

Closed retrograde retrieval of the distal broken segment of femoral cannulated intramedullary nail using a ball-tipped guide wire

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ABSTRACT

Background: Extracting broken segments of intramedullary nails from long bones can be an operative challenge, particularly from the distal end. We report a case series where a simple and reproducible technique of extracting broken femoral cannulated nails using a ball-tipped guide wire is described. This closed technique involves no additional equipment or instruments.

Materials and Methods: Eight patients who underwent the described method were included in the study. The technique involves using a standard plain guide wire passed through the cannulated distal broken nail segment after extraction of the proximal nail fragment. The plain guide wire is then advanced distally into the knee joint carefully under fluoroscopy imaging. Over this wire, a 5-millimeter (mm) cannulated large drill bit is used to create a track up to the distal broken nail segment. Through the small knee wound, a ball-tipped guide wire is passed, smooth end first, till the ball engages the end of the nail. The guide wire is then extracted along with the broken nail through the proximal wound.

Results: The method was successfully used in all eight patients for removal of broken cannulated intramedullary nail from the femoral canal without any complications. All patients underwent exchange nailing with successful bone union in six months. None of the patients had any problems at the knee joint at the final follow-up.

Conclusion: We report a technique for successful extraction of the distal fragment of broken femoral intramedullary nails without additional surgical approaches.

Key words: Ball-tipped guide wire, broken intramedullary nail, extraction, femur

INTRODUCTION

Intramedullary nailing of long bone fractures is an accepted technique with the advantages of not disturbing the fracture hematoma and the biomechanical superiority over plating.¹ However, problems with the nail are not infrequent, with broken nails and locking screws particularly posing a difficult problem for the orthopedic surgeon. Many techniques are described for extraction of

the distal broken intramedullary nail that require special equipment like olive wires or laparoscopic grabbers.¹⁻³ This equipment may not be always readily available which can make the process quite difficult.

We describe a simple reproducible method of extraction of the distal broken cannulated femoral nail fragment or broken reamers using a ball-tipped guide wire and a cannulated drill bit which are available in an orthopedic trauma unit (5 mm anterior cruciate ligament reconstruction reamer). We have successfully used this technique to extract broken cannulated intramedullary femoral nails and a cannulated reamer in eight patients.

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MATERIALS AND METHODS

Operative procedure

The patient is placed in the lateral position with the operating side up. Using the nail extraction instrumentation the proximal broken segment is removed with a surgical incision proximal to the greater trochanter. The intramedullary canal is then widened by reaming by about 2 mm beyond the diameter of the extracted nail. A standard intramedullary

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nailing guide wire mounted on a T handle inserted antegrade is then carefully negotiated into the cannulated distal nail segment under image intensifier [Figure 1a]. The guide wire is then advanced with the knee bent about 30 degrees to exit in the knee joint at roughly a point which corresponds to the entry point for a retrograde femoral nail [Figure 1b and 1c]. This is performed under image intensifier so as to accurately guide the wire to exit in the infrapatellar region without damaging the articular cartilage of the patella or the proximal tibia.

The wire is exited through the skin in the infrapatellar region with a small stab incision. A 5 mm cannulated Drill bit available from the anterior cruciate ligament reconstruction set is passed over the guide wire from the knee joint [Figure 2] and a track is created up to the distal tip of the broken nail [Figure 3a]. The plain guide wire and the cannulated drill are removed. Into the track created distal to the broken nail, a ball-tipped guide wire is then passed up from the knee with the plain end of the wire first [Figure 3b and 3c]. This wire is then advanced through the proximal surgical wound till the ball of the guide wire hitches against the distal end of the broken nail. The guide wire is then extracted from the proximal wound along with the broken nail [Figure 3d].

RESULTS

The technique was successfully used in eight patients, seven of whom had broken intramedullary femoral nails and one with a broken cannulated reamer [Table 1]. All procedures were performed between January 2008 and February 2010. The common fracture pattern identified in our series was a distal shaft fracture and the common site of nail breakage was the proximal of the two distal locking holes. All patients with broken nails underwent successful closed exchange reamed nailing with satisfactory outcomes [Figure 4]. The average operating time for exchange revision was 76 min (range 60-90 min). The mean time for successful bony union was six (range 4-9 months) months. None of the patients had any functional disability at the knee joint. This procedure entails opening the native knee joint, but a percutaneous stab incision is no larger than the joint dissection made by an arthroscopic portal. The articular cartilage is disturbed well away from the weight-bearing surfaces. All patients were briefed about the knee joint intervention and consented for the same. Our mean follow-up was 16 months (range 9-26 months) with no evidence of infection of knee joint.

DISCUSSION

Numerous techniques and their modifications have

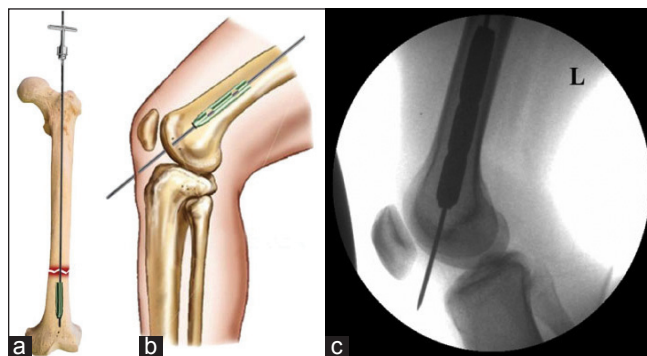


Figure 1: (a) Line diagram shows a plain guide wire negotiated into the cannulated distal nail segment. (b, c) Line diagram and fluoroscopy image shows guide wire exiting in the knee joint at the desired point

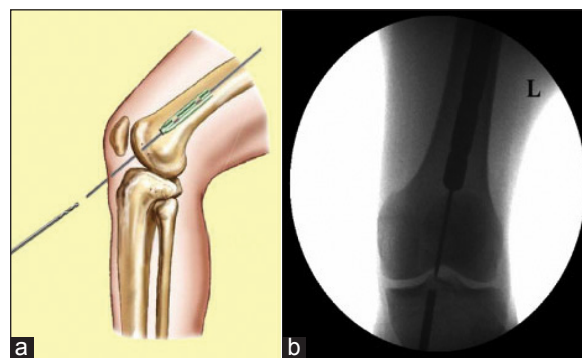


Figure 2: 5-mm cannulated drill passed over the guide wire (a) and the corresponding fluoroscopy picture (b)

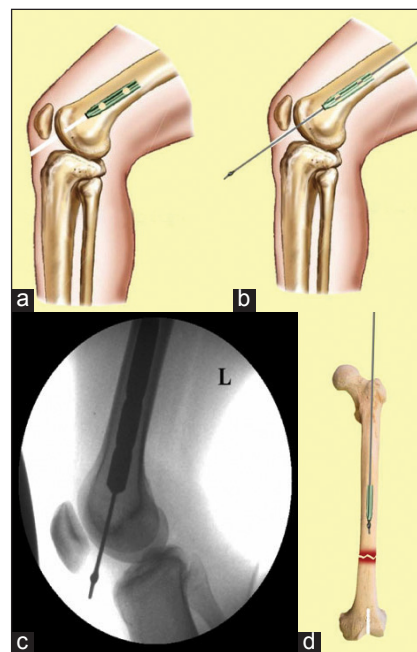


Figure 3: (a) Track created up to the distal tip of the broken nail with the cannulated drill. (b,c) Picture and fluoroscopy depiction of the ball-tipped guide wire passed up from below into the broken nail segment. (d) The ball-tipped guide wire extracted from the proximal wound along with the broken nail

been described in the literature for extracting broken intramedullary metalwork from the long bones.⁴⁻¹⁴ Our technique was successful in all the eight patients it was

Table 1: Clinical details of patients with retrieval of broken segment of intramedullary nail

Age	Sex	Type	Time to procedure in months	Operative time in min	Time to fracture union in months	Follow-up in months	Knee ROM at presentation in degrees	Knee ROM at final follow-up in degrees
35	Male	Broken IM nail	10	90	6	20	0-125	0-120
32	Male	Broken IM nail	22	78	5	26	0-140	0-140
45	Male	Broken IM nail	8	96	9	18	0-130	0-130
58	Female	Broken IM nail	9	85	8	12	0-110	0-110
27	Male	Broken IM nail	12	75	6	10	0-135	0-130
38	Female	Broken IM nail	14	100	7	24	0-130	0-130
27	Male	Broken IM nail	10	115	4	9	0-130	0-120
42	Male	Broken Reamer	not applicable	76	not applicable	10	0-130	0-130

ROM = Range of motion



Figure 4: (a) Anteroposterior and lateral view of femur with knee joint showing distal broken intramedullary implant (b) anteroposterior view of distal femur with knee showing exchange of implant after removal of distal broken part of nail with same technique

used. The technique is simple and does not demand any additional surgical equipment or instruments than those that are routinely available in any orthopedic trauma operating suite. The surgical incision is the same as that which would be used for the purpose of exchange nailing that follows the removal of the broken nails in most cases. None of the patients had any disability from the knee intervention. A recent publication about antegrade extraction of broken femoral nails where the nail exited through the knee joint showed that even in the long term, none of the patients experienced functional impairment of their knees nor had progression of osteoarthritis.¹⁵

We had few situations that required a supplementary procedure. One was a broken distal nail which was filled with bony debris at the unused locking hole not allowing the guide wire to pass through. In this case, through a small lateral thigh incision, a 4-mm Schanz pin was used to clear the debris and allow the guide wire to be passed. Another situation was a nail with a larger cannulation allowing the beaded tip to pass through and not engage the nail tip. A plain guide wire was then used along with the beaded wire; a technique described by Blake.¹⁶ Pulling on the beaded

guide wire causes it to impinge against the non-tipped wire and the outer tip of the nail aiding extraction of the nail. It is common to come across a scenario in which the broken distal nail segment lies at an angle to the long axis of the femur. In this case the initial plain guide wire passed through a cannulated rigid reamer is aligned with the broken nail. The guide wire can then be carefully maneuvered into the hollow of the nail segment, bringing it in line with the medullary canal and the procedure then completed as described earlier.

Our technique is a simple reproducible alternative that does not disturb the bone healing site and is performed through a mini arthrotomy.

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