Scientific Foundation SPIROSKI, Skopje, Republic of North Macedonia
Open Access Macedonian Journal of Medical Sciences. 2024 Dec 15; 12(4):528-531.
https://doi.org/10.3889/oamjms.2024.11989
eISSN: 1857-9655
Category: *B - Clinical Sciences*
Section: *Surgery*

Our Experience with Surgical Treatment of Scaphoid Fractures with Headless Compression Screw

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Edited by: Ksenija Bogoeva-Kostovska
Citation: Kostov H, Gavrilovski A, Merdzanoski I, Spasov M, Gjorikj-Petrushevska M, Mihajlova-Ilie RM, Kostova E. Our Experience with Surgical Treatment of Scaphoid Fractures with Headless Compression Screw. Open Access Maced J Med Sci. 2024 Dec 15; 12(4):528-531. https://doi.org/10.3889/oamjms.2024.11989
Keywords: Scaphoid fracture, surgical treatment, headless compression screw, nonunion
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Received: 24-Aug-2024
Revised: 25-Jul-2024
Accepted: 21-Sep-2024
Ahead of print: 10-Oct-2024

Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist

Abstract

BACKGROUND: Fractures of the scaphoid bone are quite common, and they come with their own set of challenges due to the specific shape of the fractures and the delicate blood supply to the scaphoid bone. Failing to diagnose and treat acute scaphoid fractures promptly can result in failure of the bone to heal and subsequent development of wrist arthritis. Advances in diagnosis, surgery, and implant materials have led to a growing inclination towards early surgical fixation, even for non-displaced scaphoid fractures that could potentially be treated without surgery.

AIM: The study's goal was to assess the effectiveness of headless compression screws for treating acute scaphoid fractures and, in two cases, nonunion following previous conservative therapy.

METHODS: Between January 2022 and March 2024 ten patients with scaphoid fractures were surgically treated at the University Clinic of Traumatology Skopje, within twelve months follow-up. All of them were male with mean age of 27,3 years. All were diagnosed with X-rays and CT scans. Six of the fractures were on the right hand and four on the left.

RESULTS: All the patients were surgically treated with open reduction and internal fixation with headless compression screw. Volar approach was used in 9 cases and dorsal approach in only one of them. Six of the patients were surgically treated within 4-14 days after injury and four of them were surgically treated due to non union after previous conservative treatment, two of them after three and two of them after seven months of injury. All fractures united after a mean time of 9,5 weeks, without secondary displacement. Throughout the follow-up period, there were no incidences of developing osteoarthritis of the wrist.

CONCLUSIONS: It is crucial to understand that achieving a positive result is not guaranteed for every patient and relies on selecting the right patients and fractures. However, our study shows favorable results in sooner surgical treatment with the headless compression screw, rather than delayed treatment of scaphoid fractures. Surgical treatment with headless compression screw showed both functional and radiographic results. While it is beneficial for the screw to be positioned in the subchondral area, it is important to be cautious to avoid cortical penetration, as this will require the screw to be removed later.

Introduction

Scaphoid fractures have a yearly frequency of 38 per 100,000 people [1], [2], and account for the vast majority (79%) of all carpal fractures. Using secure fixation procedures with a shorter immobilization duration would result in less time off work and a lesser socioeconomic burden from this injury.

Operative screw fixation is a widely accepted approach for managing displaced scaphoid fractures to reduce the risk of mal- or nonunion [3]. There is a growing trend towards surgical treatment even for non-displaced fractures of the scaphoid bone [4].

Current data does not support the long-term advantages of surgery over conservative treatment for non displaced scaphoid fractures, particularly given the high probability of fracture union found after conservative treatment with splints [5], [6], [7]. All implants aim to provide solid fragment congruence and strong inter fragmentary compression, resulting in early recovery of wrist mobility [8]. Screw size and threads varies, as do the cannulated and non-cannulated methods of insertion. Screw fixation methods have

evolved mostly from the Herbert-Whipple screw, which was introduced in 1995 [9].

The study's goal was to assess the effectiveness of headless compression screws for treating acute scaphoid fractures and, in two cases, nonunion following previous conservative therapy.

Materials and Methods

Between January 2022 and March 2024 ten patients with scaphoid fractures were surgically treated at the University Clinic of Traumatology Skopje, within a twelve-month follow-up.

Figure 1: Volar and dorsal approach. Postoperative pictures of our patients

All of them were male with mean age of 27, 3 years. All were diagnosed with X-rays and CT scans. Six of the fractures were on the right hand and four on the left. Tourniquet was used in all the patients for better visualization during surgery. All the patients were surgically treated with open reduction and internal fixation with headless compression screw. Volar approach was used in 9 cases and dorsal approach in only one of them. Six of the patients were surgically treated within 4-14 days after injury and four of them were surgically treated due to nonunion after previous conservative treatment, two of them after three and two of them after seven months of injury.

For both approaches (Figure 1.), a lengthwise incision of about 3 cm was made and the reduction was controlled by using a fluoroscope. After a blunt dissection at the level of the scaphoid, a guide wire was placed under the guidance of a fluoroscope. The length of the screw was measured, and over the wire was inserted a cannulated reamer. The cortex of the proximal scaphoid pole did not get past with the drilling.

After the removing of the reamer, a 2.5 mm headless compression screw of the required length was inserted. Intraoperative fluoroscopy verified the screw position (Figure 2). Following surgery, a short-arm orthosis was placed which permitted for unrestricted thumb interphalangeal movement, maintaining the wrist slightly extended. After 14 days, the stitches were removed.

After four weeks, physical therapy and active motion exercises were recommended. After three months, full weight bearing was permitted.

Results

After surgery, oral antibiotics were given for the next 7 days and because all the surgeries were done under a tourniquet, a daily injection of 4,000 IU low molecular heparin was given for the next 3 weeks. The patients were followed up on the 1st, 3rd, 6th, and 12 months after surgery. Four weeks after surgery we were sent to physical therapy. All fractures united after a mean time of 9,5 weeks. Infections of the wound, failure or loosening of the hardware, malunion, and avascular necrosis have not been reported as postoperative problems. There were no issues with screw insertion. Radiographic images were performed until the fractures were healed.

Assessments of grip strength and wrist range of motion were made at post-operative follow-up visits (Figure 3). Throughout the follow-up period, there were no incidences of developing osteoarthritis of the wrist.

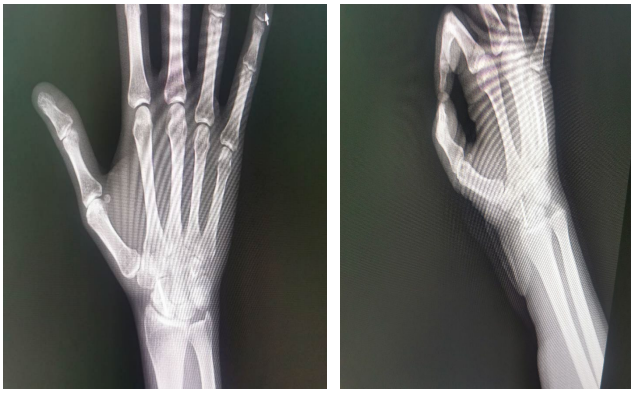

Figure 2: A.P. and lateral radiographs after insertion of the headless compression screw

Discussion

In our study, open reduction and internal fixation of acute unstable and/or displaced scaphoid fractures but also in two of the cases, nonunion after previous conservative treatment using the headless compression screw resulted in both good functional and radiological outcomes. In all patients, bone consolidation was achieved as a result of the implant's firm fixation.

Twenty-three out of the twenty-five scaphoid fractures treated with Acutrak screws showed comparable outcomes with fracture healing at ten weeks. One instance revealed a non-union. At the last

follow-up assessment, the contralateral side's motion and grip strength were 94% and 88%, respectively [10]. Following the antegrade implantation of Acutrak screws, Slade et al. reported favorable functional and radiological outcomes [11]. In 27 patients, there were no nonunion noted, and consolidation took place over the course of 12 weeks. When there was less than a month's gap between the injury and the procedure, the authors observed a faster consolidation (8 weeks). Twenty two patients with scaphoid fracture who had Herbert screw treatment were evaluated by Inoue and Shionoya [12].

Figure 3: Postoperative follow up assessment of the wrist range of motion and grip strength

All fractures were radiographically healed within 6.5 weeks. Even though headless screw fixation of scaphoid fractures appears to provide better outcomes, complicatons do arise from surgical treatment of fractures. There were reports of up to 29% of complications, such as malunion, tendon tears and regional pain syndrome [13], [14], [15],[16]. In our study, none of these were noted [17].

That is why we practice more open reduction and internal fixation rather than conservative treatment because of the shorter time of imobilisation which will lead to reduce time off work and the patient will have a smaller socioeconomic impact from this injury.

Conclusion

It is crucial to understand that achieving a positive result is not guaranteed for every patient and relies on selecting the right patients and fractures. However, our study shows favour able results in sooner surgical treatment with the headless compression screw, rather than delayed treatment of scaphoid fractures. Surgical treatment with headless compression screw showed both functional and radiographic results. While it is beneficial for the screw to be positioned in the subchondral area, it is important to be cautious to avoid cortical penetration, as this will require the screw to be removed later.

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