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e-Journal

Quarterly Journal of ACO – June 2007 – Guest Managing Editor –
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Original Articles

Cervical Spine Burst Fracture In A Hockey Player

Rick Corbett D.C., F.C.C.R.(C.), F.C.C.O.(C.)

Definition

The cervical spine burst fracture is defined as a “vertical compression injury of a vertebral body”.¹

Mechanism

This vertical compression generates an axial load which may cause an intact nucleus pulposis “to implode through the inferior end-plate of the supra-adjacent vertebral body”, bringing about an explosion of the vertebral body.²

Location, Location, Location

Burst fractures occur in the mid to lower cervical spine,³ and occur commonly at the cervico-thoracic junction.⁴

AKA

Burst fractures are also known as: bursting fractures, dispersion fractures, compression fractures, or axial loading fractures.⁵

Male:Female Ratio

Burst fractures occur at very similar rates in males and females.⁶

Concurrent Fractures

Simultaneous burst fractures of adjacent vertebrae can and do occur,⁷ however, “...[c]ervical fractures at three or more levels are extremely uncommon.”⁸

¹ Harris p. 168

² Harris p. 168

³ Yochum & Rowe p. 437

⁴ Bensch p. 128

⁵ Harris p. 168

⁶ Bensch p. 128

⁷ Harris p. 173

⁸ Tannoury p. E237

The typical burst fracture of the lower cervical spine includes a laminar fracture, either unilateral or bilateral.⁹ Concomitant articular mass fractures can occur¹⁰, as can fracture of the pedicle as in the presented case.

High Energy Traumas

Burst fractures occur frequently in high energy traumas,¹¹ such as falls, traffic accidents, and sports.¹²

High Index of Suspicion

Bensch suggests an elevated index of suspicion for burst fracture in all high energy traumatized patients.¹³ Bensch recommends as well, that in the case of established spinal injury, the whole spine should be imaged.¹⁴

Harris recommends that if burst fracture is suspected, axial CT is mandatory.¹⁵

Imaging Presentation of the Burst Fracture

There is a wide spectrum in the imaging presentation of the burst fracture, varying from minimal comminution, minimal compression, and minimal displacement of fragments, to severe comminution, severe compression, and marked dispersion of fragments.¹⁶

Neurological Deficit

Neurological deficit is highest in burst fractures in the cervical spine.¹⁷

“Fractures of the lower cervical spine very often cause permanent neurologic damage and/or vertebral artery lesions, which can lead to exitus.”¹⁸

In burst fractures in the cervical spine, there is a variable degree of retropulsion of posterior fragments,¹⁹ and these posterior fragments may cause cord impingement or penetration.²⁰

The neurologic deficit in cervical spine burst fractures ranges from transient paresthesias in the upper extremities, to complete, permanent quadriplegia.²¹

Incidence of Quadriplegia in Hockey Versus Football

Tator estimates that “on a per capita basis, hockey in Canada now causes twice as many cases of quadriplegia annually as does football in the United States.”²²

Differential Diagnosis

The cervical spine burst fracture needs to be distinguished from the wedge fracture, and the flexion teardrop fracture.²³

⁹ Harris p. 172

¹⁰ Harris p. 182

¹¹ Bensch p. 124

¹² Bensch p. 126

¹³ Bensch p. 127

¹⁴ Bensch p. 124

¹⁵ Harris p. 173

¹⁶ Harris p. 170

¹⁷ Bensch p. 124

¹⁸ Scapinelli p. E321

¹⁹ Harris p. 172

²⁰ Harris p. 168

²¹ Harris p. 170

²² Reid p. 780

They are differentiated by:

- a. Mechanism, and
- b. By radiographic features.

Mechanism

Both wedge fractures and burst fractures result from axial loads, whereas flexion teardrop fractures result from hyperflexion.²⁴

Plain Film Radiographic Features of the Cervical Spine Wedge Fracture²⁵

A/P View:

- Note: In the wedge fracture, no vertical fracture line extends through the vertebral body.

Lateral View:

- Variable degree of anterior wedging of the superior vertebral end plate.

Plain Film Radiographic Features of the Cervical Spine Flexion Teardrop Fracture

A/P View:

- A “[s]agittal fracture line may be difficult to see on the AP view.”²⁶

Lateral View:²⁷

- Signs of distraction of the posterior column:
e.g. Fanning (widening of the interlaminar and interspinous spaces),
Bilateral Interfacetal Dislocation (BID).
- Flexion of the cervical spine from the level of the injury upward.

Plain Film Radiographic Features of the Cervical Spine Burst Fracture²⁸

A/P View:

- A vertical fracture line extends through the involved vertebra;²⁹
- Widening of the vertebral body;
- Disruption/displacement of the joints of Luschka.³⁰

Lateral View:

- Straight attitude of the cervical spine;
- Comminution of the vertebral body with retropulsion of posterior fragments;
- The absence of signs of distraction of the posterior column.

CT Features of the Cervical Spine Burst Fracture

The burst fracture typically includes uni- or bilateral fracture(s) of the lamina, which may be seen on axial CT.³¹

²³ Yochum & Rowe pp. 435 & 437

²⁴ Harris p. 168

²⁵ Yochum & Rowe pp. 435 & 437

²⁶ Jacquot p. 1

²⁷ Harris pp. 125 & 172

²⁸ Harris p. 182

²⁹ Harris p. 171

³⁰ Harris p. 173

Fracture of the pedicle may also be seen.

Presented Case

History:

A 16-year-old hockey player received a vertical compression injury to his cervical spine, when while being pursued into the corner to retrieve a puck, he lost an edge and fell, and went head first into the boards. The axial load to his cervical spine was attenuated somewhat as he also took some of the blow with his extended right upper extremity. Following the collision with the boards, he lay motionless on the ice for 10 minutes. He was taken to the emergency room on a spine board, where he complained of right elbow pain, and pain in his “back”.

Hospital Imaging

Plain films were ordered of his thoracic spine (T1-T12), and his right elbow (see Fig. 1 & Fig. 2).

Note: no cervical spine imaging was ordered at this visit to the emergency room.

Fig. 1



Fig. 2



Hospital Diagnosis

The patient and his mother were told that the patient had a Mason I right radial head fracture.

Remarkably, they were also told that the patient's spine was cleared of fracture.

Mason Categories of Radial Head Fractures³²

The Mason categories of radial head fractures are as follows:

Mason I - Nondisplaced

Mason II - Marginal with displacement

Mason III - Comminuted

Mason IV - With elbow dislocation

Hospital Management

The patient's right upper extremity was placed in a sling, and an appointment was made for the patient to return for either bracing or casting of the right elbow.

Presentation at the Chiropractic Office

This young man, accompanied by his dad, was seen at the Chiropractic Office the day following the injury.

Chief Complaints

The patient reported the following chief complaints: "My right elbow hurts. My back hurts"

When asked to demonstrate where he meant by "My back", he put his hand at C6/7/T1.

Secondary Information

³² Riego de Dios p. 9

On further inquiry, the patient provided the following information: “My right hand went numb initially [transient paresthesiaes]. I wasn’t knocked out, but I felt dizzy and nauseated for about 10 minutes.”

Parent Wanted to Direct Treatment

The patient’s dad wanted to direct treatment, and stated “*Just crack his neck, doc. The hospital says he doesn’t have a fracture.*”

Hospital Imaging Reports

The hospital Imaging Department was contacted and the patient’s imaging reports were requested. The reports were faxed over, and at that time it was learned that there had been no cervical spine imaging performed.

Physical Findings

On passive cervical spine flexion and extension, there was severe pain reported at C6/7/T1. There was a moderate restriction in range on passive cervical spine flexion, extension, as well as side flexions. A mild restriction was found on passive cervical spine rotation bilaterally.

Mild tenderness was reported on palpation of C5/6/7/T1/T2.

On percussion at C6, C7, T1, and T2, the patient reported “nauseating pain”.

Neurological Findings

Upper extremity reflex, motor, and sensory function was found to be intact.

Plain Films Ordered

The following cervical spine plain films were ordered: A/P Lower Cervical View (Fig. 3), A/P Open Mouth View (Fig. 4), and Cervical Spine Neutral Lateral View (Fig. 5).

Fig. 3



Fig. 4



Fig. 5



Radiographic Findings

On the A/P view: A vertical fracture line extends through the right side of C7. There is slight widening of the C7 vertebral body. No disruption/displacement of the joints of Luschka is seen.

On the lateral view: There is a straightened attitude of the cervical spine. There is comminution of the C7 vertebral body. There is an absence of the signs of distraction of the posterior column.

Impression: There is a burst fracture of the C7 vertebral body.

Note: On the plain films, C6 was read as normal.

Management

The patient was managed with in-office stabilization with a Laerdal "Stifneck", and referral for axial CT.

Hospital CT Imaging

Fig. 6



Fig. 7



CT Findings

On CT, the fracture is seen to extend into the C7 vertebral body (see Fig. 6).

There is also a fracture of the right pedicle at C6 (see Fig. 7), which was not seen on the plain films.

Stable?

There is controversy as to whether or not burst fractures are stable.

Harris considered burst fractures mechanically stable.³³

Denis, however, in his three-column approach considered the burst fracture as unstable.³⁴

Management

The patient was placed in an Aspen Collar, which he was to wear 16-17 hours per day, 7 days a week, for 8 weeks.

Despite not wearing the collar because “it didn’t look cool”, this young man went on to have a neurologically uneventful recovery.

³³ Harris p. 182

³⁴ Bensch p. 124

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Case History

Arachnoid Cyst: A Case Report, Dr. Tim Mick

Clinical Information

34 year old, otherwise healthy, male with neck and interscapular pain. There was a history of motor vehicle accident four months earlier. Subtle gait alteration was described by the referring chiropractic physician, during phone conference with the radiologist, following his preliminary review of the MRI scan of the cervical spine. The gait alteration was not initially described in the history. This study had been ordered when neck and mid back symptoms did not resolve, as anticipated, with chiropractic management. Plain film findings were negative, except for non-specific postural findings.

Imaging Findings

Cervical spine MRI without contrast (Figure 1) reveals the caudal extent of a large, midline cystic structure, producing marked compression of the cerebellum. This was located near the third ventricle, but did not clearly arise from the ventricle. The cerebellar tonsils remained above the foramen magnum and there was no clear evidence of ventricular dilatation. The visualized portion of the cerebrum was normal. Discopathy was seen in the cervical spine, unrelated to the findings in the region of the cerebellum, although potentially related to the patient's neck and mid-back symptoms. Compare to a normal appearance of the cerebellar region on an MRI of the cervical spine from another young adult (Figure 2). Note that this patient has similar discopathy.

Diagnosis: Presumed Arachnoid Cyst

Serial MRI is appropriate to follow-up, to exclude rapid progression, but the mild symptoms and large size of the cystic structure make it likely that this is an arachnoid cyst. The clinical setting, with only minimal symptoms that may be related to cerebellar compression, along with the location of the lesion, dictates that conservative follow-up is appropriate. Shunting of a minimally symptomatic presumed arachnoid cyst or biopsy to help exclude the unlikely possibility of a slowly growing cystic tumor was not considered to be prudent, based upon neurosurgical consultation.

Discussion

Arachnoid cysts are benign congenital lesions arising from the cerebrospinal axis. They are associated with the arachnoid membrane, with no communication with the ventricular system. They typically contain cerebrospinal fluid. Rarely, arachnoid cysts arise in conjunction with neoplasms or adhesions following infection, hemorrhage, or surgery. They account for about 1% of intracranial masses, with 50-60% occurring in the middle cranial fossa and may also occur in the spinal canal. Spinal arachnoid cysts are classically located dorsal to the thoracic cord.

Arachnoid cysts are often an incidental finding on imaging studies. Patients are usually either asymptomatic or minimally symptomatic, despite the often impressive size of the lesion. The most common associated clinical features are headache, focal cranial prominence or seizures. Treatment of arachnoid cysts must be based upon the clinical findings and is somewhat controversial. Some believe that even asymptomatic patients should be treated aggressively, with decompression to avoid potential future complications. The most effective surgical treatment seems to be excision of the outer cyst membrane and shunting to the peritoneal cavity. Others advocate a more conservative approach with asymptomatic or minimally symptomatic cysts, as in this case. Serial MRI is appropriate in these cases to rule out rapidly enlarging cysts, which may indicate more aggressive management.

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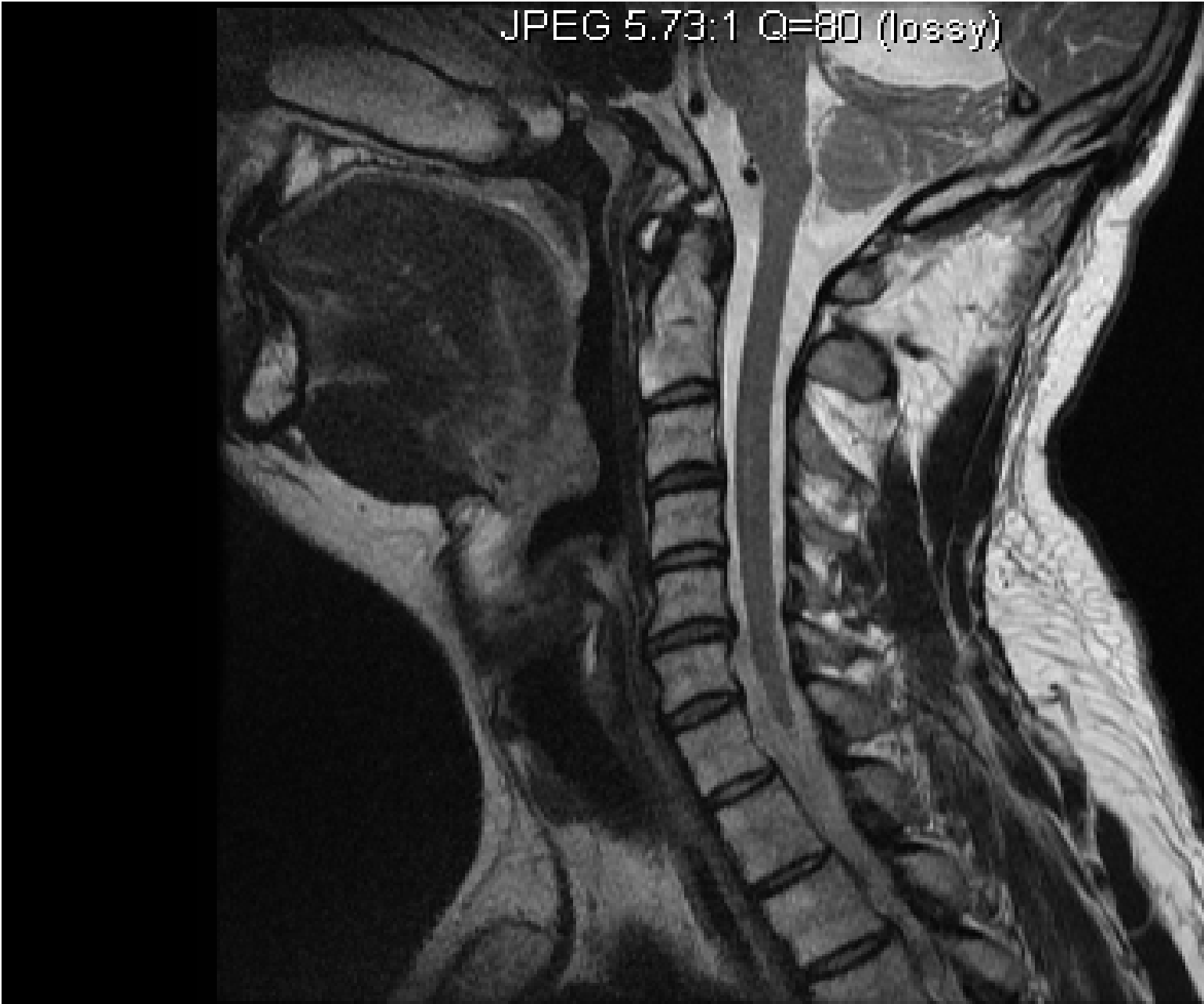


Figure 1



Figure 2

Clinical Pearl

Clinical Pearls - Lumbar Modic Type 1 Changes, James Demetrious, DC, FACO

A fifty-eight year old patient presented with severe lower back pain of three years duration following an MVA. The patient underwent numerous transforaminal, epidural, facet and SI injections with no reported lasting relief. She reported significant morbidity and altered ADL. A brief course of chiropractic care provided her relief of pain.

In the initial read, the radiologist failed to report Modic Type 1 changes or a posterior annular tear at L3/4. Modic Type 1 changes are characterized by increased proton densities that hallmark inflammation within the closed compartments of the vertebral bodies. Inflammatory changes are visualized within this space and are clinically associated with significant pain and morbidity. These findings are characterized by decreased signal intensity on T1WI and corresponding increased signal intensity on T2WI.

This represents a condition of altered microvascular drainage and increased hydrostatic pressure often secondary to degenerative deterioration combined with a mechanical insult or injury. The visualized annular tear is clinically significant and is readily visualized on T2WI. It behooves chiropractic physicians to evaluate patients' MRIs to assess underreported, clinically significant abnormalities.

Perhaps injections failed to help the patient as medications were not delivered to the origins of pain. Chiropractic care may provide relief via improved intersegmental motion that may enhance oxygen/glucose/waste exchange, re-organization of healing connective tissue along physiologic stress planes, improved proprioception and resumption of multifidus activity. More study is needed.

The recent article written by Peterson et al. Inter- and intraexaminer reliability in identifying and classifying degenerative marrow (Modic) changes on lumbar spine magnetic resonance scans. *Manipulative Physiol Ther.* 2007 Feb;30(2):85-90 provides some interesting findings.



Modic Type 1 Changes at L3/4 on T1WI as evidenced by decreased signal intensity.



Modic Type 1 Changes at L3/4 on T2WI as evidenced by increased signal intensity.



Posterior annular tear at L3/4 visualized on T2WI as evidenced by increased globular signal intensity with additional marginal cystic intravertebral herniations.

Bio...

James Demetrious, DC, FACO is a practicing chiropractic orthopedist and post-graduate lecturer. He is an Associate Professor in the Post-Graduate Education department at NYCC. He serves on the Board of Directors of the Academy of Chiropractic Orthopedists and as a contributing editor of the ACO eJournal. Dr. Demetrious is available to provide lectures pertaining to advanced diagnostic imaging, chiropractic and improving clinical outcomes utilizing mainstream medical literature. He can be contacted at: JDemetrDC@aol.com or www.RJMConference.com.

Current Events

President's Message

The Academy 2010 Masters of Science: Physical Medicine and Rehabilitation continues to advance rapidly. The Academy has a new committee called "Physical Medicine and Rehabilitation" (PM&R) chaired by Dr. Roger Russell.

The committee is made up of the Presidents of the Academy, American College of Chiropractic Orthopedists and the Council on Chiropractic Orthopedics.

There are at least two members of each Coalition member on this committee.

One additional member is a liaison with the parent 2010 development committee. The PM&R committee is currently in the process of working to obtain CV's of doctors and other professionals to assist in completing the

topic content. Other professions and specialties have applied. Chairs of the various topics are being selected along with members to assist in the content of the program. This process will advance the specialty for the option of obtaining an advanced degree (MSc: PM&R). The last Academy President's e-letter provided an outline of the topics. This is your specialty...your help is needed for this process. Please contact the Academy President if you are interested in helping or have any questions by logging onto the website...www.dorthoacademy.com

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