

An Unusual Combination of a Transection of the Cauda Equina and a Spinal Epidural Hematoma Secondary to a Chance Fracture

Robert E. Lieberman^{1*}, Gregg Adams², Ben Kelley³ and Christina M. Duffin¹

¹Kern Medical Center, 1700 Mount Vernon Avenue, Bakersfield, CA 93306, USA

²Santa Clara Valley Medical Center, 1751 South Bascom Avenue, San Jose, CA 95128, USA

³BK Product Hazard Consulting, 3157 Hacienda Drive, Pebble Beach, CA 92953, USA

*Corresponding Author: Robert E. Lieberman, Kern Medical Center, 1700 Mount Vernon Avenue, Bakersfield, CA 93306, USA.

Received: January 12, 2016; Published: January 22, 2016

Abstract

Introduction: Chance fractures most frequently result from front end collisions involving occupants using lap-only seat belts. Commonly associated with intra-abdominal injuries, neurological deficits are uncommon and associated epidural hematomas have been reported only twice before. We present a Chance fracture causing both a complete disruption of the *cauda equina* and a large spinal epidural hematoma. The mechanism is discussed and the literature reviewed.

Methods: A 17-year-old Caucasian female, wearing only a lap belt, was injured in a one-car accident and presented with a Chance fracture, an associated abdominal injury, and multiple spinal injuries. The patient was the rear, middle seat passenger, restrained only by a lap belt, in an SUV which struck a tree at 30 miles per hour. She presented with hypotension, a seat belt bruise, a sensory level at T10, absent motor function below T10, and loss of sphincter tone. An immediate exploratory laparotomy identified a colon injury but no vascular damage. A CT showed a Chance fracture at L3. MRI showed an epidural hematoma extending upwards to T2. The fracture was grossly unstable and associated with complete disruption of the paraspinal muscles. During the posterior fusion surgery, the aorta was easily palpated by reaching around either side of the spine. A decompression from T2 to T12, and a pedicle screw fusion from L1 to L5 were completed. The sensory level improved to L2.

Conclusions: Chance fractures are flexion-distraction injuries often associated with two point restraints. A seat belt bruise should prompt a search for abdominal injuries and spinal fractures. Neurological deficits are uncommon and usually correspond to the level of the fracture. Associated hematomas are rare but must be excluded when the clinical level is inconsistent with initial radiographic findings.

Keywords: Chance Fracture; Seat Belt Fracture; Spinal Epidural Hematoma; Flexion-Distraction Fracture; Spinal Fracture; Lumbar; Traffic Accident; Two-Point Restraints; Three-Point Restraints; Seat Belt; Shoulder Harness; Magnetic Resonance Imaging; Computed Tomography; Multiple Trauma

Abbreviations: CT: Computed Tomography; ED: Emergency Department;

Introduction

Chance fractures occur most frequently in front end collisions when lap-only seat belts, but not three-point belts including shoulder harnesses, are used. Although often associated with intra-abdominal injuries, neurological deficits are uncommon and we found only two prior reports of an associated epidural hematoma. We present a Chance fracture causing a complete disruption of the cauda equine as well as a spinal epidural hematoma.

Citation: Robert E. Lieberman, et al. "An Unusual Combination of a Transection of the Cauda Equina and a Spinal Epidural Hematoma Secondary to a Chance Fracture". *EC Neurology* 2.6 (2016): 261-264.

Case Report

A 17-year-old Caucasian female, the rear, middle seat passenger, was restrained only by a lap belt. She presented to the emergency department (ED) after her vehicle struck a tree at an approximately 30 miles per hour. Three other passengers, who were wearing three-point restraints, and one with no restraints, escaped serious injury. Our patient was alert and hemodynamically stable with a prominent lower abdominal seatbelt bruise. (Figure 1) On examination she was a complete paraplegic with a sensory level that rose from T12 to T10 in the ED. Computed tomography (CT) of the spine demonstrated a horizontal fracture line through the L3 vertebral body and pedicles consistent with a Chance fracture. An enhanced CT showed active bleeding with extravasation of contrast in the epidural space at the level of the fracture. Magnetic resonance images revealed that the cauda equina was physically transected at the level of the fracture and that an epidural hematoma extended upwards as far as T2 (Figure 2).



Figure 1: Lower abdominal seatbelt bruises are often associated with vertebral fractures and visceral injury.



Figure 2: MRI on admission. A physical disruption of the cauda equina is seen at the level of the fracture. An acute epidural hematoma is seen extending cranially from the fracture site.

At surgery, the epidural hematoma was decompressed first beginning at the fractured level. A narrow laminectomy sufficient to remove the hematoma, but sparing the facets, was completed. Cord pulsations did not return until the lamina of T2 was removed. The fracture was stabilized using a pedicle screw construct from L1 to L5. We did not believe that the thoracic spine had been destabilized

Citation: Robert E. Lieberman, *et al.* "An Unusual Combination of a Transection of the Cauda Equina and a Spinal Epidural Hematoma Secondary to a Chance Fracture". *EC Neurology* 2.6 (2016): 261-264.

by the narrow laminectomy. Before closing, approximately 100 grams of necrotic muscle was removed and the aorta was palpable from both sides. Gross retroperitoneal bleeding was not found (Figure 3).



Figure 3: Intraoperative X-ray demonstrating fracture stabilization and fusion with L1 to L5 pedicle screw construct.

An exploratory laparoscopy was completed and an injury to the ascending colon discovered but no gross bleeding was found. Treatment for rhabdomyolysis was required. Postoperatively, the patient regained sensation to L3 but did not recover motor function in the legs. The patient was discharged to a spinal cord injury center in a thoracolumbar orthosis.

The patient has now been followed for five years since injury. Since surgery and completing spinal cord rehabilitation, her neurological deficits have not changed. She has not developed any additional deformity at the fracture site or at any of the levels of the thoracolumbar laminectomy.

Discussion

G.Q. Chance described his eponymous fracture, a horizontal bony disruption, in 1948 but could not explain the anatomy [1]. In 1962 Garrett and Braunstein, defined the “seat belt syndrome” as an abdominal bruise with visceral and lumbar injuries. Others have since clarified the mechanism as forced flexion and distraction around a fulcrum anterior to the spine [2,3]. In 1983, Denis described four types of flexion-distraction or fractures [4]. His first, entirely through bone, was Chance’s original. His second was a one-level ligamentous disruption and the remaining two involved two-level injuries [8].

Lap-belts, patented in the United States in 1885, were not available until offered as optional equipment by Nash (1949) and Ford (1955). The first shoulder harnesses were delivered by Volvo in 1959. Adoption lagged until the seat-belt laws of the 1970s, and three-point installation and use were sporadic until the 1990s. Between the introduction of the seat belt and the widespread use of shoulder harnesses, flexion-distraction fractures became more common.

L3 is damaged most frequently. Neurological injury in adults is uncommon, [5,6] whereas 15% of pediatric flexion-distraction fractures result in paraplegia [7].

The treatment requires bracing with open reduction necessary when the lesion is either grossly unstable, severely kyphotic, or purely ligamentous [8,9]. In this case, the open reduction and fusion were mandated by the severity of the instability and the need to decompress the spinal epidural hematoma.

Although chance fractures are uncommonly associated with neurological injury, in the event of a dislocation, contusion, stretching, or transecting the roots is possible. The cauda equina is relatively resilient if not transected. In this case, the removal of the epidural hematoma allowed recovery only to the level of the fracture.

Conclusion

This case is unusual in that the patient suffered both a complete L3 cauda equina transection and epidural hematoma. She remained paraplegic despite our timely decompression and fusion. It demonstrates that even accidents at moderate speed can be devastating when three-point belts are not available and the need for vigilance when the CT bony abnormalities do not completely correlate with examination findings.

Acknowledgements

CD was a major contributor in writing the manuscript. RE and GA were attending physicians in the case and performed the described surgery. RE and BK were a major contributor in writing the manuscript. All authors read and approved the final manuscript.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. The patient was of legal age at the time of consent. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Conflict of Interest

The author(s) declare that they have no competing interests.

Bibliography

1. Chance GQ. "Note on a type of flexion fracture of the spine." *British journal of radiology* 21.249 (1948): 452.
2. Smith WS, Kaufer H. "Patterns and mechanisms of lumbar injuries associated with lap seat belts." *The Journal of Bone & Joint Surgery American volume* 51.2 (1969): 239-254.
3. Anderson PA, Henley MB, Rivara FP, Maier RV. "Flexion distraction and chance injuries to the thoracolumbar spine." *Journal of Orthopaedic Trauma* 5.2 (1991): 153-160.
4. Denis F. "The three column spine and its significance in the classification of acute thoracolumbar spinal injuries." *Spine* 8.8 (1983): 817-831.
5. Karargyris O., et al. "The unusual chance fracture: case report & literature review." *The Open Orthopaedics Journal* 7 (2013): 301-303.
6. Schwender JD., et al. "Minimally invasive transforaminal lumbar interbody fusion (TLIF): technical feasibility and initial results." *Journal of Spinal Disorders* (2005): Suppl: S1-S6.
7. Le TV., et al. "Chance Fractures in the Pediatric Population." *Journal of Neurosurgery Pediatrics* 8.2 (2011): 189-197.
8. Zhang GL., et al. "[Chance fracture of T12 vertebra with a huge epidural hematoma: a case report]." [Article in Chinese.] *Zhongguo Gu Shang* 22.3 (2009): 237.
9. Spetzger U, Weckesser A, Bani A, Gilsbach JM. "[Lumbar dislocation fracture with paraplegia after pelvic seat belt injury. Case report]." [Article in German.] *Unfallchirurg*. 99 (1996): 905-908.

Volume 2 Issue 6 January 2016

© All rights are reserved by Robert E. Lieberson., et al.