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**Original research article**

# A Prospective Study of Diagnostic Laparoscopy in Blunt Trauma Abdomen

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**Abstract**

**Background**: Blunt injuries of the abdomen constitute those cases where there is injury to contents of abdomen (one viscus or more viscera) without any external penetrating injury. Laparoscopy can be performed safely and effectively in stable patients with BTA. Most important advantages are reduction of morbidity, shortening of hospitalization, cost effectiveness, reduced the rate of negative laparotomy and allow early mobilization and resumption of work.

**Methods**: A prospective study, Department of General Surgery, The source of data for our study will be the patient with suspicion of abdominal injuries after trauma to abdomen, admitted in surgical emergency at Patna Medical College and Hospital, Patna. Study duration of two years.

**Conclusion:** Blunt Trauma Abdomen with solid organ injury forms considerable load of patients in our society. Most common age group involved is 11-20 years. Predominantly males are affected in large proportions. Road Traffic Accident forms the most common mode of injury.

**Keywords**: RTA, Laproscopy, morbidity, BTA.

## Introduction

Blunt injuries of the abdomen constitute those cases where there is injury to contents of abdomen (one viscus or more viscera) without any external penetrating injury. In the modern era, human being are expose to variety of injuries caused by road traffic accident (RTA), fall from height, physical assault etc. Road traffic accident are major cause of blunt trauma abdomen (BTA) injuries which constitute for 45-50% of BTA. BTA Injuries are results from compression, crushing, shearing OR deceleration mechanism. As the population has increased worldwide, there is an increased incidence of road traffic accident and violent assaults. This leads to popular quote "civilization and violence seem to advance hand in hand" The exact detection of an intra-abdominal injury is a frequent diagnostic problem in multiple injured

patients, more number in shock and comatose patients. Delay in diagnosis and treatment of abdominal injuries substantially increase morbidity and mortality in trauma patients due to unrecognized bleeding from solid organ, perforation of hollow viscus, subsequent vascular injury, or infection, perforation of hollow viscus. physical examination is often unreliable specially when there is associated head injury, or drug or alcohol ingestion. Most frequently injured organ are spleen (40-55%), liver (35-45%) and retroperitoneum (15%). Management of BTA requires and art of resuscitation, early diagnosis, initial evaluation and management then lastly perfect surgical skill. The key saving lives in BTA as early as possible is to recognize that there is an abdominal injury. Identification of serious intra-abdominal pathology is often challenging. Many injuries may not manifest during the initial assessment and treatment period. Missed intra-abdominal injuries and concealed hemorrhage requires proper evaluation after initial resuscitation. Coordinating trauma resuscitation demands a thorough understanding of the pathophysiology of trauma and shock, a watch full clinical examination and appropriate diagnostic modalities, skill with complex procedures, and the ability to think rationally in a chaotic milieu. Previously all BTA ended up in laparotomy and managed according to organ injury however in such cases chances of negative laparotomy were high but, due to development of new technology, laparoscopy-minimal access surgery (MAS), the chance of negative laparotomy significantly has reduced and sometimes managed conservatively.

Laparoscopy can be performed safely and effectively in stable patients with BTA. Most important advantages are reduction of morbidity, shortening of hospitalization, cost effectiveness, reduced the rate of negative laparotomy and allow early mobilization and resumption of work. Diagnostic laparoscopy can be done under direct vision with simple equipment. With advances in optics, laparoscopy allow perfect visual examination of the peritoneal cavity and organ injured. Laparoscopy is as much a surgical procedure as an exploratory laparotomy, often just as informative, and to the trained surgeon affords a better view of the entire peritoneal cavity than the usual exploratory laparotomy. To achieve a high rate of positive diagnosis from laparoscopy requires much more than correct technique, it requires a thorough background of surgery, sound clinical acumen as also knowledge and awareness of abdominal injury.

In many cases it prevents unnecessary/negative laparotomy. The rapid recovery and return to normal activity that follow diagnostic laparoscopic surgery provide an extra incentive for the surgeon to adopt more laparoscopic techniques.

**Objectives**

To evaluate the diagnostic laparoscopy in the management of BTA, To reduce the incidence of negative laparotomy.

**Review of Literature**

Trauma has been known to cause injury to abdominal organs for long since the early historic times. With advancement in civilization and culture various new modes of trauma are emerging. Earlier trauma are more likely due to war, accidental fall, natural disasters etc. **In 1275**, De saliat gave a detailed explanation of repair of intestinal wound in patient with blunt trauma abdomen. Laparoscopy was first used for a trauma patient in 1956 by Lamy, who observed two cases of splenic injury. Since then, Gazzaniga[1] et al stated laparoscopy is useful for determining the need for laparotomy. In 1993, Timothy C[2]. Et al**.** Study was performed to assess current and potential future application for laparoscopy in the diagnosis of penetrating and blunt injuries. Efficacy, safety, and cost analyses were performed. Over 19 months, 182 patients (55% stab, 36% GSW, 9% blunt) were studied. No peritoneal penetration was found

at Diagnostic laparoscopy in 55% of penetrating wounds with 66% of the remainder having therapeutic laparotomy, 17% nontherapeutic laparotomy, and 17% negative laparotomy. Therapeutic laparotomy was performed in 53% of blunt injuries after Diagnostic laparoscopy. In 2012 Eimer O'Malley [3], et **al.** In total, 51 studies were included in the analysis of which only 13 were prospective. 2,563 patients underwent Diagnostic laparoscopy for Penetrating abdominal trauma, 1,128 (46.1%) were positive for injury. Of those with an intra-abdominal injury, 13.8 % had a therapeutic laparoscopy. In total 33.8 % were converted to laparotomy, 16 % of which were non-therapeutic and 11.5 % of which were negative. 1,497 patients were spared a nontherapeutic laparotomy. Overall, 72 patients suffered complications, there were three mortalities and 83 missed injuries. In 2013 Po-Chu Lee MD[4],et al. Laparoscopy is feasible and safe for the diagnosis and treatment of hemodynamically stable patients with blunt abdominal trauma. It can reduce the laparotomy rate and provide the advantages of minimally invasive surgery for patients with significant intra-abdominal injuries in terms of shorter hospital stay. In 2015 study was done by Kyoung Hoon Lim[5],et a**l.**Study shows the conversion rate was 18%. Major complication was none without postoperative mortality. Comparing laparoscopic surgery with open laparotomy, lesser wound infection, early gas passage, and shorter hospital stay. Otherwise operative times were similar, and neither approach was complicated by missed injury or postoperative intra-abdominal abscess. In 2015 Yueli Li[6],et al**.** This study aimed to systematically review and compare the perioperative outcomes of laparoscopy with laparotomy for abdominal trauma patients. Sixty-four studies including 9058 patients with abdominal trauma were included. In these studies, laparoscopy was used as a screening, diagnostic, or therapeutic tool. In 2015 study was done by, Yehia B. A. El-Bendary[7],et al. Laparoscopic interventions in trauma patients with normal haemodynamic parameters are an excellent modality to identify diaphragmatic injuries and peritoneal penetration. In comparison with traditional laparotomies, laparoscopies are more efficient and cost-effective and associated with fewer complications. In 2017 Shah Y, Singh A[8]. Et al. A prospective evaluation of blunt trauma abdomen in rural setup" with aim to identify some of the determining factors of successful non- operative management. A two years tertiary care teaching hospital based longitudinal study was done. Selection criteria were defined and a pre-structured proforma was made to assess and note the findings. In 2019 study was done by M. Z. Koto[9], et al**.** A total of 35 stable patients underwent laparoscopy. the mean injury severity score was 12 (4–38). therapeutic laparoscopy was performed in 15 (56%) and diagnostic in 12 (44%) patients. eight (23%) patients were converted to therapeutic laparotomy. intraoperative bleeding, complex injuries, visualization problem, and equipment failure necessitated conversion. three (30%) patients with negative computed tomography scan had therapeutic laparoscopy for mesenteric injuries. there were no missed injuries. the mean length of hospital stay was 11 days in both groups. In 2021 study was done by Dr. P Amutha[10], et al. In this study Out of 30 patients 27 were males and 3 were females. The age group ranged from 20 to 60 years. The most common mechanism of injury was motor vehicle collision which occurred in about 13 individuals (43%). It was followed by automobile pedestrian injury in 7 individuals (23%). Fall from height occurred in about 5 patients (16.6%) and the least was assault which occurred in about 3 individuals (10%). Road traffic accidents were the most common cause of blunt trauma abdomen. The most common findings during laparoscopy were injury to the solid organs (both spleen and liver) which occurred in about 14 patients.

## Material and methods

A prospective study, Department of General Surgery, Total number of cases studied: 50
The source of data for our study will be the patient with suspicion of abdominal injuries after trauma to abdomen, admitted in surgical emergency at Patna Medical College and Hospital,

Patna. Study duration of two years. Ethical permissions were obtained from the institutional ethical committee The written consent was taken from patients.
All patients coming to the Surgical Emergency, Department of General Surgery, Patna Medical College and Hospital (PMCH), Patna with history or clinical signs of blunt trauma to the abdomen were initially assessed and resuscitated at casualty according to Advanced Trauma Life Support (ATLS) guidelines. Depending on the clinical findings the decision was taken up for further investigations. The decision for operative and conservative management depended upon the outcome of clinical examinations and Diagnostic tests.
The patients selected for conservative management were kept on strict bed rest, repeat clinical examination which included hourly pulse rate, blood pressure, respiratory rate, Spo2 measurement and repeated clinical examination and then prepared for diagnostic laparoscopy, the findings and methods of Management were recorded. Duration of stay and the average cost of treatment was noted.

**Inclusion criteria**
Patients admitted through surgical emergency with blunt trauma abdomen due to any cause having stable hemodynamic condition.
Patients of blunt trauma abdomen with no features of peritonitis.

**Exclusion criteria:**
Patients of BTA with head injury having GCS <13, Patients of BTA with Polytrauma, Patients of BTA with hemodynamic instability. Pregnancy.
After resuscitating the patient, all patients were subjected to proper history and clinical examination.
Those patients who have a history or physical examination findings which fit into inclusion criteria for blunt trauma abdomen were taken up for further study.

**Results**
Total number of cases studied fifty, Period of study: From September 2019 to October 2021, All patients belonged to Department of Surgery, PMCH, Patna.

**Table 1: Showing Sex Incidence among the patients observed**

| Gender | No of patients | Percentage |
|---|---|---|
| Male | 40 | 80% |
| Female | 10 | 20% |

In 50 cases, 40 were males accounting 80% of study population and 10 were female accounting 20%. Male to Female ratio was 4:1.

**Table 2: Showing Latent Period among the patients observed**
It is the time interval between time of injury to time of presentation to our hospital.

| Hours | No of cases | Percentage |
|---|---|---|
| 0-6 | 18 | 36 |
| 6-12 | 12 | 24 |
| 12-18 | 14 | 28 |
| 18-24 | 1 | 2 |
| >24 | 5 | 10 |

**Table 3: showing different Investigations done among the patients observed**

| Investigations | No of cases | Positive cases |
|---|---|---|
| Hb <10 gm% | 50 | 11 |
| Urine routine | 44 | 4 |
| Xray ABD Erect | 50 | 10 |
| USG abdomen | 39 | 30 |

**Table 4: laparoscopy to laparotomy conversion**

| Management | No of patients | Percentage |
|---|---|---|
| Laparoscopic | 45 | 90 |
| Laparotomy conversion | 5 | 10 |

Showing ratio of laparoscopic to laparotomy conversion. 3 shows 90% of the patients managed laparoscopically, only 10% patients undergone conversion to laparotomy. All the patients underwent Diagnostic laparoscopy having stable hemodynamic condition. Majority of patients having splenic injury (30%) followed by Bleeding with no organ injury (20%), liver injury (10%), mesenteric vascular injury (10%), small bowel perforation (10%), and no laparoscopic findings in 20% patients.

**Table 5: Showing complications in patients undergoing surgery**

| Post-op complications | No of patients |
|---|---|
| Wound infection including port | 5 |
| Respiratory complication | 3 |
| Wound dehiscence | 1 |
| Intra-abdominal abscess | 1 |

Complications of surgery included wound infection in 5 patients, respiratory complications in 3 patients, wound dehiscence in 1 patient and intra-abdominal abscess in 1 patient.

**Table 6: Duration of hospital stay**

| No of days | No of patients | Percentage |
|---|---|---|
| 0-3 | 30 | 60 |
| 4-6 | 8 | 16 |
| 7-10 | 6 | 12 |
| 11-14 | 4 | 8 |

60 % of the cases were discharged within 3 days. Only 8% were discharged after 10 days. Total 2 patients died in the present study. all belonged to operative group and died within 2-3 days of post operative period mainly due to hypovolemia or sepsis. Therefore, mortality is 4%.

**Discussion**

In the study of Davis et al, 70% cases were male and 30% cases were female. In our study, 80 cases were male and 20% cases were female. Males are more common victims of blunt trauma abdomen when compared to Davis et al study. The incidence is slightly more in males as males are involved in RTA and Assaults. My finding corroborate with Davis et al. In study by Davis et al, highest incidence was 24% in the age group of 21 - 30 and next was 19% in age group of 11 – 20 and least incidence was 3% in age group 61 – 70. In our study, highest incidence was 32 in the age group of 11 - 20 and next was 24 in age group 21 - 30 and least incidence was 2% in age group 61-70. Age group - in our study majority of our study population belonged to

11-20yrs of age followed by 21-30yrs of age as young people are involved in RTA which is compared to Davis et al study. My finding corroborate with Davis et al. The signs and symptoms are misleading in case of blunt trauma abdomen and are masked by concomitant head injury, chest injury and alcohol consumption. Retroperitoneal organ injury was missed in DPL and USG abdomen. In Davis et al study 43% had no specific complaints. So, this emphasizes the importance of careful and continuing observation and repeated clinical examination of individuals with blunt trauma abdomen. Haematocrit value was done in 50 patients. It was < 8 in 6% of our study population. In 3 cases there was decreasing Haematocrit on serial measurement and were taken for early intervention. Plain erect X ray of abdomen was done in 50 cases. Gas under diaphragm was not found in any cases. Majority of patients having no radiological abnormality. 40% case having ground glass appearance. In Davis et al[10] study abdominal X ray was abnormal in 21% cases. In our study it is abnormal in 40% of cases of Blunt Trauma Abdomen. Therefore, USG abdomen is more reliable in detecting solid organ injury and free fluid in the abdomen. Spleen is the most common organ injured in Blunt Trauma Abdomen as compared to international series, accounting to 30%, followed by liver in 10% cases and kidney in 4% cases. In 2013 study was done by Muhammad Rafique Memon[11], et al. This prospective study included 32 patients with blunt abdominal trauma, admitted in emergency in surgical unit, GMC Sukkur and CMC Larkana, Pakistan. Out of 32 patients, 29 were males and 3 Female. The age ranged from 12 to 60 years. The mechanism of injury included motor vehicle collision in 15(46.8%) patients, fall from height in 5(15.6%), assault in 3(9.37%) and automobile pedestrian accident in 9(28.12%).

Imaging is essential in early decision making. Sonography in Trauma examination of pericardial, perihepatic, perisplenic and pelvic areas help in early detection of clinically significant abdominal injury. In our study, patients managed Laparoscopically is 45 cases (90%), patient managed with conversion laparotomy is 5 cases (10%). There is an increase in trend towards laparoscopic management if the patient is hemodynamically stable. The grade of injury was also assessed by Diagnostic laparoscopy and was most of the time managed conservatively. In the present study, closure of bowel perforation which was done in 5 cases. Most of the splenic and liver injuries were managed conservatively only doing bleeding control laparoscopically. All renal injury cases were managed conservatively. Irrigation and Drainage procedure was done 10 patients, rest of the patient were examined laparoscopically. In 2016 Massimo Valentino [12] et al. published "Blunt Abdominal Trauma: Emergency Contrast-Enhanced Sonography for Detection of Solid Organ Injuries". Alexandru Eugen Nicolau[13] et al. Laparoscopy is accepted in penetrating abdominal trauma (PAT), but its role in blunt trauma (BAT) remains a controversial one. Our study assessed the utility of diagnostic laparoscopy and therapeutic laparoscopy in abdominal trauma between December 2006 and January 2016. In 2017 study was done by Victor justin [14, 15], et al. The management of blunt abdominal trauma has evolved over time. While laparotomy is the standard of care in hemodynamically unstable patients, stable patients are usually treated by non-operative management (NOM), incorporating adjuncts such as interventional radiology.

## Conclusion

Blunt Trauma Abdomen with solid organ injury forms considerable load of patients in our society. Most common age group involved is 11-20 years. Predominantly males are affected in large proportions. Road Traffic Accident forms the most common mode of injury.

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