

Stab Injuries Over Abdomen : Imaging And Management At Government Hospital, Dhule

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Abstract: Penetrating injury abdomen is most common in young males in the age group of 20-30 years .These injuries usually affect young healthy individuals in the society. Abdomen is the most commonly involved part in penetrating injuries. Its anatomical location makes it unprotected and most susceptible for penetrating injuries either homicidal or accidental. Penetrating injuries can be homicidal, accidental or rarely suicidal for which exploratory laparotomy is done. Abdominal stab injuries mostly homicidal are common in India. In our study, all eighteen cases had homicidal stab injuries over anterior abdominal wall. Male gender in the age group of 21 to 30 yrs of age were most commonly affected and small bowel was the commonest organ injured. In five cases intraoperative exploration revealed no internal organs injury (negative laparotomy). The indications for operations were (1) protrusion of viscera, (2) signs of peritoneal irritation, (3) positive peritoneal tap (4) peritoneal penetration and (5) X-ray showing gas under diaphragm (6) haemodynamic instability. Out of these eighteen patients, thirteen patients had visceral injury involving various organs. Only one case was presented with stab injury over both chest and abdomen. Out of eight patients of bowel injury three patients had gas under diaphragm on plain x-ray study. Negative radiological examination does not rule out a hollow viscus injury. Imaging modalities have some limitations particularly in intestinal injuries and in early period. A positive FAST is strong predictor of injury.

Keywords: Abdominal injury, abdominal wall, hemoperitoneum, knife, laparotomy, peritoneal cavity, small intestine, ultrasound.

Introduction :

The type of injuries caused by sharp pointed objects depends on the nature and shape of the weapon, the amount of energy in the weapon or implement when it strikes the body, whether it is inflicted upon a moving or a still body, and the nature of the tissue injured.⁽¹⁾ Failure of USG to detect clinically significant pathologies, particularly in intestinal injuries in the early period, is well-known.^(2,3) Focused Assessment with Sonography for Trauma (FAST) can be a useful initial diagnostic study after penetrating abdominal trauma. A positive FAST is a strong predictor of injury, and patients should proceed directly to laparotomy.⁽⁴⁾ The anterior abdominal wall is defined as the area between xiphoid and pubic symphysis and both post axillary lines. This area consists from skin, subcutaneous tissue, the three muscles of the anterior abdominal wall. (external oblique muscle, internal oblique muscle and transversus abdominis muscle).^(5,6) These muscles are separated in the flanks and fused in the ventral midline to overlap the rectus abdominis muscle and forming anterior and posterior rectus sheaths. Parietal peritoneum covers the anterior and posterior walls, the undersurface of diaphragm and the cavity of the pelvis. Stab wounds are produced from penetration with long narrow instruments having pointed (sometimes

blunt) end into the depths of the body, which are deeper than its length and width.^(6,7,8) Stab wounds are caused by knives, pens, broken bottles, ice picks, metal spikes, screw drivers, garden forks etc.⁹ Stab wounds are further classified as penetrating wounds and perforating wounds. Penetrating wounds are the stab wounds that terminate in the tissue/organ/cavity. Perforating wounds are the stab wounds that are passing the body through and through.⁽¹⁰⁾ Penetrating injuries to the abdomen form an important chunk of surgical problems confronting the surgeon. These injuries usually affect, young healthy individuals in the society.⁽¹⁰⁾

A clinical study was conducted at Govt. medical college of north maharashtra region to study the modes of injury, to evaluate the indication for emergency laparotomy in these cases, imaging features on x-rays and ultrasound of abdomen and also to study the mortality and morbidity of abdominal penetrating injuries and to find out probable weapon. In this study period total 18 cases of stab injury over abdomen were admitted. In five cases no internal organ injury noted. These cases after initial treatment were subjected to clinical examination followed by local wound exploration and ultrasound of abdomen. The indications for laparotomy were peritoneal penetration, evisceration of

bowel and /or omentum, haemodynamical instability , hemoperitoneum, signs of peritoneal irritation and free gas under diaphragm. The organs injured in this study were small bowel 6 cases, colon 1 case, stomach 1 case, spleen 1 case, mesenteric injury 2 cases. The small intestine was the most common organ involved. Wound infections were the commonest complications. Mortality is zero in this study as all cases managed promptly. No gunshot injuries were reported during the study period.

Aim and objectives:

This study was done to evaluate the various modes of injuries, indications for emergency laparotomy and morbidity and mortality in stab injuries of the abdomen. Also the most common weapon and the most common organ injured was studied. Radiological findings on ultrasound and x-rays in stab injury abdomen were also studied in this study.

Material and Methods :

A study of stab injuries over abdomen was carried out at Shri Bhausaheb Hire Government Medical college , Dhule, Maharashtra. During the two and half years period from august 2013 to february 2016. In this study , total 18 patients with penetrating stab wounds of the anterior abdomen were admitted to surgical wards at shri Bhausaheb hire government medical college and civil hospital Dhule. Of these 18 cases, 16 were male and 2 were female patients. The age range was from 7 years to 45 years with the mean age of 26 years. Peritoneal penetration was diagnosed by intraabdominal structure evisceration(omentum or bowel),gas under diaphragm, positive abdominal paracentesis and digital exploration of stab wounds under local anaesthesia. Radiological examination in the form of x-ray abdomen and ultrasonography abdomen were carried out. That gave us the amount of haemoperitoneum and probable organ injured.

Observations:

The area was sterilised with povidine iodine. Sterile drapes were used, sterile gloves and sterile instruments were prepared for these purposes. Local infiltration of the area surrounding the wound with xylocaine 1% done. Thus local wound exploration was done to judge the peritoneal penetration. Every patient had intravenous line, blood was drawn for pcv, blood urea, serum electrolytes, blood sugar, blood grouping and cross matching was done. X rays and ultrasonography helped further about diagnosis and severity. Out of 18 cases we get gas under diaphragm in 3 cases. Significant ultrasound findings were present in 10 cases. Out of 18 cases ,in 16 cases we performed laprotomies under general anaesthesia. In two cases we required local wound explorations only. But in 5 cases no

internal organ injury was noted during laprotomy I. e.negative laorotomy. In one case stab injury over chest was noted. All 18 patients were recovered completely and discharged with two weeks of surgical intervention.

Table no 1. Showing Age And Sex Distribution.

Sr No	Age group in years	Number of males	Number of females	percentage
1.	1-10	1	0	05.55
2.	11-20	4	0	22.22
3.	21-30	5	0	27.77
4.	31-40	3	1	22.22
5.	41-50	2	1	16.66
6.	51-60	1	0	05.55

Table no 2: Showing Internal Organ Injury During Laprotomy

Sr. no.	Organs involved	Number of cases	Percentage
1.	Small bowel	06	33.33
2.	Stomach	01	05.55
3.	Spleen	01	05.55
4.	Colon	01	05.55
5.	Mesentry	02	11.11
6.	Local wound exploration	02	11.11
7.	Negative laprotomy	05	27.77

Table no 3: Operative Procedures Done In This Study

Sr. no.	Name of procedure	Number of cases	Percentage
1.	Closure of bowel perforation	06	33.33
2.	Closure of stomach perforation	01	05.55
3.	Colostomy	01	05.55
4.	Spleenectomy	01	05.55
5.	Mesenteric tear repair	02	11.11
6.	Local wound exploration	02	11.11
7.	Negative laprotomy	05	27.77

Table no 4: Types Of Weapons Used

Sr. no.	Types of weapon used	No of cases	Percentage
1.	knife	10	55.55
2.	garden fork	01	05.55
3.	Screw driver	01	05.55
4.	Kitchen knife	02	11.11
5.	Sword	01	05.55
6.	Iron rod	01	5.55
7.	Sickle	02	11.11

Table no 5: complications noted during this study

Sr. no.	Complications	Number of complications of operated patients	Percentage
1.	Wound infection	04	22.22
2.	Intra abdominal sepsis	02	11.11

Table no 6: Radiological findings.

Sr. no.	Procedure	Number of cases showing positive results	Percentage
1.	X- ray abdomen standing	3	16.66%
2.	Ultrasound of abdomen	10	55.55

Discussion:

Stabbing is an age old standard mode of murder in India and rest of the world too. From ancient time, it is a popular mean to kill. They are the mechanism of approximately 2% of suicides.⁽¹⁴⁾ Stabbings are a relatively common cause of homicide in Canada¹² and the USA.⁽¹³⁾ (Stab are wounds one of the most common forms of penetrating trauma globally, but account for a lower mortality compared to blunt injuries due to their more focused impact to a person.⁽¹⁶⁾ There was no gunshot injury in study. A Ravi kamal kumar et al also noted this, as in India strict laws are in force for acquisition of firearms.⁽¹¹⁾

Penetrating injury abdomen is a common surgical emergency, involving young males in the age groups of 20-30 usually belonging to lower socioeconomic status. In Nance FC et al study, people of 21-30yrs. were commonly affected. In Nagy et al age group commonly inflicted was 20-35 yrs age. Similar findings are noted by A Ravi kamal kumar et al and Rajdev H P et al.^(15,16,11,19) In our present study, the most common age group was 21-30 yrs age followed by 31-40 and 11-20 equally. Our finding correlate with A ravi kamal kumar et al, Nance FC et al and Nagy k et al. A ravi kamal kumar noted 85% cases comprised male population⁽¹¹⁾. In Nance FC et al, males comprised of 85%. In Leppaniemi AK et al 87% of cases were males.^(15,18) In Nagy et al 88% of cases were males. Deodhar SD et al showed 88% males in their study.^(16,24) There was male preponderance as 88.88% in our study also. Not a single case of penetrating injury by gunshot was noted. Digital exploration of the wound under local anesthesia was used for proving of penetrating of peritoneum not for evaluation of intra-abdominal injuries.⁽⁶⁾ We did not used peritoneal lavage in our study. It is time consuming, may produce iatrogenic injuries and may miss solitary bowel lesions.^(6,30)

The indications for laparotomy in our study were ⁽¹⁾ protrusion of viscera, ⁽²⁾ signs, of peritoneal irritation, ⁽³⁾ positive peritoneal tap, ⁽⁴⁾ peritoneal penetration and ⁽⁵⁾ X-ray showing gas under diaphragm ⁽⁶⁾ haemodynamic instability. Similar findings were noted by A Ravi kamal kumar et al. Some authors used conservative management to omental evisceration.^(23,24) But omental evisceration remains an absolute indications for laparotomy⁶. The rate of intra-abdominal injury in patients with evisceration remains high. Organ injury was seen in 78% of patients with visceral evisceration in study by B.Sanei et al.⁽²⁰⁾ Omental herniation after stab wounds of the abdomen should routinely prompt exploratory celiotomy.⁽²¹⁾ Non-operative strategy is only possible in selected patients in trained trauma centers and with intensive supervision by experienced staff. In our study we observed and conserved 2 patients (11.11%) after local wound exploration, rest 16 patients underwent exploratory laparotomy. Serial physical examination alone for asymptomatic or mildly symptomatic patients with abdominal stab wound enables a significant reduction in unnecessary laprotomies.⁽²³⁾

Surgical intervention may be required but it depends on what organ systems are affected by the wound and the extent of the damage.⁽⁸⁾ Typically a surgeon will track the path of the weapon to determine the anatomical structures that were damaged and repair any damage they deem necessary.⁽¹⁴⁾ Nance FC et al noted peritoneal penetration was in 82% cases.⁽¹⁵⁾ In Leppaniemi AK et al study peritoneal penetration was noticed in 72% of cases.⁽¹⁸⁾ In our study peritoneal penetration was noted in 16 out of 18 cases. i.e. 88% cases. Deodhar SD et al and Nance et al have found liver as the commonest object injured followed by small bowel.^(24,15) A. Ravi kamal kumar et al noted small intestinal injury as the most common injury involving the organs.⁽¹¹⁾ Dr faris dawood reported most commonly injured organ was small intestine followed by colon.⁽⁶⁾ In our study, liver was not injured in any case but the most commonly injured organ was small intestine in six patients (33.33%). Stomach, colon and spleen were involved in each one case (each 05.55%), where as mesenteric injury was present in 2 cases (11.11%). Local wound exploration was done in 2 cases (11.11%). And no internal organ injury was noticed in 5 cases (27.77%) which suggest the negative laparotomy. However we did not noticed any major vascular injury in the thoracic or abdominal cavity. Mehmet K Y et al also noted the small intestines were the most commonly injured hollow organs (35.7%), while the liver was the most commonly injured solid organ (28.5%) in the gastrointestinal system.⁽²⁵⁾ In our study, laprotomy was therapeutic in 82.23% of cases and negative in 27.77% of cases. Similar findings are noted by A Ravi kamal kumar et al 80% and

15% respectively.⁽¹¹⁾ While in Nance FC et al¹⁵ study, in 78% it was therapeutic and in Nagy et al it showed 78% cases required therapeutic laprotomy.⁽¹⁶⁾ Penetrating abdominal injuries is a life threatening condition as it can cause injuries to the vital organs. To repair the organ injury and to save life of critically injured patients, we did various operative procedures. These includes closure of small intestine and stomach perforations, colostomy for colonic injury, splenectomy, repair of mesenteric tear and local wound exploration. Some trauma centers advocate mandatory laprotomy for any potentially penetrating stab wounds over abdomen. The policy of mandatory laprotomy leads to many negative laprotomies. In some series up to 53%.⁽⁶⁾

These wounds are contaminated wounds. Contamination occurs at the impact of injury, by the stabbing object itself. More the time taken to reach the hospital, the more are the chance of the wound to get infect. Many factors are contributory, the place and surrounding of stabbing, the object of stabbing, evisceration of bowel or omentum, perforation of hollow viscus, the way of hadling of the wound by lay persons and the time interval to reach to a surgeon. In our study, despite of higher antibiotic cover and good wound care, wound infections were noted in four cases and intra abdominal abscesses were noted in two cases, which we promptly managed. Deodhar SD et al, Nance FC et al mentioned wound infections and chest infections as the commonest complications.^(24,25) There was not a single mortality in our study and all patients were discharged within two weeks of surgical interventions. Recoveries of negative laparotomies were also uneventful. Dr faris dawood also noted abdominal and chest wound infection in two cases.⁽⁶⁾ A. Ravi kamal kumar et al also concluded similar finding that wound infections were the commonest post-operative complications followed by respiratory infection, intra-abdominal sepsis.⁽¹¹⁾ He also noted as post-operative complication in hollow viscus injury is more compared to solid organ injury.⁽¹¹⁾ As noted by Deodhar SD et al persistent sepsis is responsible for higher mortality.⁽²⁴⁾ Some rare complications such as Lumbar artery pseudoaneurysms are infrequent complications of penetrating trauma are noted by Counihan M et al.⁽²⁶⁾

From the history given by the patients, information gathered from police and by observing the nature of the stab wounds, we could identify the probable weapon used. We had found, the knife was the commonest weapon used for committing the offence. However broken piece of weapon was not found inside the body during radiography and surgery. Left upper quadrant of the abdomen was damaged in six cases (33.33%), whereas in four cases each

left lower quadrant, right lower quadrant and right upper quadrant were involved.(each 22.22%).

Hemodynamically unstable patients should be operated without delay after performing a chest X-ray and ultrasound Focus assisted sonography for trauma (FAST) to guide the surgery.⁽²⁷⁾ All eighteen patients were subjected to radiological examination in our study. We had taken plain x-rays of chest and x-rays of abdomen in the standing position. On x ray chest left sided haemothorax in one case while free gas under diaphragm was present in three cases only. However negative radiological examination does not rule out hollow viscus or solid organ injury.^(17,24) Abnormal roentgenograms we noted in 16.66% cases. A. Ravi kamal kumar et al observed it as 30%, suggesting that abdominal roentgenograms are unreliable in diagnosis of penetrating injuries.⁽¹¹⁾ Free air under the diaphragm as was demonstrated by erect abdominal x-ray considered an indication for laparotomy.⁽⁶⁾ The value of roentgenograms of the abdomen in the evaluation and management of stab wounds to the abdomen has not been well documented.⁽²²⁾ It is possible that the air entered in the abdomen may be either through through the stab wound or penetrating the right hemidaphragm as reported by D. Demetriades and Robin Owtz who treated 5 patients with air under the diaphragm conservatively, with no morbidity or mortality.⁽¹⁹⁾ But in our study those three cases having free gas under diaphragm had serious hollow viscus injuries. Overall Abdominal roentgenograms are unreliable. Peritoneal penetration as such is a poor indicator of significant organ injury. All patients undergone ultrasound examination in our study. Out of 18 cases 10 cases revealed positive findings,(55.55%). Sonography is a well-tested diagnostic method in evaluating patients with abdominal trauma. Follow-up examinations-even with negative initial results-are needed. Focused Assessment with Sonography for Trauma (FAST) is rapidly establishing its place in the evaluation of abdominal trauma.⁽⁴⁾ FAST is widely used as it is inexpensive, portable, non-invasive, highly sensitive, frequently repeatable due to not involving x-rays, easily applied by surgeons and enables a rapid response in about 4-5 minutes.⁽²⁵⁾ FAST can be a useful initial diagnostic study after penetrating abdominal trauma. A positive FAST is a strong predictor of injury, and patients should proceed directly to laparotomy. If negative, additional diagnostic studies should be performed to rule out occult injury.⁽⁴⁾ The routine use of sonography in penetrating torso injury is beneficial. The detection of pericardial or peritoneal fluid is clinically useful. However, a negative FAST examination does not exclude abdominal injury, such as a diaphragm or hollow viscus wound, and further investigation or close follow-up is required.⁽²⁹⁾ Regarding free fluid, it is possible to determine its presence and

composition through the peritoneal aspiration after a sonoguided puncture. On the other hand, ultrasound is able to detect morphologic changes in solid organs after penetrating trauma.(28) The specificity of USG was reported to be 94% in the study conducted by Udobi et al and 98% in the study by Boulanger et al.(4,29) Mayards found 6.3% mortality rate, Lowe found 1.6% mortality rate and Dr Faris Dawood noted no mortality in his study.(15,6) In our study also no mortality was noted.

Figure no 1: Ileal perforation : stab injury



Figure no 2: closure of small bowel perforation in two



Figure no 3: omental evisceration.



Figure no 4: intestinal evisceration.



References :

- 1 Reginelli A, Pinto A, Russo A et al. Sharp penetrating wounds : Spectrum of imaging findings and legal aspects in the emergency setting. *Radiol Med.* 2015.Sep;120(9):856-65.doi.10.1007/s11547-015-0553-x.Epub 2015 jun 2.
- 2 Freeman P. The role of ultrasound in the assessment of the trauma patient. *Aust J Rural Health.* 1999;7:85-89.[PubMed]
- 3 Smith J. Focused Assessment with sonography intrauma (FAST):should its role be reconsidered? *Postgrad Med J.* 2010;86:285-291.[PubMed]
- 4 Udobi KF, Rodriguez A, Chiu WC, Scalea TM.Role of ultrasonography in penetrating abdominal trauma: A prospective clinical study. *J Trauma.* 2001;50:475-479[PubMed]
- 5 R.J.Last:Anatomy, regional and applied :seventh edition 1984 page 256,269.
- 6 Dr. Faris Dawood Al Aswad, abdominal stab wounds.The journal abdominal surgery,winter 2009/spring 2010.
- 7 Taber,Clarence Wilbur;venes,Donald(2009).Tabers cyclopedic medical dictionary.F A Davis co.p.2189.ISBN-0-8036-1559-0.
- 8 Mankin SL(September 1998)."Emergency!stab wounds". The American journal of nursing 98(9):49. Doi:10.2307/3471869.PMID 9739749.Retrieved 2011-09-30.
- 9 Abdullah F, N Wernberg A, Rabinocivi R.(January 2003) "self-inflicted abdominal stab wounds". *Injury*

- 34(1):35-9.doi:10.1016/50020-1383.00084-0. PMID 12531375. Retrieved 2011-09-30.
- 10 Rajesh Bardale, principles of forensic medicine and toxicology. Jay Pee brothers, medical publications;190-193.
- 11 A Ravikumar et all. Penetrating injury abdomen : A study at Government general hospital. J of evidence based Med and Hlthcare, PISSN-2349-2562, EISSN-2349-2570/vol.2/ISSUE 17?APR;2015. Page 2585.
- 12 <http://www40.statcan.ca/101/cst01/legal01-eng.htm>. Homicides by method.
- 13 "Murder Victims; by weaoons used."info please.Sand box networks.Retrieved 2015-07-18.
- 14 <http://en.wikipedia.org/wiki/stab-wound.1/25/2016>.
- 15 Nance FC et al.surgical Judgement in the Management of penetrating Wounds of Abdomen Experience with 2212 cases. Ann J. Surg 1974;179:639-646.
- 16 Nagy K et al.Evisceration after abdominal stab wounds. Is laparotomy required? J trauma 1999;51.
- 17 Rajdeo H P and Deodhar S D: Stab wounds of the abdomen- A study of 75 cases. Ind.j.Med.Sci.29:54-59,1975.
- 18 Leppanicmi A,Solo j,Haapianinen R. Complications of negative laprotomy for truncal stab wounds. J Trauma.1995;38:54-58.[PubMed]
- 19 D.Detmetriades,B.Robinwitz:selective conservative management of penetrating abdominal wounds,a prospective study.Br.J.Surg:1984;71:92-94.
- 20 B. Sanei, M.Mahmondiesh, H. Talebzadesh et all. Do patients with penetrating stab wounds require laprotomy? Archives of Trauma Research;2013,June; 2(1):21_25. DOI 10.5812/ atr .6617.
- 21 Medina M, Ivatury RR, Stahl WM Omental evisceration through an abdominal stab wound: is exploratory laparotomy mandatory? Can J Surg. 1984 Jul;27(4):399-401.
- 22 Kester DE, Andrassy RJ, Aust JB. The value and cost effectiveness of abdominal roentgenograms in the evaluation of stab wounds to abdomen.Surg,Gynaecol obstet 1986;162-337.
- 23 Navsaria PH, Berli JU,Edu S, Nicol AJ. Non operative management of abdominal stab wounds-an analysis of 186 patients. S Afr j Surg.2007 Nov;45(4):128-30,132.
- 24 SD Deodhar, NP Patel, KB Shah. Blunt and penetrating abdominal injuries(a study of 51 cases), journal of postgraduate Medicine.1983.vol 29. Issue 2.Pg 96-9.
- 25 Menmet K Y, Erkan O et al. Analysis of 120 patients with abdominal stab wound focusing on diagnostic role of FAST. Int J Clin Exp Med.2014;7(5):1386-1390.
- 26 Counihan M,Pontell M E,sevlan B et al. Delayed presentation of a lumbar artery pseudoaneurysm resulting from isolated penetrating trauma.J Surg case Rep.2015.jul 14.:2015(7).pii:rjv083. doi10.1093/jscr/rjvo83.
- 27 Bege T,Berdash SV,Brunet C. Stab wounds in emergency department . PressMed.2013.Dec;42(120):1572-8,doi;10-1016/s00068-009-9092-2:Epub2013oct28.
- 28 Sproviero J. The Role of Ultrasound in penetrating trauma. Eur J Trauma Emerg Surg2010.Apr;36(2):138-44.doi:10.1007/s00068-009-9092:Epub2009 Nov 19.
- 29 Boulanger BR1, Kearney PA, Tsuei B, Ochoa JB The routine use of sonography in penetrating torso injury is beneficial. J Trauma. 2001 Aug;51(2):320-5.
- 30 W.Chapman Lee M.D.,Joseph F.UD,Do Fransis Nance: Surgical Judgement in the management of abdominal stab wounds utilizing criteria from 10 yrs experience. Ann.Surg:1984:199:544.

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