

INTRODUCTION

- There has been a recent increase in the use of headless compression screws for fixation of metacarpal neck and shaft fractures as they offer several advantages and minimal complications have been reported^{1,2}.
- When placed percutaneously, headless compression screws offer stable fixation with a minimally invasive surgery.^{3,4}
- The purpose of this study is to evaluate the clinical complications and their solutions following retrograde intramedullary headless compression screw fixation of metacarpal fractures.

MATERIALS & METHODS

- We performed a multicenter case series through retrospective review of 160 patients treated with intramedullary headless screw fixation of metacarpal fractures by three fellowship trained hand surgeons at three institutions.
- We defined complications as infection, loss of fixation, hardware failure, malrotation, nonunion, malunion, metal allergy and any repeat surgical intervention.

RESULTS

Four complications (2.5%) were identified through review of 160 total cases.

	n=4
Dominant hand	
Right, n (%)	4 (100%)
Injured hand	
Right, n (%)	3 (75%)
Metacarpal injured	
Small, n (%)	3 (75%)
Ring, n (%)	1 (25%)
Age, y	
Mean (Range)	24 (20-35)
18-30, n (%)	3, (75%)
31-45, n (%)	1, (25%)
Sex	
Male, n (%)	4 (100%)

Table 1. Patient demographics.

	n=4
Screw type	
Synthes® headless compression, n (%)	4 (100%)
Screw length	
40mm, n (%)	4 (100%)
Screw diameter	
2.4mm, n (%)	1 (25%)
3.0mm, n (%)	3 (75%)
Screw material	
Stainless steel, n (%)	4, (100%)

Table 2. Implant summary.

RESULTS CONTINUED

- The complications:
 - **One patient** had a reaction due to a **presumed Nickel allergy** that occurred two weeks after surgery. The screw was subsequently removed after fracture healing after 3 months and there were no sequelae.
 - **One patient** presented 10 months after surgery with a **broken screw** after repeat blunt trauma to the surgical area. This was treated with removal of the broken intramedullary screw and plate fixation of the resulting re-fractured metacarpal.
 - **Two patients** had **bent intramedullary screws**. One of these patients had also sustained repeat blunt trauma to the surgical area at 6 months postoperatively. This was treated with removal of the bent hardware and plate fixation of the re-fractured metacarpal. The final patient presented at 18 months postoperatively for clearance into the military with a bent screw but was completely asymptomatic, the fracture was healed and the screw was left in place.

DISCUSSION

- To our knowledge, this is the first case series to report on the complications and their management following intramedullary screw fixation of metacarpal fractures.
- From this large series of 160 patients, the rate of complication is low at 2.5%.
- Of these, 1 was asymptomatic and 2 were patient driven secondary to repeat blunt trauma to the surgical area.
- There were no cases of infection or extensor tendon disruption.
- Previous studies have found limited open retrograde intramedullary fixation to be safe and reliable for metacarpal neck and shaft fractures. It allows for early postoperative motion without affecting union rates, obviates the need for immobilization and is associated with minimal reoperation and complications.^{1,2,5}
- Future work is needed to report on the long term implant survivorship, functional outcomes and arthritis rates of adjacent joints.

REFERENCES

1. Doarn MC, Nydick JA, Williams BD, Garcia MJ. Retrograde Headless Intramedullary Screw Fixation for Displaced Fifth Metacarpal Neck and Shaft Fractures: Short Term Results. *Hand*. 2015;10(2):314-318. doi:10.1007/s11552-014-9620-3.
2. Ruchelsman DE, Puri S, Feinberg-Zadek N, Leibman MI, Belsky MR. Clinical Outcomes of Limited-Open Retrograde Intramedullary Headless Screw Fixation of Metacarpal Fractures. *J Hand Surg Am*. 2014;39(12):2390-2395. doi:10.1016/j.jhsa.2014.08.016.
3. Avery DM, Klinge S, Dyrna F, et al. Headless Compression Screw Versus Kirschner Wire Fixation for Metacarpal Neck Fractures: A Biomechanical Study. *J Hand Surg Am*. 2017;42(5). doi:10.1016/j.jhsa.2017.02.013.
4. Boulton CL, Salzler M, Mudgal CS. Intramedullary Cannulated Headless Screw Fixation of a Comminuted Subcapital Metacarpal Fracture: Case Report. *J Hand Surg Am*. 2010 Aug;35(8):1260-3. doi:10.1016/j.jhsa.2010.04.032.
5. Tobert DG, Klausmeyer M, Mudgal CS. Intramedullary Fixation of Metacarpal Fractures Using Headless Compression Screws. *J Hand Microsurg*. 2016;08(03):134-139. doi:10.1055/s-0036-1593390.