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SPONTANEOUS PNEUMOPERITONEUM FOLLOWING BLUNT TRAUMA CHEST –DIAGNOSTIC DILEMMA –ROLE OF DIAGNOSTIC LAPAROSCOPE-A CASE REPORT

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ABSTRACT

Introduction: Pneumoperitoneum is a striking feature of hollow viscous perforation and may need of immediate surgical intervention. Blunt trauma chest with pneumoperitoneum without evidence of hollow viscous perforation is unusual and the condition called spontaneous pneumoperitoneum.

Case Presentation: A 29 year male presented to the emergency department after a road traffic accident with hypotension and respiratory distress. Clinically there was surgical emphysema associated with diminished breath sound over left half of the chest and multiple contusions over left hypochondrium and left flank. Bedside X- ray showed fracture of ribs on left side with pneumothorax and air under both the dome of diaphragm. Emergency tube thoracostomy done and respiratory symptoms improved. Further patient evaluated with Ultrasound abdomen and Computerized tomogram of abdomen. Imaging study revealed dilated bowel loops, gross pneumoperitoneum with minimal fluid collections. We did diagnostic laparoscopy done to find hollow viscous perforation or diaphragm injury but to the surprising hollow viscous and diaphragm found to be normal. **Case Discussion:** Pneumothorax and pneumoperitoneum with presence of abdominal contusions make the surgeons in dilemma for choosing conservative or therapeutic approach. **Conclusion:** Diagnostic laparoscopy with systemic exploration of abdominal organs and spaces will help in diagnosis and mandatory laparotomy may avoided

Keywords: Pneumoperitoneum, Blunt trauma chest, diagnostic laparoscopy.

INTRODUCTION

Pneumoperitoneum(pp) denotes an abnormal collection of air in the peritoneal cavity. It results from a perforated hollow viscous in 90% of the cases and requires immediate surgical intervention [1] Spontaneous/idiopathic pneumoperitoneum associated with pneumothorax secondary to blunt trauma is rare. In this case, the thoracic air dissects retroperitoneally or leaks directly through diaphragm. The diagnosis of spontaneous pneumoperitoneum (SP) is usually made after negative laparotomy results.SP with a signs of peritonitis makes a therapeutic dilemma between

conservative or non-conservative treatment. Doing a diagnostic laparoscope in this situation is safety and avoids a major laparotomy

CASE PRESENTATION.

A 29-year male presented to emergency department after a collision with lorry with respiratory distress. Multiple external injuries noted over left half of chest and abdomen. At admission, his coma scale was 15/15, pulse rate was 120 per minute regular, and Blood pressure was 90mm Hg systolic, respiratory rate was 40/minute and oxygen saturation was 70 percentage with 5 liters of oxygen. On auscultation

of chest, there was crepitus on left side with diminished breath sound at left infrascapular and midaxillary region. On examination of abdomen, there were imprint abrasions of tyre marks over the left hypochondrium and flank. Diffuse abdominal tenderness on palpation with obliteration of liver dullness noted. Bowel sound was sluggish. Pelvic compression test was negative. Spine examination appeared normal. Resuscitation started to correct the hypotension. Bedside X-ray chest showed fracture of seventh, eighth, ninth rib on left side with pneumothorax. He underwent placement of inter costal tube drainage (ICTD) on left side which promptly improved respiratory symptoms. After fluid resuscitation and intercostal tube placement, pulse rate was 100/ minute; blood pressure improved to 100/70 mm Hg. Oxygen saturation increased up to 98%. Reevaluation of abdomen revealed tenderness all over abdomen with obliteration of liver dullness. Bedside echo excludes the pericardial effusion. X ray abdomen image demonstrated gas under both the dome of diaphragm. Ultrasound abdomen and computerized tomography scan showed gross pneumoperitoneum, minimal fluid in right sub diaphragmatic region.

Polytrauma patient with tyre marks over the abdomen and pneumoperitoneum prompted us to do the diagnostic laparoscopy. Diagnostic laparoscopy done with the 10mm scope infraumbilically. Liver and spleen found to be normal. Blood tinged fluid at right sub diaphragmatic region, no intestinal contents. The stomach and duodenum was mobilized, and the lesser sac explored. No perforation found in the distal esophagus, stomach or duodenum. The small and large bowel examined, but there was no leakage. Diaphragm searched no rent detected. Hence, the therapeutic procedure abandoned. All the laparoscopic findings were video recorded for review. Patient gradually improved. The postoperative course was uneventful, and the patient showed a significant and prompt recovery. Next postoperative day spirometry exercise started

and patient kept on liquids. Repeat chest and abdominal X-rays obtained, the sub diaphragmatic air and pneumothorax disappeared, chest tube removed and the patient discharged home on the seventh postoperative day.

CASE DISCUSSION

Erect X-ray abdomen, CT abdomen showing Pneumoperitoneum in a trauma patient reliably indicates gastrointestinal perforation in 90 % of cases and usually requires exploratory laparotomy [1]The remaining 10% of cases are attributable to a variety of non-pathologic causes that result in free sub diaphragmatic air and may not require surgical intervention. Such cases have been referred to as "idiopathic" or "spontaneous" PP.

The origin of air in these cases generally attributed to air leakage from pneumatosis cystoides intestinalis, a small perforated duodenal ulcer, a leak from a colonic diverticulum, insufflations of air through the female genital tract, chronic obstructive pulmonary disease, cardiopulmonary resuscitation, or mechanical ventilation[1,2]

SP has been attributed to several thoracic causes, such as traumas (including barotraumas), pneumothorax and bronchoperitoneal fistulas [2]. Air can reach the peritoneal cavity in both blunt and penetrating chest traumas, following normal or abnormal pathways, i.e., diaphragmatic interruptions in the former case and congenital defects or post-traumatic diaphragmatic injuries in the latter case [3,4]

The blunt trauma patient described in the case report presented with respiratory distress, pain and distension of abdomen. Clinically there was surgical emphysema with pneumothorax on left side. There was radiological evidence of fracture ribs on left side with pneumothorax. ICTD promptly relieves the respiratory symptoms.

Patterned abrasions of tyre marks (London's sign), obliterated liver dullness, tenderness on palpation of abdomen with radiological evidence of pneumothorax, and pneumoperitoneum made us

dilemma for conservative /no conservative approach. Complications from missed intra-abdominal injuries can be disastrous. Polytrauma cases with combined pneumothorax and pneumoperitoneum may have a clinical/subclinical visceral perforation permitting only the leakage of air and not of bowel contents.

Fear of missed abdominal injury made us to do diagnostic laparoscope for the present case. The laparoscopy with thorough exploration of hollow viscera and diaphragm did not show any injury or perforation. The possible explanation of his PP is that very high intrathoracic pressure following the initial impact caused pneumothorax and pneumomediastinum, leading to dissection of air through the mediastinum into the retro peritoneum and, finally to the peritoneal cavity[5]. The imprint abrasion and minimal fluid mislead us.

The patho physiology of X-ray and CT-detected PP with blunt chest without bowel perforation has been studied variously. The intraabdominal pressure exceeds intrathoracic pressure by an average of approximately 20 to 30 cm H₂O during both inspiration and expiration, hence simple pneumothorax should not lead to PP. Even patients with tension pneumothorax develop this complication infrequently due to the rapidity of treatment or inadequate buildup of intrathoracic pressure. These findings suggest that very high intrathoracic pressure is required to cause dissection of air through the retroperitoneal space. [6] Traumatic Pneumomediastinum and then pneumoperitoneum occurs in up to 10% of cases of blunt chest trauma. In more than 95% of cases, it results from air leaking from ruptured alveoli collects in the interstitial space. As intrathoracic pressure increases, the air dissects along the sheath of adjacent vessels into the mediastinum. The air can then dissect into various spaces, including the pleural space and along the thoracic great vessels and esophagus into the retro peritoneum, where it may rupture into the peritoneal cavity and cause PP This pathophysiological process was first

described by Macklin in 1939 and now called as Macklin effect [7]

Asanza –Llorent *et al* reported study of two cases of pneumoperitoneum following blunt chest and abdominal trauma. In both patients, laparotomy did not show bowel perforation and conservative treatment could have been provided. [8]

There is a dilemma for surgeons to intervene the abdomen in X-ray and CT-detected PP in traumatic patients with concurrent pneumothorax. The findings of free fluid in peritoneal cavity, mesenteric or bowel wall thickening mandate surgical emergency. If ultrasound abdomen, CT abdomen findings are questionable and surgeon wants a conservative treatment, then serial examinations of the abdomen, frequent laboratory examinations, and constant monitoring of vital signs must be undertaken. Diagnostic laparoscope may be an alternative in high index of suspicion.

Masayoshi *et al* suggested the criteria for non surgical approach in a setting of pneumoperitoneum are (a)thorough physical examination (b)no peritoneal signs (c)pneumothorax (d)negative DPL (e) no intraperitoneal effusions in USG /CT (f)closed observation and repeated examination (g)absence of major brain injury, or altered sensorium[9]

In our case, the presence of imprint abrasions over the left half of abdomen, diffuse tenderness and minimal fluid in the abdominal cavity made us to do diagnostic laparoscopy.

The use of laparoscopy for both diagnostic as well as therapeutic interventions has continued to expand. And this modality provides a viable alternative for the diagnosis of occult intra-abdominal injury following polytrauma .In the patient with combined pneumoperitoneum and pneumothorax the diagnostic laparoscopy with defined management algorithms has decreased the rate of negative and/or nontherapeutic laparotomy. This is particularly important in those patients where the potential for peritoneal violation exists without other clear indications for laparotomy. [10]

CONCLUSION

Polytrauma patients are considered to critical patients and needs emergency attention and decision by trauma surgeons. Even with high definition imaging, the diagnosis of intrabdominal injury remains challenging and sometimes surgeons forced to do a negative laparotomy. Complications from missed intra-abdominal injuries can be disastrous. The diagnostic and therapeutic laparoscopy in a stable polytrauma patient is safe and standard negative laparotomy may be avoided. Poly trauma patient with patterned abrasions over abdomen, pneumothorax, and pneumoperitoneum, may undergo diagnostic laparoscopy to exclude occult diaphragmatic injury or hollow viscous perforation. The diagnostic laparoscope may be the safe approach to avoid the confusion.

Competing Interests

The authors declare that they have no competing interests

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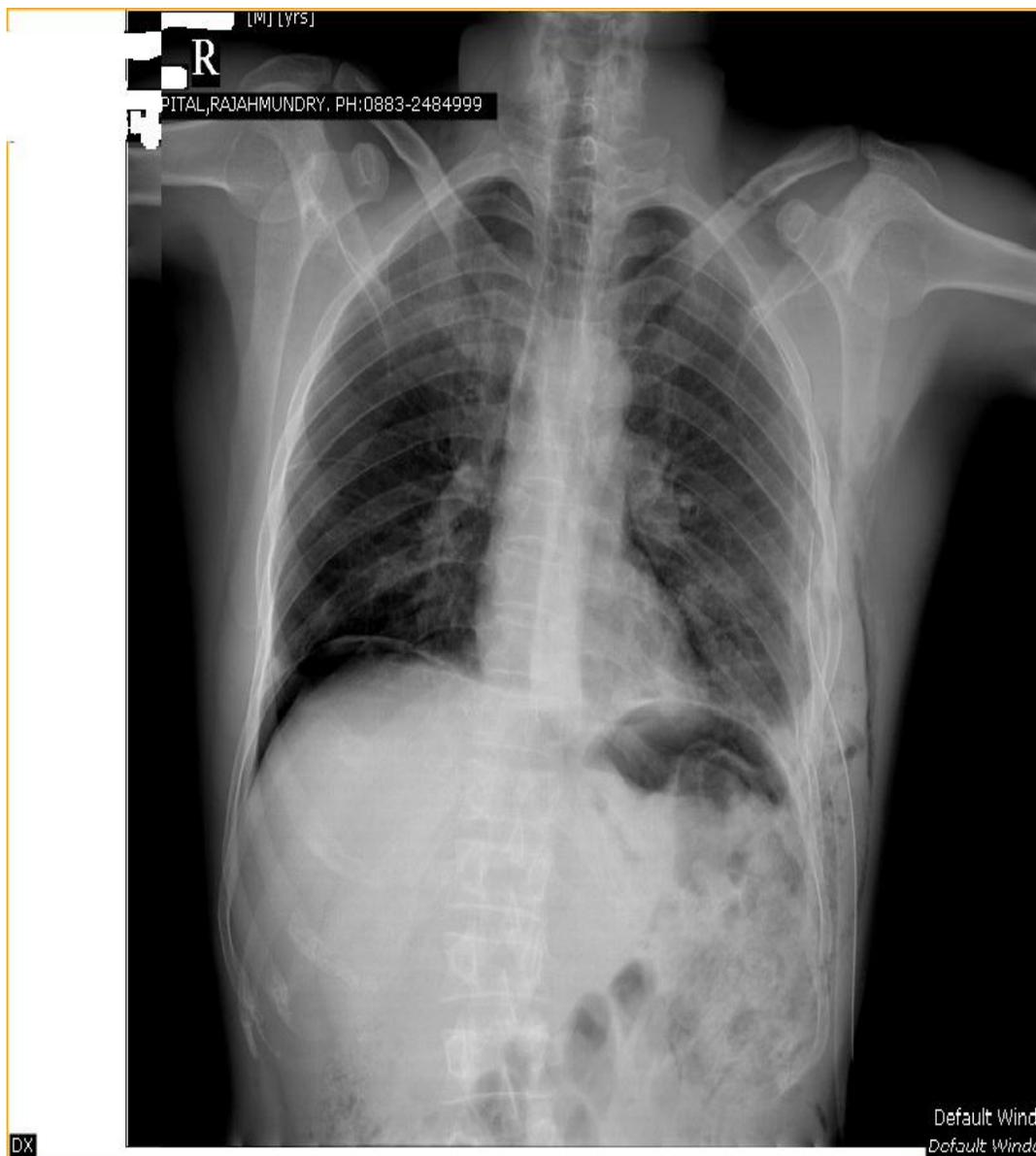


Figure 1—Xray chest –fracture ribs-chest tube insitu- pneumoperitoneum

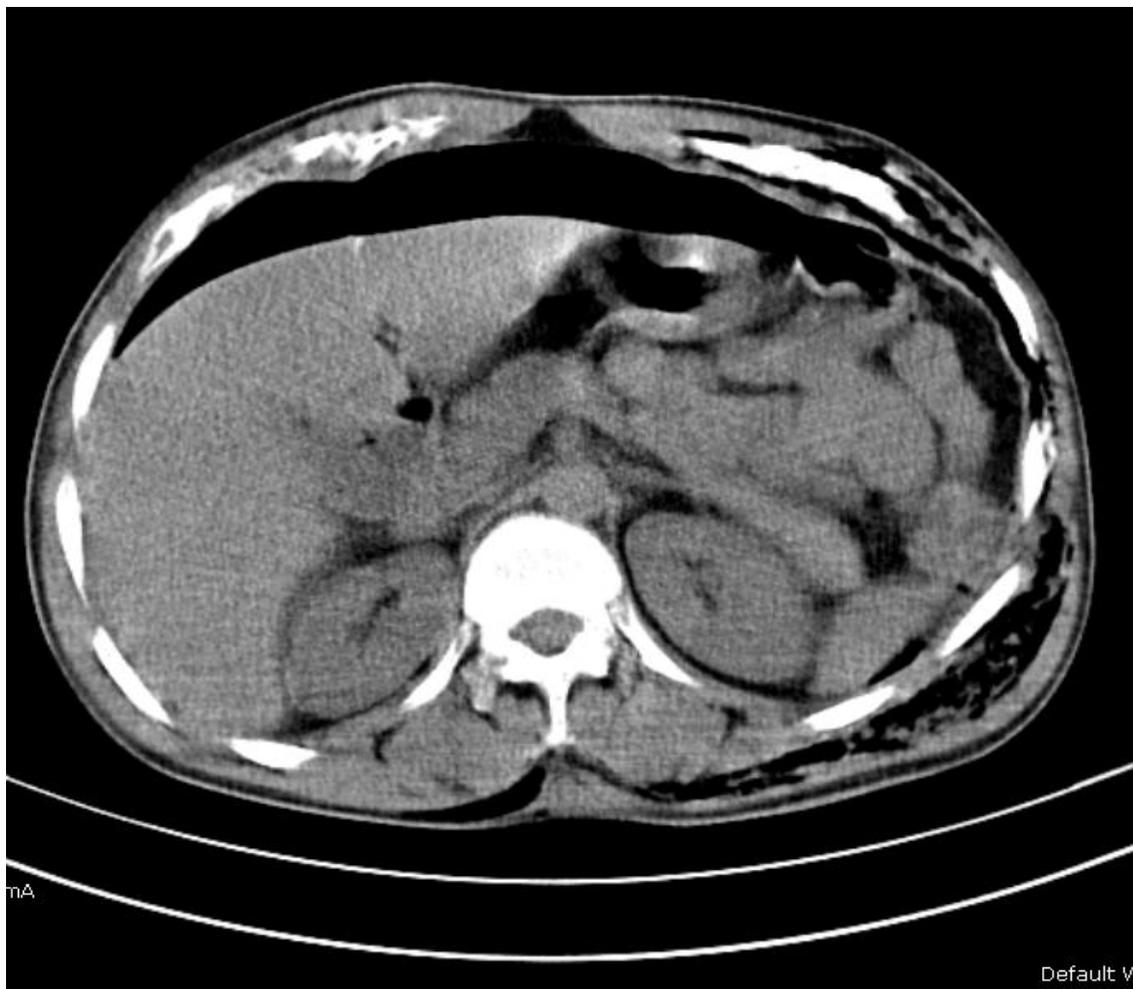


Figure 2- CT Abdomen-Gross Pneumoperitoneum