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**Minimally invasive removal of a deep-positioned cannulated screw from the femoral neck: A case report**

Yang ZH*et al*. Minimally invasive removal of a screw

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**Abstract**

BACKGROUND

Clinical femoral neck fracture is common. Based on patient age and fracture type, different surgical methods can be selected, including cannulated screw fixation of the femoral neck and artificial total hip joint or semi-hip joint replacement. When patients with femoral neck fracture are treated with cannulated screw fixation, a cannulated screw may be positioned too deep. The excessively deep-placed screw is difficult to remove and causes major trauma to the patient.

CASE SUMMARY

A patient with poliomyelitis and femoral neck fracture was treated with a cannulated screw that was placed too deep. A self-made auxiliary tool (made of a steel sternal wire) was used to remove the cannulated screw near the pelvic cavity.

CONCLUSION

The depth of the cannulated screw can be estimated before screw placement using an improved hollow screwdriver with a scale mark, thus improving the safety of screw placement and facilitating clinical use.

**Key Words:** Cannulated screw; Excessively deep-position; Femoral neck fracture; Minimally invasive removal; Case report

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**Core Tip:** A patient with poliomyelitis and femoral neck fracture was treated with a cannulated screw that was placed too deep. A self-made auxiliary tool (made of a steel sternal wire) was used to remove the cannulated screw near the pelvic cavity. The depth of the cannulated screw can be estimated before screw placement using an improved hollow screwdriver with a scale mark.

**INTRODUCTION**

Clinical femoral neck fracture is common[1]. Patients with femoral neck fracture can be treated with cannulated screw fixation, but a cannulated screw may be positioned too deep in clinical practice. The excessively deep-placed screw is difficult to remove and causes major trauma to the patient.

**CASE PRESENTATION**

***Chief complaints***

A 59-year-old Chinese man was hospitalized in the Department of Orthopaedics at the Second Hospital of Shanxi Medical University (Taiyuan, China) because of pain in his left hip.

***History of past illness***

In 1995, the patient underwent orthopedic surgery for poliomyelitis performed by an unknown surgeon.

***Personal and family history***

The patient did not smoke or drink. He had no history of other illnesses and had no known allergies.

***Physical examination***

His medical history included poliomyelitis[2] with limited activity of the left hip joint. The left limb was shorter than the right.

***Imaging examinations***

Films taken in the local hospital revealed a Garden II[3] left femoral neck fracture, and preoperative computed tomography indicated a left femoral neck fracture (Figure 1).

**FINAL DIAGNOSIS**

Based on the examination and imaging findings, a provisional diagnosis of left femoral neck fracture and poliomyelitis was made.

**TREATMENT**

With the patient’s age and basic diseases known, closed reduction of cannulated screw internal fixation for femoral neck fracture was performed[4]. Intraoperative fluoroscopic examination using the traction bed revealed good reduction. A cannulated screw guide pin was positioned percutaneously *via* minimally invasive surgery[5], and intraoperative fluoroscopy showed that the length of the guide pin was appropriate. A screw with appropriate length with respect to the measured depth was inserted, but intraoperative fluoroscopy showed that the upper cannulated screw was placed too deep and penetrated the acetabulum[6]. After attempts to unscrew the screw failed, the closed incision was connected and expanded to reach the bone. The screw tail completely entered the bone, and the cannulated screw could not be taken out by retrograde rotation of the screwdriver. An auxiliary extraction tool was made by bending the steel sternal wire and then pushing it through the rear of the screwdriver to reach the tip of the cannulated screw. The screwdriver was rotated reversely[7], and the steel sternal wire was pulled gently. The overlong hollow screw was slowly rotated out and replaced with a thickened hollow screw of appropriate length and a gasket implanted into the femoral neck. After surgery, the wound was washed thoroughly and sutured layer by layer. The patient was advised to stop eating temporarily. Bedside B-mode ultrasound revealed a heterogeneous mass on the left side of the bladder, with no obvious abnormality. A pelvic computed tomography scan showed effusion (Figure 2). A regular B-mode ultrasound examination showed normal urine and stool[8], and the patient was discharged 1 wk after surgery.

**OUTCOME AND FOLLOW-UP**

Re-examination 2 years after surgery showed that the patient’s urine and stools were normal, and the fracture was healed. Abdominal ultrasound showed no obvious abnormality, and the activity of the hip joint recovered to preoperative levels.

**DISCUSSION**

Based on patient age and fracture type, different surgical methods can be selected for femoral neck fracture, including cannulated screw fixation of the femoral neck and artificial total hip joint or semi-hip joint replacement[9]. This patient had underlying poliomyelitis, and his left hip joint had limited daily activity. Poliomyelitis leads to poor hip muscle strength, and thus the strategy of closed reduction and cannulated screw placement was adopted. However, the screw placement was difficult due to osteoporosis. Less intraoperative fluoroscopy was performed, leading to excessively deep insertion of the screw. The cannulated screw penetrated the femoral head and the ipsilateral acetabulum, and it was difficult to unscrew directly by reverse rotation because of no bone or thread friction.

The Stoppa approach[10] and ilioinguinal approach can be used for treatment of acetabular fractures. Surgery can reach the top of the acetabulum and remove the cannulated screw. However, there is major surgical trauma for patients. The tool made of the thickest steel sternal wire, with a small bend at its head, facilitated rotation of the screwdriver to remove the cannulated screw, which avoided cutting *via* the ilioinguinal approach[11] or Stoppa approach to remove the overly deep-positioned screw. Regarding its usage, a guide pin was put on the screwdriver to reach the fracture before inserting the cannulated screw, and the scale of the screwdriver and the mark at its interface with the skin were observed. After the cannulated screw was inserted, the depth was determined by fluoroscopy when the mark on the skin and the scale of the original measuring screwdriver were aligned (Figure 3), reducing intraoperative fluoroscopy and surgical time and enhancing the safety of screw positioning.

**CONCLUSION**

The depth of the cannulated screw can be estimated before screw placement using an improved hollow screwdriver with a scale mark.

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**Footnotes**

**Informed consent statement:** All study participants, or their legal guardian, provided informed written consent prior to study enrollment.

**Conflict-of-interest statement:** The authors declare that they have no conflict of interest.

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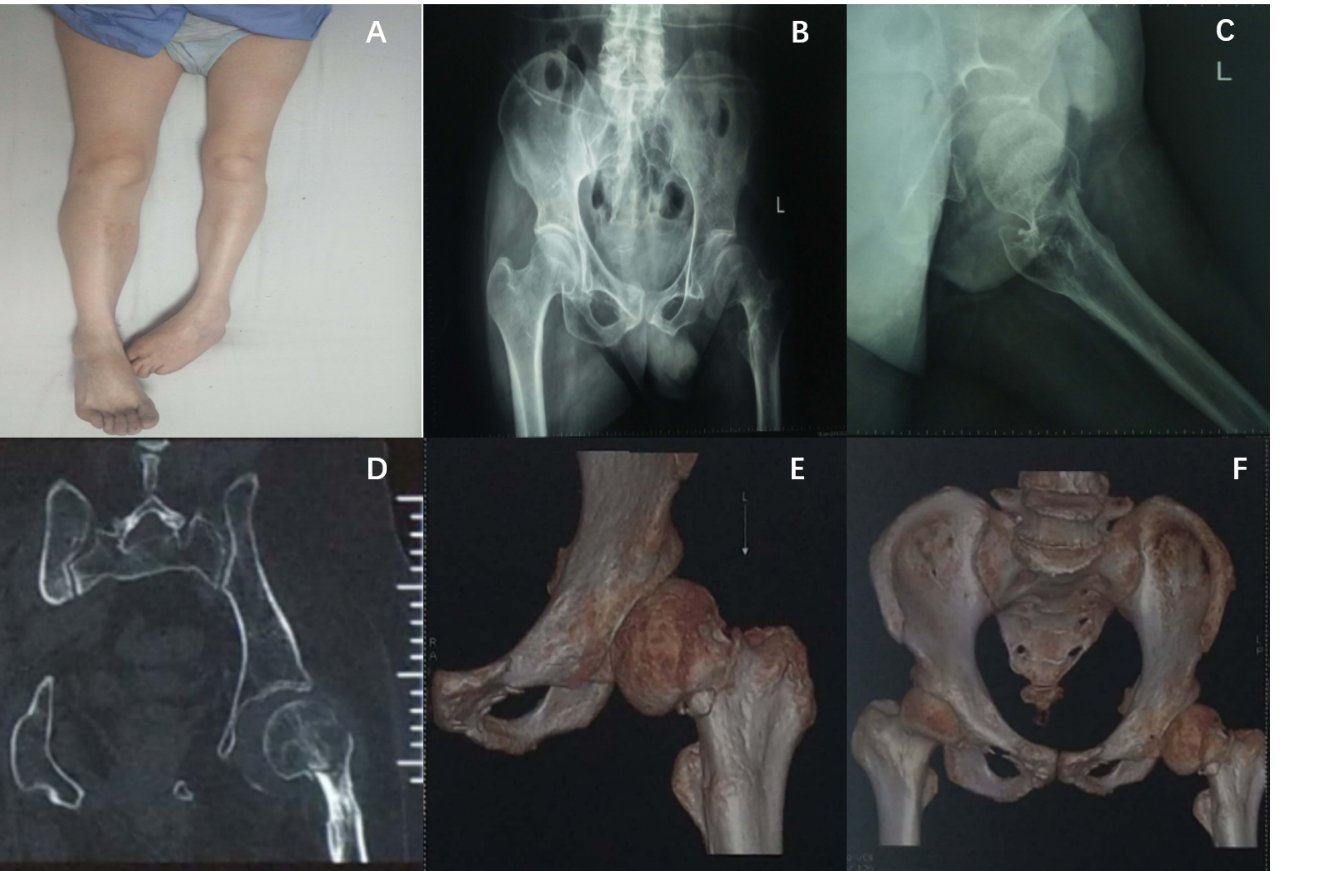
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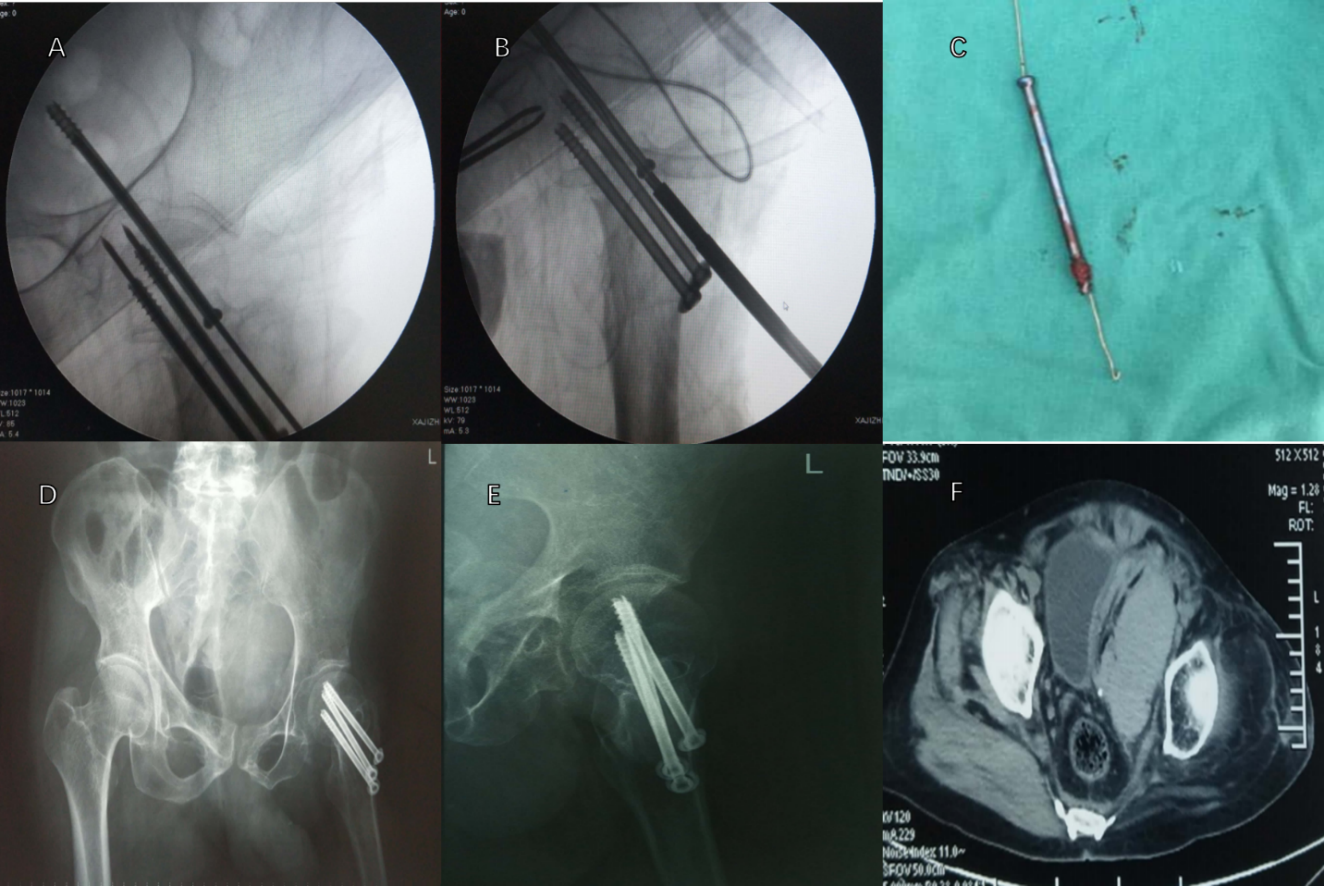
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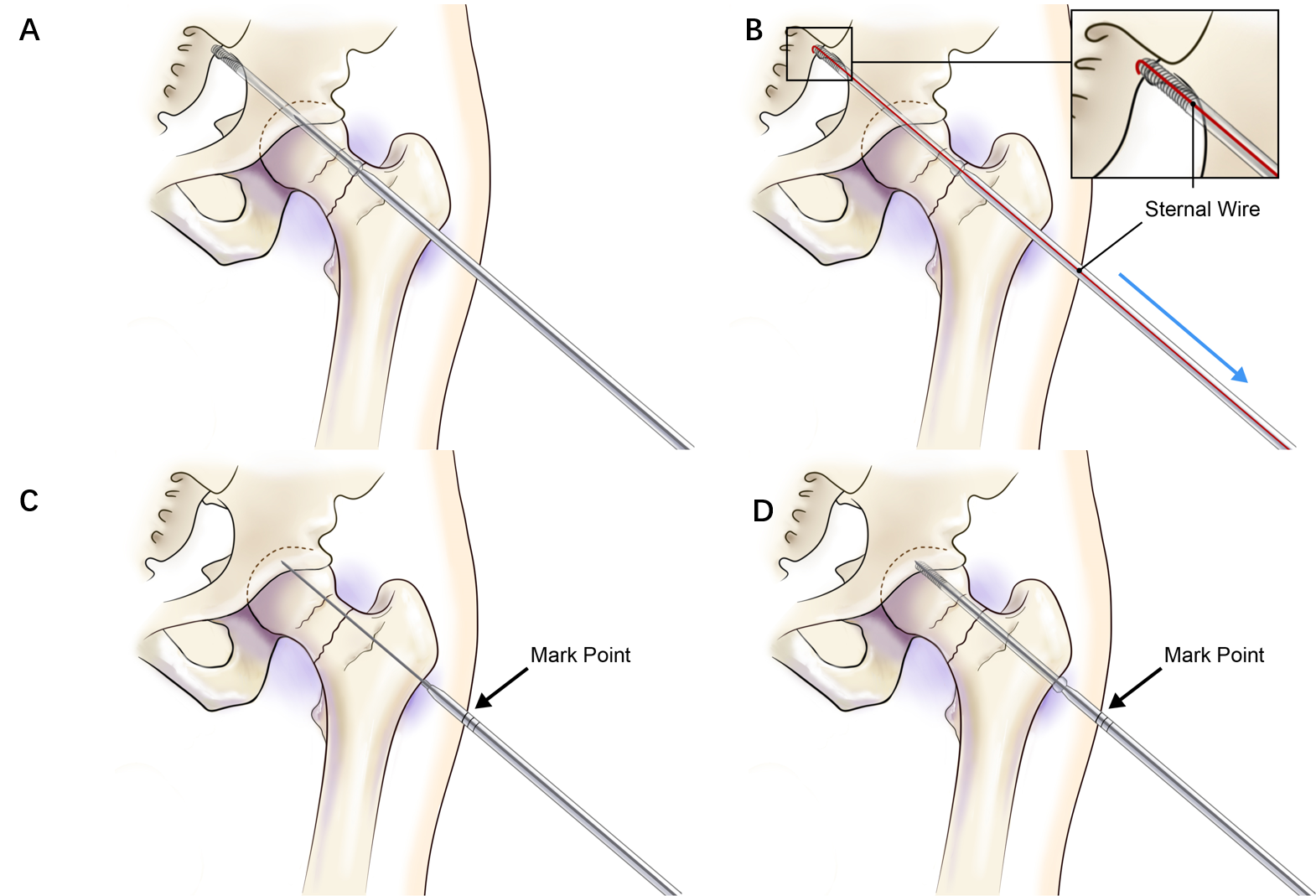
**Figure Legends**



**Figure 1 Preoperative data.** A: Preoperative general picture of both lower limbs; B: Preoperative anteroposterior pelvic radiograph; C: Preoperative lateral view of the left hip joint; D: Preoperative coronal computed tomography scan; E: Preoperative three dimensional reconstruction of the left femoral neck; F: Preoperative three dimensional reconstruction of the pelvis.

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**Figure 2 Intraoperative imaging and postoperative pelvic computed tomography.** A: Intraoperative fluoroscopy revealed that the cannulated screw was inserted too deeply; B: A self-made steel sternal wire was used to facilitate removal of the cannulated screw; C: Removal of the overlong cannulated screw and the self-made steel sternal wire with a hook; D: Postoperative posteroanterior radiograph; E: Postoperative lateral view; F: Postoperative pelvic computed tomography film showed effusion.

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**Figure 3 Process of removing the overly deep-placed cannulated screw and the use of the improved screwdriver for cannulated screws.** A: Inserting the excessively deep-placed screw; B: Using the self-made tool of steel sternal wire with bending and illustration for removal; C: Depth positioning using the scaled screwdriver before inserting the screw; D: Inserting the cannulated screw into the previously determined position with the scaled screwdriver.