



## Unusual mode of mechanical failure of an AO cannulated self drilling screw. A case report

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**Cannulated AO screws are commonly used for fracture fixation. Mechanical failure of screws has been well reported but this was mainly breakage of the screw head during removal. We report an unusual mode of failure of an AO self drilling cannulated screw which we have not previously experienced, where the screw threads were found to be unravelled during insertion. We also suggest the way to recognise this complication early and how to prevent or deal with it.**

**Keywords:** unravelling of threads ; cannulated screw failure.

### INTRODUCTION

Implant failure is a fairly common and well discussed subject. The newer generation fracture fixation implants are well tested and are generally reliable. Cannulated cancellous screws are routinely used for fixation of fractures, particularly periarticular fractures in both adult and paediatric patients (3). Failure of these implants is also well documented but these are mainly related to instrumentation or screw breakage (8).

We describe an incident involving unwinding of the screw threads over a guide wire while fixing an ankle fracture. This is a highly unusual complication that most orthopaedic surgeons are not aware of and we feel this possibility needs to be kept in mind while using cannulated screws.

### CASE REPORT

A 14-year-old Caucasian female patient was admitted after injuring her right ankle while playing on a trampoline. She sustained a supination-adduction injury with a vertical fracture of the medial malleolus and a Salter Harris type II injury to the lateral malleolus (fig 1).

It was decided to fix the medial malleolar fracture percutaneously with cannulated cancellous screws. Under anaesthesia, the fracture was reduced using a pointed reduction clamp and a guide wire was passed from medial to lateral perpendicular to the fracture, under fluoroscopy control.

A 40 mm long 4.5 mm cannulated cancellous self drilling screw was inserted over the guide wire and was tightened by hand. During this, unusual resistance was felt while the screw was halfway in. Fluoroscopy revealed an unusual picture -unwinding of threads of the screw with the threaded region migrating perpendicular to the line of the screw

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*Fig. 1.* — Supination- adduction injury of the right ankle



*Fig. 2.* — Screw threads unwinding

fixation. The fracture was fixed with another screw before attempting removal of the affected screw (fig 2).

As the screw was withdrawn gently, the threads were seen to be winding again over the guide wire and the screw was removed without any difficulty (fig 3 & 4). The fracture was fixed with one more screw in a satisfactory position (fig 5).



*Fig. 3.* — As the screw is withdrawn, the threads are seen winding again on the guide wire.



*Fig. 4.* — As the screw is withdrawn further, the threads are fully wound back.

The removed screw showed a continuous split along the root diameter in a spiral manner corresponding to the troughs of the threaded region (fig 6).

## DISCUSSION

The case reported illustrates an unusual type of structural-mechanical failure of a cannulated screw. There are studies regarding strength of cannulated screws, but they mainly deal with the pull out



*Fig. 5.* — Final fixation with an additional screw, no part of the previous screw left inside.

strength (2). Furthermore, the studies dealing with failure of these implants are all related to the instrumentation failure such as rupture of the guide wire or screw breakage during removal (3,5,8). A detailed review of literature revealed two previous case reports about this rare complication (4,6). A further mention of this complication is also found in an article by Schroeder on triple arthrodesis (7) and in McGlamary's comprehensive textbook of foot and ankle surgery (1).

Like the patient in this case report, all patients in Mooney and Simmons' report were teenagers. The authors hypothesized that the self drilling teeth of the screws could bind with, or become caught on, the dense cancellous bone and act, in combination with the rotating motion of the insertion process, to cause the screw to unravel or unwind (6).

The difference between shaft diameter and root diameter is less in a cannulated screw compared to a non cannulated one. This means that a cannulated screw has less tensile strength compared to a solid screw (1). The area of troughs in the threads forms a weak spot where a crack may propagate in a spiral manner through the screw shaft, leading to unwinding of the threads. In the case presented, this did not occur with the other two screws which were of similar configuration used to fix the same fracture in the same patient using the same technique. The senior authors (IW, IJB & DC) also do not recollect



*Fig. 6.* — The removed screw shows unravelling – threaded area split at the troughs in a spiral configuration.

any similar incident in the past. We are uncertain of the aetiology of this problem in this specific case.

We agree with authors of previous case reports that the pointed self drilling threads bind or get caught on with the dense bone, leading to a crack propagation through the weakest part, i.e. the troughs in the threads where the mechanical strength of the screw is lowest. The crack initiation might occur when the threads are passing through the cortical bone; the crack would then propagate in a spiral manner as the screw passes through dense cancellous bone, leading to unwinding of threads. This obviously puts a question mark on use of self drilling cannulated screws in periarticular fracture fixation and needs further investigations. We propose that extra care should be practiced while inserting these screws, with frequent use of the image intensifier focusing mainly on the advancing screw end, but the only way to avoid this complication is pre-drilling of bone, especially in teenagers, before screw insertion. We were able to withdraw the screw intact since the unwinding was

spotted early, otherwise the unwound threads usually break, leading to removal of only the smooth portion of the screw.

### CONCLUSION

Cannulated self drilling cancellous screws are an important constituent of an orthopaedic surgeon's armamentarium. Commonly known complications of these implants usually relate to the instrumentation or to screw breakage during removal. Structural failure in this peculiar way is mostly unknown but is a possible complication. Extra care should be practiced while putting self drilling screws in with additional fluoroscopy control if unusual resistance is felt. Pre-drilling the bone can be another option, especially in teenagers, prior to screw insertion.

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