Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 10, Issue, 03, pp.66565-66571, March, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

PEROPERATIVE PROFILE AND PROCEDURES DONE AT LAPAROTOMY IN ABDOMINAL INJURIES DUE TO POLYTRAUMA- OUR 3 YEARS EXPERIENCE

[1,*]Dr. Kannan, R.R., [2]Dr. Nandhini, C.C., [3]Dr. Sathish Devadoss, [3]Dr. Devadoss, A. and [3]Dr. Sudhir, R.

[1]Senior Consultant Surgical Gastroenterologist, Institute of Orthopedic Research and Accident Surgery, Madurai and Associate Professor, K.A.P.V. Government Medical College, Trichy
[2]Senior assistant professor, Govt. Rajaji Hospital and Madurai Medical College, Madurai
[3]Institute of Orthopedic Research and Accident Surgery, Madurai

ARTICLE INFO

Article History:
Received 14th December, 2017
Received in revised form
20th January, 2018
Accepted 03rd February, 2018
Published online 28th March, 2018

Key words:
Erosion extent,
Land use Land Cover,
Image Classification.

ABSTRACT

Background: 25% of all abdominal trauma require abdominal exploration (Townsend, 2008; Hemmila, 2008; Dipak, 2016).7-10 % of all polytrauma deaths occur due to abdominal injuries (Fabion *et al*., 2002; Karamercan *et al*., 2008). Early detection and optimal procedure would reduce the morbidity and preventable mortality. Delay in diagnosis may be dangerous to the patient and can lead to the mortality and morbidity (Rishikant *et al*., 2015).
Aim: To study the profile of various abdominal organ injuries found at laparotomy in polytrauma and various surgical procedures undertaken and outcome of the surgery.
Materials and Methods: It is a retrospective observational study conducted for three years from 1st January 2014 to 31st December 2017 at Institute of Orthopedic Research and Accident Surgery, Madurai, at Devadoss multispecialty hospital, a private tertiary teaching polytrauma institute at Madurai, South Tamil Nadu, India. Patients who left the hospital against medical advice, those aged below 12 years and injuries treated conservatively by non-operative management (NOM) were excluded in this study. Analysis is based on the intra-operative findings such as pattern of abdominal organ injury, grade of injury due to different modes of injury, various surgical procedures undertaken, hospital stay and outcome recorded in the case sheet were analyzed by statistical methods.
Results: In the span of 3 years of study, 48 patients had abdominal injuries due to polytrauma.17 haemodynamically stable patients with radiological signs of solid abdominal visceral injury were treated by non-operative management(NOM) were excluded from the study. Remaining 31 patients underwent laparotomy. The cause of injury was blunt trauma in 26 cases and penetrating injury in 5 cases. Common solid organ of injury was spleen and hollow visceral injury was small bowel. Multiple organ injuries are more common than isolated organ injury. Indications for solid organ injury were mainly for control of bleeding and for high grades of injuries as per standard protocol. All hollow visceral injury of all grades needed laparotomy. They required either resection and anastomosis or diversion. Hospital stay depended on associated injuries requiring surgery and co-morbid illness.
Conclusion: Early diagnosis and treatment are of important factors determining the overall outcome. An associated injury often determines the survival. Multiple organ injury is more common than isolated injuries. No part of the abdomen is immune to trauma. All hollow visceral injuries needs laparotomy. Role of laparotomy is to control and arrest ongoing bleed and to manage peritonitis due to bowel perforations. Although early diagnosis of intestinal injuries is difficult, it is very important to recognize them since they have tremendous infectious potential. Surgical procedures have to be tailored as per intra-operative findings, general condition of patients and facilities available at the centre to reduce the morbidity and mortality.

Citation: Dr. Kannan, R.R., Dr. Nandhini, C.C., Dr. Sathish Devadoss, Dr. Devadoss, A. and Dr. Sudhir, R. 2018. "Peroperative profile and procedures done at laparotomy in abdominal injuries due to polytrauma- our 3 years experience", *International Journal of Current Research*, 10, (03), 66565-66571.

INTRODUCTION

Abdominal injury is the third most common form of injury in road traffic accident after orthopedic and head injuries particularly in young adults causing great socioeconomic impact (Zheng *et al*., 2007).

Corresponding author: **Dr. Kannan, R.R.,**
Senior Consultant Surgical Gastroenterologist, Institute of Orthopedic Research and Accident Surgery, Madurai and Associate Professor, K.A.P.V. Government Medical College, Trichy.

At laparotomy, pattern of injuries, organs injured according to mode of injury, grade of injury, degree of contamination, time lag between injury and laparotomy varies with patients. Hence the ideal surgical procedure depends on intraoperative findings, amount of inflammation present, control of blood loss, haemodynamic stability, general condition of the patient to withstand the procedure, method of presentation-early/delayed, presence of comorbid illness. The surgical procedures should be individualiased and tailored according to patients. Morbidity and mortality of

laparotomy patients and ultimately the outcome of the surgery depends on above factors. Decision to operate should be taken early to avoid potential risk of complications of contamination and to avoid ongoing bleed and ultimately shock in a already haemodynamically unstable polytrauma patients.

MATERIALS AND METHODS

Laparotomy is common surgical emengency in polytrauma patients. It is a retrospective observational study conducted for three years from 1st January 2014 to 31st December 2017 at Institute of Orthopedic Research and Accident Surgery, Madurai, at Devadoss Multispecility Hospital, a private tertiary teaching polytrauma institution at Madurai, South Tamil Nadu, India.

Observation

Out of 31 patients who underwent laparotomy, 26 were due to blunt injury and 5 were due to penetrating injury. 5 were female out of 31 cases. In 26 cases of blunt injury abdomen, 20 (76.92%) had multiple organ injury and 6 cases (23%) had isolated organ injury. Out of 5 cases of penetrating injury, 4 had multiple organ injury and one case had isolated organ injury.

cases(16%), stomach injury 2 cases (6.45%), diaphragmatic injury 2 cases (6.45%), anal sphinter complex injury 3 cases (9.67%), duodenal injury 1case (3.2%). (Table 1, Chart 1). Of 26 cases of blunt injury abdomen, commonest injury noted was retroperitoneal injury-15 cases (57.6%) followed by spleen injury 9 cases (34.6%), liver injury 7 cases (26.9%), mesenteric injury 9 cases (34.61%), small bowel injury 8 cases (30.76), colonic injury 6 cases (23%), pancreatic injury 4 cases (15.38%), one case of duodenal injury (3.84%) and one case of diaphragmatic injury(3.84%) (Table: 2, Chart:2). Out of 5 cases of penetrating injury, organs injured were stomach 2 cases (40%), liver 1(20%), diaphragm1 (20%), pancreas 1case (20%), anal sphinter complex injury 3 cases(60%).

DISCUSSION

Due to high speed accidents occurring nowadays in four tract roads, polytrauma involving head, chest, abdomen and pelvis are common. In major abdominal trauma due to frequent altered sensorium of patients in association with severity of other injuries involving chest, pelvis, head, diagnosis becomes difficult in both blunt and penetrating injury (Ionut Negoi, 2016). Peak age incidence of injury were middle age. Males were involved more in polytrauma because of more outdoor activities and vulnerable to accident.

Table 1. Pattern of organ injury at laparotomy (combined blunt and penetrating injury) 31 cases

S.no	Organs injured	No. of Patients	Percentage	Severity of injuries
1.	Spleen	9	29%	Haematoma to shattered spleen
2.	Liver	8	25.8%	Haematoma to Grade 4 injury
3.	Retroperitoneum	15	48.38%	Haematoma to slight bleed
4.	Mesentry	9	29.03%	Haematoma to tear
5.	Stomach	2	6.45%	Perforation/Laceration
6.	Small bowel	8	25.8%	Serosal tear, perforation, transection
7.	Duodenum	1	3.2%	Transection of 3rd part
8.	Large bowel	6	19.35%	Serosal tear, perforation, transection
9.	Pancreas	5	16.1%	Haematoma, transection
10.	Diaphragm	2	6.45%	Traumatic diaphragmatic hernia
11.	Anal sphinter complex	3	9.67%	Perineal injury involving levator ani

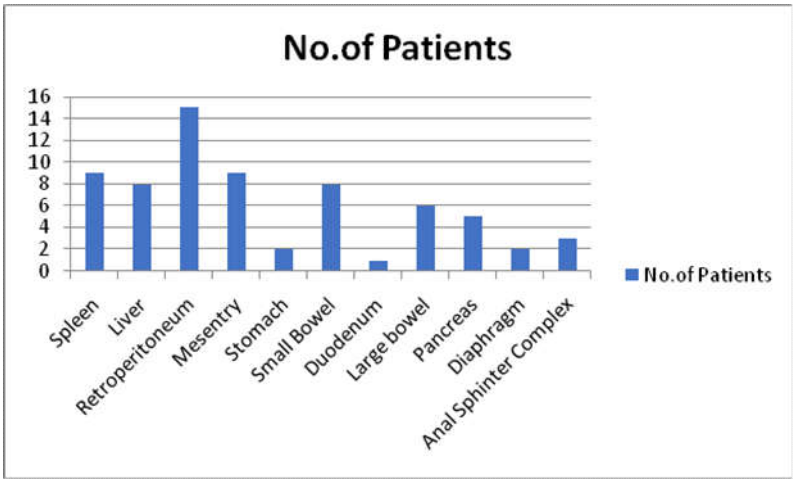

Chart 1.Pattern of organ injury at laparotomy (combined blunt and penetrating injury) 31 cases

In polytrauma due to combined blunt and penetrating injuries of 31 cases who underwent laparotomy, 15 cases (48.38%) had retroperitoneal injury, splenic injury 9 cases (29%), liver injury 7 cases (25.8%), small bowel mesentry 9 cases (29%), small bowel injury 8 cases (25.8%), large bowel injury 6 cases(19.35%), injury to pancreas 5

Nonoperative management (NOM) is nowadays a gold standard in isolated solid organ injuries of low grade in a haemodynamically stable, young, patient without comorbid illness in an ICU setup. But almost all the patients with hollow visceral perforation needs surgery. Since there is always a role for conservative management for solid organ injury, the incidence of solid

Table 2. Organs injured in blunt injury -26 cases

s.no	Organs injured	No. of patients	Percentage of patients
1.	Spleen	9	34.6%
2.	Liver	7	26.9%
3.	Retroperitoneum	15	57.6%
4.	Mesentry	9	34.61%
5.	Small bowel	8	30.76%
6.	Duodenum	1	3.86%
7.	Large bowel	6	23.07%
8.	Pancreas	4	15.38%
9.	Diaphragm	1	3.8%

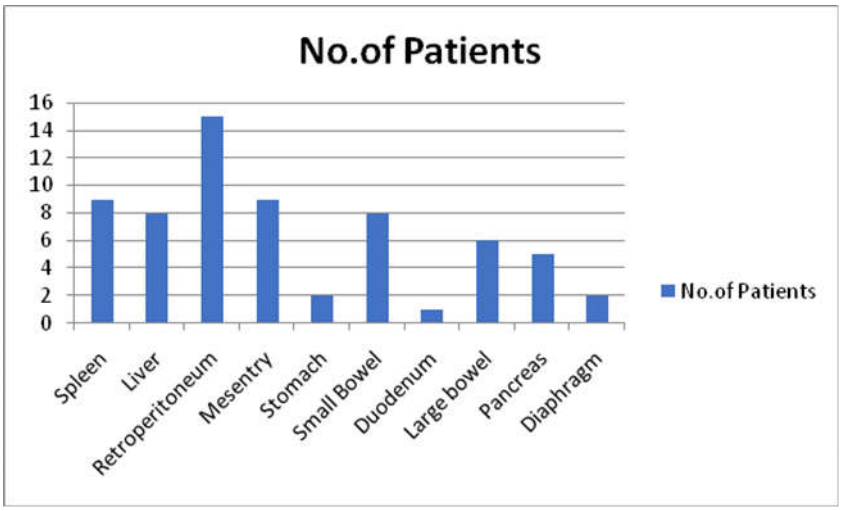

Chart 2. Organs injured in blunt injury -26 cases

Table 3. Organs injuired in penetrating injury abdomen (5 cases)

S.no	Organ injured	No. of patients	Percentage of Patients.
1.	Stomach	2	40%
2.	Liver	1	20%
3.	Diaphragm	1	20%
4.	Pancreas	1	20%
5.	Anorectum	2	60%

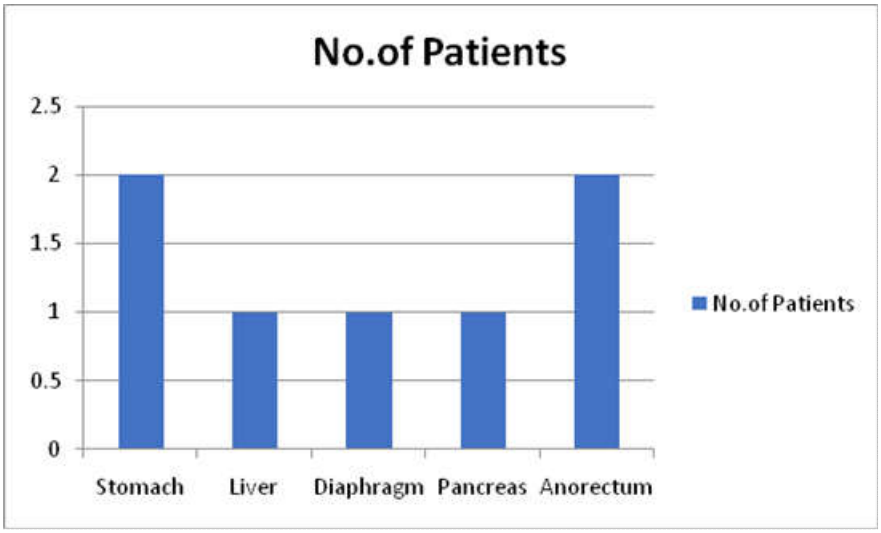

Chart 3.Organs injuired in penetrating injury abdomen (5 cases)

Table 4. Surgical procedures done in hollow visceral injury

s.no	Organ injured	Total no. of patients	Type and grade of injury	Subgroup of patients.	Surgical procedure done
1.	Stomach	2	Laceration anterior wall	2	Suturing
2.	Duodenum	1	Complete transection of 3rd part of duodenum	1	Resection, duodenojejunal anastomosis, decompression gastrostomy, feeding jejunostomy.
3.	Small intestine	8	Complete transection/ laceration more than 2/3rd circumference Perforation Serosal tear	3 3 2	Resection and anastomosis Perforation closure Serosal suturing
4.	Large bowel	6	Perforation, vascular compromise due to thrombosis Colonic perforation /tear with gross contamination/ delayed diagnosis/poor G.C Serosal tear	2 2 2	Resection and anastomosis Diversion colostomy Serosal suturing
5.	Anal sphinter complex and rectum	3	Sphinter laceration-1 Severe laceration of anorectum with gross contamination Severe laceration of anorectum	1 2 1	Suturing Diversion colostomy Leveteroplasty,gracilis sling anoplasty, colostomy closure

Table 5. Surgical procedures done in solid visceral injury

S.no	Organ injured	Total no.of patients.	Type and grade of injury	Subgroup of patients	Surgical procedures done
1.	Spleen	9	Grade III-IV Grade V Hematoma,grade I/II without bleed	6 1 2	Splenectomy Conservative (along with other organ injury)
2.	Liver	8	Active bleeding Grade III-IV	2 6	Suturing Debridement/ gel foam packing
3.	Pancreas	5	Laceration at tail/ Pancreatic injury without main ductal laceration	5	Conservative
4.	Retroperitoneum	14	Active bleeding Nonexpanding Haematoma	1 13	Suturing Conservative
5.	Mesentry	9	Mesentric tear/ thrombosis causing vascular compromise Tear without bowel vascular compromise	2 7	Resection of the gangrenous small bowel and anastomosis Suturing
6.	Diapharagm	2	Persistent air leak (due to stab injury) Traumatic hernia of stomach, spleen, colon, omentum into left chest (Blunt injury)	1 1	Suturing through abdominal approach Suturing of tear after reduction of content

Table 6. Incidence of small and large bowel injury in blunt trauma

s.no	Study	Small bowel injury (%)	Large bowel injury (%)
1.	Dipak Kr *et al*. (2016)	40.35%	1.75%
2.	Hildebrand *et al*. (2006)	21%	21%
3.	Costa *et al*. (2010)	10%	6%
4.	Watts *et al*. (2003)	3%	0.9%
5.	Arumugam *et al*. (2015)	12%	5%
6.	Our study	30.76%	23.07%

organ injury is comparatively lesser at laparotomy (Dipak, 2016). According to current standards, for low morbidity and mortality, the trauma may be approached by multidisciplinary and experienced trauma team. Even if NOM is continuously expanding, this may be applied only by a trained and skillfull trauma surgeon, who is able to perform difficult techniques at any moments (Ionut Negoi, 2016).

cases who underwent laparotomy, retroperitoneal haematoma with or without bleed was seen in 15 cases (48.38%), ranking first in injury abdomen. Most of these patients had associated multiple organ damage. The occurrence of trauma causing bleeding into the retroperitoneal space was noted in 14.59% of patient (Everard, 1984). In our study, solid organ injuries were more common than hollow visceral injury. Most common organ that was injured in polytrauma was spleen followed by liver.9 cases out of 31 cases(20.03%) had splenic injury.

Out of 9 cases, 2 had isolated splenic injury and rest 7cases had multiple organ injury. One study, it was 42% (Chalya, 2012). Splenic injury of grade IV –V were takenup for surgery. Haemodymically stable patients with CT grading of injury less than 3 without active bleeding were managed by NOM. Eventhough liver is the most vulnerable organ for abdominal injuries, it is not the most common cause of massive bleeding in blunt injury abdomen. This position is taken by spleen which bleeds heavely (Fabion, 2002). Fracture of left lower ribs are associated with splenic laceration in 23% of cases (Seongsik Park, 2012). In our study, 5 cases (16.1%%) of left lower rib fractures with splenic injury were reported. Splenic injury are common in adults compared to liver in children. Next common organ that was injured was liver, 8 cases out of 31 cases (25.8%). In some studies liver injury are more common than splenic injury (Smith, 2005). Liver injury occurs in 5% of patients with blunt injury abdomen (Pacher *et al*., 1995). Studies has shown that in upto 86% of the liver injuries, the bleeding have stopped by the time the surgical exploration is undertaken (Velhos *et al*., 2003). Though liver is protected by ribcage, large organ size, friability, thin capsule, relatively fixed position in relation to the spine, position of organ makes liver most vulnerable organ for injury(15,4) .Liver injuries present as serious risk for shock because the liver tissue is delicate and has large blood supply and capacity (Blank-Reid, 2006). Severity of injury graded by CT scan were studied. The injury ranged from subcapsular haematoma to severe laceration with compromised blood supply with or without bile leak. In our study, out of 8 cases of liver injury found at laparotomy, one had haematoma, 2 cases had laceration with bleeding which required suturing, 5 cases had laceration without active bleeding underwent debridement. Debridement should be performed based on anatomical structure of liver in order to remove any necrotic tissues, ligature the damaged vessels and bile ducts and retain normal tissue. This is routinely performed because debridement is focused upon the injured part of liver, unlike anatomical hepatectomy (Fu, 2009). Patient with liver trauma in a hamodynamically stable patient without signs of peritoneal irritation should apply the standard of care represented by nonoperative management (NOM), regardless of severity of injury (Mc Vay *et al*., 2008).

In traumatic pancreatic injury, the decision for conservative or surgical depends on integrity of main pancreatic duct, extent of parenchymal damage, stability of patient and degree of associated organ damage (Duchesne *et al*., 2008). Out of 31cases who underwent laparotomy, 5 cases (16.1%) had pancreatic injury. Injury includes hematoma, capsular tear, laceration at tail of pancreas without main ductal injury were managed by drainage alone. All 5 cases had associated other organ injuries which required major surgical procedures. Studies have shown that 90% of pancreatic injury has at least one other abdominal injury (Uma Debi, 2013). Injury to abdominal structures can be classified into 2 primary machanisms of injury- compression forces and deceleration forces (Salomone, 2009). Compression or concussion forces may result from direct blows or external compression against a fixed object (e.g. lap belt, spinal column). These forces may deform hollow organs and transiently increase intraluminal pressure, resulting in rupture. Deceleration forces cause stretching and linear shearing between relatively fixed and free objects.

As bowel travels from mesenteric attachments, thrombosis and mesenteric tears, with resultant splanchnic vessel injuries can result. Whatever the mechanism, early recognition of these lesions can be difficult. An overlooked bowel injury is very dangerous because of its tremendous infectious potential (Madhumitha Mukhopadhyay, 2009). In our study, 2 cases of stomach injury was reported by penetrating trauma and none in blunt injury. Both were managed by simple suturing in two layers with wide bore nasogastric tube insitu and post operatively. Duodenal injuries are rare in blunt injury abdomen. In our study, we had one case of duodenal injury with complete transection at level of third part due to blunt injury. Procedure done was closure of proximal end, duodenojejunostomy, decompression gastrostomy, feeding jejunostomy. Everard F cox reported a single case of duodenal injury in 5 years of study (Everard, 1984). Out of 26 cases of blunt injury trauma, hollow visceral injury include small bowel injury 8 cases (30.76%) (Fig:1), large bowel injury 6 cases (23.07%),duodenum injury 1 case (3.86%).

Out of 6 cases of large bowel injury, 2 cases underwent resection and anastomosis for injury to right colon,2 cases diversion colostomy for left colon with gross faecal contamination and restoration of continuity later on as second stage, serosal injury required suturing 2 cases. All colonic injuries were due to blunt trauma.In case of destructive colonic injury, hypovolemic shock, severe intraabdominal fecal contamination, old age, associated severe underlying medical disease the proximal diversion is performed more frequently for blunt trauma colon injury (Miller, 2001). Carrillo *et al* reported that complication between the group who received primary anastomosis after resection and the group who received proximal diversion after resection were not different (Carrillo *et al*., 1996). Neverthless, for patients with unstable vital signs, cases with severe contaminations and cases with severe associated extra abdominal injuries, proximal diversion is recommended. All the small bowel injuries were due were due to blunt trauma. Out of 8 cases, 3 cases underwent resection and anastomosis for either traumatic transection of bowel or gangrene of bowel.

For 3 cases, with perforation or laceration of bowel less than $1/3^{rd}$ of the circumference of bowel needed simple suture closure.2 cases of serosal injury needed suturing. 2 cases of diaphragmatic injury were reported, one due to penetrating and another due blunt injury. Patient with blunt trauma had delayed presentation with massive herniation of abdominal contents which include stomach, spleen,distal transverse colon into the thoracic cavity causing complete collapse of the left lung. Patient with penetrating injury presented with persistant air leak and pnemothorax. Both cases had repair of defect in diaphragm by abdominal approach with nonabsorbable sutures with intrathoracic drain (Fig:2,3). An extensive review of literature revealed that 74% of diaphragmatic injury were repaired via laparotomy,18% via thoracotomy and 8% via combined approaches (Carter, 1951). As in majority of studies, in ours also showed that both the injuries were on the left side. Carter *et al* revealed the majority (80-90%) of blunt diaphragmatic ruptures have occurred on the left side (Carter, 1951). 3 cases of anal sphinter complex injury were reported. All the 3 were due to penetrating injury.2 underwent sphinter repair.

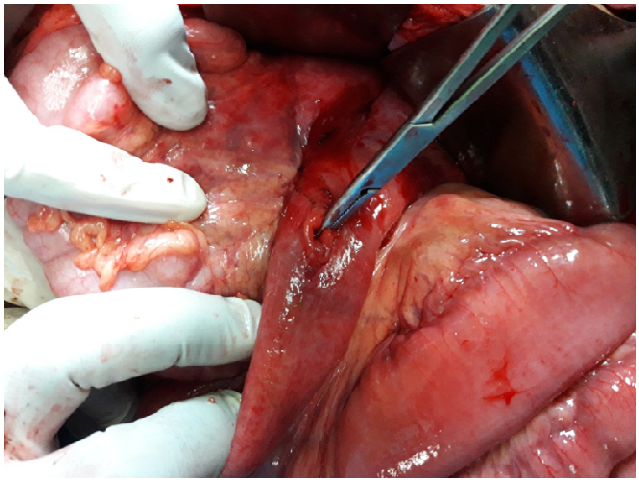

Fig. 1. Traumatic jejunal perforation

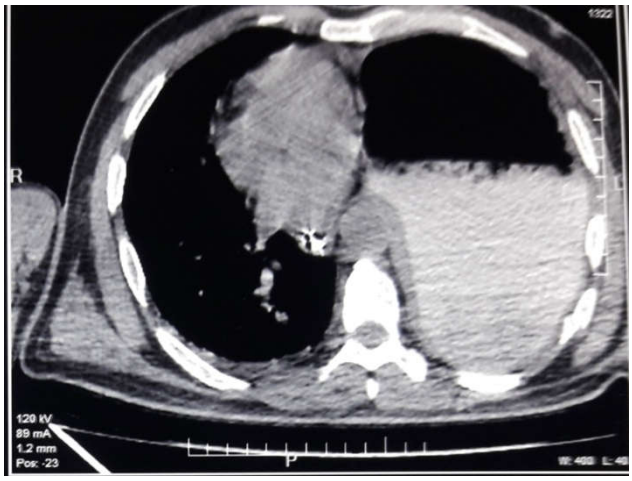

Fig. 2. CT Chest showing traumatic left diaphragmatic hernia

Fig. 3. Rent in left diaphragm

One patient who has pelvic fracture with deep perineal injury with gross contamination and anorectal injury underwent staged procedure. Initially she underwent diversion trephine sigmoid loop colostomy. Later she underwent leveteroplasty after 4 months. Since it was ineffective she again underwent Gracilis sling anoplasty which was successful leading her normal life. Almost all of the retroperitoneal injury in our study had associated visceral injury. Retroperitoneal haematomas were usually not opened unless evalution of specific organs in this space was required (Everard, 1984). Out of 9 cases of small bowel mesentric injury (31.61%), 2 had extensive laceration compromising the vascularity of bowel which required resection of adjacent bowel. One study reports 13% of laparotomy cases had mesentic injury (Everard, 1984). Length of hospital stay varied widely with polytrauma patients. Usually isolated abdominal injuries in polytrauma patients who underwent laparotomy were discharged once they were able to take soft solids and passed motion. Other patients with multiple organ system injury who were on staged procedure in neuro, orthopaedic, ENT, dental and spinal injuries required longer hospital stay. Outcome of the patient depends on mode of injury, age of patient, co-morbid illness like preexisting diabetis millitus, ischemic heart disease, chronic renal or liver disease, time lag between the injury and resuscitation and the necessary surgical procedure, development of complications like sepsis, acute respiratory distress syndrome, multiple organ failure. In our study, 2 deaths were reported, one patient due to splenic injury with multiple organ system failure died due to Acute Respiratary Distress Syndrome(ARDS) on eighth postoperative day . One patient with massive haemoperitoneum due to avulsion of root of mesentry with active bleed expired due to intraoperative cardiac arrest. Studies have shown that massive intraabdominal haemorrhage was identified as the frequent cause of early mortality following multiple trauma (Hildebrand *et al*., 2006).

Conclusion

Early diagnosis and treatment are of important factors determining the overall outcome. Associated injuries are often the determining factors in survival. In blunt injury abdomen, multiple organs were found injured more than isolated organs. Nonoperative management is an established and accepted management protocol for solid visceral injuries in haemodynamically stable patients. All hollow visceral injuries needs laparotomy. Role of laparotomy is to control and arrest ongoing bleed and to manage peritonitis due to bowel perforations. Although early diagnosis of intestinal injuries from abdominal trauma is difficult,but it is very important to recognize them because of its tremendous infectious potential. Nowadays, only patients not satisfying the criteria of nonoperative management undergo laparotomy. Liver may need suturing, debridement , packing. Spleen may require suturing or splenectomy. Pancreas may need resection or drainage. Hollow visceral injuries needs suturing or resection and anastomosis or diversion depending on various factors.

REFERENCES

Arumugam S, Al-Hassani A, EL-Menyay *et al*. 2015. Frequency, causes and pattern of abdominal trauma: A 4

year descriptive analysis. *Injuries J Emerg Trauma shock*. Oct-Dec;8(4):193-198.

Blank-Reid C September 2006. A historical review of penetrating abdominal trauma Crit Care Nurs Clin North Am 18(3);387-401

Carrillo EH, Somberg LB, Ceballos CE *et al*. 1996. Blunt traumatic injuries to the colon and rectum. *J Am CollSurb.* 183:548-552.

Carter BN, Giuseggi J, Felson B. 1951. Traumatic diaphragmatic hernia. *Am J Roentgenol RadiumTher Nucl Med.,* Jan.65(1):56-72.

Chalya PL, Mabula JB, Dass RM *et al*. 2012. Injury characteristics and outcome of road traffic crash victims at Bugando medical centre at northwest Taanzania. *J Trauma Manag Outcomes*.6

Costa G,Tierno SM, Tomassini F, Venturini l, Frezza B,Cancrini G, *et al*. 2010. The epidermiology and clinical evaluation of abdominal trauma. An analysis of a multidisciplinary trauma registry. *Ann Ital chir.,* 81:95-102.

Dr. Dipak Kr, Sarma *et al*. 2016. Visceral injuries in blunt abdominal trauma, Journal of medical science and clinical research Volume 04 Issue 07 July.

Duchesne JC, Schmieg R, Islam S *et al*. 2008. Selective nonoperative management of low grade blunt pancreatic injury:arewe there yet? *J Trauma.,* 65:49-53

Everard F, COX MD. 1984. from department of Surgery,Maryland of Institute for emergency medical sevices, Batimore, Maryland. Blunt abominal trauma. A 5year analysis of 870 patients requiring Celiotomy.

Fabion TC, Croce MA, Minard G *et al*. 2002. Current issues in trauma. *Curr Probl Surg.,* 39:1160-244.

Fu S.Y., Lai E.C., Li A.J. 2009. Liver resection with selective vascular exclusion: a cohert study. *Ann Sury.,* 249:624-627.

Hemmila MR, Wahl WL. 2008. Management of injuried patient. In: Dorethy GM, editor. Current surgical diagnosis and treatment. New York: McGraw-hill Medical;pp.227-8.

Hildebrand F, Winkler M, Griensven MV, Probst C, Musahl V, Krettek C, *et al*. 2006. Blunt abdominal trauma requiring laparotomy: An analysis of 342 polytraumatized patients. *Eur J Trauma.,* 32:430-8.

Ionut Negoi, Sorin Paun, BogdanStoica *et al*. 2016. Latest progress of research of acute abdominal injuries, Journal of acute disease, 5(1);16-21

Karamercan A, Yilmaz TU, Kamercan MA, Aytac B. 2008. Blunt abdominal trauma: Evaluation of diagnostic option and surgical out comes. *Turk J Trauma Emerg Surg.,* 14:205-10.

Kumawat, J.L., Mathur, P.N., Kuasm Mathur, F.S. Mehta. 2015. "Retrospective study of Blunt Abdominal Trauma" *Journal of evolution of medical and dental sciences,* Vol 4, Issue 59. Juy23; Page:10263-10269.

Madhumitha Mukhopadhyay *et al*. 2009. Intestinal injury from blunt abdominal trauma: a study of 47 cases; *Omen medical Journal.*

Mc Vay MR, Kokoska ER, Jackson RJ, Smith SD. 2008. Throwing out the great "book"management of isolated liver and splenic injury based on hamodynamic status. *J Pediatr Surg.,* 43(6); 1076-6.

Miller BJ. 2001. Colonic injury: does colostomy still has a place? Injury. 32: 433-434.

Pacher HL, Guth AA, Hofstetter SR, Spencer FC. 1995. Changing pattern in the management of splenic trauma: the impact of nonoperative management of abdominal solid organ injury. *Ann Surg.,* 222(3):311-322.

Rishikant Vishistha, Himanshu Bansal,Sanjay DA *et al*. 2015. Study of clinical profile of blunt abdominal trauma at tertiary care centre of central India, Journal of evalution of medical dental sciences/Volume 4/Issue 93/Nov.19

Salomone JA, Salomone JP. 2009. Abdominal trauma, Blunt. Available at emedicine at Web MD. Accessed o 2nd oct.

Seongsik Park, M.D. 2012. Clinical analysis for the correlation of intraabdominal organ injury in theepatients with rib fracture; *Korean J Thorac Cardiovas Surg.,* Aug; 45(4):246-250.

Smith J, Cadwell E, D Amours *et al*. 2005. Abdominal trauma: A disease in evaluation. *ANZ J Surg.,* 75:790-4.

Townsend CM, Jr, Beauchamp RD, Evers BM *et al*. 18th ed. Philadelphia; Elsevier-Saunders; 2008. Sabiston Texbook of surgery, the biological basis of modern surgical practice;p.512

Uma Debi, Ravinder Kaur, Kartar Singh, 2013. Pancreatictrauma: Aconcisereview; World Journal of Gastroenterology. Dec21;199(47):9003-9011

Velhos GC, Toutouzas KG, Radian R *et al*. 2003. Nonoperative treatment blunt injury to solid abdominal organs: A prospective study. *Arch Surg.,* 138(8): 844-851.

Watts DD, Fakhry SM. 2003. EAST Multi institutional Hollow Viscus Injury Research Group. Incidence of hollow viscus injury in blunt trauma: An analysis from 275,557 trauma admissions from the East multiinstitutional trial. *J Trauma.,* 54:289-94.

Zheng YX, Chen L, Tao SF, Song P, Xu Sm. 2007. Diagnosis and management of colonic injuries following blunt trauma. *Worl Journal of Gastroenterology*., 13:633-636.

****