

Case Report

Iatrogenic femoral neck fracture: an unusual cause

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Received: 28 April 2019

Revised: 16 June 2019

Accepted: 18 June 2019

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ABSTRACT

The femoral diaphyseal fracture is now commonly treated by intramedullary nailing. The fracture of the femoral neck following this gesture is an exceptional complication of this technique. Rarely reported in the literature, several authors incriminate mainly errors of the introduction point. We report a case of iatrogenic fracture of the femoral neck following an unusual cause.

Keywords: Femoral neck, Fracture, Iatrogenic, Intra-medullary nailing

INTRODUCTION

Intramedullary nailing is currently a common method of closed internal fixation of diaphyseal fractures in long bones.¹ However, this technique is not devoid of complications.² Among these, the iatrogenic fracture of the femoral neck - during anterograde intramedullary nailing of the femur - is rarely reported in the literature and remains little known.² There are only 25 cases in which the authors mainly incriminate a misplaced introduction point.

In this paper, the authors report a case of iatrogenic fracture of the femoral neck whose cause has never been described.

CASE REPORT

A 29-year-old patient, right-handed, driver of military heavyweight vehicles, with no notable antecedents, no smoking, admitted to the emergency department following a road accident.

Clinical examination revealed a swelling right thigh with pain in palpation. The cutaneous and vasculo-nervous

examinations were normal as well as examination of ipsilateral knee and hip.

X-rays revealed an oblique fracture of the femoral diaphysis with a third fragment (Figure 1). The ipsilateral hip X-rays were normal.

The intramedullary nailing was decided and performed in the same day. After locoregional anesthesia and installation on orthopedic table, fluoroscopic incidences of the femoral diaphysis were performed to verify the reduction of the fracture but also the state of the proximal and distal femoral epiphysis in search of associated fracture line.

During the procedure, trepanation was performed at the pisiform fossa under fluoroscopic control, successful at the first attempt. The passage of the guide rod and reamers with ascending diameter to size 12, 5 was achieved without difficulty. The introduction of the nail diameter 11 was performed without impaction. The difficulty arose with the proximal screwing. It was necessary to perform some impactions. The introduction of this screw was blocked despite proper drilling and tapping.



Figure 1: X-rays showing the diaphyseal fracture and the absence of femoral neck lesions.



Figure 4: X-rays showing the consolidation at the last control.



Figure 2: Post-operative X-rays showing fracture of the femoral neck.



Figure 3: X-rays showing the final treatment by a reconstruction nail.

The postoperative X-rays revealed the occurrence of a femoral neck fracture; the fracture line was distant from the point of introduction of the nail (Figure 2). The patient was reoperated the next day by the placement of a femoral reconstruction nail with 2 cervical screws (Figure 3).

Both fractures consolidated after 5 months. Total foot support was authorized in the 6 months and a return to previous activities after 7 months. At the last follow-up of 14 months, the patient had no clinical or radiological abnormalities (Figure 4).

DISCUSSION

Intramedullary nailing of the femur has become a common treatment of diaphyseal fractures and even a treatment of choice given many advantages such as conservation of the fracture hematoma and the reduction of the risk of infection. However, like any surgical procedure, it exposes to other known risks such as rotational disorders, nonunion and other rare risks like iatrogenic fractures of the femoral neck.^{3,4}

The iatrogenic fracture of the femoral neck during the femoral nailing remains a little-known complication and is rarely reported in the literature. We found only 25 cases reported (Table 1).

This complication is confusing with the femoral neck fracture associated to femoral diaphysis fracture. Indeed, this association appears in 2.5% to 6% of cases of femoral diaphyseal fractures and is diagnosed late in 19% to 31% of cases.¹⁰ Yang et al describe that X-rays is insufficient to detect an occult non displaced fracture of the femoral neck and propose the realization of a tomodynamometry of the hip or a fluoroscopic examination before the surgical act.⁸ In our case, this possibility of confusion has been ruled out by performing a digital good quality X-rays as well as fluoroscopic front and side views before surgery.

Table 1: Table describing all cases published in the literature relating to iatrogenic fractures of the femoral neck.

Year of publication	Authors	Number of cases	Théorie femoral neck fracture causes
1986	Harper ⁵	02	Bad introduction of nail with neck injuries
1988	Christie ³	04	Oblique position of the nail at the introduction with a point of entry too lateral in the trochanteric region
1989	Bostman ⁶	01	-
1994	Simonian ⁷	04	Anterior entry point Impaction of the medial edge of the nail holder on a valgum neck
1995	Khan ⁴	03	Forced use of the awl in the wrong direction Multiple introduction points into the trochanteric region that weakens the neck
1998	Yang ⁸	02	Awl Introduction in the great trochanter Nail impaction
1999	Deep ²	01	Neck fracture during the removal of a broken reamer
1999	Bonnevialle ⁹	03	-
2001	Apivattahakakul ¹	01	Neck fracture following the introduction of the nail with inverted curvature
2009	Castellanos ¹⁰	04	-
Total		25	

Although this intraoperative complication is poorly described, several authors have studied the issue and have tried to advance theories to avoid this incident. Harper reported 2 cases and relates this complication to the wrong direction of the nail during the introduction.⁵ Christie in his retrospective study reporting 4 cases on a series of 143 femoral nailing, links this incident to a lateral introduction point in the trochanteric region obliging the operator to introduce the nail obliquely.³ Simonian described 4 cases in a series of 315 femoral nailing and based on Miller's cadaveric studies to incriminate an anterior introduction point; he also identified the impaction of the prominent edge of the nail on a valgum neck (cervico-trochanteric angle greater than 135°) as the cause of this type of complication.^{7,11} Khan described 3 cases and incriminates the forced use of the curved awl in the wrong direction and the realization of multiple entry points.⁴ Castellanos described 4 cases in a series of 494 nailing and insists that the introduction of the nail from the pisiform fossa would be more adequate than the top of the greater trochanter.¹⁰

Thus, we found that in the majority of the writings, the authors revolve around errors related to the point of initial introduction or the introduction of the nail. But it also seems likely that the iatrogenic fracture of the cervix is not entirely due to an inappropriate point of introduction, excessive insertion depth, an oblique nail, or nail impaction. Deep and Apivattahakakul each reported respectively a clinical case related to the removal of a broken reamer and the insertion of a nail with inverted curvature.^{1,2} In the case we report here, the point of introduction was well at the level of the pisiform dimple and the nail was introduced without impaction. The difficulty arose during the setting up of the proximal

locking screw requiring some impactions, which suggests that this is the cause of the iatrogenic fracture of the femoral neck. This has never been described.

CONCLUSION

Intramedullary nailing as a treatment for femoral diaphyseal fractures remains a treatment of choice, however the surgeon must keep in mind that such complication can occur during all stages of nailing and that he must be vigilant and respect all steps of this procedure. We propose to avoid the kind of maneuver that can cause iatrogenic fracture of the femoral neck. A reboring of the cervical screw path would be more suitable and will avoid this incident.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Bouya A, Elghoul N, Zaddoug O, Bennis A, Benchakroune M, Zine A, et al. Iatrogenic femoral neck fracture: an unusual cause. *Int J Res Orthop* 2019;5:961-4.