uşurează întreţinirea victimelor şi duce la reducerea complicaţiilor.

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Rezumat

Fracturile multiple a sistemului locomotor în asocierea cu leziuni ale organelor interne creează condiţii critice pentru pacienţi. La etapa de evaluare iniţială deseori se întâlnesc dificultăţi obiective în rezolvarea sarcinilor medicale şi tactice. Autorii au experienţă în numeroase investigaţii şi tratament al pacienţilor cu politraumatism. Sunt convinşi profund de faptul că sarcina principală este de a determina leziunea dominantă, o secvenţă de acţiuni în perioada preoperatorie şi de intervenţii chirurgicale, în evaluarea conformităţilor compensatorii şi a capacităţii de adaptare a unui organism, prognozarea dezvoltării a complicaţiilor şi rezultatelor de tratament, ce în total duce la creşterea eficăcităţii tratamentului.

Summary

Multiple injuries of the musculoskeletal system associated with the viscera lesions create critical conditions for the patients. Objective difficulties are often meeted at the first step of examination, in the resolving of treatment and tactic problems. The authors have years of experience in the examination and treatment of polytrauma patients. They are convinced that the primary task is to determine the dominant injury, the sequence of actions in the preoperative period and sequence of surgical interventions, conformity assessment of compensatory and adaptive capacity of an organism, predicting of complications and outcomes – all these increase the effectiveness of treatment.

Резюме

Множественные переломы опорно-двигательного аппарата в сочетании с повреждениями внутренних органов создают критические условия состояния пациентов. На этапе первичного обследования нередко встречаются объективные трудности, при решении лечебно-тактических задач. Авторы обладают многолетним опытом обследования и лечения пострадавших с политравмой. Глубоко убеждены, что первостепенной задачей является определение доминирующего повреждения, последовательность действий в предоперационном периоде и очередность оперативных вмешательств, оценка соответствия компенсаторных и адаптационных возможностей организма, прогнозирование развития осложнений и исхода, все это повышает эффективность лечения.

TRAUMATIC DIAPHRAGMATIC RUPTURE (Review)

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Introduction

Traumatic diaphragmatic rupture (TDR) is uncommon occurring in 1 to 7% of patients admitted due to thoracoabdominal trauma and in 10-15% of patients with penetrating lower chest wounds [1]. The most common etiologic factors are blunt and penetrating traumas [2]. Other etiological factors for TDR are iatrogenic injuries as well as spontaneous diaphragmatic ruptures [3-5].

The diagnosis of a TDR is quite challenging, especially when other competing injuries are present and require a high index of suspicion. The poor outcome in patients with TDR is influenced by late diagnosis (over 50%) as well as concomitant injuries [6]. Diaphragmatic injuries in the acute phase are rarely life threatening, however the competing injuries associated with TDR are commonly life threatening [3]. The missed TDR are accompanied with increased morbidity and mortality due to intra-abdominal organ herniation and strangulation through the diaphragm defect, thus all the TDR must be repaired. Under these circumstances all the cases of penetrating injuries affecting the lower chest, upper abdomen and back, as well as the cases of blunt thoracic and abdominal traumas must be considered as potential diaphragm injures [7].

The aim of the present review is to highlight the diagnostic pitfalls as well as the treatment modalities for the patients suspected with TDR.

Anatomy

The diaphragm separates the thoracic and abdominal cavities. Embryologically it arises from the pleuroperitoneal membranes, body wall, the dorsal mesentery of the esophagus and the septum transversum. Development and fusion deficiencies of these components are the potential factors for congenital hernias of Morgagni and Bochdalek which could predispose adults to traumatic diaphragmatic hernias. There are two distinctive parts in the diaphragm: 1) muscle fibers that arise radially from the thoracic aperture and 2) a large central tendon which is fused to the pericardium above. The diaphragm posterior attachments are located lower than the anterior ones while the right dome lies higher than the left one. The diaphragm is passed through at its crura by the inferior vena cava, esophagus and aorta. The thoracic and abdominal surfaces are lined by parietal pleura and peritoneum respectively, except the 'bare area' of the liver [8].

Injury mechanism

The first description of a diaphragmatic rupture with abdominal organ herniation is attributed to Sennertus in 1541 [9, 10]. Diaphragmatic injury is usually a result of high velocity blunt or penetrating trauma to the abdomen, chest or both, rather a trivial fall [10, 11]. These patients usually have multi system injuries due to the significant force required to rupture the diaphragm [11, 12]. Shah R et al. in a large review published in 1995 suggested that 75% of the injuries to the diaphragm are induced by blunt trauma and 25% by penetrating trauma, but the true incidence of TDR is unknown due to missed or overlooked cases [2]. On the other hand in the recent retrospective study published by Dirican A et al. the reported proportion of TDR in patients with abdominal and thoracic injuries was 1.3%, the penetrating injuries being the principal cause of diaphragm lesions [3].

According to Grimes OF., there are three phases of diaphragm rupture: 1) initial acute phase, at the time of the injury to the diaphragm; 2) a delayed phase associated with transient herniation of the viscera, thus accounting for absent or intermittent nonspecific symptoms; 3) the obstruction phase involving the complication of a long-standing herniation, manifesting as obstruction, strangulation and posterior rupture [13].

Classically, the left hemidiaphragm is affected more frequently, with a ratio of 25:1 [14]. However, autopsy studies have revealed equal incidence of right and left diaphragmatic ruptures, most recent series show that right hemidiaphragm injuries can represent almost 35% of all TDR [10]. This pattern may explain why the liver develops a protective cushioning pressure, although some authors believe that right hemidiaphragm injuries are associated with increased mortality so would be undiagnosed, and for this reason would be found in equal proportion at autopsy [15].

According to Dirican A et al., the size of TDR is smaller in penetrating traumas compared to the blunt traumas [3].

A small size rupture is potentially more dangerous due to a higher frequency of misdiagnosis and a higher rate of strangulation in the later phase due to the progression of posttraumatic diaphragmatic herniation. Unlike the small size diaphragmatic ruptures, large injuries have a higher frequency of intraabdominal organs herniation into the thoracic cavity in the acute phase.

Etiology, TDR site, surgical approach and mortality rates are presented in table 1.

Diagnosis

The early diagnosis of TDR is mandatory and also quite difficult, a late or misdiagnosis may induce severe complications [21]. In most cases TDR are overlooked since there are often concurrent injuries involving solid organs, pelvis, central nervous system, or mediastinum that may divert the attention from a TDR [22].

Over the last 50 years many diagnostic procedures have been suggested for the diagnosis of TDR, including plain chest X-ray, CT scan, USG, magnetic resonance imaging (MRI), upper gastrointestinal oral contrast study, fluoroscopic evaluation of diaphragmatic motion, intraperitoneal injection of radioisotopes, laparoscopy, and video-assisted thoracic surgery, the plain chest radiograph being the earliest, most familiar and accessible [6,11]. Specific signs of TDR are still contentious (table 2) and the diagnosis of uncomplicated TDR remains difficult [18].

The diagnostic accuracy of the plain chest x-ray

Table 1

Etiology TDR site, surgical approach and mortality in early reported studies

Author	*Nr. of cases*	*Trauma type Blunt/Penetrating*	*Location Left/Right/Both*	*Management Abdominal/Chest/Both*	*Mortality %*
Lewis JD., et al. [16].	254	99/155	129/78/9	165/8/21	22*
Athanassiadi K., et al. [17]	41	41	24/15/2	22/10/4	6
Gwely NN., et al. [18]	44	44	30/12/2	4/37/3	13
Matsevych OY. [19]	12	12	9/2/1	11/0/1	25
Chandra A., et al. [20]	15	12/3	12/3/0	0/11/4	6.7
Dirican A., et al. [3].	48	15/33	35/10/3	46/2/0	14.8

*54/254 did not survive to undergo surgery; mortality figure is for those who survived to surgery

Table 2

X-Ray signs of TDR

Specific signs	*Non-specific signs*
NG tube visible in the thorax	Irregularity of diaphragmatic outline
Hepatic displacement	Atelectasis of lower lobes
"Collar sign" of herniated abdominal viscus	Mediastinal shift
Bowel loops in the thorax	Pleural effusion
	Hemidiaphragm elevation
	Air-fluid levels in the lower thorax

is almost four times greater (62% *vs.* 17%) for left than right sided injuries [6]. Up to 50% of the initial chest x-rays of the patients with later confirmed TDR are reported as normal or misinterpreted (figures 1, 2) [6, 23, 24].

Initial chest x-ray examinations are diagnostic in 27–62% of patients with left-sided and 18–33% of cases with right-sided diaphragmatic injuries [22, 25]. Chest radiographs are suggestive but not diagnostic in another 18% of cases [26, 27].

The diagnosis of TDR could be delayed for intubated patients, with a positive end expiratory pressure (PEEP) ventilator support, since the usual pressure gradient across the pleural and peritoneal cavities is neutralized or even reversed, as a result herniation of the intraperitoneal organs will not occur until PEEP is finished [28, 29].

Diagnostic accuracy is increased by serial chest x-rays, especially in mechanically ventilated patients, as visceral herniation can occur after intrathoracic and intraabdominal pressures are equalized [30].

Although supine chest x-ray is the initial screening study performed to evaluate a potential TDR in many centers it is being replaced by multi-detector computed tomography (MDCT) study of the entire torso [22]. A CT scan or contrasted upper GI series can increase the diagnostic accuracy for patients suspected with TDR (figures 3, 4).

Conventional CT has a reported sensitivity of 14–61% and specificity of 76–99% for diagnosing TDR [31-35].

Conventional CT limitations include difficulty visualizing the entire diaphragm due to the shape (dome) on axial images, low-resolution sagittal and coronal reformatted images performed with 8–10 mm axial slice thickness, and difficulty differentiating the diaphragm from adjacent pulmonary pathology or normal soft tissue structures [22]. The above mentioned limitations could be eliminated by spiral CT, particularly with multiple detectors, by using the thin-slice collimation and slice overlap to optimize z-axis resolution, the capacity to obtain large volumes of data during a single breath hold, and decreased motion and misregistration artifacts [36, 37]. Currently the MDCT-16 and MDCT-40 are used to study most acute trauma patients using the "whole body" protocol [22].

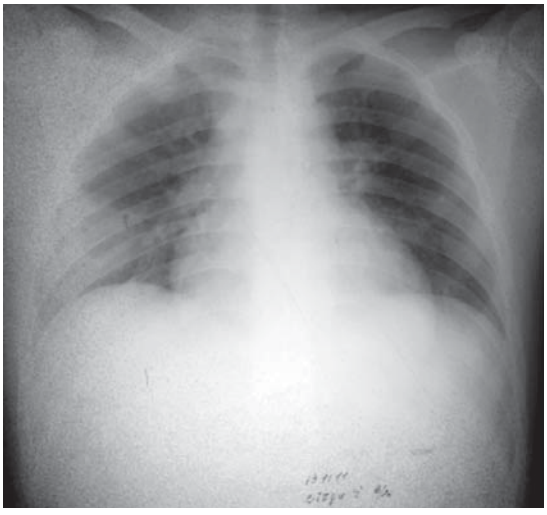

Fig. 1. *Initial chest x-ray (no TDR was evidenced).*

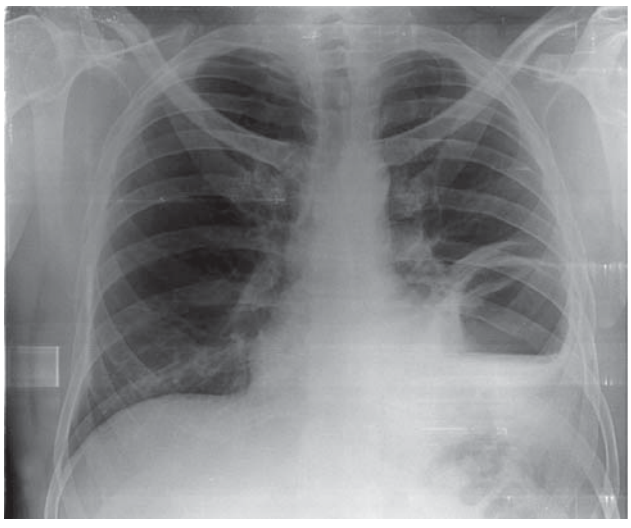

Fig. 2. *Air-fluid level in the left thoracic cavity (pseudo pneumo hydrothorax) – herniated stomach.*

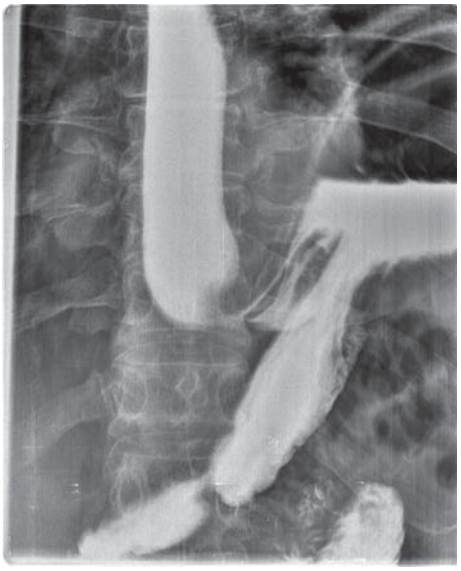

Fig. 3. *Contrasted gastrography – displaced stomach into the left thoracic cavity.*

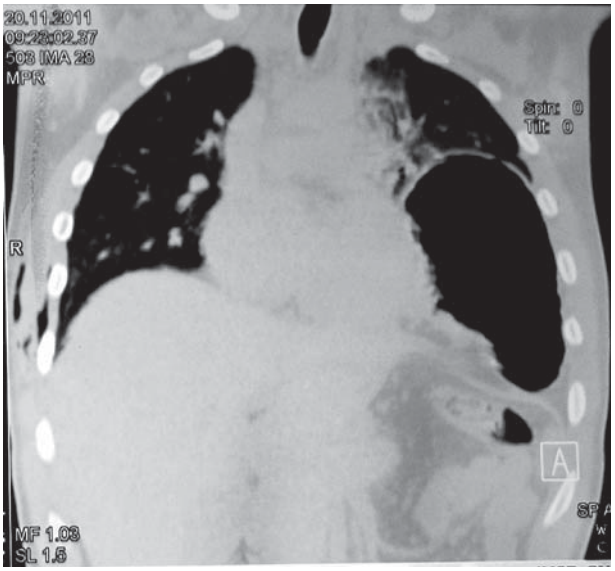

Fig. 4. *Herniated stomach into the left thoracic cavity – CT.*

Treatment

The surgical management of TDR may be diagnostic or therapeutic, open or minimally invasive, *via* the thoracic, abdominal cavities or combined and the choices made depend on the experience and facilities of the individual trauma units and surgeons [11]. The review of some recent published series of TDR (table 1) shows the distribution of penetrating and blunt, right and left diaphragmatic injuries. It also demonstrates that the approach of choice is heavily influenced by the reporting surgeons' specialty; units were the thoracoabdominal trauma is managed by the thoracic surgeons report higher rates of thoracotomy [18, 20] compared to series reported by general surgeons [3, 16, 17, 19]. Recently the Video Assisted Thoracoscopy (VATS) to assess the integrity of the diaphragm before converting to laparotomy is becoming more popular [38].

The goal of surgical technique up to date is straightforward, any hernia must be reduced and the ruptured diaphragm debrided up to healthy tissue, concomitant visceral injury must be repaired as well as the diaphragmatic defect [39]. All the TDR must be repaired using direct suture with interrupted or running sutures either with absorbable or non-absorbable sutures [39].

According to Hanna WC et al., there is a higher recurrence rate with absorbable sutures reporting 1/13 recurrences after a mean follow up of 4 years in patients with TDR, but this is likely to represent a technical rather than suture failure [40]. Large defects can be managed by laparoscopy [41], reinforced using prosthetic mesh [42] or gelatin matrix can be used to rapidly seal a diaphragmatic defect with omentum [43].

Up to date there appears to be no evidence of superiority of thoracic over the peritoneal cavity approach in a haemodynamically stable patient [11]. Laparotomy is indicated in case of intraabdominal visceral pathology which is difficult to be attend *via* a thoracotomy [11]. It is considered that acute right sided TDR as well as chronic hernias should be approached through a right-sided thoracotomy while left sided injuries should be approached through a laparotomy [44]. Similar guidelines are recommended by Peer SM. et al., thoracotomy for delayed presentations or acute presentations in whom concomitant abdominal injury has been excluded [45].

The question of what must be the initial surgical approach (chest or abdomen) becomes more critical in a haemodynamically unstable patient and has been examined for penetrating thoracoabdominal injury by Asensio JA. et al., who discuss the sequencing of thoracolaparotomy rather than the management of TDR [46]. In a retrospective analysis of 254 patients admitted with penetrating thoracoabdominal injury during a 4 year period - 73 required thoracolaparotomy [46]. Once the initial cavitary procedure had to be stopped to access another cavity due to continued haemodynamic instability, this was considered as incorrect sequencing [46]. When laparotomy was performed initially, 18/34 (53%) had to be interrupted compared to 14/39 (36%) when thoracotomy was initially performed [46]. The commonest indication for opening another cavity was persistent haemodynamic instability unexplained by the findings in the first cavity (18%) and abnormally high chest drain outputs interpreted as significant intrathoracic haemorrhage but actually originating from abdominal visceral injury and traversing an injured diaphragm (10%) [46]. Overall, nearly 50% of the thoracoabdominal procedures were incorrectly sequenced and the mortality

for these two cavity procedures was almost double that of patients in whom only one cavity was opened (31% *vs.* 59%) [46].

Minimally invasive procedures may be used either as a diagnostic or therapeutic tool and as in open surgery may be applied *via* a thoracic or abdomen approach [11]. Diagnostic thoracoscopy for TDR was first described in 1976 [66] in 11 patients with penetrating wounds of the left chest; in six the diaphragm was visualised clearly, in two of which a clinically unsuspected TDR was revealed [47]. Four other patients with confirmed diaphragmatic integrity were managed conservatively [47].

The first report of diagnostic laparoscopy for TDR came from Adamthwaite DN., in 1984 [48]. In 1998 Murray JA., et al., used laparoscopy in 110 haemodynamically stable patients with penetrating injury of the left thorax (94 stab and 16 gunshot wounds) without other indication for laparotomy during the first 6 hours after injury [49]. Twenty six (24%) had occult diaphragmatic injuries, 22 of whom required open repair to ensure there were no other missed injuries [49].

According to the published series of 34 asymptomatic haemodynamically stable penetrating thoracoabdominal injury patients by Friese RS., et al., laparoscopy was both specific and sensitive for the diagnosis of TDR (100% and 87.5% respectively) [50]. Powell BS., et al., reported a rate of TDR of 20% during diagnostic laparoscopy due to penetrating thoracoabdominal injury, 2/3 of whom had a normal chest x-ray [51].

Conclusions

Up to date TDR represent a challenging diagnosis and require a high index of suspicion. Right sided injuries are more commonly missed compared to the left sided ones. There are no ideal diagnostic tools, since the initial thoraco-abdominal x-ray examination look like normal, or are interpreted as normal.

Surgery remains the standard of care for TDR and both diaphragmatic domes must be inspected during laparotomy. In a haemodynamically stable patient without other competing injuries, laparoscopy or thoracoscopy must be considered in order to diagnose a potential TDR after thoracoabdominal trauma.

Diaphragm injury repair can be performed either by laparotomy, thoracotomy or minimally invasive technique *via* the chest or abdomen as long as competing injury in the other cavity was ruled out.

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Rezumat

Leziunile traumatice ale diafragmei sunt potenţial fatale şi prezintă dificultăţi diagnostice. Implicarea diafragmei este relativ rară (5-7%), factorul etiologic dominant fiind traumatismele închise şi penetrante toracice şi abdominale. La momentul actual nici una din metodele de investigare nu asigură stabilirea diagnosticului cert de leziune traumatică a diafragmei în timpul spitalizării primare a pacientului. Radiografia toracoabdominală este considerată informativă în circa 33% din cazuri, totuşi informativitatea este redusă în cazul pacienţilor intubaţi. Deşi leziunea traumatică a diafragmei nu este una letală, mortalitatea şi morbiditatea semnificative sunt condiţionate de leziunile concomitente vasculare şi viscerale, precum şi diagnosticării incorecte. În acest context diagnosticarea precoce este obligatorie deoarece cazurile nediagnosticate sunt asociate cu rate semnificative de morbiditate şi mortalitate.

Summary

Traumatic diaphragmatic rupture is a potential life-threatening and a challenging diagnosis condition. Diaphragmatic injuries are uncommon (5–7%), the most common etiologies are blunt and penetrating thoracic or abdominal traumas. Up to date no single investigation provides a reliable diagnosis tool for the initial diagnosis of diaphragmatic rupture upon the patients' first hospital admission. Initial chest x-ray is considered informative in almost 33%, but the percentage is lower in already intubated patients. Although acute diaphragmatic injuries are not lethal, the high mortality and morbidity are due to concomitant vascular and visceral injuries as well as due to missed diagnosis. Under these circumstances the early diagnosis is mandatory since delayed diagnosis is accompanied with significant morbidity and mortality rates.

Резюме

Травматический разрыв диафрагмы является потенциально опасным для жизни повреждением, сложным в диагностике. Травмы диафрагмы встречаются редко (5-7%), наиболее распространены по этиологии тупые и проникающие травмы грудной или брюшной полости. До настоящего времени ни одно исследование не является надежный инструментом ранней диагностики диафрагмальных разрывов у ургентных пациентов. Рентген грудной клетки, считается информативным почти в 33%, но процент ниже у интубированных пациентов. Хотя острая диафрагмальная травма не смертельна, она приводит к высокой смертности и заболеваемости в связи с сопутствующей сосудистой и висцеральной травмой, а также в связи с ошибочным диагнозом. В этих условиях ранняя диагностика является обязательной, так как поздняя диагностика сопровождается значительной смертностью.

DEHISCENŢA ANASTOMOZEI INTESTINALE ÎN CHIRURGIA COLORECTALĂ (Revista literaturii)

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Introducere

Chirurgia colorectală a fost şi rămâne unul dintre domeniile prioritare a chirurgiei. Atenţia sporită către acest domeniu al chirurgiei se datorează incidenţei în creştere a patologiei chirurgicale a colonului precum maladiile oncologice, inflamatorii, dereglărilor de tranzit şi vascularizare. O mare parte din aceste intervenţii necesită o soluţie de continuitate a tractului digestiv. În pofida progreselor înregistrate în medicina contemporană în general şi a chirurgiei în particular, dehiscenţa anastomozei digestive rămâne a fi una din cele mai periculoase complicaţii chirurgicale.

Actualmente o definiţie unanim acceptată a termenului de dehiscenţă a anastomozei intestinale nu există [1]. Contraversele sunt determinate de opiniile contradictorii la definirea criteriilor clinico-instrumentale dehiscenţei anastomotice. După datele lui Komen N. şi coaut. dehiscenţa anastomozei se defineşte ca pătrunderea conţinutului intestinal în cavitatea peritoneală prin defectul anastomozei [2]. Grupul Internaţional de Studiu al Cancerului Intestinului Rect determină dehiscenţa anastomozei intestinale, ca comunicare dintre compartimentul intraluminal şi extraluminal prin intermediul defectului peretelui intestinal a anastomozei între colon şi intestinul rect sau între colon şi anus [3]. Grupul de Studiu a Infecţiei Chirurgicale în anul 1991 au determinat dehiscenţa anastomozei, ca extravazare a conţinutului intestinal prin conexiunea chirurgicală între două organe cavitare [4]. De regulă, conţinutul intestinal, în caz de dehiscenţă anastomotică, pătrunde în cavitatea peritoneală, dar în literatura de specialitate, au fost descrise câteva cazuri de erupere în spaţiul retroperitoneal [5].