Avascular Necrosis with Cystic Changes in the Triquetrum after Trauma in Combination with Heavy Smoking and Local Corticosteroid Injections

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Abstract

Keywords

- avascular necrosis of bone
- carpal bones
- osteonecrosis
- triquetrum
- wrist injuries

The triquetrum is rarely affected by avascular necrosis compared with other carpal bones. We report a case of avascular necrosis of the triquetrum in a 50-year-old patient, with a history of wrist trauma, local corticosteroid injections, and heavy smoking. She presented with severe wrist pain and signs of cystic changes and avascular necrosis determined by magnetic resonance imaging. She was effectively treated with a proximal row carpectomy. We suspect that the combination of the injury in combination with local corticosteroids and smoking may have led to the necrosis.

Introduction

Avascular necrosis (AVN) of bone tissue, also known as *osteonecrosis*, is a pathologic process that follows an interruption of bone vasculature leading to necrosis, collapse, and, ultimately, mechanical failure.

In case of AVN of the carpal bones, the lunate is most frequently affected (Kienbock's disease), followed by the scaphoid (Preiser's disease) and capitate.¹ AVN of the trapezium is very rare.

AVN is caused by interruption of the bone vascularization. This may be caused by local extraluminal obliteration, such as increased pressure due to trauma or increased marrow fat. Another cause is intraluminal obstruction, such as microscopic fat emboli, which will often be seen with a clinical picture of multiple bone infarctions.²

The risk of mechanical failure due to the collapse of necrotic segments depends mainly on the location and size of affected bone tissue. This can be accurately determined by magnetic resonance imaging (MRI).^{2,3}

We report a rare case of AVN with cystic changes of the triquetrum in a patient with a history of wrist trauma. To our knowledge, AVN of the triquetrum has only been reported in literature three times before.^{1,4,5}

Case Report

A 50-year-old woman presented with pain in her right wrist following two similar traumata within a period of 8 months, hitting the dorsal ulnar side of her right wrist on the edge of the sink after sliding in the bathroom. She was treated at another hospital for mild wrist pain complaints without abnormalities on X-ray. Local corticosteroid injections at the area of the ulnar styloid in combination with a neutral wrist splint for several weeks resulted in a relief of symptoms. Eight months later, a second similar accident occurred, resulting in unbearable pain in the right hand.

We saw the patient 1 week after the second trauma. Her past medical history was uneventful except for smoking more than a pack of cigarettes a day for 20 years.

On presentation the pain was located at the ulnar side of the right wrist. Pain was aggravated by a strong grip and ulnar deviation. On examination of the right wrist, there was no deformity noted. The dorsal surface of the triquetrum was extremely tender. Provocative testing, such as the Lichtman or Watson test, could not be performed due to severe pain induction.

An X-ray of the right wrist showed cystic changes in the triquetrum with some degenerative changes in the

distal radial ulnar joint. There was no evidence of fractures or dislocations (►Fig. 1). An MRI showed diminished signal intensity of the triquetrum with a loss of marrow signal on the T1-weighted coronal image and hyperintensity on short tau inversion recovery (STIR) sequence, suggesting avascular necrosis with cystic changes as suggested by the initial X-ray (►Figs. 2 and 3).

Fig. 1 X-ray (AP) of the right wrist. Signs of cystic changes in the triquetrum with degenerative changes in the distal radial ulnar joint, without evidence of fractures or dislocations.

Fig. 2 Coronal T1WI MRI. Multiple well-defined hypointense lesions are seen at the triquetrum.

Fig. 3 Coronal STIR MRI. Multiple well-defined hyperintense lesions are seen at the triquetrum.

The patient was counseled on the possible treatment options and chose to undergo a proximal row carpectomy after declining conservative measures and after being counseled that vascularized bone grafting was not expected to be a successful option due to age and history of smoking.

During surgical removal of the proximal row, the triquetrum appeared necrotic without signs of punctate bleeding. The articular cartilage shell of the triquetrum was thin and fragile. This was confirmed in the pathologic report with the additional finding of cystic changes in the triquetrum.

Postoperatively the patient was treated with a cast for 1 week followed by a removable splint and physiotherapy. At 24-month follow-up, the patient was free of pain and regained a good function.

Discussion

This is the fourth case in the literature to report an AVN of the triquetrum.^{1,4,5}

The rarity of AVN in the triquetrum in comparison to other carpal bones is explained by the classification of Gelberman et al. This classifies risk patterns of AVN by dividing the carpal bones into three groups based on size and location of nutrient vessels, the presence or absence of intraosseous anastomoses, and the dependence of large areas of the bone on a single intraosseous vessel. Group III bones such as the triquetrum have rich extra- and intraosseous vascularity, resulting in a lower risk of AVN.^{6,7}

We hypothesize that in our case the trauma as a local extraluminal factor in combination with corticosteroids and heavy smoking as systemic factors caused AVN with cystic changes of the triquetrum. The patient was at higher risk of developing AVN after trauma, as a brief dose of corticosteroids can trigger AVN due to deficient bone repair² and as cigarette smoking shows an increased risk of developing AVN due

to peripheral vessel contraction and damage to the vessel epithelium.⁸

According to available data, AVN becomes detectable after 1 to 6 months after the initial injury. We therefore assume that the AVN in our patient occurred after the initial trauma, as AVN was seen on the X-ray made 1 week after the second trauma.²

There is no specific treatment described for AVN of the triquetrum due to the rarity of cases. The only cases previously reported in the literature showed reversible changes¹ or no symptom improvement⁴ with conservative measures. However, it is known from treatment strategies applied in common forms of carpal AVN, like lunate and scaphoid AVN, that it remains unclear whether any particular form of surgical intervention results in improved outcomes over nonoperative treatment. A common surgical option is a proximal row carpectomy that has been shown to be a reliable intervention for relieving pain and improving function. Another newer surgical option is the use of vascularized bone grafts from the distal radius. This may improve revascularization in earlier stages, potentially arresting the progression of collapse.⁹ One may question whether this approach is appropriate for our patient considering her age, history of smoking, and poor condition of the articular cartilage shell of the triquetrum, which was expected to be a suboptimal recipient site for the graft.

Our patient was counseled regarding these options and chose for a proximal row carpectomy due to the persistence of severe pain, preferring the treatment with the highest chance of early symptom relief.

In conclusion, AVN of the triquetrum is rare due to its rich vascularity. Little is known about AVN of the triquetrum due to the rarity of occurrence. A proximal row carpectomy can be considered a suitable surgical option after failure of initial conservative measures.

Conflict of Interest

None declared.

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