# Danger of self-drilling self-tapping screws: case report

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Some locking plate systems make use of self-drilling and self-tapping screws. Theoretically, this technology facilitates insertion and decreases operative time. This case illustrates one possible danger of broken screws in these systems. They may carry a risk of migration within the soft tissue, which could endanger vital structures along it course of penetration.

**Keywords:**
complication, hardware, locking plate, migration, self-drilling self-tapping screw

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## Introduction

Locking pate technology has become a standard of care for comminuted fractures, particularly those that are osteoporotic in nature. Designers have used locked plates with minimally invasive insertion techniques to decrease potential soft tissue complications from open reduction and internal fixation. The screw design of the construct was optimized to allow easy one-stage insertion [1]. Self-centering, drilling, and tapping screws are used with the less-invasive stabilization system (LISS) plates (Synthes). The screws lock through small incisions after subcutaneous insertion of the plate. This effectively converts the construct into a fixed angle device, illustrated to have a stiffness similar to 95° condylar plate, dynamic condylar screw, or condylar buttress plate [1,2]. The LISS plate was initially designed for unicortical locking screw usage. Reducing thread pitch as well as adding the drill and tap sections to the screw tip facilitated unicortical screw fixation technique. These design parameters include additional benefits such as screw length measurement is no longer necessary, surgical technique is simplified, and all diaphyseal screws can be nearly the same length. Failures of the plating technique itself have been reported with dedicated unicortical plating, particularly plate pull off and malalignment of the fracture. More recent literature has indicated that bicortical screw fixation is needed in at least some of the screws, particularly in osteoporotic bone [3].

Local complications include nonunion, delayed union, implant loosening, implant breakage, infection, heterotopic ossification, restricted movement, and rotational and angular deformities [4].

## Case report

A 53-year-old male patient sustained musculoskeletal extremity injuries including an open comminuted supracondylar femur fracture with intra-articular extension and an ipsilateral talar neck fracture.

He was taken urgently to the operating room for irrigation and debridement and closure of the wound over his open fracture. Spanning external fixation was used initially for the femur fracture. He underwent second-look irrigation and debridement and open reduction internal fixation by LISS (Synthes, West Chester, PA) plate. Early follow-up radiographs (1 month) are shown in Fig. 1. The patient was allowed to begin weight bearing at 2 months after surgery to facilitate rehabilitation. During that time, he had complaints of mild mid to distal femur pain that was decreasing progressively in intensity. His strength was returning quickly.

On further follow-up radiographs at 4 months postoperatively, there was (Fig. 2) hardware failure and migration of one of the locked screws medially, but the screw was still partially within the cortical bone. This screw was the first proximal fixation after the bridging portion of the comminution. There were no signs or laboratory results consistent with infection. The condition was discussed with the patient, and he was offered hardware removal. He was so happy with his clinical course that he was hesitant to have more surgery.

During follow-up at 4 weeks later, the patient complained of mid-femur pain at the skin level. He claimed that every time he flexed and extended his thigh, he felt a worsening stabbing pain in the medial thigh. Radiographs (Fig. 3) revealed more migration



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**Figure 1**

Early postoperative radiographs showing a locking construct used for an open comminuted femur fracture.

**Figure 2**

Four-month follow-up radiographs showing hardware failure.

had occurred to the medial thigh. The screw was palpable and was removed in the orthopedic clinic under local anesthesia.

## Discussion

The reported failures for the LISS plate have been soft tissue coverage issues, plate failure owing to unicortical screw cut-out, breakage of the plate, or failure to provide adequate support until osseous healing [5–7]. We report a case of screw breakage and migration from one such plate. Generic risks of hardware breakage and complications can include local migration or systemic embolization [8,9]. Obviously, migration of the self-drilling screws from a LISS femur fixation specifically could endanger vital structures. Failures of the plating technique itself have been reported. Screw migration has occurred after failure at the screw shaft region. The screw is minimal in cross-section at this point. This particular screw was also at the point of maximal stress for this fixation construct. The screw has unicortical fixation, but this may have been on the far cortex only. The butterfly segment on the plate side of the bone may not have been solidly held by the screw, may have broken away from the screw with weight-bearing, or may have been stripped during insertion when the screw tip hit the far cortex. The resultant screw bone construct for this fixation point would have maximal stress at the screw neck where it exits the plate. The bone fragment needing solid fixation was maximally away from the plate. This would result in hardware failure at the screw neck. The length of the screw is dictated by inventory sizes in this system. The inventory is limited to cut down overhead costs. Diaphyseal screws therefore can sometimes be quite long when used in a bicortical fashion. In this particular case, the screw protruded into the soft tissue envelope. Potentially, friction or torque moment of the screw by the soft tissue may have resulted in progressive migration through the femoral cortex and along a straight path to the medial thigh. Any neurovascular structure along the path of the migrating screw is in danger. The movement through the soft tissue was also quite rapid and predictable in hindsight.

**Figure 3**

Progressive migration has occurred. The screw is now palpable subcutaneously along the medial thigh. Potentially, neurovascular structures may be at risk from this migration.

## Conclusion

With this locking plate system in particular, the first screw after a large bridge segment should be unicortical in the diaphyseal bone that is nearest the plate. In that case, if breakage does occur, there would be no migration, as there would be an intact femoral cortex at the tip of the screw. There would also be no soft tissue friction to cause screw motion owing to the medullary position of the broken screw. If screw breakage does occur in a bicortical screw, careful radiographic and clinical examinations should be followed to ensure that migration does not occur.

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**Conflicts of interest**

There are no conflicts of interest.

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