

Clinical Study

# Traumatic dural tears: what do we know and are they a problem?

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## Abstract

**BACKGROUND CONTEXT:** Iatrogenic dural tears are common complications encountered in spine surgery with known ramifications. There is little information, however, with respect to the implications and complications of traumatic dural tears.

**PURPOSE:** To describe the demographics and characteristics of traumatically acquired dural tears and evaluate the complication rate associated with traumatic dural tears in patients who have undergone surgical treatment for spine injuries.

**STUDY DESIGN:** Retrospective review of a single Level I trauma center to identify patients with traumatic dural tears between January 1, 2003 and December 31, 2009.

**PATIENT SAMPLE:** The sample comprises 187 patients with traumatic dural tears identified from 1,615 patients who underwent operative management of their traumatic injury.

**OUTCOME MEASURES:** The outcome measures consisted of a description of the location and nature of dural tears and associated fracture patterns and neurologic status as well as an assessment of complications attributable to the traumatic dural tear.

**METHODS:** No funding was received or used in this study. In total, 1,615 operatively managed spine injuries over a 7-year period were reviewed to identify 187 patients with traumatic dural tears. Operative reports were reviewed to assess location and description of injury as well as type of repair, if done. Associated spinal cord injuries as well as fracture level, patterns, and complications were recorded. Postoperative records were assessed focusing on complications related to the traumatic dural tears.

**RESULTS:** Traumatic dural tears were identified in 9.1% (67/739) of cervical, 9.9% (45/452) of thoracic, and 17.6% (75/424) of lumbosacral spine fractures. Among the patients, 82.3% (154/187) had a formal dural repair. Fracture patterns included burst (AO Type A3) 26.2% (49/187), flexion distraction (AO Type B) 16% (30/187), and fracture dislocations (AO Type C) 36.4% (68/187). A complete neurologic injury was noted in 48.7% (91/187) of the patient population, whereas no neurologic injury was noted in 17.1% (32/187). Two patients (1%) developed a persistent cerebral spinal fluid leak that necessitated an irrigation and debridement with exploration and closure of the cerebral spinal fluid tear. Two patients (1%) developed a pseudomeningocele; one required a return to the operating room for irrigation and debridement, and the other suspected of having developed meningitis was treated with intravenous antibiotics. Among the patients, 2.1% (4/187) were noted to have a complication directly related to a traumatic dural tear.

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**CONCLUSIONS:** Traumatic dural tears occurred in 11.6% of patients with operatively managed traumatic spine injuries at a regional Level 1 trauma center. In total, 83% had a neurologic injury and 49% had complete spinal cord injuries. Patients with traumatically induced dural tears have a low likelihood of developing a complication attributable to the dural tear. © 2014 Elsevier Inc. All rights reserved.

**Keywords:** Dural tear; Trauma; Complications; Spine fracture; Spinal cord injury

## Introduction

Traumatic lacerations of the dura are commonly associated with spine injuries with reports ranging from 18% to 36% [1–5]. Usually, traumatic dural tears are not identified with advanced imaging tools such as magnetic resonance imaging but are identified at the time of operative management either at decompression or by cerebral spinal fluid (CSF) leaking around the injured segments [6,7]. The classic fracture patterns most associated with traumatic tears are lumbar burst fractures with associated vertical lamina fractures in which the dura may become trapped; however, traumatic tears are also seen with other injuries as well, particularly highly unstable injuries [1–4,8].

Reported complications of dural lacerations include CSF leak leading to pseudomeningocele [9–11], dura-cutaneous fistula [12], meningitis [13], arachnoiditis, epidural abscess [14], intracranial subdural hematoma [15], nerve root entrapment [11], wound healing complications, persistent headache, and return to the operating room for closure of the leak. The majority of these complications have been described in the setting of elective spine surgery in which the durotomy was created iatrogenically. The incidence of iatrogenic durotomy during elective spine surgery has been reported to occur at a rate of 1% to 16% and appears to be higher in cases of revision surgery or previously irradiated spines [16–21]. The most common complication of incidental durotomies in elective spine surgery is persistent CSF leak leading to pseudomeningocele and/or chronic wound drainage occurring at a rate of 2% to 3% [16,21].

Little information exists in the literature describing the overall nature of traumatic dural tears as a result of spine injuries. The primary purposes of this study were twofold: to describe the demographics and nature of traumatic dural tears and evaluate the complication rate associated with traumatic dural tears in patients who have undergone surgical treatment for spine injuries.

## Materials and methods

After obtaining institutional review board approval, the prospectively collected trauma registry at a Level I trauma center was assessed to identify all traumatic spine fractures managed operatively between January 1, 2003 and Dec 31, 2009.

A total of 1,615 operatively managed, traumatic spine cases were reviewed. Operative reports for each case were

scrutinized for any evidence of a traumatic dural tear mentioned in the body of the report. Known iatrogenic tears in the setting of these patients were not included in this study, nor were tears associated with pathologic fractures.

The operatively treated injuries were categorized into cervical, thoracic, and lumbosacral regions. Dural tears were also categorized as being predominantly anterior, posterior, or along a root sleeve, and an attempt was made to separate these into simple, defined as linear and less than 1 cm in length, or complex, defined as longer than 1 cm, stellate in nature, or in multiple locations. In the cervical spine, the Allen-Ferguson classification was used to classify injuries in the subaxial spine [22]. Craniocervical dissociation injuries with an associated traumatic dural tear were also included in the cervical spine section. Fractures in the thoracolumbar spine were classified using the Denis classification [23,24]. All sacral fractures in our series were a component of an associated spinal-pelvic dissociation. All patients with noncontiguous fractures are counted independently.

Clinical charts and radiographic data were reviewed in detail from each patient that sustained a traumatic dural tear to garner information regarding the fracture pattern, nature of the tear, form of repair, and clinical course to up through final follow-up. Complications related to the traumatic dural tears were documented as was the treatment and outcome of the tear. An attempt was made to separate complications occurring as a result of the dural tear from other perioperative complications unrelated to the dural tear. Our study was limited to only immediate postoperative complications occurring within 30 days of the initial injury. This time period was chosen under the assumption that a complication that was a direct result of a dural tear would not likely present >30 days after the injury with the exception of arachnoiditis. Pseudomeningocele was defined as an abnormal collection of CSF that has no surrounding dura mater but is contained in a cavity within the soft tissues.

Documentation of the preoperative neurologic status was stratified into complete American Spinal Injury Association (ASIA A), incomplete (ASIA B–D) and no neurologic injury (ASIA E) [25]. The surgical method used to address the dural tear was also documented. Tears were repaired using suture, fibrin sealants, commercial collagen matrix, fascia, fat, muscle, or absorbable sponges. These products were used either alone or as a combination in an attempt to achieve a watertight seal.

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