Pediatric Vertebral Body Compression Fracture: Diagnosis and Therapeutic Options for Severe Pain

Moderators: Jacob Aubuchon MD, Rosemary Foster MD

Institution: St Louis Children’s Hospital, Washington University School of Medicine, St Louis, Missouri

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Objectives:
- Discuss the risk factors, diagnostic tests and physical exam when there is concern for vertebral body compression fracture
- Review the treatment options for patients with vertebral body compression fractures: interventions (vertebroplasty), medical management, and bracing
- Review the evidence for vertebroplasty in pediatrics: risks, long term effects, etc
- Besides analgesics (NSAIDs, opioids, acetaminophen), examine the evidence for other medications (bisphosphonates, nasal calcitonin, etc).

Case history:
A 14 y/o male is referred to the pain clinic for management of severe back pain. He has a h/o T cell ALL diagnosed at 3 y/o, s/p bone marrow transplant at 5 y/o, complicated by GVHD of the skin requiring long term steroid use.

Questions:
What additional information would you like on history?
What would be in your differential diagnosis?

Case history continued:
After complaining of back pain, he was diagnosed with osteoporosis and vertebral compression fractures at 7 yo. His pain eventually resolved over the following year with back bracing, bisphosphonates, calcium, vitamin D and narcotic pain medications. However, at age 14, he had a complicated 3 month hospital course related to complications after undergoing a subtotal colectomy for colonic polyposis. During this hospitalization, he had return of his back pain and imaging showed worsening of his spinal vertebral compression fractures. At the time of referral, he was taking methadone 7.5 mg TID, oxycodone 5mg prn, Tylenol, ibuprofen, cyclobenzaprine, calcium, vitamin D, and risedronate.
Questions:
What risk factors does this patient have for vertebral compression fractures?
What history and physical exam findings are consistent with vertebral compression fractures?

Case history and diagnostics:
At 7 y/o, the patient’s initial vertebral compression fractures were identified with Thoracic and Lumbar spine plain films after the patient complained of back pain. At 8 y/o, he had a DEXA scan which showed low bone mineral density (BMD) with an L spine z-score of -3.2.

Questions:
What is the preferred diagnostic/imaging modality to assess for vertebral compression fracture?
Any additional studies if you are concerned there is associated osteoporosis?
Can DEXA z-score values be used to predict those at risk for vertebral compression fractures?
How common are vertebral compression fractures in patients with ALL? What percentage of patients are asymptomatic?
What other disease states put patients at risk for vertebral compression fractures?
Should patients with ALL or these other disease states be screened for bone health and/or vertebral compression fractures?

Case history and treatment:
This patient was placed in a brace with initial presentation of compression fractures after which some time the pain resolved. When he had additional worsening compression fractures at age 14, bracing was not an option as the patient had an ostomy. He had a variety of treatments aimed at improving BMD and bone growth in the associated setting of delayed puberty and short stature including bisphosphonates, calcium, vitamin D, and growth hormone. His response to treatment was monitored by repeat DEXA scans.

Questions:
Does bracing provide therapeutic benefit for vertebral compression fractures or just symptomatic relief during the natural progression?
What is the natural progression of vertebral compression fractures in children? Does age matter?
What are the pathophysiologic mechanisms by which patients with ALL and patients on chronic steroids develop osteoporosis and vertebral compression fractures?
How do bisphosphonates counteract these mechanisms?
How do bisphosphonate treated vertebral compression fractures compare to non-treated vertebral compression fractures?

Case history, further imaging, and treatment options:
On referral to the pain clinic in November 2014, at age 14, MRI showed the following:

Compression fractures at all levels of the spine with relative sparing of C1-T3. Mid-lower thoracic compression fractures had markedly worsened since CT in 8/2014 (3 months prior). New vertebral plana was present at L1, L2, and L4 since imaging in 10/2014 with marrow edema consistent with acute or subacute fractures.
At this time, the patient had been up titrated on methadone with little improvement in pain. His back pain ranged from 5-9/10, averaged 6/10, and was mainly localized to the lumbar region where imaging showed acute/subacute fractures.

Questions:
What are the most common areas for vertebral compression fractures in pediatric patients with ALL and or on chronic steroids?
Is this patient a good candidate for vertebroplasty? Why or why not? Does acuity matter?
What is/are the evidence/outcomes for vertebroplasty in children?
What are contraindications to vertebroplasty?
What are complications associated with vertebroplasty?

Case history and outcomes:
The patient was started on Baclofen and ultimately uptitrated to TID dosing of 5/5/10 mg, which seemed to provide the most benefit. He was transitioned to hydromorphone for breakthrough pain, which was associated with less headaches he was experiencing with oxycodone. His methadone was continued but slowly weaned over follow-up visits and down to 2.5 mg BID on last follow-up. His GVHD subsided and he was able to wean off chronic steroids in January, 2015 for the first time in nearly 10 years. He continues on bisphosphonate treatment for continued osteoporosis and BMD z-scores below -2. His growth hormone therapy had to be discontinued after development of papilledema and headaches possibly related to pseudotumor. He is now 16 yo, has a height of only 3 feet 10 inches, but functioning well in daily life and back pain is well controlled.

Questions:
Besides the medications already discussed, is there evidence for use of other medications, such as inhaled calcitonin, for therapeutic or symptomatic relief in the treatment of vertebral compression fractures?

Discussion Outline:
In our case, we review a topic that has very little published evidence: pediatric vertebral compression fracture. We will first focus on the presentation of the disease, risk factors, and what further workup is required. We as moderators will then discuss the different treatment options for these compression fractures. The focus will be on the advantages, disadvantages, and potential complications of each therapeutic intervention. Since there is limited data on many of the treatment options, one goal will be to determine what are the best therapies given the adult data and limited pediatric evidence. By the end of the PBLD, our goal is to have a better understanding of vertebral compression fractures in children but also to have an idea of what treatment options are available.

References:


