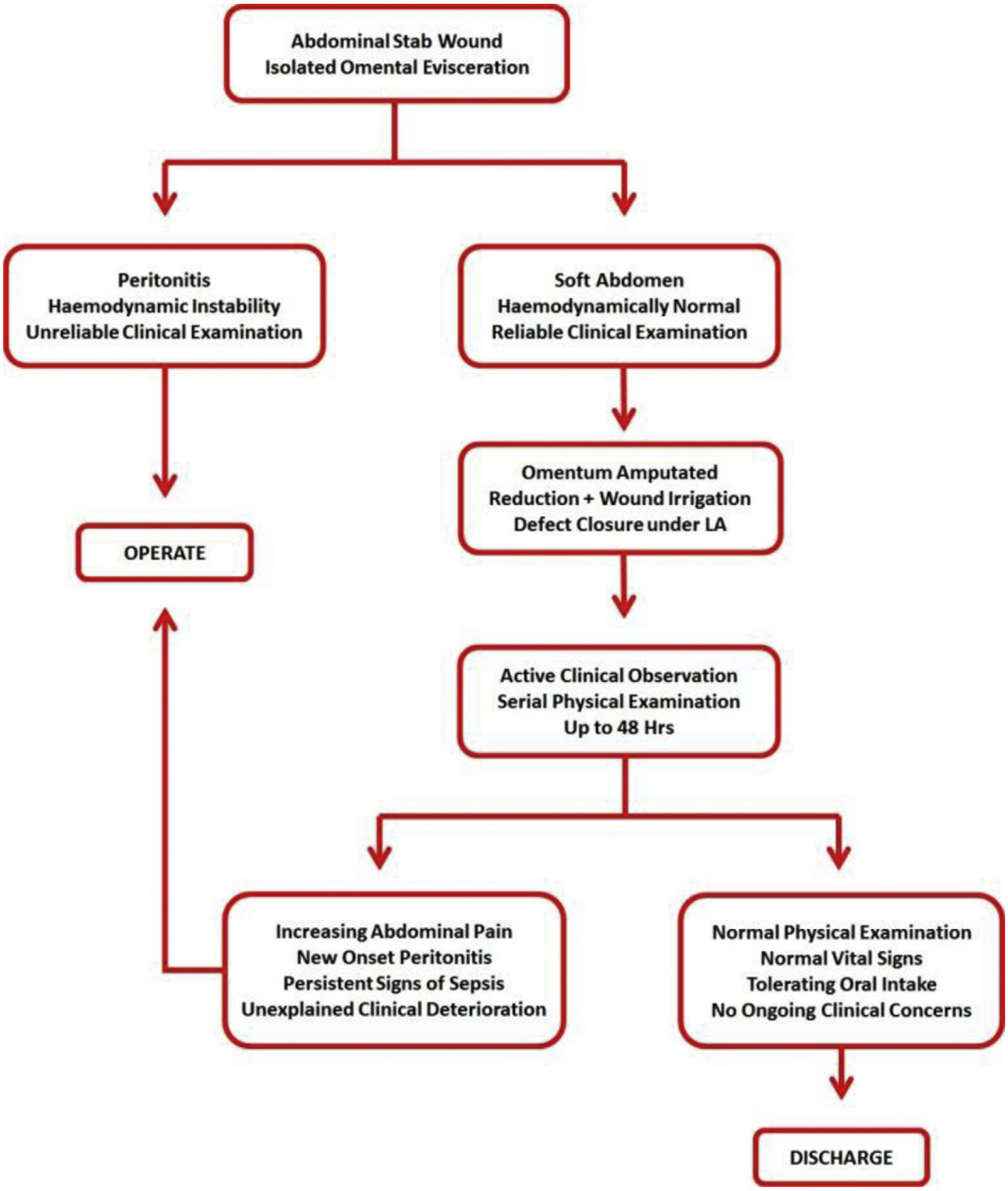

Fig. 1. Management protocol for abdominal SW with isolated omental evisceration.

Spectrum of organ injuries

Of the 244 patients who underwent laparotomy, 40% (95/238) sustained a single organ injury while the remaining 60% sustained injuries to multiple organs. A total of 463 injuries were identified. The spectrum of organ injured is summarised in Fig. 4. Fig. 5 illustrates an example of colonic injury sustained as a result of abdominal SW with associated omental evisceration. The operative procedures performed are summarised in Table 1.

Morbidity and mortality

The overall complication rate was 15%. Twenty patients developed pneumonia, 15 wound sepsis, 7 renal failure and 6 had other complications. Nine percent (23/244) required intensive care unit admission. The mean length of hospital stay was 9 days. The overall mortality rate for all 244 patients was 2%.

Discussions

Selective non operative management (SNOM) of penetrating abdominal trauma has been widely accepted as a safe approach and is the standard of care for most high volume trauma centres worldwide.[5] Although the opinion remains divided on the appropriateness of SNOM in the setting of omental evisceration, based on our historical experience at our parent institution at King Edward VIII Hospital in Durban, SNOM has been practice at our institution for over three decades. Abdominal SW with isolated omental evisceration is a relatively uncommon injury, and it is difficult for any single institution to accumulate sufficient experience. To our knowledge, our current study was the largest series to date that documented the full spectrum of injury encountered on laparotomy.

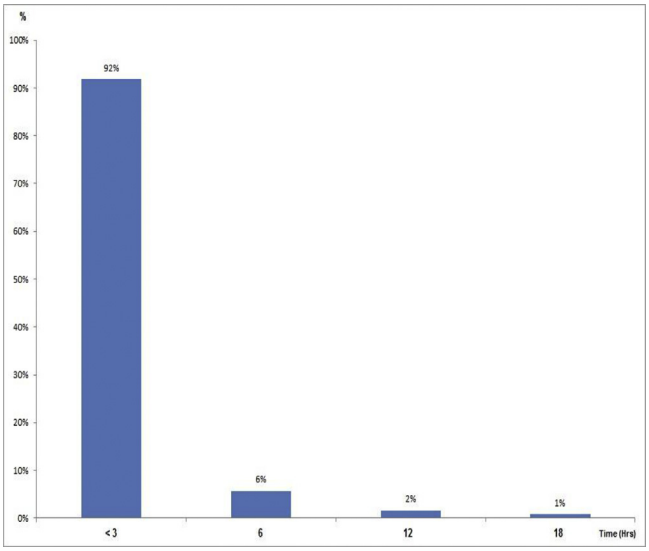

Fig. 2. Time from injury to decision for laparotomy.

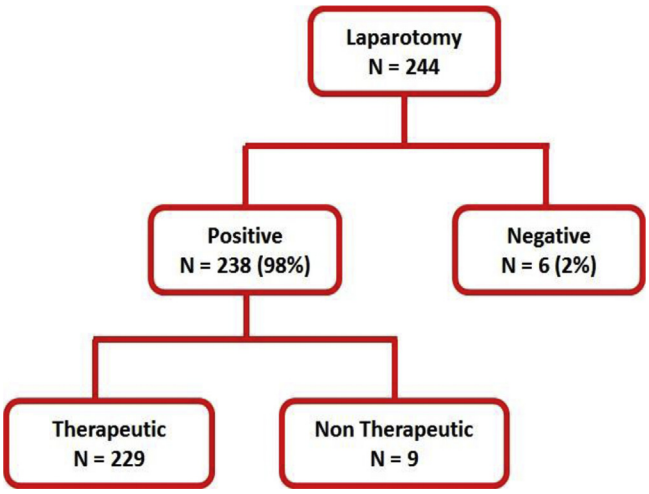

Fig. 3. Laparotomy Findings in 244 patients.

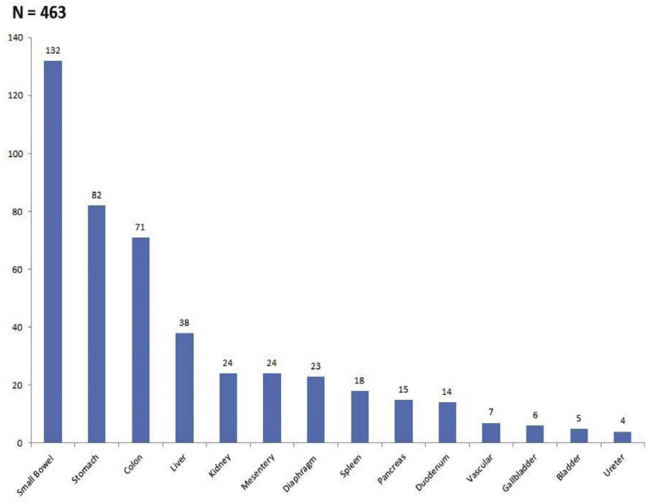

Fig. 4. Spectrum of Organ Injury in 244 patients.

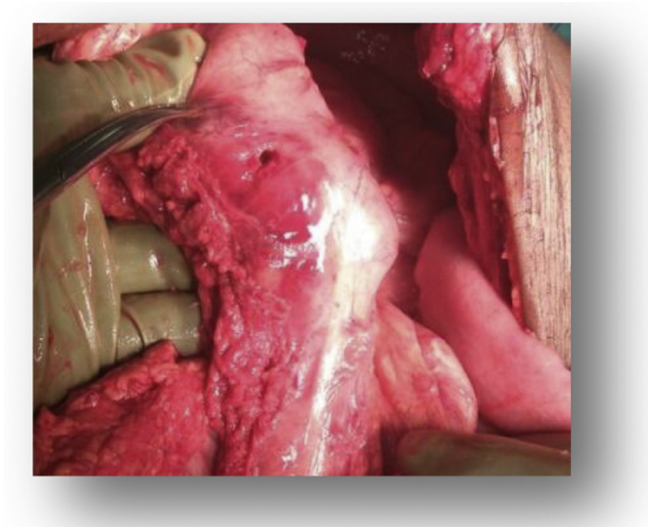

Fig. 5. Colonic Injury found on laparotomy.

Table 1
Operative procedures performed for all organ injuries.

Organ Injured	(N = 463)	Operative Procedure(s)	(N = 463)
Small Bowel	132	Primary Repair	110
		Anastomosis	20
		Exteriorisation	2
Stomach	82	Primary Repair	14
Colon	71	Primary Repair	62
		Anastomosis	7
		Exteriorisation	2
Liver	38	Drainage	36
		Packing	2
Kidney	24	Nephrectomy	13
		Organ Sparing Procedure	11
Mesentery	24	Primary Repair	21
		Ligation	3
Diaphragm	23	Primary Repair	23
Spleen	18	Organ Sparing Procedure	11
		Splenectomy	7
Pancreas	15	Distal Pancreatectomy	11
		Drainage	2
Duodenum	14	Primary Repair	14
Vascular	7	Ligation	5
		Primary Repair	2
Gallbladder	6	Cholecystectomy	6
Bladder	5	Primary Repair	5
Ureter	4	Primary Repair	4

Riley from our parent institution (King Edward VIII Hospital, Durban) published the first South African series of 111 patients and noted that the most common injuries were that of small bowel, large bowel and stomach.[6] The spectrum of injury found on laparotomy in our study was similar to most of the published series, in that enteric injury, particularly small bowel, stomach and colon were the most commonly injured organ.[6–11] Most importantly, almost two-third of patients in our study sustained multiple organ injury. This must be kept in mind for any surgeons performing laparotomy in this setting. In our experience, due to the dramatic nature of such injury, many surgeons often focus on attempting to reduce the omentum and their concerns for future potential of incisional hernia can be distracting. Pancreatic and duodenal injuries can often be subtle, and the potential for these injuries must be considered in all patients, especially if one does not manage with these injuries on a frequent basis. One should adhere strictly to careful and methodical operative exploration as missed injuries in

this setting can be potentially disastrous.

The major limitation to this study was the lack of long term follow up data, especially in regard to the incidence of wound site hernia. Due to socio-economic factors, follow-up of patients in our setting is invariably poor, and is consistent with other similar local studies.[12] We assume these patients did not have any further sequelae following discharge. To our knowledge, there were no delayed morbidities to date. Our experience is that for the majority of patients, if they remain well following discharge, they usually resume their occupation and seldom sees the need to re-attend hospital for follow-up. The perceived 'time lost' in attending hospital leads to loss of earnings and fear of redundancy. Furthermore, due to the significant resource limitations in our setting, routine follow-up for all these patients would be challenging. In the coming decades, when hopefully healthcare reform will lead to more abundant resources, the establishment of a dedicated trauma follow-up clinic may improve the situation.

Conclusions

The spectrum of injury associated with abdominal SW with omental evisceration is similar to smaller published series. The most commonly encountered injuries are intestinal and gastric. Clinicians must remain vigilant as injuries may be subtle.

Conflict of interest statement

Kong VY, Weale R, Blodgett JM, Buitendag J, Oosthuizen GV, Bruce JL, Laing GL, Clarke DL all have no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.amjsurg.2018.06.003.

References

1. Casali M, Di Saverio S, Tugnoli G, et al. Penetrating abdominal trauma: 20 years experience in a western European trauma center. *Ann Ital Chir*. 2008 Nov-Dec;79(6):399–407.
2. Inaba K, Demetriades D. The nonoperative management of penetrating abdominal trauma. *Adv Surg*. 2007;41:51–62.
3. Alzamel HA, Cohn SM. When is it safe to discharge asymptomatic patients with abdominal stab wounds? *J Trauma*. 2005;58:523–525.
4. Advanced Life Support for Doctors. *Student Manual*. ninth ed. Chicago: American College of Surgeons Committee on Trauma; 2012.
5. Como JJ, Bokhari F, Chiu WC, et al. Practice management guidelines for selective nonoperative management of penetrating abdominal trauma. *J Trauma*. 2010;68(3):721–733.
6. Riley P. Disembowelment–a retrospective study of patients suffering evisceration following penetrating abdominal injury. *Injury*. 1987 Jul;18(4):286–290.
7. Huizinga WK, Baker LW, Mtshali ZW. Selective management of abdominal and thoracic stab wounds with established peritoneal penetration: the eviscerated omentum. *Am J Surg*. 1987 Jun;153(6):564–568.
8. Nagy K, Roberts R, Joseph K, An G, Barrett J. Evisceration after abdominal stab wounds: is laparotomy required? *J Trauma*. 1999 Oct;47(4):624–626, 622-4; discussion.
9. Medina M, Ivatury RR, Stahl WM. Omental evisceration through an abdominal stab wound: is exploratory laparotomy mandatory? *Can J Surg*. 1984;27:399–401.
10. Burnweit CA, Thal ER. Significance of omental evisceration in abdominal stab wounds. *Am J Surg*. 1986;152:670–673.
11. Granson MA, Donovan AJ. Abdominal stab wound with omental evisceration. *Arch Surg*. 1983;118:57–59.
12. Whalen G, Angorn IB, Robbs JV. The selective management of penetrating wounds of the back. *J Trauma*. 1989 Apr;29(4):509–511.