

Isolated small bowel perforation following blunt abdominal trauma



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Isolated small bowel perforation following blunt abdominal trauma.

Small bowel perforation from blunt abdominal trauma is a common injury. Isolated perforation of the small bowel after blunt abdominal trauma is infrequent and the diagnosis can be elusive. A case of isolated perforation from blunt trauma is presented. Deterioration of the clinical picture raised suspicion of acute abdomen, perforated sore. If acute abdomen is the case even with a history of minimal abdominal trauma, delayed intestinal trauma should be considered in the diagnosis. The uses of various diagnostic procedures, such as chest radiograph for free air, abdominal ultrasonography and computed tomography for diagnosing intestinal perforation was reviewed. Serial abdominal examination continued to be paramount in diagnosing intestinal injuries. Explorative laparotomy revealed the perforation on the antimesenteric border. Early surgical intervention leads to good recovery. Sufficient vigilance and suspicions of small bowel perforation should always be considered after blunt trauma even when symptoms and physical findings are minimal. Diagnostic difficulties result in delayed surgical treatment and eventually in increased morbidity and mortality.

KEY WORDS: Blunt abdominal trauma, Isolated perforation, Small bowel

Introduction

Intestine injuries take the first place among closed injuries of abdominal cavity's alvus, and the third place among all other organs ^{1,2}.

Quarino and associates noted that 41,6% of patients with blunt trauma had intestine perforation ³. Wotts and associates noted that 25.7% of 2632 patients had small intestine perforation.

The high risk of small intestine trauma while getting closed injury is to be attributed to its anatomic and topographical features (more superficial location in abdominal cavity, large mass, big length and mobility, the fact of its being unprotected by skeletal system). Serous layer removal, injury of mesenterial veins, perforations and disruptions are referred to closed injury of intestines ⁴.

Isolated small intestine perforation is of interest among such injuries due to the following features: a) delay of surgery due to difficulty and complexity of diagnosis; b) impossibility of getting always satisfactory results, heavy complications and high postsurgical death rate; c) vague pathogenesis of injury.

During blunt traumas isolated small intestine injury is a rare case.

Medical literature provides information on this pathology. In 1837 Samuel Annan, in 1980 Robbs and associates and in 2011 Goudar and associates noted availability of isolated small intestine perforation at patients with blunt

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trauma of abdominal cavity. At these patients signs of injury around perforative holes were not observed^{3,5}. In the following presentation the information on the patient with isolated small intestine perforation during blunt trauma is given.

Case report

A 18 years old patient, was delivered to hospital with extended pain in the abdomen, with dry and bitter tasting mouth and general weakness complaints. He considered himself ill for a day, the reason being attributed to received blunt trauma of the abdominal cavity.

Physical examination

Upon delivery general condition of the patient was moderately severe, his consciousness was clear. His skin

and visible mucous membrane were of common color. Blood pressure – 110/70mmHg, pulse – 82 sinus. Vesicular respiration was audible on the lungs surface. Tongue was dry and furred. Palpation of all abdomen caused sharp pain, irritating sign was sharply positive.

Instrumental examination

Ultrasonography showed availability of free fluid in both pleural sinuses. In both fossas dilated intestinal loops full of fluid were observed. Survey radiograph of the abdomen had not detected any pathology. CT-scan showed free air bubbles (Fig. 1, 2, 4) and fluid in the abdominal cavity (Fig. 3). Mesenterial adipose tissue was “dirty” (Fig. 3).

Due to the fact that the conducted physical and instrumental examinations aroused suspicion of “acute abdomen, perforated sore and disseminated peritonitis”, the patient was immediately performed the “laparotomy”. During intraoperative inspection at 10 sm distance from the ligament of Treitz bonds on the antimesenterial



Fig. 1: Air bubbles under diaphragm are shown by arrow.



Fig. 3: Free fluid and “dirty” adipose tissue in the abdominal cavity are shown by arrow.



Fig. 2: Air bubbles under diaphragm are shown by arrow.

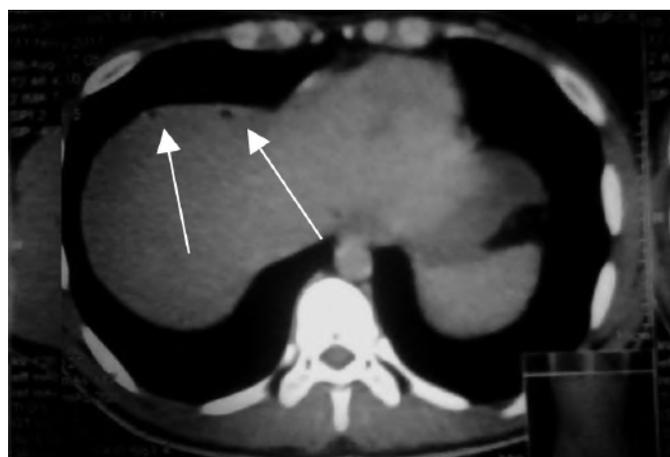


Fig. 4: Air bubbles under diaphragm are shown by arrow.



Fig. 5: Perforative hole is indicated by arrow.



Fig. 6: Perforative hole is indicated by arrow.

surface of small intestine a 0,8 sm diameter hole shedding yellow fluid was detected (Figg. 6, 7). Little parts of serous tissue around the hole were taken for histological study, the intestine wall was restored by putting in three-layer stitches. The rest of the bowel and other organs were normal. The perforation was closed primarily. The abdominal cavity was sanitized and drained. The postoperative course was uneventful. Histological study detected necrosis and acute inflammation of the intestine wall.

Discussion

As isolated small intestine perforation is a rare case while receiving blunt traumas (less than 1%), it is difficult to diagnose it which complicates the work of surgeon and traumatologist ^{3,6}.

Perforation in close vicinity of Treitz ligament is observed most rarely. There is information on patients with intestine perforation at 10 or 25 cm distance from in medical Treitz ligament literature ⁷. The patient presented by us had intestine perforation at 10 cm distance from Treitz ligament.

During blunt trauma transversal power created between abdominal wall and spine increases abdominal pressure, which leads to injury of the antimesenteric surface being the weakest part of the intestine ^{3,6}. In practice there was a case when a football player received isolated perforation of the intestine as a result of analogous mechanisms of physical influence and knee blow ^{8,9}. This patient received a knee blow in his abdomen.

As surgeons rarely encounter such a trauma, they have insufficient appropriate work experience. Accordingly, due to lack of optimal diagnosis and exact algorithm of treating patients, the disease aggravation and death rate increase ¹⁰.

Gradual filling of abdominal cavity with fluid and air precede symptoms of peritonitis that can be observed in a few hours. Due to this fact early examination allows to set a right diagnosis in 30% of cases ³.

During clinical investigation of patient other kinds of investigation should be conducted at the same time in order to evade any loss.

The data on the number of leukocytes and the level of amylase can be of diagnostic value alongside with other investigations. However, such data cannot be relied upon severally (without other investigations) in case of small intestine perforation ^{4,11}.

The following investigation methods allow to diagnose isolated perforation of intestine.

Detection of air under diaphragm during survey radiograph of the abdomen is indicative of hollow organ perforation and in 7-8% of cases helps to set an early diagnosis ^{11,12}. In case with our patient no free air under diaphragm was found out during survey radiograph.

Ultrasonography is one of the early used methods of evaluating blunt traumas of abdomen. The sensitivity of this method in detecting fluid gathered in the abdomen constitutes 91-100%, while in detecting perforations it constitutes 8% ¹³. The method was of diagnostic value in the case of our patient. Free fluid was observed in both pleural sinuses. In both fossas dilated intestinal loops full of fluid were observed.

CT-scan is method with 92% sensitivity and 94% specificity ¹⁴. In the experience of Fakhri and associates CT-scan diagnosed intestine perforation at 21,1% of patients with free fluid ⁴. The reason of delay of surgery at 15 out of 70 patients observed by Frik and associates was lack of detection of any pathology by CT-scan investigation ¹⁵. At 13 out of 69 patients observed by Kemmeter and associates CT-scan didn't detect any pathology, however found out intestine injury ¹⁶. Klick and associates noted that wrong diagnosis was set at 5

out of 49 patients investigated by CT-scan ¹¹. During CT-scan of the presented patient free air bubbles in the abdominal cavity (Figg. 1, 2, 4), fluid and “dirty” mesenterial adipose tissue were detected (Fig. 3).

If intestine perforation is found out during 24 hours, death rate and complications level are low ⁸. Robbs and associates noted that death rate among patients with multi-traumas constituted 57,8%, among those with isolated perforation 21,2%; death rate among patients with perforations that were not detected during 24 hours was high ¹⁷. According to Klick and associates, isolated perforation of intestine that had not been detected during 24 hours, does not cause significant increase of death rate, however it increases the number of complications. Due to the fact that the presented patient was delivered 24 hours after perforation, the latter was aggravated by diffuse peritonitis.

Conclusion

Diagnosis of small intestine isolate perforation is difficult. Early diagnosis and the appropriate surgical treatment are delayed in the majority of cases and cause aggravation of the disease. Clarification of the mechanism of the received trauma, keeping under observation a patient with high probability of perforation, conduction of repeated medical examinations, exact evaluation of results of CT-scan and other investigations help prevent aggravations of small intestine isolated perforation.

Riassunto

Dopo traumi ottusi si nota spesso la perforazione dell'intestino tenue, ma la perforazione isolata dell'intestino tenue si nota molto raramente ed è difficile fare la sua diagnosi. Di seguito apportiamo le informazioni sulla perforazione isolata dell'intestino tenue.

Il peggioramento della clinica della malattia ha messo in dubbio la perforazione acuta dell'addome e di ulcera. Nel caso se vengono notati gli acuti sintomi addominali provocati dalla minima trauma addominale, va negato al trauma intestinale. Per rilevare le bolle d'aria sono stati effettuati la radiografia degli organi della gabbia toracica, il controllo ultrasonografico e la tomografia computerizzata della cavità addominale ed altri controlli. I controlli alla cavità addominale svolgono il ruolo importante per la rilevazione dei traumi intestinali. Durante la laparotomia si nota la perforazione nella parte opposizionale del mesenterio. L'operazione chirurgica effettuata in anticipo favorisce al risultato positivo. Anche se i sintomi clinici, a causa dei traumi ottusi provocati dalla minima perforazione dell'intestino tenue, sembrano leggeri bisogna sempre essere in dubbio. La difficoltà della diagnosi può causare al ritardo dell'intervento, all'avanzamento dei casi di malattia e di morte.

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Commento e Commentary

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Il caso clinico riportato dagli autori, che si riferisce ad una perforazione del digiuno (a circa 10 cm dal Treitz) a seguito di trauma chiuso isolato dell'addome che è stato trattato chirurgicamente dopo 24 ore dall'esordio, merita un certo interesse in quanto conferma, sia nella modalità lesiva, sia in quella di presentazione, quanto fino ad oggi riportato in letteratura.

La spiegazione fisiopatologica di questo tipo, non comune, di lesione sta nel fatto che l'applicazione diretta dell'energia cinetica del trauma in un punto isolato dell'addome può, in alcuni casi, produrre negli organi sottostanti la parete addominale, sede di applicazione del trauma, anche una lesione da scoppio del viscere cavo e ciò in accordo alla formula - $KE=1/2 MV^2$: in cui KE sta per Energia Cinetica, M per la massa e V per la velocità. Se la velocità è elevata ed applicata su un punto ristretto (M piccola perché circoscritta) si potrà ottenere, essendo la velocità elevata al quadrato, una Energia Cinetica anch'essa elevata capace di raggiungere gli strati sottostanti, anche ad addome chiuso, e produrre effetti lesivi sui visceri cavi.

Per quanto concerne la modalità di presentazione, nei traumi chiusi dell'addome, è stato osservato che nelle prime 12-72 h una diagnosi misconosciuta di lesione di organi cavi è riscontrata nel 10-30% dei casi.

E che tra le lesioni da scoppio degli organi cavi, nei pazienti con trauma chiuso dell'addome, il digiuno e l'ileo sono interessati in circa l'80% dei casi lo conferma una ampia revisione effettuata da EAST Multi Institutional Trial - J. Trauma 2008 che colloca il tratto intestinale (digiuno-ileo) al secondo posto dopo il colon, come sede di lesione da scoppio dei visceri cavi dopo trauma chiuso dell'addome. La diagnostica con TC multislice con iniezione di mezzo di contrasto è obbligatoria per la diagnosi. Il trattamento chirurgico adottato dagli autori è stato corretto ed adeguato.

Importante nella scelta del trattamento è la valutazione dell'entità di coinvolgimento dell'ansa intestinale se inferiore o superiore al 50% del diametro del viscere. Se inferiore si potrà optare per la sutura diretta, se superiore: si dovrà optare per la resezione ed anastomosi, se consentita.

* * *

The clinical case reported by the authors that refers to a perforation of the jejunum (about 10 cm from Treitz) following isolated blunt trauma of the abdomen which was treated surgically after 24 hours of onset, deserves some interest as it confirms, both in the mode of the injury and of its presentation, what up to now reported in the literature.

The pathophysiological explanation of this type, not common, of lesion lies in the fact that the direct application of the kinetic energy of trauma in an isolated point of the abdomen may, in some cases, produce even an outbreak lesion of the hollow viscus underlying in the abdominal wall the site of application of the trauma, according to the formula - $KE = 1/2 MV^2$: where KE stands for Kinetic Energy, M for the mass and V for the speed of the traumatic agent. If the speed is high and applied on a small area (M small because circumscribed) it will obtain, since the high velocity is squared, a high Kinetic Energy also able to reach the underlying layers, even at abdomen closed, and is able to produce an effect of damage in the the hollow viscera.

As for the mode of presentation, in closed traumas of the abdomen it has been observed that a diagnosis of lesion of unacknowledged hollow organs is found in 10-30% of cases in the first 12-72 h.

Among the blast injuries of hollow organs, in patients with blunt abdominal trauma, jejunum and ileum are involved in about 80% of cases, and confirms a comprehensive review conducted by EAST Multi Institutional Trial - J. Trauma 2008, which places the intestinal tract (jejunum-ileum) in second place after the colon as the site of the outbreak of the hollow viscera injury after blunt abdominal trauma. The multislice CT diagnostic with injection of contrast medium is mandatory for diagnosis. The surgical treatment adopted by the authors appears correct and appropriate.

Important in the choice of treatment is to assess the extent of intestinal involvement of the loop if less or more than 50% of the diameter of the bowel. If lower you can opt for primary closure, but if it is higher you must opt for resection and anastomosis, wether allowed.

