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A Study of Safety and Outcome of Non Operative Management of Blunt Abdominal Trauma

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Abstract
Blunt trauma continues to be the most common mechanism of injury to the abdomen. Now with the improvement in diagnostic & therapeutic intervention, modern treatment tilts more towards non-operative management of blunt trauma abdomen .This is a prospective study of 100 cases of blunt abdominal trauma, Managed in the Department of surgery S.C.B Medical college & hospital, Cuttack during the period from july 2010- 0ct 2012, with special emphasis on non operative management based on clinico radiological examination. In this study,Males out number female in the ratio of 4:1 and the age ranging from 4 years to 69 years. Majority of cases were victims in 2nd, 3rd and 4th decades taking a toll of 71.25% of cases. Road traffic accident being the commonest cause.
Abdominal pain, tenderness, rigidity, shock, pallor, absence of bowel sounds and distension were the common manifestations found in patients with blunt abdominal injuries.
USG abdomen was the important tool in unstable patients to detect hemoperitoneum (61.3%) and to decide the protocol in stable patients for conservative management. However it missed 9 patients with splenic injuries, 5 with liver injuries, 3 with kidney injuries. It is a poor tool to detect kidney, pancreas, bowel and mesenteric injuries.
CECT abdomen is the most important tool in grading the organ injuries and deciding conservative management. CT detected 37 splenic injuries of which 29 were managed conservatively. 21 liver injuries were detected of which 16 were managed conservatively &5 cases of kidney injury were detected all of which were managed conservatively.
66 patients with blunt abdominal injury were managed conservatively. Spleen is the most common organ injured that managed conservatively. Out of 37 splenic injuries 29 were managed conservatively. Other organs which were managed conservatively are liver (16), kidney (5), bladder (2), pancreas (1) and mesentery (2).
Only one patient in the conservative group developed pseudocyst of pancreas. Another patient developed clot retention. The hospital stay period in the conservative group was 9-12 days.
There was no mortality in the conservative group. The overall mortality was 4% all in the operative group. The mortality was due to associated organ and system injuries.
The advent of sophisticated imaging technologies and adjunctive minimally invasive techniques has

somewhat lightened the trauma surgeon's operative burden. Despite that, more than ever, nothing surpasses the value of repeated clinical assessment by an experienced trauma surgeon, in guiding the ultimate therapeutic decisions. After all, the ultimate default pathway for severely injured trauma patients who failed non operative management is the operating theatre.

Introduction

Trauma is emerging as a serious public health problem in last two decades. It is the leading cause of death and disability in the first four decades of life and it is the third most common cause of death overall.

Abdomen is the third most commonly injured body organ with injuries requiring operation, accounting in about 20% of civilian trauma Victims. Blunt trauma continues to be the most common mechanism of injury to the abdomen. (Gackowski W et al 1997)[2]. Blunt trauma has been recognized as a clinical emergency since long. It can be a formidable challenge to the surgeon on account of diversity of its presentation. Variation can range from a simple laceration or bruise to multi organ injuries with shock. The major problem in dealing with blunt trauma abdomen is that most commonly injured organs are solid, that bleeds slowly, therefore peritoneal signs may be lacking in the first several hours after admission to emergency room. So a high degree of suspicion and adequate vigilant observation is mandatory for proper care of the patient. The serious nature of the patient demands early & correct diagnosis & prompt management. Now with the improvement in diagnostic & therapeutic intervention, modern treatment tilts more towards non-operative management of blunt trauma abdomen.

Over the past two decades, there has been a major shift from operative to selective non operative management of traumatic injuries. The increased utilization of non operative surgical management of abdominal solid organ injuries is facilitated by the various sophisticated and highly accurate noninvasive imaging tools at the trauma surgeon's disposal. The non operative approach relies heavily on the availability of trauma trained surgeons, modern radiographic imaging, particularly FAST and CT scanning, accurate interpretation of such high quality radiographic images, as well as the presence of appropriate supporting infrastructure and ancillary services. FAST examination can be performed repeatedly providing an excellent adjunct to serial physical examination.

This review studies selected cases of blunt trauma abdomen, the potential complication and the pitfalls of non operative management in blunt abdominal trauma.

Aims and Objective

1. To study the epidemiologic and demographic distribution of blunt trauma abdomen in our population.
2. To study the severity of abdominal organ injuries in a blunt abdominal setting by using simple methods of physical examination and imaging techniques.
3. To make a decision and outline which type of patient with abdominal trauma will benefit and safely be managed by non operative management.
4. To find out the pitfalls of non operative management and vis-a-vis comparative study with operative management.

Materials and Methods

Material

This is a prospective study of 100 cases of blunt abdominal trauma, Managed in the Department of surgery S.C.B Medical College & hospital, Cuttack during the period from july 2010- 0ct 2012, with special emphasis on non operative management based on clinico radiological examination.

Selection criteria of the patient

- All cases with suspected blunt trauma to abdomen due to various causes like road

traffic accident, fall from height, history of assult by blunt and heavy object over abdomen.

- Patient having a clinical suspicion of trauma to the abdomen.
- Injury occurring during natural calamity.

All age groups of both sexes were included in this study.

Exclusion criteria

Patient with penetrating injury (like stabbing & gunshot injuries).

Methods

On admission, all the patients were evaluated after necessary resuscitative measure, a quick detail history and thorough clinical examination was carried out to reach at a provisional diagnosis regarding nature of injury. Associated injuries were noted. “AMPLE" histories were taken which consists of

A-Allergy

M-Medication, including tetanous toxoid

P-Past medical history

L- Last meal.

E- Events of the incidence

Primary Survey

Primary Survey was done and the patients was examined in the following manner.

- General physical examination
- Abdominal examination

General Physical examination

Particular attention was given to life supportive measures like airway breathing, ventilation and control of shock and hemorrhage.

- Pulse rate, blood pressure were taken at 15 minutes interval for one hour then hourly for six hours and then 2 hourly.
- Rate and mode of respiration were noted at intervals.
- Pallor, cyanosis and capillary refill at lip mucosa were noted.

Abdominal examinations

After thorough inspection of superficial thoacoabdominal injuries, abdomen was properly examined for signs of any internal injury like presence of abdominal guarding, rigidity, rebound tenderness and significant abdominal tenderness, obvious lump in peritoneal cavity. Abdominal distension, Kehr's sign, Ballance's sign, Gray Turner sign, Cullen sign, shifting dullness and absence of bowel sounds were elicited.

Per rectal examination was done to exclude bleeding per rectum or any injury to distal part of colon.

All external injuries were managed accordingly. All patients were given tetanus toxoid, human anti-tetanus immunoglobin and antibiotic in the ward.

Resuscitation

Along with the above examination the following resuscitative measures were taken simultaneously.

- Airway cleaning and maintenance of airway was done by putting oropharyngeal airway in mouth or endotracheal intubation if required.
- Wide bore intravenous cannula was inserted and rapid infusion of crystalloid done, after collecting a sample of blood for blood grouping and cross matching, hematocrit and Hb. In case of urgency blood transfusion was given.
- Inter-coastal chest tube was given in cases of associated hemo- pneumo thorax.
- Tracheostomy was performed in case of associated facial or laryngeal injury, when required.
- Nasogastric tube was given to decompress the stomach.
- Urethral catheterization was done to see for injury to urinary tract and to monitor urine output. But catheterization was not tried in those patients having urethral injury.

Secondary survey was done to see the other systemic injuries and for abdominal injuries which was missed in primary survey.

Investigations

Following investigations were done in all cases:

- Blood for hemoglobin, PCV, DC & TLC.
- Urine for routine and microscopic examination.
- Plain x-ray of chest and other parts for associated injuries.
- USG and CT abdomen were advised for stable and selected patients for favourable diagnosis and management.
- Abdominal paracentesis using medicatheter of 18 FR, either 4 quadrants or bilateral flank tap done, changing the position of the patient and assessment was done for presence of blood or enteric content inside peritoneal cavity. It has got better diagnostic value in acute emergency cases.
- Diagnostic peritoneal lavage using peritoneal dialysis catheter or 14 FR intracath and normal saline, was done under local anesthesia.

Non-clotted blood in aspiration confirms the presence of haemoperitoneum. The perfusate obtained was sent for laboratory analysis for RBC, WBC, Amylase, and Alkaline Phosphatase. Gram staining was done for presence of bacteria. It was tested or presence of enteric material and bile also.

Management

A -Conservative

During the admission process the following were prescribed: intravenous maintenance fluids, appropriate analgesia, a nil per oral regimen, and bed rest for a 'clinically appropriate' duration. The setting, i.e. a high-care/intensive care or ward environment, was dictated by the clinical and metabolic condition of the patient and by associated injuries, particularly intracranial pathology. The patient was monitored with regular & repeated assessment from a clinical and metabolic perspective, when needed laparotomy was done based on signs of peritonitis or hemodynamic instability.

B-Laparotomy

Laparotomy was done by mid line incision & and appropriate management as for the injury.

Observation and Discussion

The incidence of blunt trauma was 0.88% of all cases admitted in the surgery department.

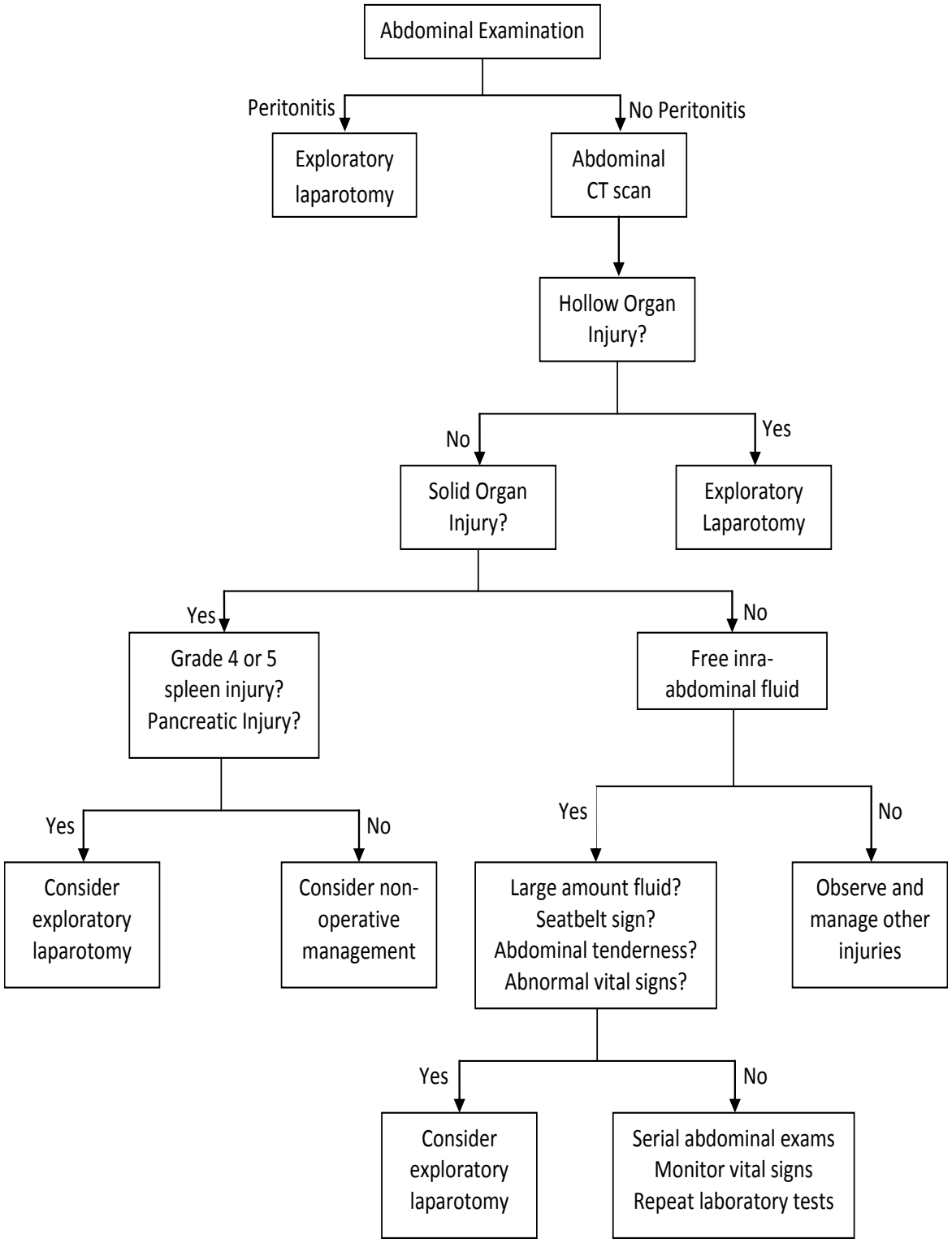
Age: In this study it was seen that the age of the patient varied between 5years to 75 years. The majority of cases (70%) were in the age group of 11-40 years and only 25% were in the age group above 40 years. Bag Well (1980)[16] observed 56% cases in the 35-61 age group. The incidence observed in this series was comparable to the above series.

Sex: In our series, the Male and female cases were 87% and 13% respectively. In the study conducted by Canty TG (1999)85 and Davis (1976)[18] the male preponderance was 80% & 82% respectively. From allthese studies males predominated females because they were more exposed to outdoor activity with longer outdoor life in comparison to females. The finding is well marked among Indian females who usually confine themselves to the indoor.

Table – 1: Age & Sex Distribution (N=100)

Age Group	Male	Female	Total no. of cases	Percentage
year				
0-10	03	02	05	5
11-20	16	02	18	18
21-30	25	5	30	30
31-40	20	2	22	22
41-50	19	1	20	20
51-60	2	1	3	3
60 & above	2	-	2	2
Total	87	13	100	100

(Algorithm for the evalution and management of blunt abdominal trauma)



Spectrum of Blunt Trauma Abdomen

Majority of our patients (74%) sustained motor vehicle accident either as an occupant of vehicle or as a pedestrian, 14% due to fall from height, 7% due to blunt blow and 5 % due to animal attack, two cases due to elephant attack. In the study of Ciftic et al (1998)[19] and Davis[18] automobile accidents were 60% & 70% respectively which is comparable with our results.

Clinical Manifestations

In our series, the clinical manifestations were abdominal pain & tenderness (78% and70%) either with or without external bruise, scratch mark or skin erythema over the site of impact. this was closely followed by guarding and abdominal rigidity 65%,abdominal distention 45%.fewer number presented with pallor 34%,absent bowel sound 40%,vomiting 12%.

These were also the common findings in the series of Nwabrinke T et al[20] with tenderness 69%, pain 52%, rigidity 25%, abdominal distension 48%, pallor 37%.

Associated Injuries: in this series the common associated injuries were chest injury (24%), head injury (20%) & pelvic injury (5%). Davis[18] found in his series of 437 patients of blunt trauma abdomen, 27% cases were associated with chest injury & 9.2% patients with head injury. This is very much similar to our series.

Table II Associated Injuries

Associated injuries	no. of cases	percentage
Chest injury	24	24
Head injury	20	20
Pelvis injury	05	05
Lower extremity bone injury	06	06

Ultrasonography and fast

After initial resuscitation USG abdomen and pelvis/ FAST done in 80 patients depending upon the general condition of the patient. The commonest finding was free peritoneal fluid seen in 47 (58.75%) patients followed by splenic injury in 28 (35%) patients either in the stage of subcapsular hematoma or with splenic capsular tear or peri splenic collection. In splenic injuries USG missed 6 patients with grade I and 3 patients of grade II injuries. It detected all splenic grade III injuries. This revealed that USG abdomen has got poor sensitivity for detecting grade I and II splenic injuries

There were 16 patients with liver injuries identified while it missed 4 cases with grade I injury and 1 cases of grade II injury.

USG detected 03 patients with kidney injuries while missed one patient with grade I and one patient with grade II injuries. USG was unable to identify pancreatic injuries due to overlapping bowel and ongoing blood loss.

However USG abdomen is operator dependent but its clinical utility can't be challenged for determining further course, whether to go for further investigation or do direct exploratory laparotomy. FAST is helpful in the early decision point whether the patient needs immediate exploration to control bleeding. Those with a negative FAST are not at substantial risk for bleeding and can be evaluated in a less urgent fashion. The main pitfall of USG abdomen was its inability to determine nature of fluid, difficulty due to overlying bowel gas shadows, and. adequately grade the solid viscus injury.

Our study showed that USG / FAST is a sensitive tool to detect haemoperitoneum. This suggests that in the absence of haemoperitoneum surgical intervention is not required. Brain IM et al[21] studied 220 severely 'injured abdominal trauma cases and had USG abdomen with a sensitivity & specificity of 82. 7% and 89% respectively.

Studies assessing the FAST technique for detecting haemoperitoneum report sensitivities from 63% to 98% and specificities above 90%. Localization of specific organ injuries by ultrasound is less successful, with sensitivities ranging from 44% to 73% for all combined organ injuries. Solid organ injuries, such as spleen and liver, are more accurately identified with ultrasound than bowel and mesentery injuries. Ultrasound has better sensitivity for detecting parenchymal spleen injuries than liver injuries.

A negative ultrasound examination cannot completely rule out the possibility of intra abdominal injury.

CECT Abdomen

In our study CT scan was done in selected few cases where USG study was doubtful or to bring greater elaboration to the finding of USG. The main role of CT was to grade injuries in

haemodynamically stable patients so that the treatment options i.e. conservative or operative could be decided. CT also showed injuries missed by USG abdomen.

CT was done in 63 patients of whom most common organ injured was spleen (37 cases). 9 cases of splenic injuries were missed by USG abdomen. 29 were managed conservatively & 2 splenic injuries were managed subsequently by splenectomy, one due to associated mesenteric injury and other due to features of intraperitoneal hemorrhage.

CT also diagnosed 21 cases of liver injuries 5 of which were missed by USG. 16 patients diagnosed by CT were managed conservatively. CT also diagnosed 5 cases of kidney injuries of which USG abdomen missed 2 injuries.

In our study no patients with hollow viscus injury was subjected to CT due to associated features of peritonitis, other organ injury. All the cases were diagnosed on laparotomy.

Multiple studies have demonstrated CT to have sensitivities and specificities consistently above 90%. Sensitivity of CECT to detect solid organ injuries is more than 97% while for hollow viscus it ranges from 64 to90%. Yet another advantage is helical CT, which has significantly shorter scanning time. CT, while excellent at detecting solid-organ intra abdominal injury, is less accurate for bowel and mesentery injuries. Buzzas GR 1998[22] showed sensitivity of 79.5% &Specificity 99.3% for CECT abdomen in identifying blunt injuries to abdomen. Sensitivity improved with exclusion of hollow visceral injuries. Sensitivity between 92% and 97.6% and specificity as high as 98.7% have been reported in patients subjected to emergency CT scanning[23,24]. Most authors recommend admission and observation after a negative CT scan[25,26]. In a recent study of 2,774 patients, the authors concluded that the negative predictive value (99.63%) of CT scanning was sufficiently high to permit safe discharge of blunt trauma patients after a negative CTscan.[27]

Visceral Involvement

Spleen was the most common involved organ and accounted for 37% of cases, followed by liver (21%), mesentery, small intestine & bladder.

Table III Visceral Involvement

Organ	Present study	Cox EF 1984 in	Dais et al 1976
	(n=100)	n=870	n=437
Spleen	37	42.6	20
Liver	21	35.6	29
Pancreas	02	-	-
Kidney	05	2.6	-
Small intestine	18	4.7	15
Stomach &duodenum	02	-	0
Large intestine	03	<0.1	-
Mesentery.	11	-	7
Urinary bladder	02	3.2	29

With the above comparison it is clear that the pattern of visceral injuries is similar to our study with a little variation.

Management

Out of 100 cases studied 64 (64%) cases were managed conservatively. With iv fluid, nasogastric aspiration, iv antibiotic, frequent Periodic physical examination for appearance of signs of peritoneal irritation like rigidity, absence of bowel sound and rebound tenderness. In 36 cases laparotomy was performed due to definite evidence of single or multiple organ injury. Early laparotomy was performed in 28 cases i.e within 12 hours. In the rest cases, laparotomy was conducted within 12 hour after where positive abdominal signs of visceral injuries appeared late as confirmed by USG study, CT scan or straight X ray abdomen. A total of 70 cases were selected for the conservative management, four splenic injury, two liver injury subsequently required laparotomy due to appearence of features of ongoing blood loss & peritonitis. More patients were subjected to operative treatment because of bowel &mesenteric injuries.

Table- 10: Conservative Vis Operative

Organ	Conservative	Operative
Spleen	29	8
Liver	16	5
Pancreas	2	0
Kidney	05	0
Small intestine	0	20
Stomach & duodenum	0	**2**
Large intestine	0	3
Mesentery	3	08
Urinary bladder	01	02

Spleen

James et al (1999), Cathey KL et al (1998)[14] and many others advocated splenic salvage procedures to avoid complications like OPSI and immunological imbalance.

In our study 29 patients (74.28%) with splenic injuries were managed conservatively. S. P. Stawicki et al[94]also showed that conservative management is possible in 80% of splenic injuries. The lower number is due to higher grade IV injuries and associated hollow viscus injury. Conservative management was possible in 100%, 73.68% & 64.% of grade I, II, & III splenic injuries respectively.

Table IV Management of Splenic Injury

Grade	Conservative	Operative	Total	% (consv./total *100)
Grade I	8	-	8	100%
Grade II	14	2	16	87.5%
Grade III	6	3	9	66.6%
Grade IV & V	4	4	4	0
Total	28	9	37	75.67%

Liver

Many studies such as those by Richardson JD.(2008)[29], Pachter HL et al(2000)[30], Cuff RF et al(2000)[31] have confirmed that 80-90% of all blunt liver injuries may be managed without laparotomy. In our study 76.16% of blunt liver injuries were managed conservatively which is consistent with the above series.

When patients with isolated liver injuries were analyzed, 91.5% of grade I and II injuries, 79% of grade III, 72.8% of grade 4, and 62.6% of grade 5 injuries were successfully managed without operative intervention. Therefore, even high-grade injuries have a high likelihood of successful nonoperative management.[32]

S. P. Stawicki et al[28] also showed that conservative management is possible in 80% of hepatic injuries.

Table V Management of Liver Injury

Grade	Conservative	Operative	Total	% (consv./total *100)
Grade I	9	-	9	100%
Grade II	7	2	9	77.77%
Grade III	-	3	9	0
Total	16	5	21	76.19%

Kidney

In a retrospective study comprised of 126 patients with blunt renal injury by Matthews LA et al, 90% were treated conservatively[33]. In our study all the patients were treated conservatively with no morbidity or mortality. However conservative management of all the 5 patients was possible because they were associated with grade I and II injuries without any laceration or renal vascular injury.

In another review of 55 patients (95%) with blunt renal trauma by Goff et al, 69% of hemodynamically stable patients and 38% of hemodynamically unstable patients were successfully managed non operatively.

Pancreatic Injury

Only one case of pancreatic contusion was managed conservatively. However this patient developed pseudocyst of pancreas 6 weeks later which was also managed conservatively. This complication was acceptable compared to high mortality and morbidity associated with pancreatic surgery.

Urinary Bladder Injury

In a number of series, conservative, non operative management of blunt extra peritoneal bladder rupture has had a similar outcome to that of patients treated with primary suturing. In our study one patient with extra peritoneal bladder injury received conservative treatment in the form

of catheter drainage and recovered well. other two cases with intra peritoneal injury to bladder were repaired in two layer followed by insertion of indwelling catheter.

Corriere JN Jr in their series managed 39 of 58 patients with extra peritoneal bladder injuries with catheter drainage alone. The author concluded that patients with extra peritoneal bladder ruptures may be treated with simple catheter drainage, if not requiring exploration for associated injuries. This is consistent with our study.

Stomach & Duodenum

There were 2 patients one each of stomach & duodenal injury. CECT could not identify injury to stomach. Both the injuries were detected intra operatively &repair done. There was no mortality in this group. Stomach &duodenal contusion can be managed conservatively provided they should be adequately diagnosed by CECT abdomen &perforation should be ruled out by oral contrast enhanced CT.

Small Intestine

There were 18 patients of small intestine varying from perforation to transaction of gut. Injuries were suspected on clinical and radiological grounds and were managed operatively. Bowel contusion can be managed conservatively provided they should be adequately diagnosed by CECT abdomen &perforation should be ruled out by oral contrast enhanced CT.

Colon Injury

In our study 03 Patients had colon injuries. Injuries were suspected on clinical and radiological grounds or positive DPL and were managed operatively. One patient died due to associated multiple organ injury & delay in performing operative intervention due to diagnostic dilemma.

Mesentric Injury

Out of 11 patients with mesenteric injury, CT was done in 3 patients. One had mesenteric hematoma that was managed conservatively. Others had mesenteric laceration which were operated. The remaining 9 patients with mesenteric injury had positive paracentesis and had features of ongoing blood loss. Therefore these patients were managed operatively. 3 patients who had undergone laparotomy died due to associated pancreatic &splenic injuries.

Morbidity & Mortality

There was no mortality in group of patients which were managed conservatively. 4 patients died in the operative group. One due to associated head injury, one due to fecal peritonitis due to delayed hospitalization &2 patients due to pancreatic head transaction.

The stay period in the hospital, managed conservatively ranged from 9- 11 days compared to 14- 20 days in operative group. There was lower incidence of pulmonary complication, early return of GI function, lower need of antibiotic prophylaxis. The patients were saved from the surgical trauma. Only one patient developed pseudopancreatic cyst and other with bladder injury developed clot retention in the conservative group.

Conclusion

Non operative management of blunt traumatic injuries is challenging. However, it can be quite satisfying to be able to successfully manage patients with severe and multiple traumatic injuries in non operative fashion. The advent of sophisticated imaging technologies and adjunctive minimally invasive techniques has somewhat lightened the trauma surgeon's operative burden. Despite that, more than ever, nothing surpasses the value of repeated clinical assessment by an experienced trauma surgeon, in guiding the ultimate therapeutic decisions. After all, the ultimate default pathway for severely injured trauma patients who failed non operative management is the operating theatre.

References

1. B&L Short practice of surgery 25th ed. page 271to298.
2. Gackowski W, Najninigier B et ai, Treatment of liver injuries in personal clinical material from 1990-1996, 1997; Su Ipt 2; 223-7
3. OPUS 12 Scientist 2007 Vol. 1, No. 1 S. P. Stawicki Trends in non operative management of traumatic injuries.
4. Wilson RF, Walt AJ. Et ai, Injury to stomach and small bowel-EDS Management of trauma, Pitfalls & Practice. 1996; 497-509 (Motz 1890)
5. Ruddock et al 1937, Rao, Ivatury, Louis F. Zantat, Surg. CN.A.M. 1291, 796, 1999
6. Demetriades 0, Velmahos G. Technology-driven triage of abdominal trauma: The emerging era of nonoperative management. Annu Rev Med 2003;54:1-
7. Knudson MM, Maull KI. Non-operative Management of solid organ injuries Past, Present and Future. Surg Clin North Am 1999;79:1357-1371.
8. Christmas AB, Wilson AK, Manning B, et al. Selective management of blunt Hepatic injuries including nonoperative management is a safe and effective strategy. Surgery 2005;138:606-610.
9. Rutldege R, Hunt JP, Lentz CW, et al. A statewide, population based time series analysis of the increasing frequency of non-operative management of abdominal solid organ injury. Ann Surg 1995;222: 311-326.
10. John udeani MD FFEM,e medicine, medscape ,ref sep 20,2012
11. Champion HR, Sacco WJ, Garner SP et ai, Emerging technology for vehicular safety and emergency response to road way crashes, Tr care
12. Canty TG Sr., Canty TG Jr., Brown C et ai, Injuries of GI tract from blunt abdominal trauma in children, A 12 year experience at a designated trauma centre, J Trauma 1999 Feb 46(2) 234-40
13. Geoghenan T, Brush BE 1965 Arch surg 73;455.
14. Cathey KL, Brady WJ Jr., Butler K et ai, Blunt splenic trauma, characteristic of patients requiring urgent laparotomy, Am surg. 1998 May 64(5) 450-4
15. Arkovitz MS, Johnson N et ai, Pancreatic trauma in children, mechanism of injury, J Trauma 1997 Jan; 42(1) 47-53
16. Bagwell ce, ferguson ww et al 1980 ann.surg 140;368-372
17. Moore EE, Cogbill TH, Molarigoni MA et al,organ injury scale surg.
18. Davis jj,colinI,Nance FC et al 1976 ann.surg 183(6)672-77
19. Ciftic Ao, Tanyel FC, Salman AB et ai, GI perforation due to blunt abdominal trauma, Pedia. Surg tNt.1998, Apr. 13(4); 259-64
20. Nwabrinke t et al,1984injury ;372-75
21. Bain 1M, Kirby RM, Tiwari P et ai, USG & DPL for suspected intra abdominal injury following blunt trauma injury, 1998 Jan29(1);65 -71
22. Buzzas GR 1998 A comparison of sonographic examinations for trauma performed by surgeons and radiologists. J *Trauma.* 44: 604-608.
23. Peitzman AB, Makaroun MS, Slasky BS, et al. Prospective study of computed tomography in initial management of blunt abdominal trauma. J *Trauma*
24. Webster VJ. Abdominal trauma: pre-operative assessment and postoperative problems in intensive care. *Anaesth Intensive Care. 1985;13:258-262*
25. Lang EK. Intra-abdominal and retroperitoneal organ injuries diagnosed on dynamic computed tomograms obtained for assessment of renal trauma. *J* trauma. 1990;30;1161-68
26. Matsubara TK, Fong HM, Burns CM. Computed tomography of abdomen (CTA)

in management of blunt abdominal trauma. *J* Trauma. 1990;30:410-14

27. Livingstone dh,lavery rf Admission or observation is not necessary after a negative abdominal computed tomographic scan in patients with suspected blunt abdominal trauma: results of a prospective, multi-institutional trial. J *Trauma. 1998;44*:272-282.
28. S p stawiki trend in non operative management of traumatic injury ;a synopsis OPUS 12 scientist 2007 vol 1 no 1
29. Richardson jd. Changes in the management of injury to the liver and spleen
30. Patcher HL, Liang HG liver and biliary tract trauma; Trauma mc graw-hill; 2000.p 633
31. Cuff RF, Cogbill TH, Lambert PJ. Nonoperative management of blunt liver trauma: The value of follow-up abdominal computed tomography scans. Am surg 2000;66;332
32. Western trauma association, management of adult blunt hepatic trauma
33. Matthews la, smith em ,Non operative management of blunt renal laceration with urinary extravasation. Journal of urology.157(6);2056-8.