



Bisphosphonate Infusion for Managing Hip Pain from Avascular Necrosis in a Pediatric Cancer Patient: A Case Report.

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Introduction

Avascular necrosis (AVN) is a debilitating disorder affecting bone architecture leading to destruction and collapse.

The femoral head is the most common site followed by the proximal humerus.

Non-traumatic causes for AVN include corticosteroid use, alcoholism, SLE, sickle cell disease, and hemoglobinopathies.

The presentation of AVN depends upon the site and stage of disease. Pain is the presenting symptom in most of the cases.

Case Presentation

12-year-old, 125 lb male with a recent history of acute myeloblastic leukemia, who was referred for pain management due to left hip pain caused by avascular necrosis, a complication secondary to steroid use during cancer treatment. The patient reported that the pain was most intense during ambulation, necessitating the use of a walker, and required acetaminophen 2-3 times per week for relief. Initial imaging, including a left hip X-ray, revealed avascular necrosis that was more pronounced on the left side compared to the right. Further evaluation with magnetic resonance imaging showed osteonecrosis of the left femoral head, involving approximately 25-30% of the femoral epiphysis, along with changes suggestive of early or impending femoral head collapse. Physical exam was pertinent for decreased left hip active and passive range of motion due to pain. Family elected to pursue intravenous bisphosphonate therapy to treat the pain associated with AVN in addition to prevent further collapse of the left femoral head and avoid surgical intervention if possible. He was cleared by his dentist to move forward with infusion. He was admitted to the hospital for observation during his first scheduled infusion of zoledronic acid, with an initial dose of 0.0125 mg/kg. To minimize the risk of hypocalcemia, he was premedicated with calcitriol. At a four-week follow-up, the patient reported significant pain improvement, requiring much less frequent use of acetaminophen, with only a single dose needed. He then proceeded with the second of five planned infusions, receiving a full dose of 0.0250 mg/kg of zoledronic acid. He is scheduled to complete three additional full-dose infusions at three month intervals.



Figure 1. T1-weighted coronal MRI demonstrates a ring-like subchondral area of AVN (arrow) present in the anterior-superior femoral head.



Figure 2. Coronal T2-weighted fat suppressed MRI demonstrates a small focus of avascular necrosis with the double-line sign. The linear high signal intensity inner line (arrow) and dark peripheral line (arrowhead) is typical.

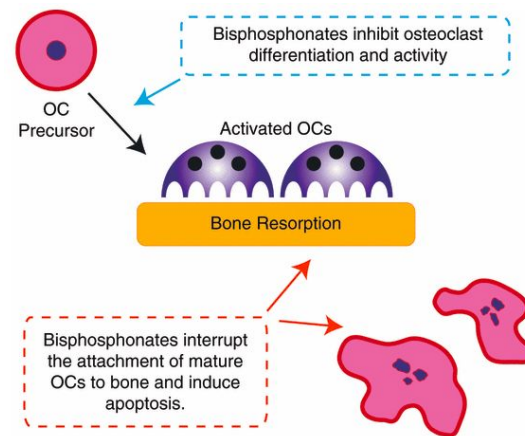


Figure 3. Schematic mechanism of action of bisphosphonates including zoledronic acid.

Discussion

AVN of the femoral head can have many etiologies, including steroid use as in our patient.

AVN can result in stress fractures, which can propagate distally into the femoral neck region, causing femoral head collapse, joint space narrowing, and severe osteoarthritis.

The goal of bisphosphonate therapy is to maintain the structural integrity of the femoral head to limit the development of femoral head collapse and resulting secondary pathologies that pose as potential pain generators.

Zoledronic acid has higher bioavailability and faster onset of action than oral bisphosphonates such as alendronate in the management of AVN.

Conclusion

Intravenous (IV) bisphosphonate therapy can prevent long-term radiological progression of AVN as well as early pain relief.

IV zoledronic acid is superior to/can be used in conjunction with the classic oral bisphosphonates to manage patients with AVN when pain management is the primary focus.

1. <https://radsourc.us/avn-of-the-hip>

2. <https://onlinelibrary.wiley.com/doi/10.1111/j.1601-6343.2009.01472>

3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6480654/>