

## CASE REPORT

# Avascular necrosis of the distal pole of the scaphoid

Abbas Tokyay & Izge Gunal

*Department of Orthopaedics, Dokuz Eylul University Hospital, Izmir, Turkey*

### Abstract

Avascular necrosis (AVN) of the scaphoid predominantly occurs in the proximal pole. Review of the literature revealed only six cases and all are suspect due to the lack of either MRI investigation or investigation of bleeding preoperatively. We report four new cases and one of them appears to be a real distal pole AVN of the scaphoid in the literature.

### Keywords:

Avascular necrosis, distal pole, scaphoid

### History

Received 16 July 2014

Revised 30 December 2014

Accepted 7 January 2015

Published online 21 January 2015

### Introduction

Posttraumatic avascular necrosis (AVN) of the scaphoid is a common complication probably due to the precarious blood supply [1]. The rate of incidence is about 13% to 40% and almost all are seen in the proximal fragment [2,3]. Careful review of the literature revealed six cases of distal AVN in three studies [4–6]. The diagnosis of AVN of the scaphoid is made by combining the MRI findings with direct observation of the punctuate bleeding during the operation [7]. However, the diagnosis of AVN is suspicious in these cases, as MRI investigation had been performed in one case [5] and preoperative bleeding was observed in the other [4].

Here, we report four new cases, all with the correlation of MRI and punctuate bleeding.

### Case report

The series consisted of four patients aged 29, 33, 53 and 57 years. Three of the patients were male. All had a history of scaphoid fracture following a fall on an outstretched hand 3–5 years ago, and all had been treated by casting before.

Radiographic examination revealed suspected areas, such as sclerosis and/or cystic changes, on the distal pole of the scaphoid (Figure 1) and MRI views were identical with AVN of the distal pole, showing hyperintense changes (Figure 2).

During the operation, tourniquet was deflated in order to observe punctuate bleeding; it was observed in three cases and the patients were treated by bone grafting and wire fixation (Figure 3) In the remaining, there was no punctuate

bleeding despite drilling and the scaphoid was excised and radial advancement osteotomy (Figure 4) was performed [8].

All patients were evaluated by quick disabilities of shoulder, arm, and hand score 7–11 years after the operation by telephone interview. According to this score, 11 questions related to daily living were asked and all had rated as '0', that none were having problems with activities of daily living.

### Discussion

Posttraumatic AVN of the scaphoid occurs as a result of impairment of the vascular supply to the involved bone fragment. Several studies had demonstrated a strikingly poor blood supply to the proximal pole, particularly in comparison with the abundant supply to the distal two-thirds of the scaphoid [1,2]. Review of the literature revealed six cases in three reports [4–6]. There may be several explanations for this condition. According to Espinosa et al., AVN in the distal fragment occurs if the volar vessel is damaged and the fracture line is distal to the line of entry of the dorsal vessels [4]. Another explanation maybe the anomalous different vascularization of the distal pole [5,6,9].

The diagnosis of AVN of the scaphoid was made by combining the MRI findings with direct observation of the punctuate bleeding during the operation [7]. However, there is no such approach in the previously described cases [4–6]. In the case of Sherman et al., MRI was not available and there was no chance to observe bleeding, as the patients had refused



Figure 1. Avascular necrosis of distal pole of scaphoid with collapse.

surgical treatment [6]. So in our opinion, the diagnosis of the AVN is uncertain. Similarly, in the case of the Garg et al., although MRI suggested AVN, the patient had been treated conservatively, so there was no chance for punctuate bleeding, and the fracture united [5]. The diagnosis is also suspicious in this case as no correlation was possible and the fracture had healed. According to Herbert [10], AVN means



Figure 2. MRI appearance of avascular necrosis of the distal pole.



Figure 3. Treated by bone grafting and wire fixation.



Figure 4. Scaphoid was excised and radial advancement osteotomy.

irreversible necrosis or death of bone and healing is impossible.

No MRI was performed in cases of Espinosa et al. and only one case had been operated [4]. In this case, the authors had confirmed AVN by the pinning attempt that had failed [4]. There seems no such method for the diagnosis of AVN, so the diagnosis is again in doubt. In our opinion, all these cases should be labeled as suspected AVN.

In three of our cases, although preoperative MRI suggested AVN (Figure 2), punctuate bleeding was observed during the operation and all were treated by pinning and grafting and healed uneventfully. In those cases, the appearance of AVN was probably due to the normal marrow of bone that has not been established yet, but bleeding was observed due to revascularization [9]. In the remaining case, MRI suggested AVN along with lack of punctuate bleeding and scaphoid was excised and radial advancement osteotomy was performed.

In conclusion, all six cases reported before [4-6], and three of our cases that were treated by pinning and had healed, were not real AVN or the diagnosis was doubtful. So our fourth case seems to be a unique case of distal pole AVN of the scaphoid in the literature.

#### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

**References**

- [1] Botte MJ, Pacelli LL, Gelberman RH. Vascularity and osteonecrosis of the wrist. *Orthop Clin North Am* 2004;35:405–21.
- [2] Amadio PC, Taleisnik J. Fractures of the carpal bones. In Green DP, Hotchkiss RN, editors. *Green's operative hand surgery*. 3rd edition. New York, NY: Churchill Livingstone; 1993. p 799–801.
- [3] Freedman DM, Botte MJ, Gelberman RH. Vascularity of the carpus. *Clin Orthop Relat Res* 2001;383:47–59.
- [4] Espinosa GA, Michael AS, Wilbur AC, McKusick MA, et al. Osteonecrosis of the distal pole of the carpal navicular following fracture. *Mil Med* 1986;151:663–5.
- [5] Garg B, Gupta H, Kotwal PP. Nontraumatic osteonecrosis of the distal pole of the scaphoid. *Indian J Orthop* 2011;45:185–7.
- [6] Sherman SB, Greenspan A, Norman A. Osteonecrosis of the distal pole of the carpal scaphoid following fracture—a rare complication. *Skeletal Radiol* 1983;9:189–91.
- [7] Gunal I, Ozcelik A, Gokturk E, Ada S, et al. Correlation of magnetic resonance imaging and intraoperative punctate bleeding to assess the vascularity of scaphoid nonunion. *Arch Orthop Trauma Surg* 1999;119:285–7.
- [8] Gunal I, Oztuna V, Kose N, Seber S. Avascular necrosis of the scaphoid treated by total excision and radial advancement osteotomy. *J Hand Surg* 1995;20B:736–40.
- [9] Ceri N, Komman E, Gunal I, Tetik S. The morphological and morphometric features of the scaphoid. *J Hand Surg* 2004;29B: 393–8.
- [10] Herbert TJ. *The fractured scaphoid*. Saint Louis, Mo: Quality Medical Publishing; 1990.