VALIDITY OF PARACENTESIS IN DIAGNOSING BLUNT TRAUMA ABDOMEN

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ABSTRACT

BACKGROUND
Blunt abdominal trauma is a common case that comes to an emergency department and it is the most easily missed diagnosis resulting in catastrophic consequences. Delay in diagnosing a case is due to the nonspecific character of the symptoms with which it presents. Clinical signs that could be elicited in blunt trauma abdomen are equally nonspecific. Thus, to avoid delay and save the life of the patient, a doctor has to depend on various investigations to rule out blunt trauma abdomen. The modalities which help include paracentesis, diagnostic peritoneal lavage, Focused Abdominal Sonography for Trauma (FAST) and Contrast-Enhanced Computed Tomography (CECT). To choose the right investigation for the right patient helps in saving precious lives. Validity of each investigation, availability, condition of the patient are the main points to look into before deciding on the right investigative modality. Paracentesis is the simplest investigation that could be done in emergency department and also at the site of accident to triage the patient. Paracentesis has low sensitivity to detect blunt trauma. FAST is a better investigation with higher validity rates than paracentesis. This study aims to validate paracentesis, which is the simplest and commonest investigation used to identify blunt abdominal trauma.

MATERIALS AND METHODS
In this study, 106 patients who fulfilled the inclusion and exclusion criteria were followed up by detailed history, clinical examination, paracentesis and FAST to identify blunt abdominal trauma and then compared with a gold standard investigation, which was assigned as CECT for haemodynamically stable patients and laparotomy for haemodynamically unstable patients. Commonest organs injured in blunt trauma and their management was noted. Patients were followed up till discharge or death. Subsequently, the data were compiled using excel sheet and evaluated using tables and charts.

RESULTS
Paracentesis is found to have a sensitivity of 33.3% and specificity of 98.7% in diagnosing blunt abdominal trauma, whereas FAST was found to have a sensitivity of 63% and specificity of 100% in diagnosing the same. With a low sensitivity of 33.3%, paracentesis could not rule out blunt abdominal trauma, but if a patient is found to have a positive paracentesis, the chance of that patient having blunt abdominal trauma is almost 99%. Compared to paracentesis, FAST is a better investigation with 63% chance of diagnosing blunt trauma and a specificity of 100%.

CONCLUSION
FAST is a better investigation than paracentesis in diagnosing blunt abdominal trauma with higher sensitivity and specificity. But, in centres where FAST is not available, paracentesis may be used, but clinician must keep in mind that a negative paracentesis does not rule out blunt abdominal trauma, whereas a positive paracentesis indicate that the chance of blunt abdominal trauma is almost 100%.

KEYWORDS
Blunt Abdominal Trauma, Paracentesis, Fast, CECT.

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BACKGROUND

Blunt trauma abdomen is one of the most common surgical emergencies that come to our casualty. Spectrum of the injury ranges from trivial to fatal. It is a condition, which is easily overlooked with catastrophic consequences.[1] In most cases, clinical suspicion is the only factor that helps the surgeon to identify a blunt abdominal injury. Clinical findings are inconsistent and unreliable in most cases, thus we have to depend on various investigations including laboratory and imaging studies to confirm or negate our suspicion.

Most common cause of blunt trauma abdomen in any part of the world is road traffic accidents. Unexplained shock in a person who was involved in road traffic accident is mostly due to intraabdominal injury.[2] Time delay in identifying a case of intraabdominal injury could lead to fatal consequences.

Investigations to diagnose a case of blunt trauma abdomen include paracentesis, FAST (focused abdominal sonography for trauma), contrast-enhanced computed tomography, diagnostic peritoneal lavage and diagnostic laparoscopy.[3,4] The point against all these investigations

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except FAST and paracentesis is that it is time consuming and is thus useless in a haemodynamically unstable blunt trauma injury patient. Paracentesis is proved to be having a sensitivity of more than 75 percentage in various studies. FAST is a more sensitive investigation in diagnosing blunt trauma abdomen than paracentesis.[5]

OBJECTIVES

To validate paracentesis in diagnosing intraabdominal injury among cases of blunt trauma abdomen attending emergency department as against conventional methods, which include ultrasound abdomen, CECT abdomen or exploratory laparotomy.

MATERIALS AND METHODS

Methodology- Paracentesis is a form of body fluid sampling procedure, generally referring to peritoneocentesis (also called laparocentesis) in which the peritoneal cavity is punctured by a needle to sample peritoneal fluid.[6]

Indications of Paracentesis

It is used for a number of reasons-

1. To relieve abdominal pressure from ascites.
2. To diagnose spontaneous bacterial peritonitis and other infections (e.g. abdominal TB).
3. To diagnose metastatic cancer.
4. To diagnose blood in peritoneal space in trauma.
5. To puncture the tympanic membrane for diagnostic purposes such as taking a bacterial swab from the middle ear (tympanocentesis).
6. To reduce intraocular pressure in central retinal artery occlusion and any hyphaema in the anterior chamber of the eye where blood does not get absorbed in a week's time.

Mild haematologic abnormalities do not increase the risk of bleeding.

Relative contraindication include-

- International normalised ratio >2.0.
- Platelet count <20,000 per cubic millimeter.

Absolute contraindication is acute abdomen due to inflammatory causes.

Relative contraindications are-

- Pregnancy.
- Abdominal wall cellulitis.
- Distended bowel loops.
- History of intraperitoneal surgeries.

In this present study, the diagnostic value of paracentesis is used to try positively diagnose blunt trauma abdomen.

Technique of Paracentesis

Four quadrant paracentesis was done using 20 gauge needle. The 4 quadrants include right and left hypochondrium, right and left iliac fossas.

Complications

1. Abdominal wall haematoma.
2. Perforation of bowel.
3. Introduction of infection-
   Infection following paracentesis is rare unless the paracentesis needle has pierced bowel loop. Bowel perforation following paracentesis occurs in approximately 6/1000 taps. Fortunately, this doesn't lead to clinical peritonitis and is generally well tolerated.
4. Mortality- Mortality due to paracentesis is extremely rare nil in most cases.
5. Bleeding- Bleeding from an artery or vein that is impaled by the needle can be severe and potentially fatal. An external figure-of-eight suture can be placed surrounding the needle entry site if the inferior epigastric artery is bleeding. Rarely, a laparotomy is required to control the haemorrhage.

Study Design- Descriptive study.

Study Setting- Surgical Ward and Emergency Department of Government T.D. Medical College, Alappuzha.

Study Period- 1 year duration from January 2015 to January 2016.

Sample Size- Prevalence of bleeding in blunt trauma abdomen was detected to be 15% according to a study conducted in Alexandria Journal of Medicine. Sensitivity of paracentesis was found to be 80% by a study conducted by Olson and William in Journal of Trauma, Injury, Infection and Critical Care. Sample size was statistically calculated using the formula.

A = sensitivity× (1-sensitivity)/(deviation)[7]
Deviation taken to be 1
A=1600
Sample size n=A/prevalence
n=1600/15
=106
Sample size for the current study was estimated to be 106.

Sampling Method

All cases coming to the casualty with history of hit on the abdomen or unexplained shock.

Study Population

Inclusion Criteria

1. Those patients willing to take part in the study.
2. Those patients with lap belt marks - correlate with small intestinal injury.
3. Ecchymosis involving the flanks (Grey Turner sign) or the umbilicus (Cullen sign).
4. Local or generalised tenderness, guarding, rigidity or rebound tenderness suggests peritoneal injury.
5. Crepitation or instability of the lower thoracic cage indicates the potential for splenic or hepatic injuries.

Exclusion Criteria

1. Pregnant patients.
2. Patients with known bleeding disorder.
3. Those patients not willing to take part in the study.
4. Those patients with history of abdominal surgeries, which required opening up of the peritoneum.

Study Variables

Dependent Variables

1. History of hit on abdomen and/or lower chest.
2. Unexplained shock following trauma.
3. Contusion lower chest and/or abdomen.

Independent Variables

1. Laparotomy.
2. Mortality.
3. Blood transfusion.
4. Blood pressure.
5. Pulse rate.
6. Hypertension.

Data Collection Tools- Semi-structured questionnaire.

Data Collection Procedure

Paracentesis and FAST is done on all patients presenting to the emergency department fulfilling the inclusion criteria. Regardless of the findings in paracentesis and/or FAST, a patient may undergo laparotomy to rule out intraabdominal injury, if the patient is found to be haemodynamically unstable. More than 10 mL of blood in paracentesis is considered as a positive paracentesis.

FAST is a bedside ultrasonography, which is rapid, portable, noninvasive and accurate examination that can be performed by emergency clinicians and trauma surgeons to detect haemoperitoneum. The current FAST examination protocol consists of 4 acoustic windows (pericardiac, perihepatic, perisplenic, pelvic) with the patient supine. An examination is interpreted as positive if free fluid is found in any of the 4 acoustic windows, negative if no fluid is seen and indeterminate if any of the windows cannot be adequately assessed.[8]

If a patient doesn't require laparotomy as in a case of haemodynamically stable patient regardless of his paracentesis and/or FAST result, he/she will undergo imaging studies in the form either CECT abdomen or USG abdomen at the earliest to rule out intraabdominal injury.[9,10,11]

All the patients will be followed up till death or discharge to assess the prognosis in intraabdominal injury.

Ethical Consideration

1. Study will be conducted only after getting approval from institutional ethical committee.
2. A written informed consent will be taken from all the patients included in the study.
3. The patients participating in the study shall not have to incur any expenses.

Expected Outcome

Paracentesis helps us diagnosing cases of intraabdominal injury easily without any time delay and thus helps us in proceeding with the treatment plan helping us save many valuable lives.

Analysis

Sex	Frequency	Percent
Male	84	79.2
Female	22	20.8
Total	**106**	**100**

Table 1. Percentage and Frequency Distribution of Sex Among Subjects

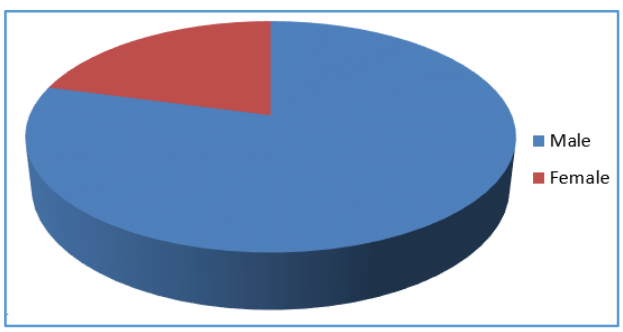

Figure 1. Percentage and Frequency Distribution of Sex among Subjects

79.2% were males and 20.8% suspected with blunt trauma abdomen were females.

Mode of Injury	Frequency	Percent
Road traffic accidents	78	73.6
Fall	22	20.8
Assault	6	5.6
Total	**106**	**100**

Table 2. Percentage and Frequency Distribution of Mode of Injury Among Subjects

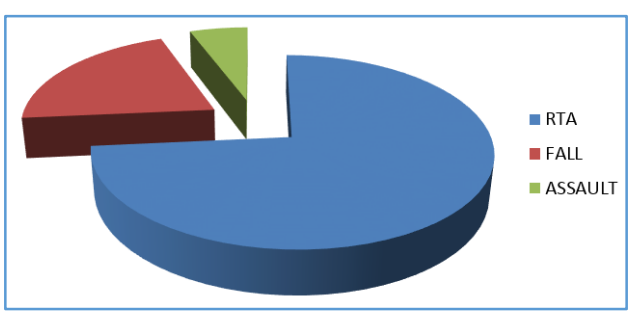

Figure 2. Percentage and Frequency Distribution of Mode of Injury among Subjects

RTA constituted 73.6% of the cases, fall included 20.8% and assault 5.7% of those who were detected to have blunt abdominal trauma.

Pallor	Frequency	Percent
Present	8	7.5
Absent	98	92.5
Total	**106**	**100**

Table 3. Percentage and Frequency Distribution of Pallor Among Subjects

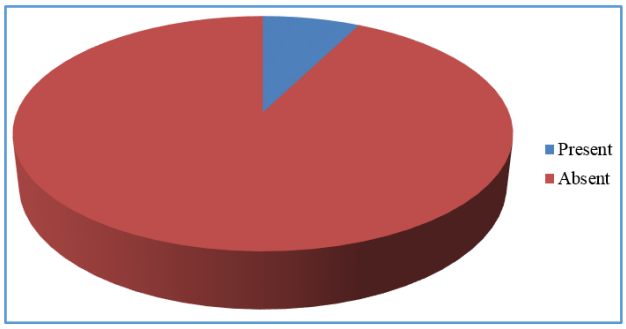

Figure 3. Percentage and Frequency Distribution of Pallor among Subjects

Of all the cases, 7.5% had pallor and 92.5% did not.

Chest Compression Test	Frequency	Percentage
Positive	8	7.5
Negative	98	92.5
Total	**106**	**100**

Table 4. Percentage and Frequency Distribution of Positive Chest Compression Test among Subjects

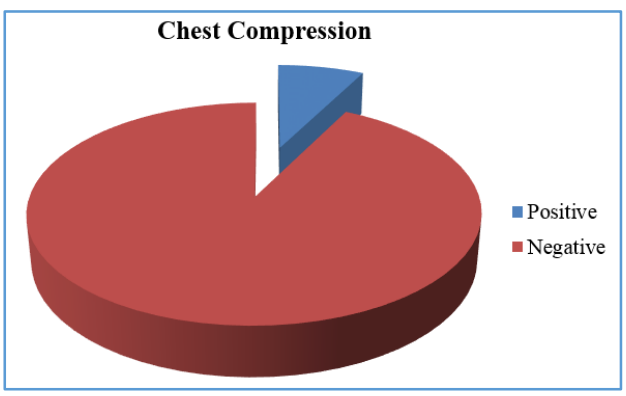

Figure 4. Percentage and Frequency Distribution of Positive Chest Compression Test among Subjects

Chest compression test, which suggest presence of chest injury was positive in 7.5% of patients and absent in 92.5% of patients.

Guarding	Frequency	Percent
Present	77	72.6
Absent	29	27.4
Total	**106**	**100**

Table 5. Percentage and Frequency Distribution of Abdominal Guarding Among Subjects

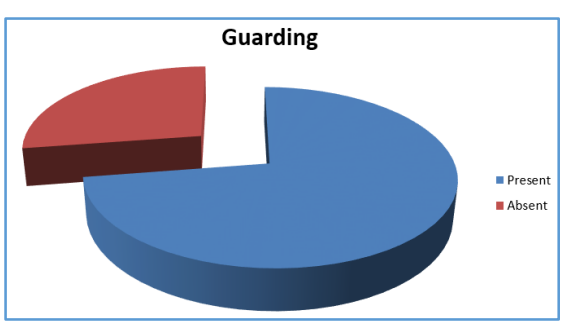

Figure 5. Percentage and Frequency Distribution of Abdominal Guarding among Subjects

72.6% of patients with suspected blunt abdominal trauma had abdominal guarding, while 27.4% did not.

Tenderness	Frequency	Percent
Present	105	99.1
Absent	1	0.9
Total	**106**	**100**

Table 6. Percentage and Frequency Distribution of Abdominal Tenderness among Subjects

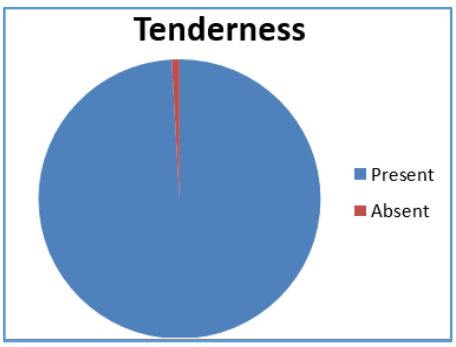

Figure 6. Percentage and Frequency Distribution of Abdominal Tenderness among Subjects

99.1% of patients had abdominal tenderness, only 0.9% had a nontender abdomen.

Bowel Sounds	Frequency	Percent
Present	27	25.5
Absent	79	74.5
Total	**106**	**100**

Table 7. Percentage and Frequency Distribution of Presence of Bowel Sounds Among Subjects

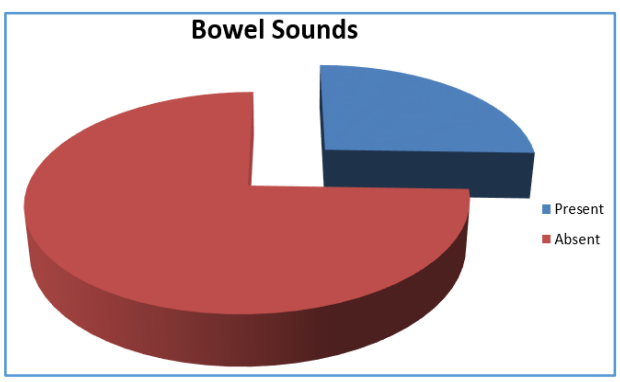

Figure 7. Percentage and Frequency Distribution of Presence of Bowel Sounds among Subjects

Bowel sounds were present in 25.5% and absent in 74.5%.

Shifting Dullness	Frequency	Percent
Present	4	3.8
Absent	102	96.2
Total	**106**	**100**

Table 8. Percentage and Frequency Distribution of Shifting Dullness among Subjects

Figure Percentage and Frequency Distribution of Shifting Dullness among Subjects

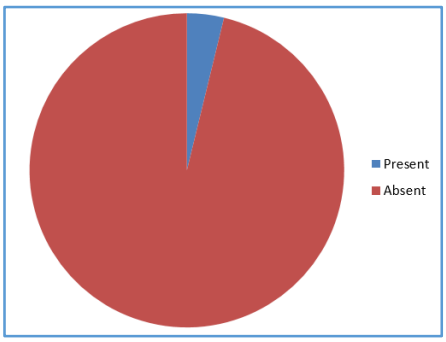

Figure 8. Shifting Dullness was Present in 3.8% and it was Absent in 96.2%

Abdominal Distension	Frequency	Percent
Present	10	9.4
Absent	96	90.6
Total	**106**	**100**

Table 9. Percentage and Frequency Distribution of Abdominal Distension among Subjects

Figure Percentage and Frequency Distribution of Abdominal Distension among Subjects

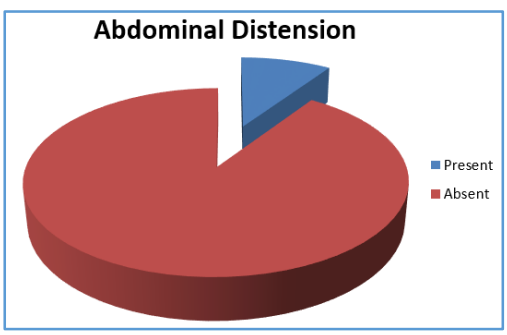

Figure 9. Abdominal Distension was Present in 9.4% and Absent in 90.6%

Flank Dullness	Frequency	Percent
Present	10	9.4
Absent	96	90.6
Total	**106**	**100**

Table 10. Percentage and Frequency Distribution of Flank Dullness Among Subjects

Figure percentage and frequency distribution of flank dullness among subjects.

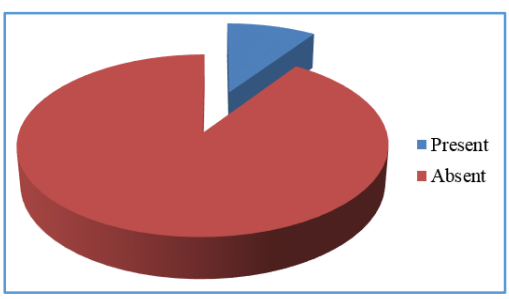

Figure 10. Flank Dullness was Present in 9.4% and Absent in 90.6%

Age	
Mean	35.3
Deviation	13.13

Table 11. Mean Age Among Subjects

The mean age of patients who were evaluated for suspected blunt abdominal trauma was 35.3 with a mean deviation of 13.13. This is in coherence to the fact that most common cause is road traffic accidents where more of young individuals are victims.

Duration	
Mean	4 hrs.
Standard Deviation	6.2 hrs.

Table 12. Mean of Duration at Presentation

Duration since injury when the patient is brought to the casualty plays a major role in the fact that many patients succumb to their injuries due to the delay in diagnosing and transporting the patient to a tertiary care centre where proper treatment could save the life of the patient.[12,13,14] Average time taken to get the patient to the emergency department was 4 hrs. with a mean deviation of 6.2 hrs.

Blood Pressure	Systolic	Diastolic
Mean	111.42	67.41
Standard Deviation	24.44	12.58

Table 13. Mean of Blood Pressure among Subjects

The blood pressure of the patients with suspected blunt abdominal trauma was on an average 111 mm of Hg systolic and 67.41 diastolic with a standard deviation of 24 for systolic and 12 for diastolic blood pressure, which is in the normal range.

Pulse Rate	
Mean	107.63
Standard Deviation	17.12

Table 14. Mean Pulse Rate among Subjects

Mean pulse rate of the patients was 107 bpm (beats per minute) with mean deviation of 17. Most of the patients had tachycardia. Thus, if a patient with suspected blunt abdominal trauma has tachycardia, it is more likely that he may have blunt abdominal trauma.

	Haemoglobin	PCV
Mean	10.93	32.26
Standard Deviation	2.64	6.08

Table 15. Mean of Haemoglobin and PCV among Subjects

Mean haemoglobin levels in the patients was 10.9 with a mean deviation of 2.6. Haematocrit was having a mean of 32.2 with a mean deviation of 6.

Paracentesis	Frequency	Percent
Positive	10	9.4
Negative	96	90.6
Total	**106**	**100**

Table 16. Percentage and Frequency Distribution of Positive Paracentesis among Subjects

Figure percentage and frequency distribution of positive paracentesis among subjects.

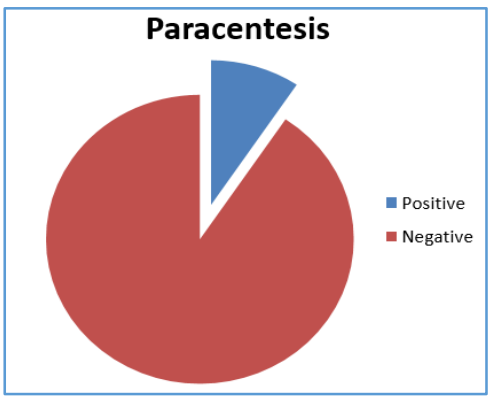

Figure 11. Paracentesis was Positive in 9.4% Patients and was Negative in 90.6%

CECT	Frequency	Percentage
Normal	78	73.6
Not done	4	3.8
Bowel perforation	12	11.3
Splenic injury	5	4.7
Liver injury	2	1.9
Mesenteric tear	4	3.8
Renal injury	1	0.9
Total	**106**	**100**

Table 17. Percentage and Frequency Distribution of CECT Abdomen among Subjects

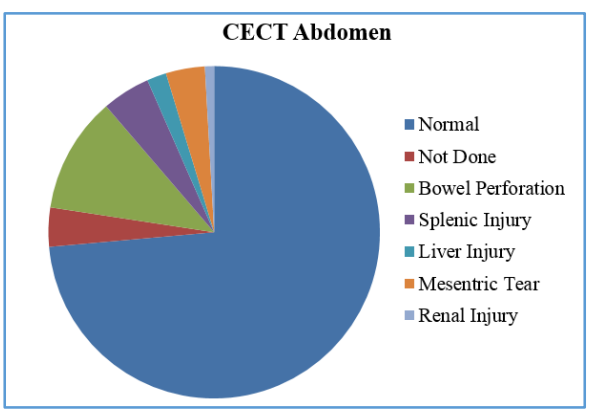

Figure 12. CECT Abdomen

CECT was not done in 3.8% of patients as they were haemodynamically unstable and they underwent emergency laparotomy. Of the rest of the 96.2% patients who underwent a CECT study, 78 (73.6%) had a normal study, bowel perforation was detected in 12 (11.3%), splenic injury in 5 (4.7%), liver injury in 2 (1.9%), mesenteric tear in 4 (3.8%) and renal injury in 1 (0.9%) of patients.

Laparotomy	Frequency	Percentage
Not done	80	75.5
Liver laceration	4	3.8
Splenic injury	5	4.7
Bowel perforation	12	11.3
Mesenteric tear	4	3.8
Renal injury	1	0.9

Table 18. Percentage and Frequency Distribution of Laparotomy among Subjects

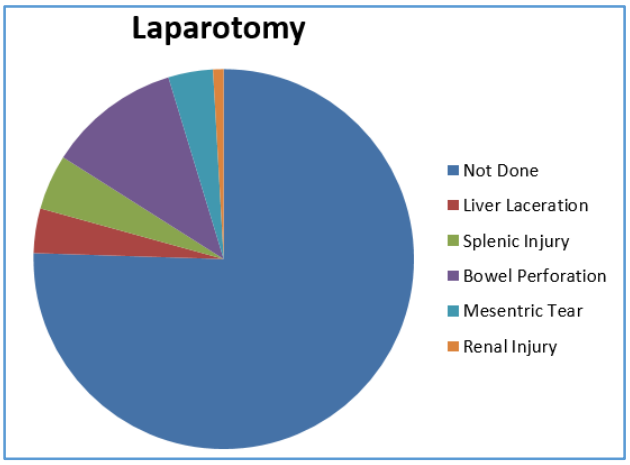

Figure 13. Laparotomy

Laparotomy was not done in 80 (75.5%) of patients as they were managed conservatively. Of those who underwent laparotomy, liver laceration was present in 4 (3.8%), splenic injury in 5 (4.7%), bowel perforation 12 (11.3%), mesenteric tear 4 (3.8%) and renal injury in 1 (0.9%).

		Blunt Trauma		Total
		Positive	**Negative**	
Paracentesis	Positive	9 (33.3%)	1 (1.3%)	10 (9.4%)
	Negative	18 (66.7%)	78 (98.7%)	96 (90.6%)
Total		**27**	**79**	**106**

Table 19. Paracentesis Blunt Trauma Cross Tabulation

Paracentesis was found to have a sensitivity of 33.3% and specificity of 98.7% in my study to diagnose blunt abdominal trauma. Positive predictive value of paracentesis is 90% and negative predictive value is 81.25%.

		Blunt Trauma		
		Positive	**Negative**	
Fast	Positive	17 (63%)	0 (0%)	17 (16%)
	Negative	10 (37%)	79 (100%)	89 (84%)
Total		**27**	**79**	**106**

Table 20. FAST - Blunt Trauma Cross Tabulation

FAST was found to have a sensitivity of 63% and specificity of 100% in diagnosing blunt abdominal trauma. Positive predictive value of FAST was calculated to be 100% and negative predictive value is 88.7%.

DISCUSSION

My sample size was 106. Among the 106 who were followed up as part of the study, 79.2% were males and rest 20.8% were females. The mean age of those involved was 38 yrs. reiterating the fact that those involved are mostly males and those who are young. The most common cause of blunt abdominal trauma is road traffic accidents (73.6%) as in any

part of the world followed by accidental falls at job sites and home. Assault forms a minor share of cases (5.7%).[15,16,17]

The most common complaint of the patient with blunt abdominal trauma is abdominal pain, which was reiterated by the fact that 99.1% of patients had abdominal tenderness. Clinical sign of guarding was present in 72.6% of patients. Bowel sounds, which may be absent in hollow viscous injury was absent in 74.5%, whereas it was present in the rest of the 25.5%. This further proves the nonspecific nature of absence of bowel sounds to diagnose blunt abdominal trauma.[18] Flank dullness, which is usually found in blunt abdominal trauma with significant intraperitoneal bleed was present in only 9.4% of patients. Rest of the 90.6% patients had resonance at the flanks. Shifting dullness is a sign used to elicit presence of fluid in the peritoneal cavity, which may be seen in intraabdominal bleeding or due to ascites from any medical conditions. Shifting dullness was present in only 3.8% of patients, whereas the rest of the 96.2% had no shifting dullness. This shows the very low sensitivity of shifting dullness to diagnose blunt abdominal trauma, which may be due to the fact that at least 1 liter of fluid is required to get a positive shifting dullness.[19,20] Abdominal distension, which may be due to intraabdominal collection or due to ileus maybe found in blunt abdominal trauma. In my subjects, abdominal distension was present in only 10% and rest 90%, it was absent. Chest injury, which is usually seen in association with blunt abdominal trauma is also a potential area were patient may lose significant amount of blood. All patients with blunt abdominal trauma must be evaluated to rule out chest trauma also. The fact that many of the abdominal organs like liver, spleen, stomach and great vessels are protected by the ribcage, an injury to the lower chest CA itself cause blunt abdominal trauma, which is reiterated by the fact that splenic injury and liver injury are usually associated with rib fractures and lung contusions. In the subjects in the study, 7.5% had a positive chest compression test, whereas 92.5% had no chest wall tenderness.

The mean blood pressure of subjects in the study was systolic of 111 and diastolic of 67 with a mean deviation of 24 for systolic and 12.5 for diastolic blood pressure. This is in accordance to the fact that a fall in blood pressure is seen in patients who have lost significant amount of blood of more than 15% within a short period of time when the body cannot compensate.[21] Fall in blood pressure occurs only when patient has lost significant amount of blood, so the blood pressure will be normal even in blunt abdominal trauma when the loss is not more than 15%, which is in accordance to the findings in my study. The mean haemoglobin level in the subjects was 12.3 with a mean deviation of 2. Haemoglobin levels in blunt abdominal trauma depend in pre-accident levels. A subject with anaemia due to other reasons maybe found to have low Hb during evaluation even in the absence of any significant intraabdominal injuries and on the other hand a patient with high Hb levels may have an acceptable Hb levels even in the presence of significant blood loss. The mean of haematocrit in the sample was 35.45 with a mean deviation of 4.5, which is in the normal range. The average heart rate in the subjects was 107 bpm with a mean of 17. Tachycardia is the first change that occurs when there is blood loss, but it is a nonspecific finding. A subject may have tachycardia due to the stress of the situation.

Paracentesis was done in all the subjects with a positive result in 9.4% of subjects. Among the 27 subjects who were confirmed to have blunt abdominal trauma by gold standard investigation, 9 cases were detected by paracentesis indicating a sensitivity of 33.3%. Specificity of paracentesis was 98.7% with only a single subject in whom paracentesis was false positive. For paracentesis to be positive, significant amount of blood is to be present in the peritoneal cavity, so it can miss cases with minimal blood loss. Also, in case of hollow viscous injury, there may not be significant blood loss, which can also be missed in paracentesis. These maybe the reason for the low sensitivity of paracentesis in detecting blunt abdominal trauma. A significant finding is that the specificity of paracentesis is 98.7% in my study, reiterating the fact that a positive paracentesis is almost confirmatory for a blunt abdominal trauma. The site or organ of injury cannot be identified with any certainty by paracentesis. A patient with a positive paracentesis requires laparotomy in most cases as there is already significant blood loss.

FAST is a better investigation in detecting blunt abdominal trauma than paracentesis with a sensitivity of 63% and specificity of 100%. It can detect minimal fluid in the peritoneal cavity and also it can comment with good certainty that whether it is blood or ascites. FAST is operator dependent so that some maybe missed due to the inexperience of the operator. Another short coming for FAST is the fact that it can miss bowel injuries as in FAST we are looking for dependent areas in the peritoneal cavity where there is the highest chance of getting a fluid collection. Also, FAST can miss an early blunt abdominal trauma, if the blood loss is slow to collect and also late sequelae of blunt abdominal trauma like a delayed bowel perforation or a rupture of a haematoma or aneurysm.[22]

CONCLUSION

Blunt abdominal trauma is a common surgical emergency that comes to the emergency department. Delay in diagnosis can result in loss of valuable lives. Clinical signs and symptoms are not conclusive in diagnosing blunt abdominal trauma. Preliminary investigation to be done is FAST and diagnosis is to be confirmed by CECT or laparotomy. In centres where FAST is not available or to triage the patient paracentesis may be done keeping in mind that paracentesis has high chance of false negativity. In our country, where FAST is not available even in tertiary centres, paracentesis still has a role in diagnosing blunt abdominal trauma. A positive paracentesis is 99% confirmation for the diagnosis of blunt abdominal trauma. Thus, a patient with positive paracentesis and who is haemodynamically unstable should undergo emergency laparotomy, no further confirmation of the diagnosis is required. A patient with negative paracentesis must undergo further evaluation preferably FAST initially and followed by CECT or laparotomy according

to the haemodynamic condition of the patient as a negative paracentesis cannot rule out blunt abdominal trauma. Thus, in our country where facilities for costly equipments and investigations are not always available, paracentesis still has role to play in blunt abdominal trauma. Only point to be kept in mind is that a negative paracentesis cannot rule out blunt abdominal trauma.

RECOMMENDATIONS

Preliminary investigation to rule out blunt abdominal trauma is FAST. Facility for FAST is to be made available in every emergency department and the doctor who is attending to the emergency cases must be given proper education on performing and interpreting FAST. FAST when not available, paracentesis can be used, but the low sensitivity of paracentesis must always be kept in mind. Technique of paracentesis also determines its sensitivity. A properly done paracentesis, when positive is the only investigation required to confirm blunt abdominal trauma. Four quadrant paracentesis technique rather than a single quadrant is to be done. Healthcare providers must be educated on the technique and the usefulness of the procedure and the way to interpret it. Timely diagnosis and intervention in blunt abdominal trauma can save valuable lives. Paracentesis is a safe procedure and can be done not only by doctors, but also other healthcare providers. It is the only investigation available, which can triage the patient at the site of accident and can ensure that a patient with positive paracentesis reaches tertiary centre early. If a case of blunt abdominal trauma is diagnosed early and if patient reaches a tertiary care centre early, his/her life could be saved.

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REFERENCES

[1] Ruess L, Sivit CJ, Eichelberger MR, et al. Blunt hepatic and splenic trauma in children: correlation of a CT injury severity scale with clinical outcome. Pediatr Radiol1995;25(5):321-325.

[2] Deunk J, Brink M, Edwards MJR, et al. The value of a standard CT of the spine, chest and abdomen after blunt trauma preliminary results of a prospective evaluation. Research Gate 2007;38(4):113-114.

[3] Bell C, Coleridge ST. A comparison of diagnostic peritoneal lavage and computed tomography (CT scan) in evaluation of the haemodynamically stable patient with blunt abdominal trauma. J Emerg Med 1992;10(3):275-280.

[4] Hughes TM. The diagnosis of gastrointestinal tract injuries resulting from blunt trauma. Aust N Z J Surg 1999;69(11):770-777.

[5] Amoroso TA. Evaluation of the patient with blunt abdominal trauma: an evidence based approach. Emerg Med Clin North Am 1999;17(1):63-75.

[6] Liu M, Lee CH, P'eng FK. Prospective comparison of diagnostic peritoneal lavage, computed tomographic scanning, and ultrasonography for the diagnosis of blunt abdominal trauma. J Trauma 1993;35(2):267-270.

[7] Manzini N, Madiba TE. The management of retroperitoneal haematoma discovered at laparotomy for trauma. Injury 2014;45(9):1378-1383.

[8] Radwan MM, Abu-Zidan FM. Focussed assessment sonograph trauma (FAST) and CT scan in blunt abdominal trauma: surgeon's perspective. Afr Health Sci 2006;6(3):187-190.

[9] Beuran M, Gheju I, Venter MD, et al. Non-operative management of splenic trauma. J Med Life 2012;5(1):47-58.

[10] van der Vlies CH, van Delden OM, Punt BJ, et al. Literature review of the role of ultrasound, computed tomography, and transcatheter arterial embolization for the treatment of traumatic splenic injuries. Cardiovasc Intervent Radiol 2010;33(6):1079-1087.

[11] Haan JM, Bochicchio GV, Kramer N, et al. Nonoperative management of blunt splenic injury: a 5-year experience. J Trauma 2005;58(3):492-498.

[12] She WH, Cheung TT, Dai WC, et al. Outcome analysis of management of liver trauma: a 10-year experience at a trauma center. World J Hepatol 2016;8(15):644-648.

[13] Croce MA, Fabian TC, Menke PG, et al. Nonoperative management of blunt hepatic trauma is the treatment of choice for hemodynamically stable patients. Results of a prospective trial. Ann Surg 1995;221(6):744-755.

[14] Mahajan A, Kadavigere R, Sripathi S, et al. Utility of serum pancreatic enzyme levels in diagnosing blunt trauma to the pancreas: a prospective study with systematic review. Injury 2014;45(9):1384-1393.

[15] Phelan HA, Minei JP. Pancreatic trauma: diagnostic and therapeutic strategies. Curr Treat Options Gastroenterol 2005;8(5):355-363.

[16] Lin BC, Chen RJ, Fang JF, et al. Management of blunt major pancreatic injury. J Trauma 2004;56(4):774-778.
[17] Iaselli F, Mazzei MA, Firetto C, et al. Bowel and mesenteric injuries from blunt abdominal trauma: a review. Radiol Med (Torino) 2015;120(1):21-32.
[18] Brofman N, Atri M, Hanson JM, et al. Evaluation of bowel and mesenteric blunt trauma with multidetector CT. Radiogr Rev Publ Radiol Soc N Am Inc 2006;26(4):1119-1131.
[19] Munns J, Richardson M, Hewett P. A review of intestinal injury from blunt abdominal trauma. Aust N Z J Surg 1995;65(12):857-860.
[20] Wisner DH, Chun Y, Blaisdell FW. Blunt intestinal injury. Keys to diagnosis and management. Arch Surg 1990;125(10):1319-1322.
[21] Murray JA, Demetriades D, Colson M, et al. Colonic resection in trauma: colostomy versus anastomosis. J Trauma 1999;46(2):250-254.
[22] Ng CJ, Chen JC, Wang LJ, et al. Diagnostic value of the helical CT scan for traumatic aortic injury: correlation with mortality and early rupture. J Emerg Med 2006;30(3):277-282.