



การยึดตรึงกระดูกสแคฟฟอยด์แบบผ่านผิวหนังทางด้านหลัง ด้วยวิธีสไนเปอร์ : รายงานผู้ป่วย 1 ราย

ณัฐดนัย จูสิงห์

หน่วยงานออร์โธปิดิกส์ โรงพยาบาลขอนแก่น อำเภอเมือง จังหวัดขอนแก่น 40000

A Novel Surgical Technique for Percutaneous Fixation of Scaphoid Fractures with Sniper Technique : A Case Report

Natdanai Chusing

Department of Orthopaedics, Khon Kaen Hospital, Khon Kaen Province, Thailand

Received: 4 April 2023 / Revised: 29 June 2023 / Accepted: 30 June 2023

บทคัดย่อ

หลักการและวัตถุประสงค์: การผ่าตัดยึดตรึงกระดูกสแคฟฟอยด์หักบริเวณเอวที่ไม่เคลื่อนหรือเคลื่อนน้อย สามารถทำการรักษาโดยการผ่าตัดแบบผ่านผิวหนังขนาดเล็กทางด้านหลังได้ โดยการศึกษาครั้งนี้เป็นการนำเสนอการวิธีผ่าตัดทางด้านหลังแบบใหม่และง่ายเรียกว่าวิธี Sniper ซึ่งคล้ายกับการเล็งยิงปืน

วิธีการศึกษา: ผู้วิจัยทำการอธิบายขั้นตอนการผ่าตัดยึดตรึงกระดูกแบบผ่านผิวหนังทางด้านหลังด้วยสกรูแบบไม่มีหัวโดยละเอียด โดยทำการผ่าตัดผู้ป่วยตัวอย่างจำนวน 1 ราย ที่มีกระดูกสแคฟฟอยด์หักบริเวณเอว

ผลการศึกษา: หลังผ่าตัดได้วัดค่าความยาวบีบอัดที่มีประสิทธิภาพเท่ากับ 9.5 มิลลิเมตร และทำมุม 78.6 องศากับรอยหัก พบมีกระดูกติดที่ 8 สัปดาห์หลังผ่าตัด

สรุป: การผ่าตัดด้วยวิธี Sniper สามารถเป็นทางเลือกในการผ่าตัดยึดตรึงกระดูกแบบผ่านผิวหนังทางด้านหลังของสแคฟฟอยด์หักได้

คำสำคัญ: กระดูกสแคฟฟอยด์หัก, การยึดตรึงแบบผ่านผิวหนัง, วิธีผ่าตัดแบบ Sniper

Abstract

Background and Objects: The operative treatment of a nondisplaced or minimally displaced scaphoid waist fracture can be performed using dorsal percutaneous fixation. This article presents a novel surgical technique for dorsal percutaneous fixation of scaphoid fractures. It is designed for individuals with limited procedural experience and aims to offer a more straightforward alternative.

Method: The authors provide a detailed description of the procedure for dorsal percutaneous fixation surgery using headless screws. The operation was performed on a single patient who had a scaphoid waist fracture.

Result: Postoperatively, the effective compression length measured 9.5 mm, and an angle of 78.6° to the fracture. Bone union was achieved 8 weeks after the surgery.

Conclusion: This novel surgical technique can be an alternative to dorsal percutaneous fixation surgery for scaphoid waist fractures.

Keywords: scaphoid fracture, dorsal percutaneous fixation, Sniper technique

*Corresponding author: Natdanai Chusing, E-mail: natdanai30@gmail.com

Introduction

The percutaneous fixation with a headless screw with or without arthroscopic assistance has yielded high rates of union for the nondisplaced or minimally displaced waist of scaphoid fractures, compared to open surgery or non-operative treatment. Because open surgery is necessary to dissect soft tissues that may violate intact ligaments and may further inhibit a blood supply, possibly resulting in delayed union and osteonecrosis of the scaphoid¹⁻³. The cast treatment must be worn for 6-12 weeks, delaying the patient's return to normal activities⁴. Percutaneous fixation is a widely used method for the treatment of fractures, offering several approaches including the dorsal and volar techniques. Recent studies have shown that the dorsal approach allows for superior central screw placement⁵. However, the original dorsal percutaneous Slade technique can pose challenges due to its technical complexity. This article aims to introduce a novel surgical technique, the Sniper technique, which offers a simplified, step-by-step approach to percutaneous fixation.

Surgical technique

Under appropriate anesthesia, the patient is in a supine position. The wrist was pronated and fully flexed. Draws 3 lines along the axis of the scaphoid; 1) Radiocarpal joint line (PA view), 2) Coronal axis of the scaphoid (PA view), and 3) Sagittal axis of the scaphoid (lateral view) (Fig 1). Locate the entry point at the center of the scaphoid, starting by bending the wrist down and looking at the lateral view. The guidewire is inserted into the dorsal hard point of the scaphoid. Then also look at the coronal view, and move the guide wire to the proper entry point (Fig 2). Position the wrist with the surgeon looking from the back of the wrist. Align the thumb with the axis of the scaphoid, and insert the guidewire by pointing to the tip of the thumb like a sniper. Then insert as far as close to the subchondral bone to get the core of the scaphoid (Fig 3). Measure the length of the screw to be inserted using the depth gauge and subtract 2-4 mm (Fig 4). Make a stab incision of 1-2 mm in size, and blunt dissection along the guidewire exposed a tract to the dorsal of the scaphoid. Insert the 3.0 mm headless screw in a freehand manner. (Fig 5) Check the final position of the screw, using an image intensifier.

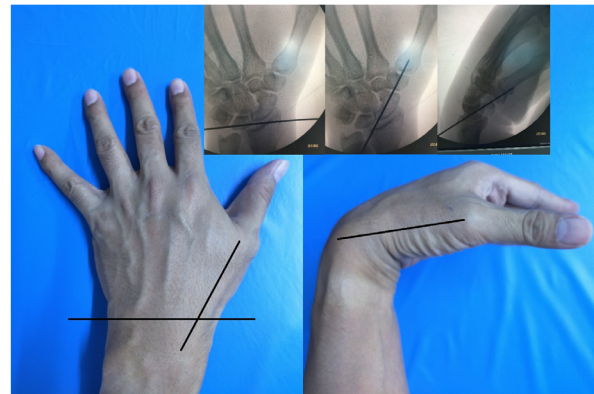


Fig 1 Draws 3 lines 1) Radiocarpal joint line (PA view), 2) Coronal axis of the scaphoid (PA view), 3) Sagittal axis of the scaphoid (lateral view).

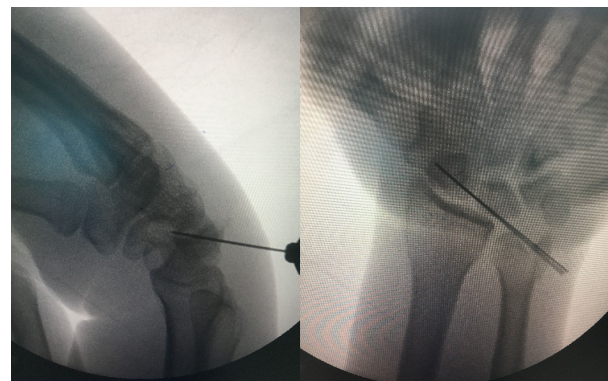


Fig 2 Locate the central axis of the scaphoid in the lateral view and coronal view.

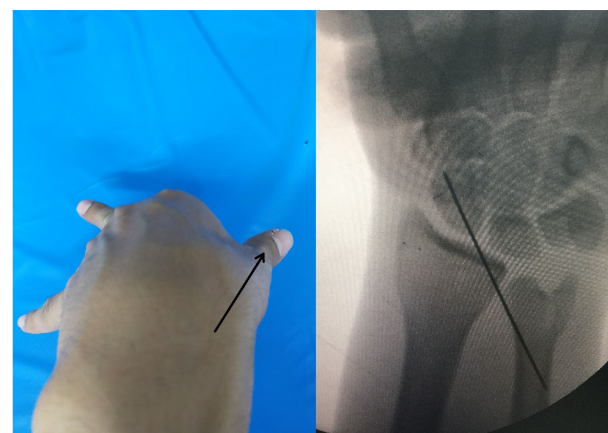


Fig 3 Align the thumb with the axis of the scaphoid, and insert the guidewire by pointing to the tip of the thumb like a sniper.

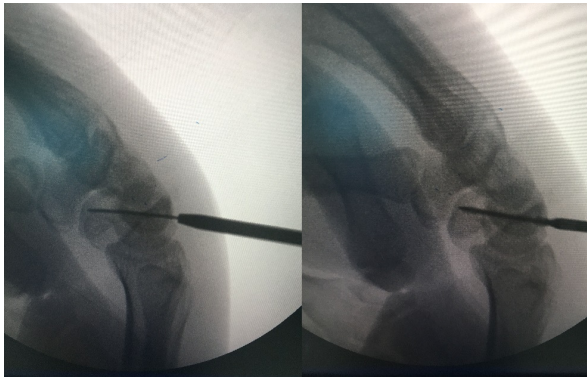


Fig 4 Measure the length of the screw to be inserted using the depth gauge and subtract 2-4 mm.

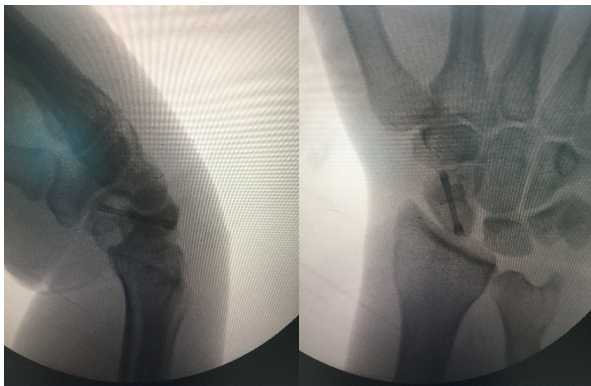


Fig 5 Insert the 3.0 mm headless screw.

Post-operative management

Several cadaveric studies have demonstrated that using longer screws with centrally positioned placement for waist fractures results in higher stiffness, reduced fracture motion, and enhanced stability compared to shorter screws that are placed eccentrically. After surgery, an X-ray of the wrist will be performed to measure the effective compression length (Fig 6). This parameter represents the strength of the screw, the longer and more perpendicular to the fracture, the better⁶⁻⁸.



Fig 6 Demonstration of effective compression length, which refers to the length of the scaphoid bone that is compressed when a headless screw is used to fixate the scaphoid bone. It is the distance between the head of the screw and the surface of the screw that contacts the bone.



Fig 7 A 47-year-old patient arrived at the hospital complaining of right wrist pain after falling from a height a day earlier. Two days later, the patient underwent percutaneous scaphoid fixation using a headless screw. The effective compression length was measured at 9.5 mm, with an angle of 78.6 degrees perpendicular to the fracture site. At the 8-week follow-up, complete healing of the scaphoid was observed.

Discussion

Percutaneous scaphoid fixation is a minimally invasive technique that involves the use of small incisions to access the scaphoid bone and insert screws. It has the advantage of being less invasive, with potentially faster recovery times, according to previous several studies. However, it may not be suitable for all types of fractures, particularly those with significant displacement or angulation^{3,9}.

The researcher presents a dorsal percutaneous surgical technique that can be easily followed step by step. The benefit of this technique is that the screw can be precisely inserted along the central axis of the bone. Multiple studies have demonstrated that using a longer screw with central placement results in greater stiffness, reduced fracture motion, and increased stability, leading to faster bone healing^{6,8}.

Conclusion

This study introduces a novel surgical technique for dorsal percutaneous scaphoid fixation that is straightforward to follow, offering an alternative option for scaphoid fixation surgery.

Acknowledgment

The author declares that there have been no conflicts of interest and no financial or other benefits have been received in any form from a commercial party related to the subject of this article. No funds have been received in support of this research.

References

- Slade JF, 3rd, Grauer JN, Mahoney JD. Arthroscopic reduction and percutaneous fixation of scaphoid fractures with a novel dorsal technique. *Orthop Clin North Am* 2001;33(2):247–61. doi.org/10.1016/S0030-5898(05)70247-9
- Dodds SD, Zalikha AK, Rush AJ 3rd, Fullerton N. Retrospective review of differences in complication rates between dorsal percutaneous and mini-open surgical fixation of scaphoid fractures. *J Wrist Surg* 2021;10(1):42–7. doi.org/10.1055/s-0040-1716511
- Li H, Guo W, Guo S, Zhao S, Li R. Surgical versus nonsurgical treatment for scaphoid waist fracture with slight or no displacement: A meta-analysis and systematic review. *Medicine (Baltimore)* 2018;97(48):e13266. doi.org/10.1097/MD.00000000000013266
- Buijze GA, Goslings JC, Rhemrev SJ, Weening AA, Van Dijkman B, Doornberg JN, Ring D. CAST Trial Collaboration. Cast immobilization with and without immobilization of the thumb for nondisplaced and minimally displaced scaphoid waist fractures: a multicenter, randomized, controlled trial. *J Hand Surg Am* 2014;39(4):621–7. doi.org/10.1016/j.jhssa.2013.12.039
- Kang KB, Kim HJ, Park JH, Shin YS. Comparison of dorsal and volar percutaneous approaches in acute scaphoid fractures: A meta-analysis. *PLoS One* 2016;11(9):e0162779. doi.org/10.1371/journal.pone.0162779
- McCallister WV, Knight J, Kaliappan R, Trumble TE. Central placement of the screw in simulated fractures of the scaphoid waist: a biomechanical study. *J Bone Joint Surg Am* 2003;85(1):72–7. doi.org/10.2106/00004623-200301000-00012
- Dodds SD, Panjabi MM, Slade JF 3rd. Screw fixation of scaphoid fractures: a biomechanical assessment of screw length and screw augmentation. *J Hand Surg Am* 2006;31(3):405–13. doi.org/10.1016/j.jhssa.2005.09.014
- Kupperman A, Breighner R, Saltzman E, Sneag D, Wolfe S, Lee S. Ideal starting point and trajectory of a screw for the dorsal approach to scaphoid fractures. *J Hand Surg Am* 2018;43(11):993–9. doi.org/10.1016/j.jhssa.2018.03.044
- Gutow AP. Percutaneous fixation of scaphoid fractures. *J Am Acad Orthop Surg* 2007;15(8):474–85. doi.org/10.5435/00124635-200708000-00004

SMJ