Basrah Journal of Surgery

Original Article

Bas J Surg, September, 12, 2006

EVALUATION OF ABDOMINAL BULLET INJURIES IN BASRAH GENERAL HOSPITAL (A PROSPECTIVE STUDY)

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Abstract

The incidence of civilian abdominal gunshot wounds is on the increase in many cities, attributed to the increasing rate of unemployment, high rate of corruption in the polity, and political violence. Gunshot wounds of the abdomen are associated with 90% or greater incidence of intra abdominal injury, prompting many trauma centers to routinely explore these patients via laparotomy. The aim of this prospective study was to evaluate the pattern of injuries, treatment, and outcome of patient with abdominal gunshot wounds in Basra General Hospital. This is a prospective study of patients with abdominal gunshot wounds admitted to Basra General Hospital, Department of Surgery, between April 2003 to October 2005. One hundred and sixteen patients were included in this study. Data recorded on database. Patient's characteristics, injury to arrival time, type of weapon, single or multiple gunshot wounds, surgical intervention time, clear urine or macroscopically haematuria, preoperative and postoperative blood transfused, operative finding, and postoperative complications and mortality. The indications for emergency laparotomy after vigorous resuscitation were shock, peritonitis, evisceration, leakage of intestinal content through wound, haematemesis, proctorrehagia, and macroscopical haematuria with entrance wound. The study included 116 patients, Male:Female ratio was 4:1 and 44.8% of patients ranged in age from 20-29 years. The common weapon used was gun in 88.8%patients. Three (2.6%) patients sustained superficial wounds of the abdomen; they were managed by local wound care. Laparotomy was undertaken in 113 (97.4%) patients who presented with acute abdomen. The commonest injured organ was the small intestine (26%), colon (18.8%), liver (11.7%), kidneys (9%) and stomach (6.7%).The mortality rate was 10.6%. shock was the cause of death in 9 patients. It is concluded that Bullet injury is a serious injury which need careful attention by surgeon .Mandatory exploration is the standard method for managing patient with gunshot wounds to the abdomen and back;. Most of the deaths in this study are due to haemorrhagic shock. The unavailability of blood in our hospital blood bank and the delay in bringing blood from the central blood bank add adverse effect on the outcome of patient.

Introduction

Gunshot wound is caused by a missile propelled by combustion of powder. It implies high-energy transfer and unpredictability of extent of intra-abdominal injuries, not only is missile track unpredictable but also secondary missiles such as bone fragments or fragments of bullet are capable of inflicting additional injuries[1].

Bullets are aerodynamically unstable because the center of mass lies behind the center of resistance to flight, thus bullet tend to oscillate or yaw around its long axis. Motion of bullet in flight and within human tissue after impact depends upon the size, shape, stability, composition, and above all the velocity. Tissue density and elasticity are most important factors inflicting the retardation of missile. Tissue of increasing density (compact organ) cause greater retardation of missile and therefore greater energy is released to cause damage[1-3].

Bullet wounds can be divided into low velocity (<2000 feet/sec., <609m/sec.)

and high velocity (>2000 feet/sec., >609m/sec.). Missile wounds are now described in term of energy transfer, recognizing that velocity is merely one factor determining energy available and its transfer to tissue. Low-energy transfer wounds are characterized by injury confined to the wound track. High-energy transfer wounds because of their high energy causes in addition phenomena known as temporary cavitations[2,3]. The extent of cavitations depends upon the density and elasticity of the target organ and it is associated with tissue injury many centimeters around the missile track[4].

In abdomen a large temporary cavity is formed with gross displacement and visceral damage, also gas contain within hollow viscera (e.g. colon) is compressed by passage of missile close by, and this followed by explosive expansion rupturing the wall of viscera from within[1].

The site of entry, direction of missile motion, and patient position at time of injury can often dictate the outcome of patient[1,3]. Bullets are not sterilized by firing; the sub atmospheric pressure within the created cavity can actively suck in bacteria, clothing, and debris via the entrance and exit wounds[1].

The incidence of civilian abdominal gunshot wounds is on the increase in many cities[5-15]. The suggested reasons for this ever-increasing problem include easy availability of firearms, acts of spontaneous violence, and civil strife[8,16,17]. These violent activities are attributed to the increasing rate of un-employment, high rate of corruption in the polity, and political violence. It is important that surgeon should be conversant with management of gunshot wounds, more so of the abdomen, which presents a large surface area to assault[5,6]. Gunshot wounds of the abdomen are associated with 90% or greater incidence of intra abdominal injury, prompting many trauma centers to routinely explore these patients via laparotomy[18]. It was found that 75-90% of abdominal missile injuries require emergency laparotomy. Only 25-35% of patients with stab wounds, and 15-20% of patients following blunt trauma require operative intervention[4].

Mandatory laparotomy, irrespective of abdominal signs, was the treatment of choice before the proposal of selective conservatism by Shaftan in 1960[19]. this approach based on non operative management of carefully selected group of patients, presenting with minimal or equivocal abdominal signs after sustaining gunshot wounds of the abdomen, has been reappraised and Popularized[10,11,20,21].

Selective approach to laparotomy for gunshot injuries, similar to that for stab wounds has been suggested, but is controversial[14,22-25].

The aim of this prospective study was to evaluate the pattern of injuries, treatment, and outcome of patient with abdominal gunshot wounds in Basra General Hospital.

Patients and method

This is a prospective study of patients with abdominal gunshot wounds admitted to Basrah General Hospital, department of surgery, between April 2003 and October 2005. One hundred and sixteen patients were included in this study .The surface anatomical definition of the abdomen was from the nipple line to the pubis anteriorly and between two anterior axillary lines[10]. the flank is area between anterior and posterior axillary lines[26].

The posterior trunk or back was defined as the area between the inferior angle of scapulae, the iliac crest, and posterior to axillary lines[27]. Patients with entrance wounds outside these surface landmarks, but with clinical features of abdominal injury or radiological evidence of missile in the abdomen were also included in the study. Data were recorded on databases.

Patient's characteristics, injury to arrival time, type of weapon, single or multiple gunshot wounds, surgical intervention time, catheterization or not, clear urine or macroscopically haematuria, pre-operative and postoperative blood, operative findings, and postoperative complications were studied.

Shock, peritonitis, evisceration, leakage of intestinal content through wound, haematemesis, proctorrehagia, and macroscopically haematuria with entrance wound, were indications for emergency laparotomy after vigorous resuscitation. Careful history was obtained and the patients are examined in systematic fashion, from head to toe, to identify all occult injuries. All patients were undergone digital rectal examination to evaluate sphincter tone, and to look for blood, perforation or high riding prostate before surgery, a naso-gastric tube was passed to stomach. Laparotomy was done through a long midline incision. Laparotomy consider, negative if there was no peritoneal penetration or penetration without visceral injury, and unnecessary for superficial wounds.

Shock defined as systolic pressure of less than 100 mmHg and pulse rate greater than 100 beat per minute.

Surgical intervention time defined as the period between arrival in hospital and induction of general anesthesia[14].

Results

One hundred and sixteen patients who sustained gunshot wounds were included in this study. Ninety three (80.1%) patients were male and 23(19.9%) patients were female. Male: female ratio was 4:1.The age range was from 8 months to 63 year, 52(44.8%) patients ranged in age between 20-29 years (Table I).

The time between injury and arrival to hospital ranged from 20 minutes to 24 hours. Median, injury to arrival time, surgical intervention time, and injury to surgery were 116,104,220 minutes respectively. Injury to arrival time was ≤1hour in 74 (63.8%) patients, ≤3 hour in109 (94%) patients, ≤6 hour in 114(98.3%) patients, >6 hour in 2(1.7%) patients {one of them after 7 hours of injury, other one after 24 hours}.

A common weapon used was gun in 103(88.8%) patients, while pistols in 13(11.2%) patients {fig. 1}.

Nineteen (16.4%)patients injured by cross fire. fig. (2).

Three (2.6%) patients sustained superficial wounds of anterior abdominal wall (2 patients), and back (one patient), they were managed by local wound care Sixty six (56.9%) patients were have entrance only. {Table II}.

The entrance wound was in anterior abdominal wall in 72(62%)patients, back in 38(32.8%)patients ,and flank in 6(5.2%) patients respectively. one hundred and one (87%) patients had single entrance while 15(13%) patients had multiple entrance wounds {all of them were caused by gunshot} (fig.3).

Laparotomy was undertaken in 113 (97.4%) patients who presented with acute abdomen. Surgical intervention time was ≤1 h in 74(65.5%) patients, ≤3h in 108(95.6%) patients, and ≤6h in 113(100%) patients.

Urinary catheterization was don in 110(94.8%) patients, with clear urine output found in 82(70.6%) patients, 2 of them found to have urological injuries {one had uretric transection in middle 3rd, 2nd had renal perforation through and through in lower pole of the left kidney}. Macroscopical haematuria discovered in 34 (29.4%) patients, all had urological injuries except one patient had no obvious urological injury. Thirty two (27.6%) patients were shocked at time of hospital admission.

Table III show that the number of patients that not received blood are more than those received blood.

The commonest injured organ was the small intestine in 58(26%), injuries to

this organ were perforation and tangential laceration. simple closure or resection of segment containing multiple perforations followed by anastomosis was performed as appropriate in all patients.

Forty two (18.8%) patients sustained injuries of the colon, right colon (9 pateints), transverse colon (14 pateints), and left colon (19 patients) colonic injuries were treated by resection of the segment containing perforation followed by anastomosis in (9) patients, exteriorization of injured colon as loop colostomy in (20) patients, resection of injured segment followed by exteriorization as colostomy and mucous fistula in (13) patients.

Twenty six (11.7%) patients sustained hepatic injuries, (20) injuries were laceration, (5) injuries were through and through penetrations, and one was complex with inferior vena cava, hepatic veins and aorta injuries (this died at time of operation). (4) lacerating and (3) penetrations were not bleeding at operating time. Hepatic injuries were treated by suturing and or drainage, and application of gelfoam. Non bleeding hepatic injuries managed by subhepatic drain.

Twenty (9%) patients sustained renal injuries, (8) injuries were lacerations, (12) were through and through penetrations, lacerated kidney treated by nephrectomy with drainage while penetrating wounds sutured.

Two (0.9%) patients were sustained duodenal injuries (in 1st part); injuries to this organ were treated by debridment and simple suture closure.

Three (1.3%) patients were sustained gall bladder injuries and treated by cholecystectomy lacerations and perforations of stomach, bladder, diaphragm and uterus were repaired with sutures.

Seven (3.1%) injured spleen were treated by splenectomy.

Five (2.3%) contused pancreas (one in tail, 2 in head, 3 in the body) treated by drainage repaired.

Six (2.7%) had rectal lacerations were protected with proximal colostomies.

Three (1.3%) patients sustain uretric injuries, middle third, treated by debridment, and suturing over stent. They were developed urine leak (2 of them respond conservatively, one develop intra abdominal abscess and treated by drainage and referred to urologist)

The organ injured versus mortality rate is listed in table V.

Total of (223) abdominal organs were injured in 113 patients who required laparotomy. A positive linear relationship was demonstrated between the number of organ injured and mortality.

Shock was the cause of death in 9 of 12 patients (one died at operation, 2 immediately after operation, one after 3 h, one after 7h, one after 12h and 3 after 16h).one of 12 patients died from renal failure at 2nd post operative, other one developed pulmonary oedema and died at 3rd post operative day, last one who sustained pancreatic injury developed pancreatitis and multiple organ failure and died at 11th post operative(table VI).

There were 8(7.1%) negative Laparotomies (2 female, 6 male).

Post operative complications include wound infections in 48(42.5%) , burst abdomen in 3 (2.7%), uretrocutaneouse fistula in 3 (2.7%), postoperative jaundice 6 (5.3%), missed pack 1 (0.88%).

Discussion

There appears to be an increasing incidence of civilian gunshot wounds of the abdomen, this due to availability of firearms, absence of security, political violence, and religious violence as seen in elsewhere in the world[28,29]. Male preponderance reported by other workers[7,14,24,29-31], were also found in this study. Some of the reasons adduced for the male predilection in the various

studies are that males particularly the younger age groups are generally more aggressive and more adventurous in demonstrating resistance to perceived threat[32,33].

The incidence of gunshot wounds in this study is about 44.9% cases per year, which is higher compared with study done in Lagos, Nigeria, which are 17%cases per year[14].

In this study, 88.8%of the patients sustained injuries suggestive of high-velocity weapons, whereas the remaining 11.2%had injuries suggestive of low velocity weapons. This is at variance with finding of Katchy et al,[31] who reported a low incidence 7.7% of high-velocity weapons in a study conducted in eastern Nigeria, and to studies from other parts of the world which shown an equally low incidence of high-velocity weapons[7,34]. However, the current finding attributed to easily accessible assault weapons as result of the war.

One hundred and thirteen (97.4%) patients presented with indication for emergency laparotomy, and there were 8(7.1%) cases with negative laparotomy. this finding is higher than studies on penetrating abdominal injuries from gunshot injuries[14,10,35].

Considering the morbidity that can follow negative laparotomy, the abdomen should be carefully evaluated[10,35-37], the high incidence of negative laparotomy is due to poor radiological backup.

However, in centers where adequate radiological facilities are available, some cases of gunshot injuries could be managed conservatively and if indicated, surgery can then be performed[38].

In this study, and in many others[5,8,9,14], the small bowel, colon, and liver were the organs most commonly injured. The frequency of penetrating injury to intra-abdominal organs is related to size, location, and protection offered by the pelvis and spine to these organs[8].

The surgical management of small intestinal gunshot injuries has not changed, and it poses no major problem. However, the management of colonic injuries poses challenge to surgeon throughout the world because of concern about infection after primary repairs. It has long been believed that the safest practice is to divert the faecal steam and anticipate a delayed colostomy closure[39].

It is now commonly believed that most civilian gunshot injuries are caused by low-velocity handguns. Therefore ,most trauma surgeon argue that more than half of civilian colonic injuries can be treated by primary repaired instead of exteriorization or colostomy, especially those on the right side of the colon.

This change in practice had been documented by Nance[40], who reviewed published reports from major trauma centers in the United States demonstrating the increasingly common practice of primary repair, as compared with colostomy, for colonic wounds in the past two decades .however, primary repair of left side colonic injuries is not advised unless intra luminal on –table lavage can be performed. Moreover, the facilities for this were not available in the current study environment. This practice would have been very useful in the study environment, where the people were unwilling to accept colostomies for social and cultural reasons[15].

The catheterization dons for 110 out of 116 patients. One patient of macroscopical haematuria has no obvious urological injury; this may be due to intra luminal injury caused by effect of temporary cavitation.

Two patients had clear urine and they sustained urological injuries one of them sustained left uretric transection at middle third and other had renal injury in lower pole left kidney.

The median injury to arrival time was 116 minutes, this is in contrast to other studies where gunshot victims are transferred to hospital within 30

minutes[41] it was previously shown that longer the interval between injury and operation the greater the risk of developing post operative sepsis[42]. Prolong surgical intervention time was also observed by others[43]. It was due to great reluctance by surgeon to perform Laparotomy before procurement of adequate units of donor blood. Surgical intervention time of less than 2 hours has been achieved.

The mortality rate in this study was (10.6%) patients which is higher than the rate quoted by Katchy et al[31] (8.6%).all death was from gunshot injuries, 9 of 12 patient's dead due irreversible haemorrhagic shock and unavailability of blood because blood bank centre lie away from hospital so the donors spend a lot of time until blood available . in current study there is positive linear relationship between the number of organs injured and mortality.

Conclusion

From this study we conclude that bullet injury is serious injury need careful attention by surgeon. Mandatory exploration is standard method for managing patient with gunshot wounds to the abdomen and back, this associated with significant morbidity. Most of the deaths in this study are due to haemorrhagic shock. The unavailability of blood in our hospital blood bank and the delay in bringing blood from the central blood bank add adverse effect on the outcome of patient.

Age group(years)	male	female	total
0---9	-----	4	4(3.5%)
10---19	9	1	10(8.6%)
20----29	41	11	52(44.8%)
30----39	29	2	31(26.7%)
40---49	7	1	8(6.9%)
50---59	5	3	8(6.9%)
60---69	2	1	3(2.6%)
total	93	23	116(100%)

Table I: Age and sex

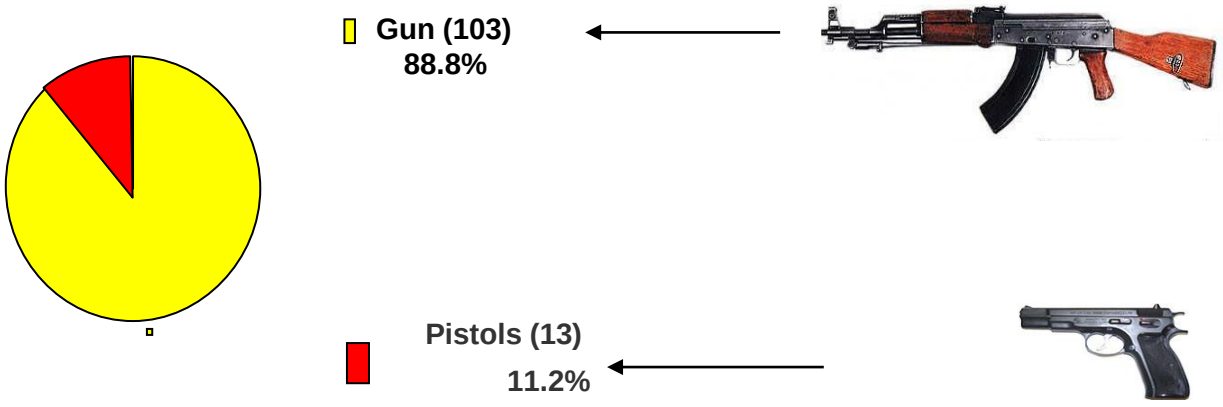

Fig.1: Types of weapon

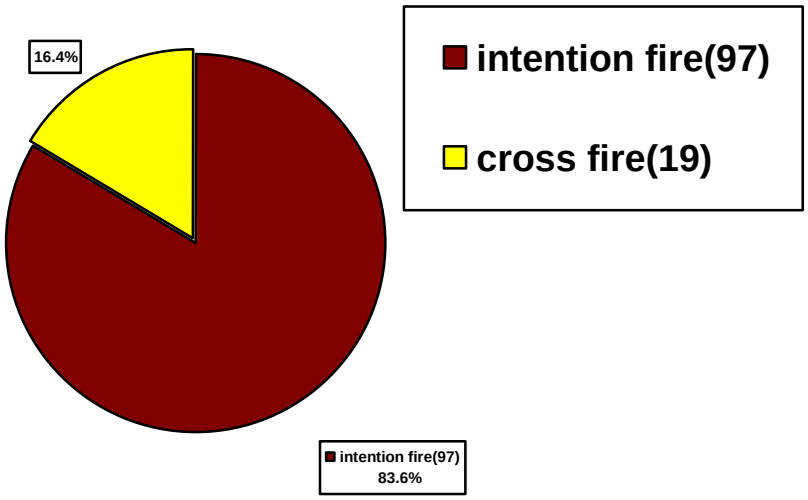

Fig 2: Intention and cross fire

Region	entrance	Exit
Anterior abdominal wall	72 (62%)	14(28%)
flank	38(32.8%)	13 (26%)
back	6 (5.2%)	23 (46%)
total	**116 (100%)**	**50 (43.11%)**

Table II:Sites of injury

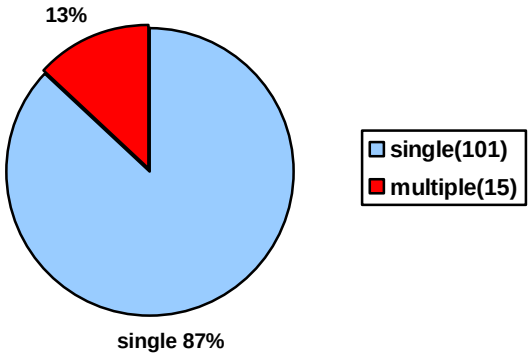

Fig. 3: Types of wound injury.

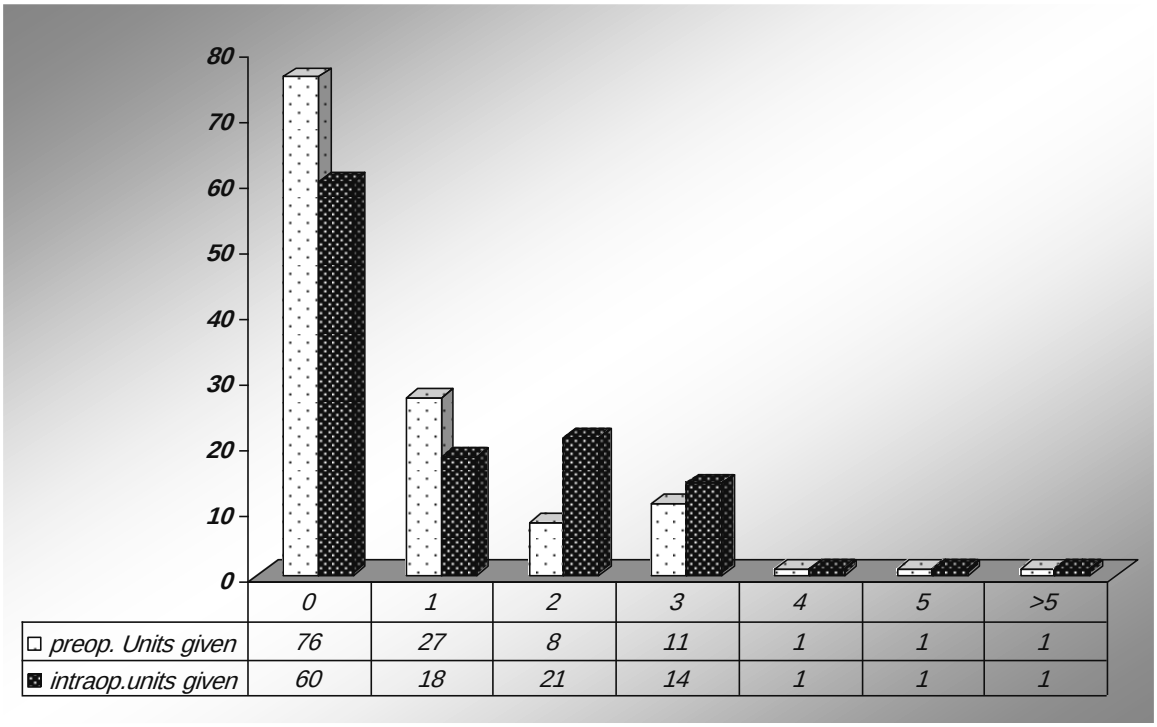

Table III: Number of patients vs. number of blood units received

organs	**number**
Small intestine	58 (26%)
colon	42 (18.8%)
liver	26 (11.7%)
kidney	20 (9%)
stomach	15 (6.7%)
Urinary bladder	12 (5.4%)
Pelvis and spinal column	10 (4.5%)
Large vessels	9 (4%)
spleen	7 (3.1%)
rectum	6 (2.7%)
pancreas	5 (2.3%)
diaphragm	4 (1.8%)
ureter	3 (1.3%)
Gall bladder	3 (1.3%)
duodenum	2(0.9%)
uterus	1(0.5%)
total	**223(100%)**

Table IV: Type of organs injured.

Number of organ injured	Number of patients	Mortality rate
o	3	---------
1	19	----------
2	29	2(6.9%)
3	20	3(15%)
4	6	2(33%)
5	5	3(60%)
6	3	2(66.7%)
total	**113**	**12(10.6%)**

Table V: Number of organs injured vs. mortality rate.

causes	*number*
shock	*9 (75%)*
renal failure	*1 (8.33%)*
pulmonary oedema	*1 (8.33%)*
multiple organ failure	*1 (8.33%)*
total	***12(100%)***

Wound infection	48 (42.5%)
Burst abdomen	3 (2.7%)
Urinary leak	3 (2.7%)
Jaundice	6 (5.3%)
Missed pack	1 (0.88%)
Intra abdominal abscess	1 (0.88%)
Total	**62 (54.9%)**

Table VI: Complications

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