

Case report of a traumatic abdominal wall hernia resulting from falling onto a flat surface

Düz zemine düşme sonucu gelişen travmatik karın duvarı fitiği:
Olgu sunumu

Neslihan YÜCEL,¹ Murat Yahya UĞRAŞ,² Burak IŞIK,³ Gökhan TURTAY¹

This article reports a case of high-energy type traumatic abdominal wall hernia (TAWH) associated with multiple organ injuries including pelvic fractures, liver laceration and ascending colon perforation. The cause of the trauma was falling to the ground from a height of approximately 8 meters. Since the forces affecting the abdomen are unique when falling on a flat surface, the mechanism of defect may be different between a low-energy type handlebar hernia and high-energy type TAWH. Only a few cases of high-energy type TAWH exist in the literature, all reporting falling on or hitting an angled or curved material. To our knowledge, this is the only report of TAWH resulting from falling onto a flat surface. The diagnosis and management are summarized, the literature data are reviewed, and the mechanism of action is discussed.

Key Words: Fall; flat surface; high-energy; traumatic abdominal wall hernia.

Bu yazıda, pelvis kırığı, karaciğer laserasyonu ve çıkan kolon yaralanmasını içeren çoklu organ yaralanmasının eşlik ettiği yüksek enerji tipi travmatik karın duvarı fitiği (TKDF) olgusu sunuldu. Travmanın nedeni, yaklaşık 8 metre yüksekten toprak zemin üzerine düşme idi. Düz zemine düşme esnasında karna etki eden kuvvetler farklı olduğundan, hasar mekanizması düşük enerjili bisiklet ya da motorsiklet gidonunun neden olduğu herniden veya yüksek enerji tipi diğer TKDF'den farklı olabilir. Literatürde yüksek enerji tipi TKDF raporları kısıtlı sayıda olup, hepsi de açılı veya kıvrımlı yüzey üzerine düşme hakkındadır. Bildiğimiz kadarıyla bu yayın, düz yüzey üzerine düşme sonucu oluşan TKDF konusunda tektir. Tanı ve tedavi özetlenmiş, literatür gözden geçirilmiş ve hasar mekanizması tartışılmıştır.

Anahtar Sözcükler: Düşme; düz yüzey; yüksek enerjili; travmatik karın duvarı fitiği.

Traumatic abdominal wall hernia (TAWH) is a rare clinical entity, with only a few cases reported since 1906.^[1] Most cases are caused by an injury of falling on or hitting an angled or curved material. This relatively common injury is low-energy type and is named as "handlebar hernia", as it is caused mostly by the bicycle handlebar.^[2,3] Less common causes of TAWH are high-energy type traumas like motorcycle accidents, fall from a height, seat belt injuries, pedestrian accidents, and larger deceleration forces.^[3-5] High-energy type TAWHs are always associated with other injuries.

This article reports a TAWH of high-energy type, caused by falling from a height of approximately 8 meters onto a flat surface (ground), associated with colonic perforation, liver disruption and pelvic frac-

ture. To our knowledge, this is only the second report of TAWH caused by falling from a height and the only one that is associated with a fall to a flat surface.

CASE REPORT

A 29-year-old construction worker was admitted to the Emergency Department with multiple traumas caused by falling from approximately 8 meters. A witness reported that he had landed on his front, with his abdomen hitting the ground first. He was alert, complaining of abdominal and pelvic pain. His blood pressure was 80/46 mmHg, heart rate 122/min and respiratory rate 26/min. He was urgently resuscitated with crystalloids and colloids. Physical examination revealed a painful bruise over his right shoulder, pelvic bone tenderness, right flank abrasion, and diffuse

Departments of ¹Emergency Medicine, ²Urology, ³General Surgery, Inonu University Faculty of Medicine, Malatya, Turkey.

İnönü Üniversitesi Tıp Fakültesi, ¹Acil Tıp Anabilim Dalı, ²Üroloji Anabilim Dalı, ³Genel Cerrahi Anabilim Dalı, Malatya.

Correspondence (İletişim): Neslihan Yücel, M.D. Turgut Özal Tıp Merkezi, Acil Servisi, 44069 Malatya, Turkey.
Tel: +90 - 422 - 341 06 60 e-mail (e-posta): nyucel@inonu.edu.tr

abdominal tenderness with silent bowels on auscultation. A right flank tender swelling of 20x15 cm was noted with intact overlying skin. His prior medical history did not reveal any abdominal surgery or pre-existing hernia. All other system examinations and laboratory findings were normal. As a consequence of multiple trauma approach, a urethral catheter was placed, which revealed hematuria. After stabilization and before evaluation by general surgery, a quick radiological evaluation, including a brain computed tomography (CT) and neck and chest roentgenograms, was made, and all were reported as normal. Pelvic roentgenogram revealed left ramus pubis fracture, left acetabular fracture and left sacroiliac joint fracture dislocation (Fig. 1a). Abdominal ultrasonography showed a defect in the abdominal wall with bowel present under the skin and hyperechogenic particles inside the gallbladder. No free fluid, solid organ injury or hollow viscus perforation was seen on ultrasonography. Emergency contrast abdominal CT revealed a fascial defect of 5x4 cm in the right flank area, free air in the peritoneum and Morrison's pouch, and laceration of the liver (Figs. 1b-d). The peritoneum was protruded through the defect with bowel loops inside.

After consultation with General Surgery, Urology and Orthopedic Surgery and Traumatology, an emergency exploratory laparotomy was performed by the general surgeon. During the operation, the ascending colon was found inside the hernia. An ischemic hypoperfused colonic segment of 20 cm with an irregular perforation of 2x3 cm was revealed and transected with right hemicolectomy and loop ileostomy. A grade 2 liver laceration was repaired primarily. The TAWH was closed primarily with #1 Vicryl, since no prosthetic material was available. External fixation of pelvic bones was also performed. No surgical cause of hematuria was noted.

The patient did well and was reoperated for anterior plaque osteosynthesis electively after 12 days. He was discharged from the hospital on the 23rd postoperative day. The ileostomy was closed two months later.

DISCUSSION

Traumatic abdominal wall hernia is a rare condition, with fewer than 100 cases described over the past century.^[6] This type of hernia was first described by Selby in 1906.^[1] In the literature, there is consensus that this kind of hernia occurs at anatomically weak

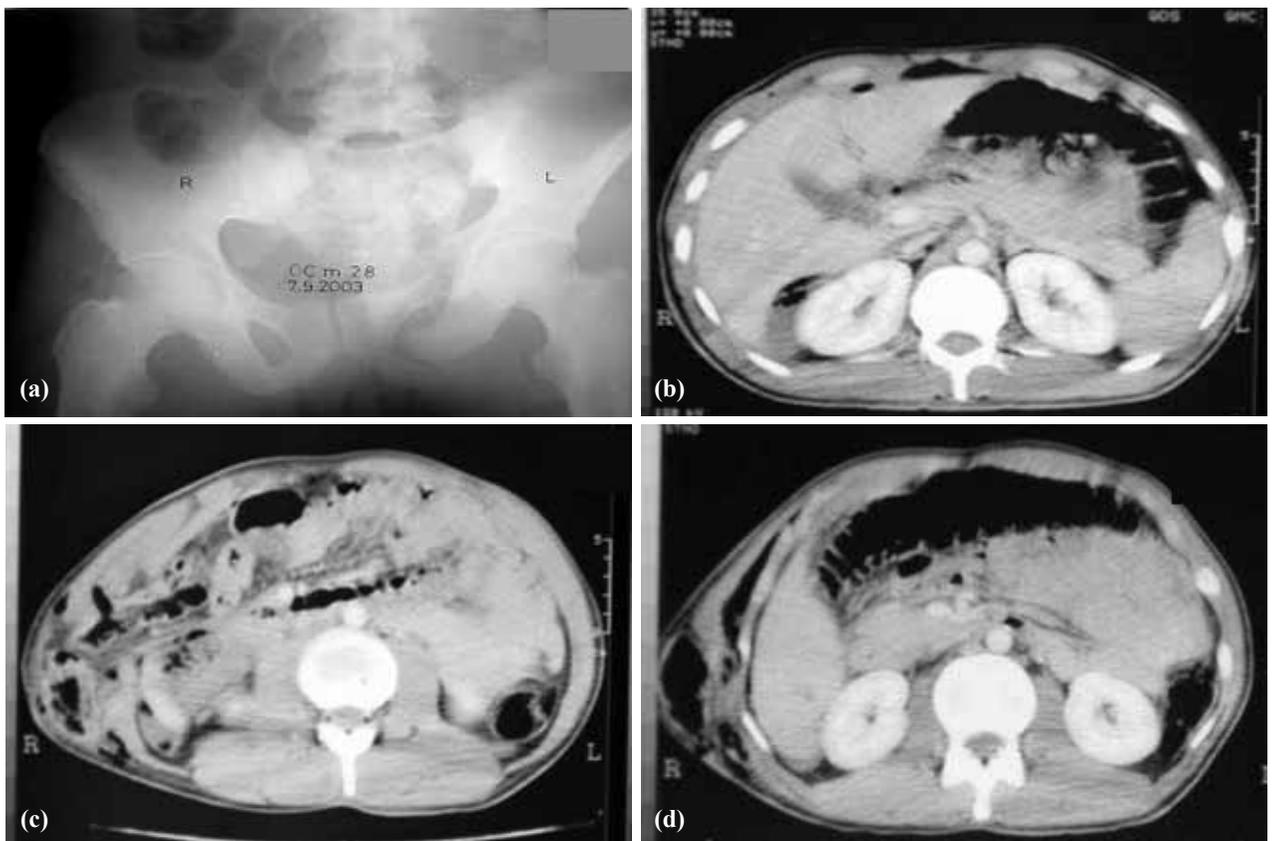


Fig. 1. (a) Pelvic X-ray revealing fractures of the left ramus pubis, left acetabulum and left sacroiliac fracture-dislocation. (b) Contrast-enhanced abdominal CT scan demonstrating free air in the abdomen and liver laceration. (c) CT scan showing bowel loops in the subcutaneous area along with disruption of underlying abdominal wall musculature. (d) CT scan demonstrating the right colon protruded through a defect in the abdominal wall into the subcutaneous area.

points of the abdomen with a blunt trauma. The main mechanism proposed is that the skin can tolerate traumatic intraabdominal pressure elevation while underlying fascial structures cannot, resulting in fascial disruption.^[4,6-9] These weak points may be potential or iatrogenic. Damschen et al.^[10] defined TAWH as a “herniation through disrupted musculature and fascia which is associated with a blunt trauma but without skin penetration or evidence of a prior defect at the site of injury”. The case reported had a skin laceration, but not penetration. This is one of the very few cases with trauma related to falling from a height, and is unique in that the victim landed on a completely flat surface, the ground. Although the mechanism and/or survey of so-called “handlebar hernia” is discussed in the literature, only a few arguments are possible on injuries due to falls from height.^[9] We agree with the literature that acute deceleration at the moment of hitting may cause TAWH. This deceleration generates a high-energy tension on the musculature, tendons and fascial surfaces as well as solid or hollow organ attachments.^[11] The result may be tearing or rupture of these structures as well as organs attached to them. However, this mechanism may not be the only explanation for the injuries encountered. We think that there is a second action that may take place on herniation, i.e. the acute increase in the intraabdominal pressure generated by the vertical component of strike energy transferred to the body, compressing the abdomen between the back musculature-bone construction and the ground. This is only possible if the blocking material is a wide flat surface. With curved material, straining of structures is more likely. In any case, the resultant intraabdominal pressure elevation pushes the fascia and musculature out to the skin. The skin is elastic enough to overcome this interior force, but the fascia is not. Fascial structures may disrupt with this interior force. At the same time, the intestines may be forced through the disrupted fascia into the subcutaneous area. This idea is supported by presence of bowel in TAWH at the sole report of a height-falling injury.^[8]

Another consequence of this case is to emphasize the importance of the initial physical examination in the Emergency Department. As the patients are traumatic and alert, a thorough physical examination may not be done at all times, and it is possible to miss a diagnosis of TAWH.^[3] The primary point of diagnosis is suspicion of TAWH, which should be considered in any patient with severe abdominal trauma, especially in the presence of a flank hematoma or pelvic fracture. Abdominal wall hematoma, abdominal wall tenderness, abrasion, or ecchymosis may be the only findings. An obvious fascial defect may exist with or without reducible hernia. Differential diagnosis includes rectus sheath hematoma, tumor or preexisting hernia, and may not be possible by physical examination at all

times, but the lesion should alert the physician to the need for further evaluation. Differential diagnosis is possible with barium contrast study, ultrasonography, CT scans, or magnetic resonance imaging (MRI).^[3,12-16] We think that CT is more suitable than ultrasound, since solid or hollow organ injuries are more likely to coexist with high-energy type TAWH. Clinical survey is related not only to the hernia itself, but rather to associated or coexisting injuries. Traumatic abdominal wall disruption is rarely isolated; associated intraabdominal injuries are determined in up to two-thirds of patients with TAWH.^[3,6] Nevertheless, if the cause is a high-energy trauma and if the hernia includes bowel inside, more serious solid or hollow organ injuries may still be present, even if radiological findings were non-revealing.

Most authors suggest that management of the hernia is operative either with laparotomy or laparoscopy.^[3,7,15,16] Primary or mesh repair should be appreciated according to size and site of the abdominal wall defect, coexisting intraabdominal injury and timing of repair.^[16] Complications due to herniation can appear early or late following injury.^[14] Early complications are bowel ischemia, perforation, strangulation, incarceration, and infection. A reported late complication is recurrent herniation. If the diagnosis and surgical repair are delayed, risk of infection, bowel obstruction, strangulation, and incarceration increases.^[14,16]

In conclusion, high-energy type trauma induced by hitting a flat surface may also cause TAWH. The mechanism differs from “handlebar injury” in that pressure is generated by pressing the abdomen between the flat surface and the back musculature-skeleton. In high-energy type traumas, solid and/or hollow organ injuries are more likely to complicate TAWH, even if the initial diagnostic studies are non-revealing.

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