Jejunal Perforation From Blunt Abdominal Trauma by an End Zone Pylon in a Division I Football Player

Karl V. Reisig, MD,[†] and Christopher M. Miles, MD^{*‡}

This case highlights the importance of vigilant clinical suspicion in diagnosing abdominal perforation. Intra-abdominal injury can be difficult to identify during competition, and timely diagnosis of jejunal perforation is difficult because of initially subtle clinical findings that gradually progress over time. Identifying intra-abdominal injuries early can improve the outcome of the patient. In-game evaluation did not identify this injury. The athlete completed the game, and the injury was ultimately identified with peritoneal signs and a negative Carnett sign, making abdominal wall injury less likely. The athlete underwent surgical repair of the perforation without complication and has since returned to full activity. It is important to maintain a high index of suspicion and to be observant with serial examinations, advanced abdominal examination maneuvers, and to have a broad differential diagnosis in the case of significant impact to the abdomen during athletics.

Keywords: jejunal perforation; football; end zone pylon; Carnett sign

CASE REPORT

A 19-year-old previously healthy African American male wide receiver at a Division I university presented with abdominal pain after blunt abdominal trauma. He complained of immediate-onset mild, sharp, nonradiating epigastric pain after diving into the end zone and striking his abdomen on a corner pylon, scoring his second touchdown of the game early in the second quarter. He was immediately evaluated by the team physician and was mildly tender in the epigastrium without rebound or guarding. Sit-ups, sprinting, cutting, and jumping did not worsen the pain. He returned to play and scored 2 more touchdowns, setting a school record with 4 touchdown receptions in a single game.

Postgame (2 hours after the injury), he was reevaluated by the team physician. He noted diffuse abdominal pain (9 out of 10) with nausea. He had urinated without hematuria. He had not had a bowel movement or passed flatus. He denied lightheadedness, chest pain, shortness of breath, coughing, vomiting, back pain, or shoulder pain.

The athlete's heart rate was 96 with otherwise normal vital signs. He appeared in mild distress. Abdominal examination

revealed diffuse tenderness to light palpation with rebound and guarding, equivocal distention, and mid-abdominal ecchymosis, which was in the shape of the pylon. Carnett and Grey-Turner signs were negative. Femoral pulses were equal.

Because of his worsening clinical status and concern for peritonitis, especially given the negative Carnett sign,³ despite the ecchymosis, he was urgently referred to the emergency room for possible peritonitis. Evaluation revealed a white blood cell count of 11,000 with 85% neutrophils and otherwise normal laboratory test results. A computed tomography scan of the abdomen and pelvis showed pneumoperitoneum with small-volume hemoperitoneum (Figure 1).

The athlete underwent urgent exploratory laparotomy, where a 2- to 3-mm full-thickness proximal jejunal injury about 10 cm from the ligament of Treitz was identified and repaired. A small amount of straw-colored fluid was noted in the right upper quadrant, and there was no gross fecal contamination. The colon, spleen, and liver were normal, and there was no retroperitoneal hematoma.

He had an unremarkable postoperative course. He began progression of activity at 6 weeks postoperatively, and he has since returned to football without restriction.

From [†]Bozeman Health Family Medicine at Belgrade Clinic, Belgrade, Montana, and [‡]Department of Family and Community Medicine, Wake Forest University School of Medicine, Winston-Salem, North Carolina

*Address correspondence to Christopher M. Miles, MD, Department of Family and Community Medicine, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157 (email: cmmiles@wakehealth.edu).

The authors report no potential conflicts of interest in the development and publication of this manuscript.

DOI: 10.1177/1941738118796130

© 2018 The Author(s)

Figure 1. Computed tomography scan of the abdomen and pelvis 2 hours postinjury demonstrating pneumoperitoneum (arrows) on axial and sagittal cross sections, consistent with hollow organ perforation.

DISCUSSION

Jejunal perforation is very rare in sport, with only 3 published cases in football.^{1,4,7} Football has the highest injury rate of collegiate sports, with a game injury rate of 35.9 per 1000 athlete-exposures. However, abdominal injuries account for only 6.3% of injuries.² Blunt abdominal trauma in sport usually affects nonhollow organs such as the liver and spleen and rarely affects hollow organs like the small bowel.

The most common injury mechanism in football is player-player contact at 74.5%, while 8.1% and 0.6% of injuries occur from contact with the playing surface and contact with equipment, respectively.² Fixed areas of the bowel, including the duodenum, terminal ileum, and proximal jejunum, are susceptible. The usual mechanism is a shearing force of bowel fixed to the spine.⁶ In this case, it is likely that a direct compression of the jejunum between the pylon and spine caused the perforation. Pylons are composed of a firm and compliant foam core that deforms when contacted with a plastic exterior. Fixation to the playing surface is maintained with a weighted base.

This case highlights the importance of serial abdominal examinations and maintaining of vigilant clinical suspicion in diagnosing abdominal perforation. Timely diagnosis of jejunal perforation is difficult because of initially subtle clinical findings that gradually progress over time. The progression of pain within hours is consistent with development of chemical peritonitis. In-game evaluation did not identify the injury. The initial reassuring examination was likely because of the size of the perforation. The athlete had no peritoneal signs on initial evaluation, though he did have midline epigastric pain, which may be an early sign of small bowel injury.⁴ He tolerated exertional testing without increased pain. He returned to play for the remainder of the game and continued to excel in his position.

Figure 2. Correct patient position and technique for the Carnett sign. The provider presses on point of maximum tenderness while the patient contracts the abdominal muscles by lifting legs and torso off the examination table.

The Carnett sign can assist in differentiating abdominal wall injury from intra-abdominal injury. The Carnett sign is positive when abdominal tenderness to palpation increases or remains the same when the abdominal muscles are activated through an abdominal crunch, indicating injury to the abdominal muscles (Figure 2).³ In a study of 24 patients with acute abdomen, 23 with a positive Carnett sign had a normal laparotomy.⁵ A negative Carnett sign raised our clinical suspicion for intra-abdominal injury, leading to further evaluation.

It is important to be vigilant with serial examinations and advanced abdominal examination maneuvers and to maintain a high index of suspicion in the case of significant impact to the abdomen during athletics. Evaluation of the safety of equipment is also important.

ACKNOWLEDGMENT

We would like to thank the Wake Forest University Athletic Training staff for their assistance in the care provided and the production of this article.

REFERENCES

1. Baker BE. Jejunal perforation occurring in contact sports. *Am J Sports Med.* 1978;6:403-404.
2. Kerr ZY, Simon JE, Grooms DR, Roos KG, Cohen RP, Dompier TP. Epidemiology of football injuries in the National Collegiate Athletic Association, 2004-2005 to 2008-2009. *Orthop J Sports Med.* 2016;4:2325967116664500.
3. Macaluso CR, McNamara RM. Evaluation and management of acute abdominal pain in the emergency department. *Int J Gen Med.* 2012;5:789-797.
4. Murphy CP, Drez D Jr. Jejunal rupture in a football player. *Am J Sports Med.* 1987;15:184-185.
5. Thomson H, Francis DM. Abdominal-wall tenderness: a useful sign in the acute abdomen. *Lancet.* 1977;2(8047):1053-1054.
6. Williams RD, Sargent FT. The mechanism of intestinal injury in trauma. *J Trauma.* 1963;41:288-294.
7. Zavotsky KE, Zavotsky J. Worsening left upper quadrant pain after a football injury. *J Emerg Nurs.* 2002;28:392-394.