



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Morbidity and Mortality Case Report

Iatrogenic sciatic nerve injury secondary to clamp placement around the femoral neck during proximal femoral fracture intramedullary nailing

George D. Chloros^a, Vasileios P. Giannoudis^a, Peter V. Giannoudis^{a,b,*}^a Academic Department of Trauma and Orthopaedics, School of Medicine, University of Leeds, United Kingdom^b NIHR Leeds Biomedical Research Center, Chapel Allerton Hospital, Leeds, United Kingdom

ARTICLE INFO

Keywords:

Femoral fracture
Sciatic nerve
Nerve palsy
Clamp

ABSTRACT

- 20-year-old male road-traffic accident
 - Sustained right acetabulum fracture, left proximal femur fracture, right patella fracture and pulmonary contusions
 - Had fixation within 4 days of his left proximal femur fracture and his right acetabulum:
- Following fixation of his left femur fracture, developed symptoms of complete left sciatic nerve palsy.
- At the time of surgery, a heygroves clamp around the neck of the femur was used to assist in the reduction of the fracture.
- Subsequent exploration of the sciatic nerve showed several clamp indentations on it but fascicles in continuity.
- Nerve conduction studies at 4 months post-operatively confirmed a high sciatic nerve injury.
- The patient has still not recovered any function 1 year post-operatively.

Case study

A 20 year-old otherwise healthy male was involved in a road traffic accident and suffered a left proximal femur fracture, a right patella fracture and a right acetabulum fracture as well as pulmonary contusions. On the right side, there were also incidental findings of advanced Perthes disease (Fig. 1). On presentation, the patient was neurovascularly intact bilaterally in the lower extremities. The patient was subsequently taken to the operating room to undergo a left femur intramedullary nailing under general and regional anesthesia (block). The surgery was performed outside of normal hours, by an orthopaedic trainee. Following traction, fluoroscopic images showed that the fracture reduction was not satisfactory (Fig. 2). Therefore, a lateral incision over the trochanter and proximal femur was made for open reduction and two heygroves clamps were used: one was put around the femoral shaft, and another one was put around the proximal neck fragment (Fig. 3). Subsequent completion of the procedure with successful intramedullary nailing of the femur was undertaken (Fig. 4). At the immediate post-operative period, there was difficulty of accurately assessing the neurological

* Corresponding author at: Academic Department of Trauma & Orthopaedic Surgery, School of Medicine, University of Leeds, Clarendon Wing, Floor D, Great George Street, Leeds General Infirmary, LS1 3EX Leeds, United Kingdom.

E-mail address: pgiannoudi@aol.com (P.V. Giannoudis).

<https://doi.org/10.1016/j.tcr.2021.100532>

Received 3 July 2021; Received in revised form 27 August 2021; Accepted 28 August 2021

Available online 6 September 2021

2352-6440/© 2021 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

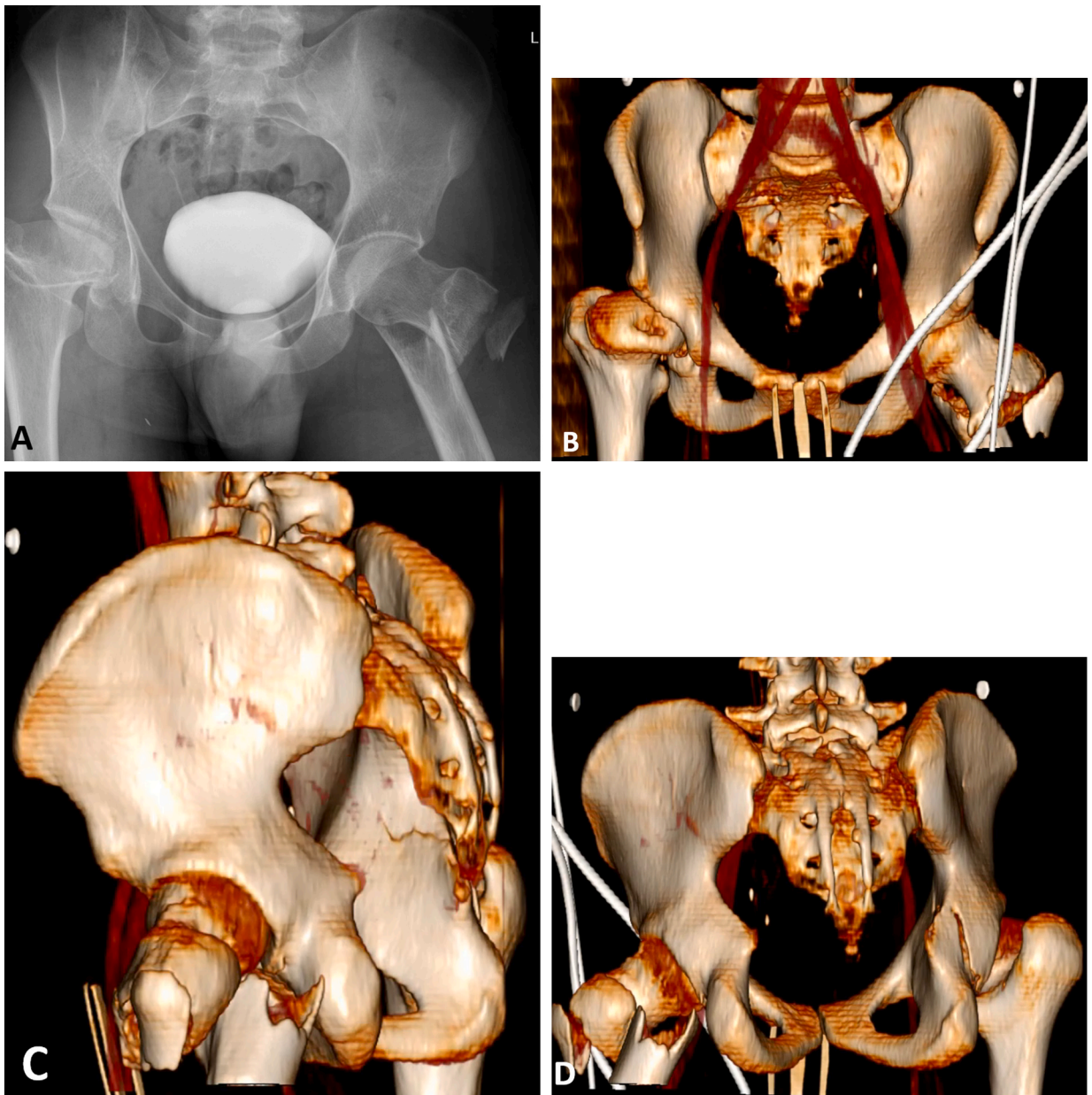
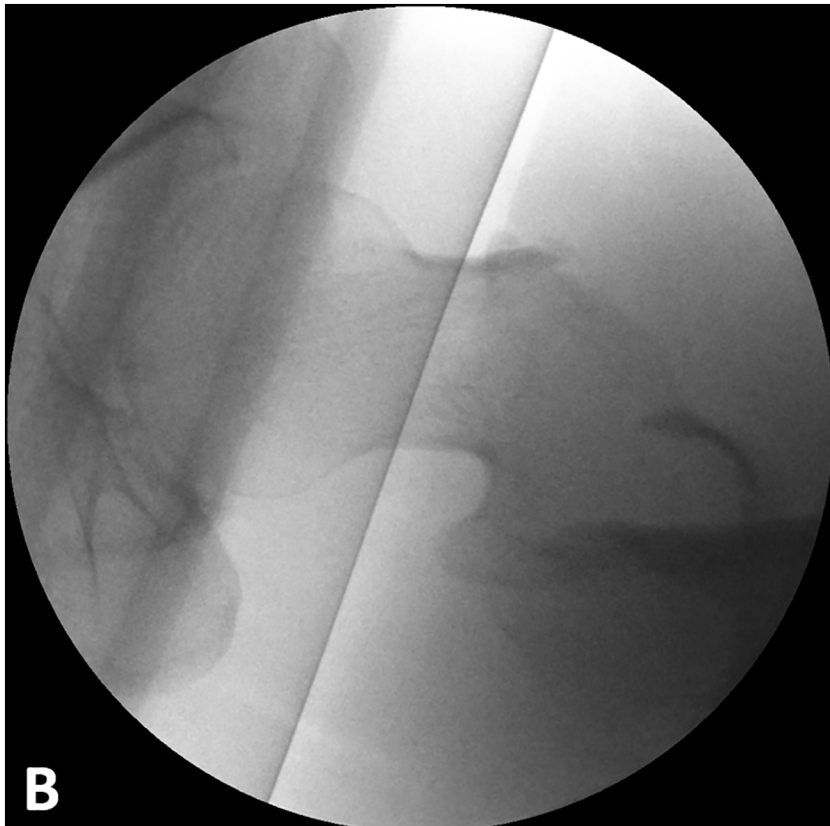
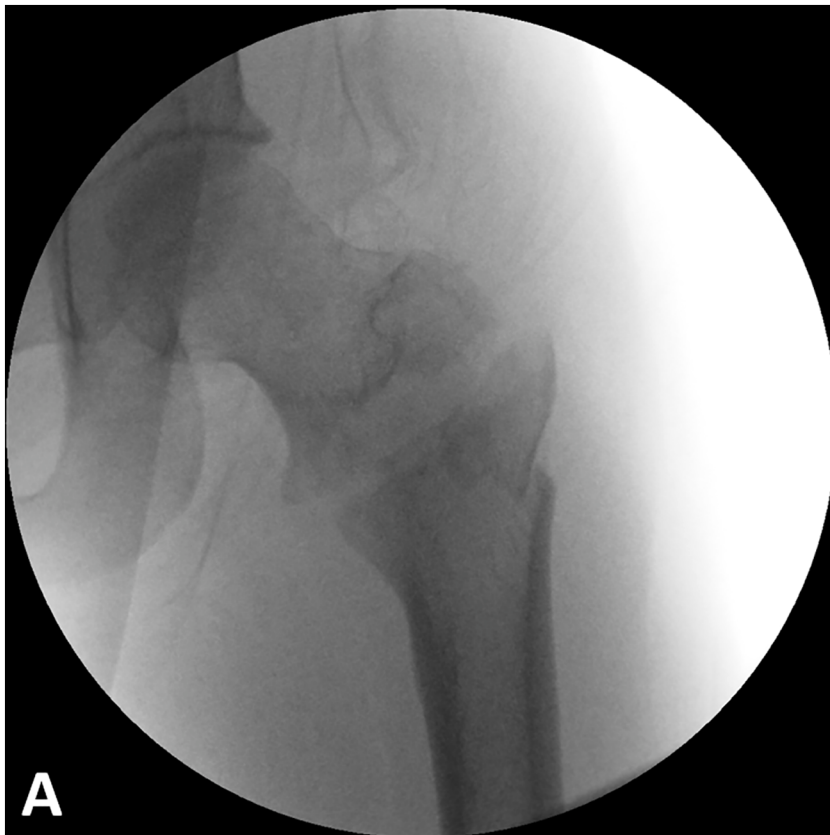


Fig. 1. Pre-operative AP Pelvic film and 3D-CT reconstructions showing the left proximal femoral fracture.



← **Fig. 2.** Post-traction intraoperative fluoroscopy demonstrating the need for open reduction.

status of the extremity secondary to regional anesthesia. However, after two days, the patient still was not showing any signs of left sciatic nerve recovery, as he was unable to move his foot or toes, bend his knee or have sensation to light touch. Of note, as far as his other injuries, the right patella was managed non-operatively and he underwent open reduction and internal fixation of his right pelvic fracture after intramedullary nailing was performed. Given the persistence of clinical sciatic nerve lesions along with fluoroscopy images depicting the clamp around the proximal neck fragment, it was felt that this may represent an iatrogenic nerve injury. Therefore, 10 days after the surgery, the sciatic nerve was explored and it was found in continuity. However, there was a discrete area of pressure around it with multiple indentations present and that had no direct communication with the fracture site. (Fig. 5) Nerve stimulation to branches above the lesion was normal, however there was no contraction below or across the injured segment. The nerve was explored under the microscope where intrafascicular dissection, and nerve fascicles were seen crossing the injured segment and therefore nerve grafting was not deemed appropriate. Four months after the initial surgery, the fracture demonstrated radiological signs of healing activity (Fig. 6), however nerve conduction studies were performed and showed that the left tibial and peroneal sensory and motor responses were not recordable and an EMG indicated no activity in the tibialis anterior and gastrocnemius and diminished activity in the gluteus medius suggesting severe axonotmesis type injury to the tibial and peroneal branches, as well as trauma to the superior gluteal nerve suggesting a high sciatic nerve lesion. At 12 months postoperatively, there is no recovery of the sciatic nerve function (Fig. 7).

Determined reasons for morbidity and mortality

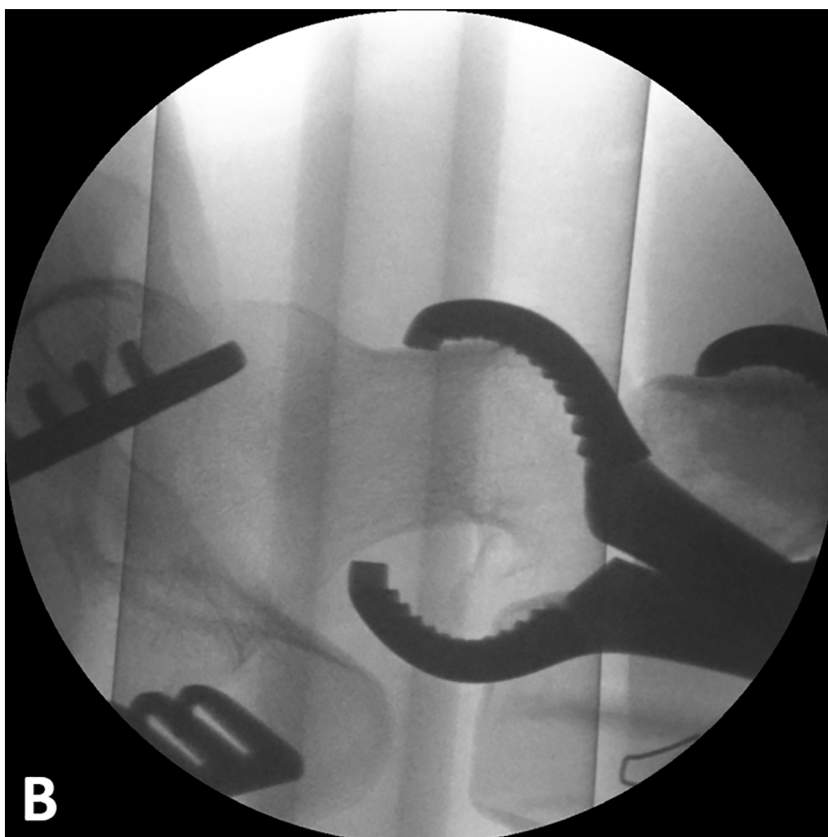
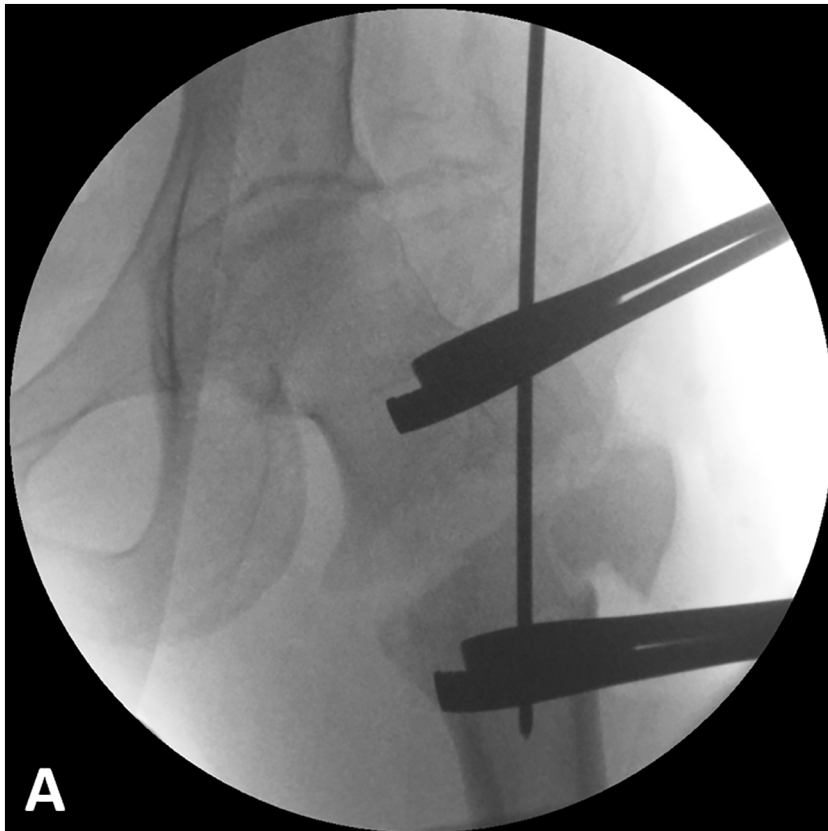
This otherwise healthy young patient underwent a routine operation of fixation of his left proximal femur fracture. Intraoperatively, the fracture could not be adequately reduced by traction alone, and therefore open reduction was necessary. The proximal and distal ends of the fracture were exposed by a lateral incision on the proximal femur, with an aim to reduce and stabilize the fracture in order to prepare for subsequent nail insertion. Immediate postoperative sciatic nerve palsy is an established complication after hip arthroscopy or arthroplasty, but it is extremely rare after peritrochanteric/subtrochanteric nailing of femur fractures [1,2]. This complication has been reported secondary to postoperative hematoma accumulating and compressing the sciatic nerve with successful evacuation 13 h post-operatively and return of normal function. However, in contrast to the case presented herein, symptoms were progressively worsening, including increased pain, fullness of the thigh at the incision level, and progressive loss of sensation and inability to plantar-flex or dorsiflex the foot [2]. Another case of immediate sciatic nerve palsy following intramedullary nailing of a subtrochanteric femur fracture, but without open reduction, was reported by Britton [1]. After 48 h, exploration revealed that the nerve had been crushed between the two fracture fragments and it was released by partial excision of the posterior femoral cortex and found to be in continuity but markedly thinned focally. The patient did only partially recover. Although these cases show that there can be an iatrogenic sciatic nerve injury following intramedullary nailing of proximal femur fractures, the case highlighted herein is unique in that a technical error of positioning the Heygroves clamps around the proximal femur resulted in permanent palsy.

Recommendations

Proximal femoral fractures are frequently a challenge to treat as the fracture may not be amenable to reduction by traction and closed means. In those cases, the decision to open the fracture site and reduce the fragments is imperative. There are several ways of reducing the fracture, including the use of clamps, wires, or pins. Those instruments should be carefully placed to avoid damage to nearby neural structures. Catastrophic consequences are highly likely when putting clamps around the femoral neck, and therefore, a free floating proximal fragment containing the femoral neck should be reduced and/or temporarily stabilized using retrograde wires or Schantz pins. Adequate knowledge of the anatomy and experience of the surgeon are of paramount importance, along with proper and detailed pre-operative planning regarding exposure, appropriate tools for reduction and subsequent fixation. Although lower limb monitoring may be useful when nerves may be at risk, it is not routinely recommended in proximal femoral fractures as long as the above principles are met. In such cases of acute nerve symptoms, prompt nerve exploration may be warranted to identify and attempt preservation/repair.

Summary educational points

- 1) Prior to intramedullary nailing, open reduction of a proximal femoral fracture is required in cases of unsuccessful closed means.
- 2) Sciatic nerve palsy as an immediate complication of such a procedure is extremely rare and has been reported secondary to hematoma and fracture ends entrapping the nerve.
- 3) Several instruments may be used for reduction, including a variety of clamps (eg. Heygroves, Verbrugge, etc), wires and pins.
- 4) A clamp should never be placed around the femoral neck as this will almost certainly damage the sciatic nerve.
- 5) Careful positioning of reduction instruments is of paramount importance to avoid complications. Use of Schantz pins and wires is safer in manipulating the femoral neck.
- 6) The surgeon needs to have sufficient level of experience and craft a careful pre-operative plan for reduction and fixation.



(caption on next page)

Fig. 3. AP and lateral radiographs showing reduction of the fracture using two heygroves clamps, on the proximal and distal fragments respectively. Note the heygroves clamp placed around the femoral neck.

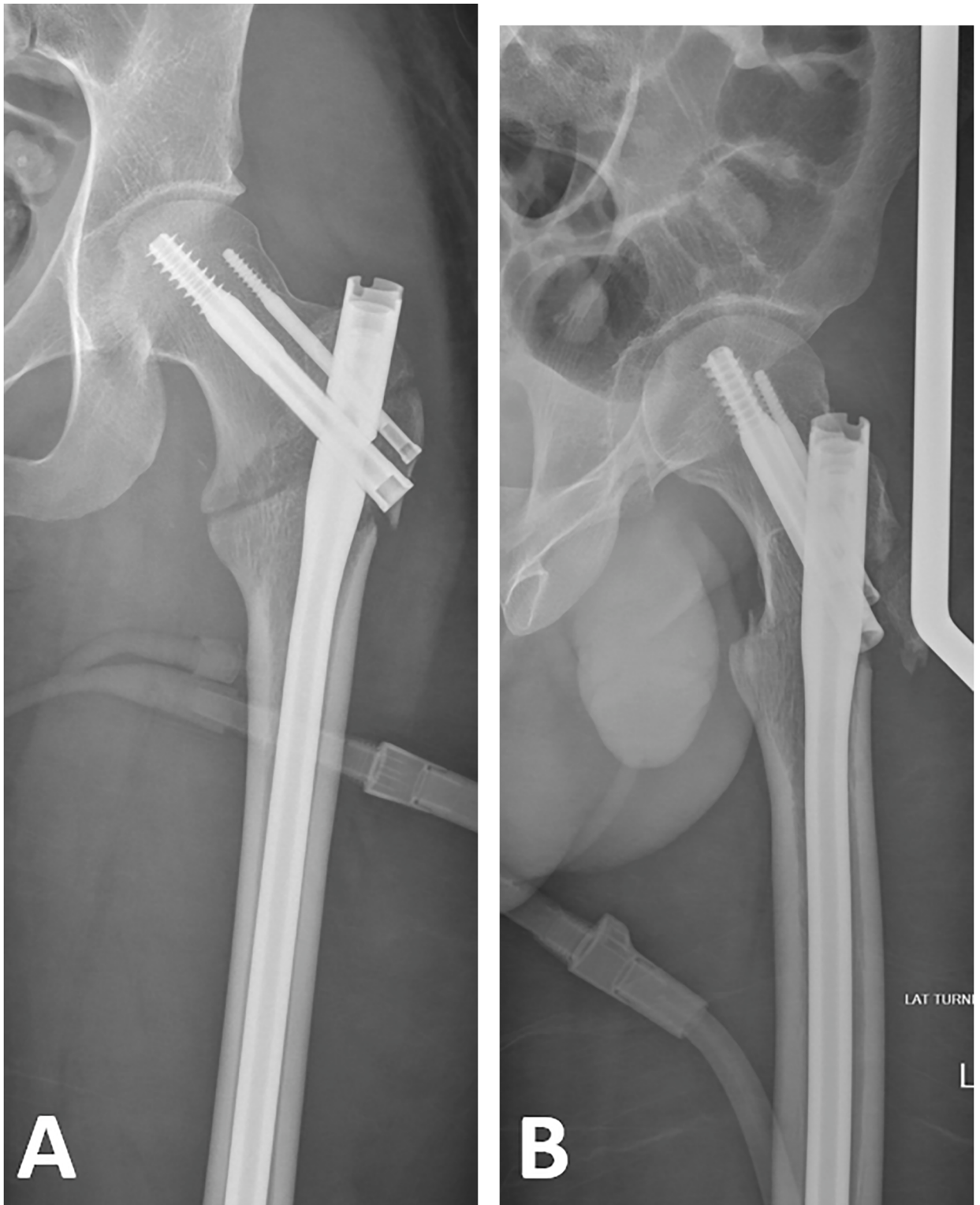


Fig. 4. Postoperative AP and lateral radiographs of the fixation.

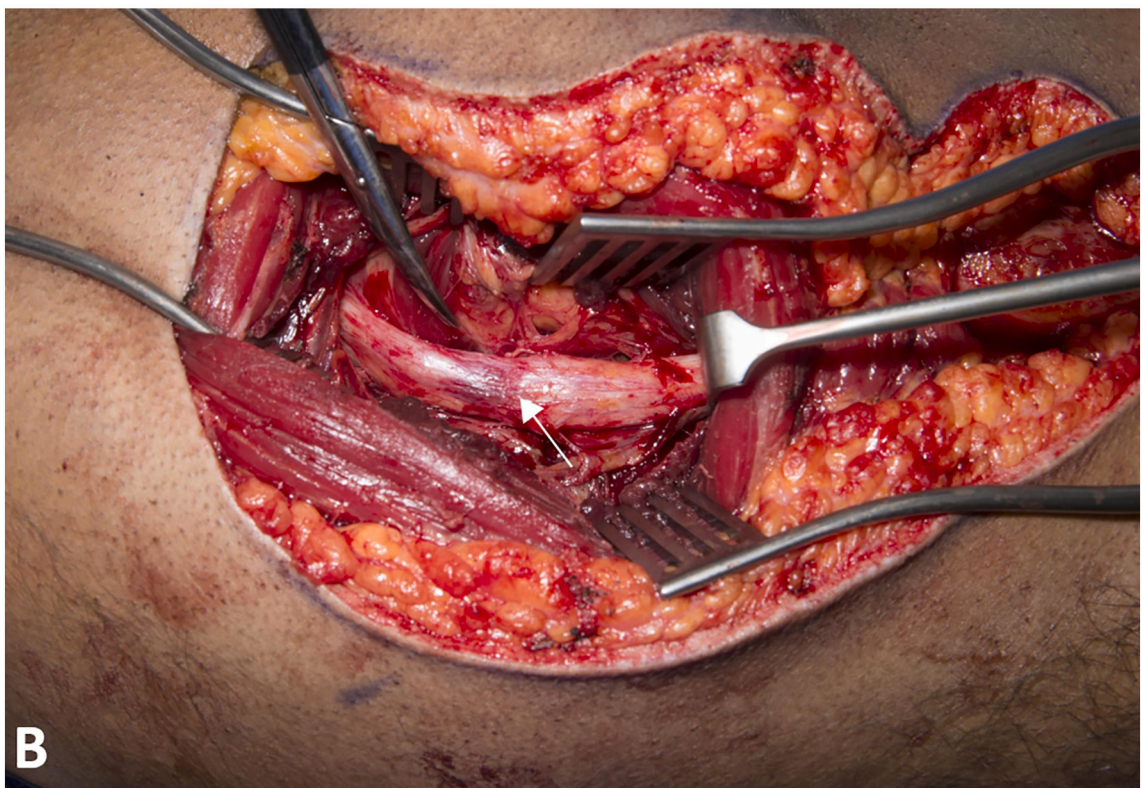


Fig. 5. Intraoperative images of the sciatic nerve exploration showing multiple indentations (white arrow) on the nerve from the clamp.

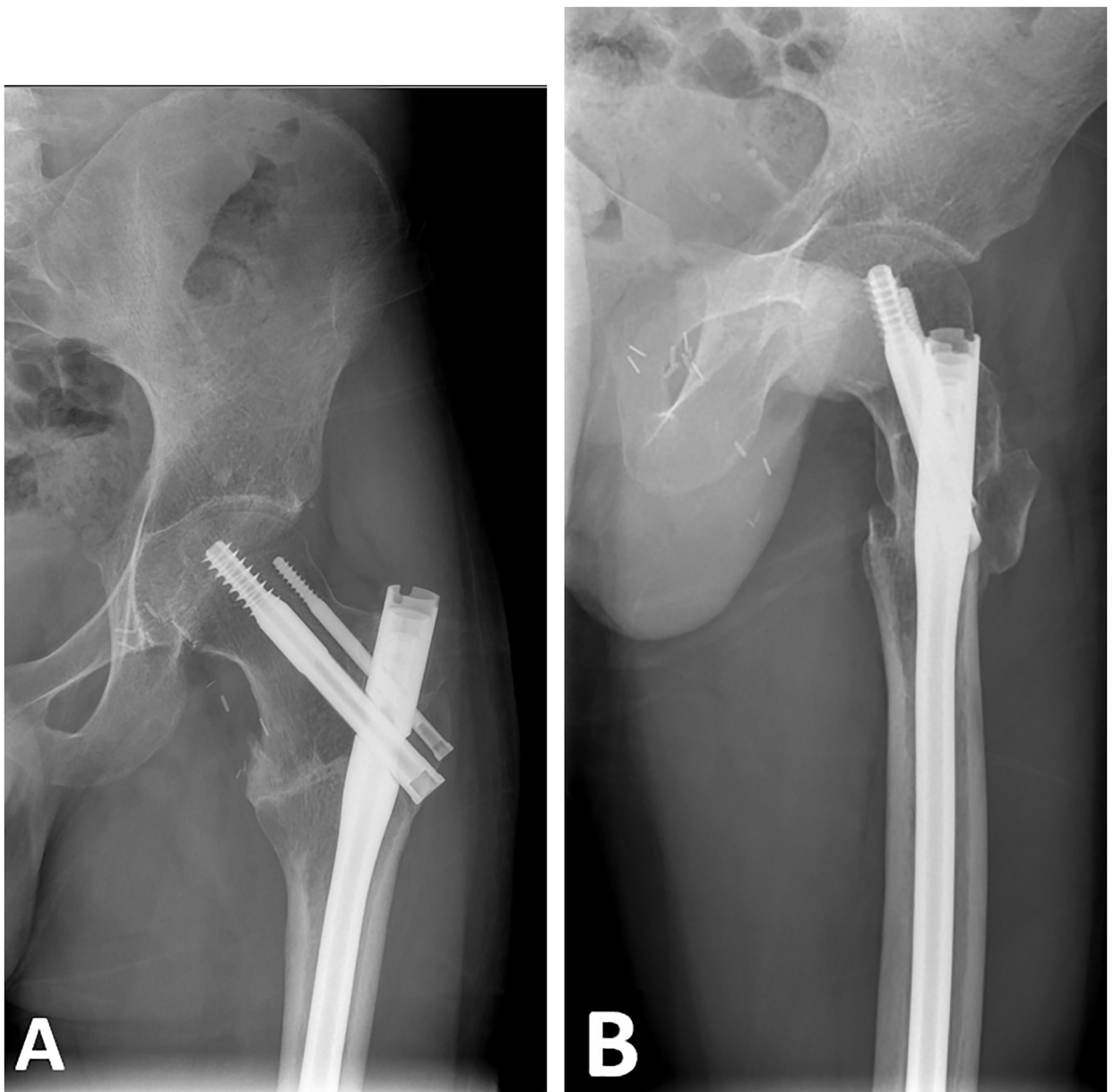


Fig. 6. At 4 months, AP and lateral radiographs show radiological features of healing activity of the fracture.



Fig. 7. At 1 year post-injury, there is no motor or sensory function recovery as demonstrated on the left side.

Declaration of competing interest

The authors have no conflicts of interest.
No funds were obtained for doing this research.

References

- [1] J. Britton, D. Dunkerley, Closed nailing of a femoral fracture followed by sciatic nerve palsy, *J. Bone Joint Surg. Br.* 72 (2) (1990) 318.
- [2] T.G. Pedri, G.P. Treme, Sciatic nerve palsy after operative treatment of subtrochanteric femur fracture resulting from postoperative hematoma: a case report, *UNM Orthop. Res. J.* 6 (1) (2017).