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# Case 2: 40 Degree Femoral Procurvatum Deformity Treated with Internal Fixation

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## Abstract

A 24 year old healthy male had a motor vehicle accident (MVA) in 2001 at age 11 resulting in an open right femur fracture. It was treated with an external fixator with no deformity correction. The femur healed in 40° of flexion causing hip and knee pain and a 4.5 cm limb length discrepancy. A first stage of femoral deformity correction was performed. In a second stage, femur lengthening will be offered using an intramedullary motorized nail. A fixator-assisted nailing was performed for the first stage, achieving a good clinical and radiographic outcome.

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## 1 Brief Clinical History

This is a healthy 24 year old male that had a (MVA)13 years ago with an open femoral fracture. Multiple surgeries were performed at that time that included debridements and a static monolateral external fixator. No deformity correction was performed at that time. He developed a femoral malunion: 40° of femur procurvatum and a 4.5 cm leg length discrepancy. The patient presented with knee and hip pain that had been ongoing for several years. A fixator-assisted nailing was offered and accepted by the patient. The leg length discrepancy correction will be performed in the near future using an intramedullary motorized nail.

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## 2 Preoperative Clinical Photos and Radiographs

See Figs. 1 and 2.

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## 3 Preoperative Problem List

1. Right femur 40° procurvatum deformity
2. 4.5 cm limb length discrepancy
3. Sciatic nerve at risk

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**Fig. 1** Standing 51" hip-to-ankle X-ray. Mechanical alignment is within normal limits, Note the patient has a 5 cm block under his right foot in order to level his pelvis



**Fig. 2** Lateral X-ray of the right femur demonstrating an apex anterior mid-diaphyseal deformity

#### 4 Treatment Strategy

1. Peroneal nerve release (do not close the wound, monitor nerve tension during surgery)
2. Open wedge resection (location and size previously planned)
3. Proximal fragment reaming
4. Distal fragment reaming through osteotomy
5. Nail insertion
6. Autograft application (from resected wedge)

#### 5 Basic Principles

The surgical planning should consider a wedge with an angle equal to the angle to correct. Its apex should be located posteriorly in the bone (closed wedge) to keep the bone length. In case a concern of sciatic nerve stretching exists, the apex should be located at the posterior soft tissues (trapezoid bone wedge). In that case, less nerve stretching will take place. Temporary anterior and lateral external

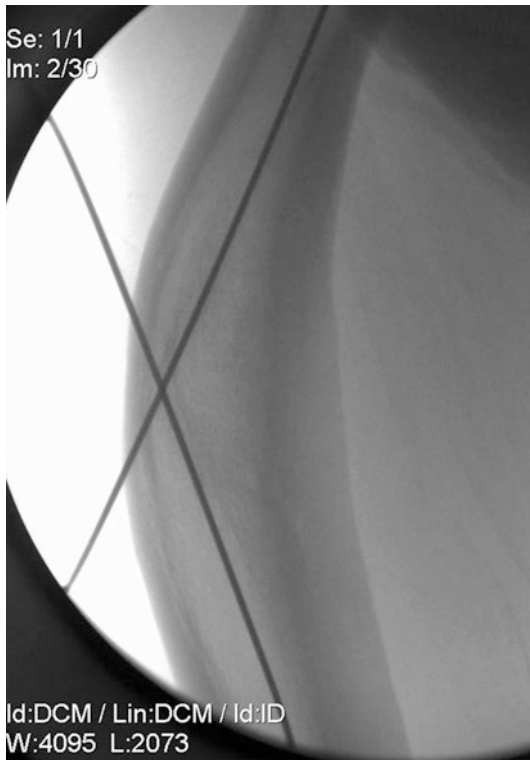
fixation (fixator-assisted nailing) is an option during the surgery to help with reduction and maintain rotational alignment (not used in this case). A lengthening will be performed at a second stage as needed to achieve femoral length equality. An alternative would have been to do a percutaneous osteotomy and perform a gradual correction using a Taylor spatial frame. However, following patient desires to avoid external fixation, a staged procedure was elected as the treatment method.

#### 6 Images During Treatment

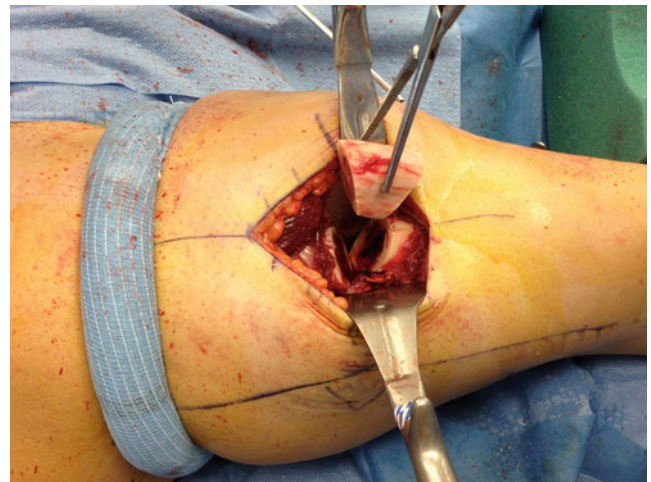
See Figs. 3, 4, 5, 6, 7, and 8.

#### 7 Technical Pearls

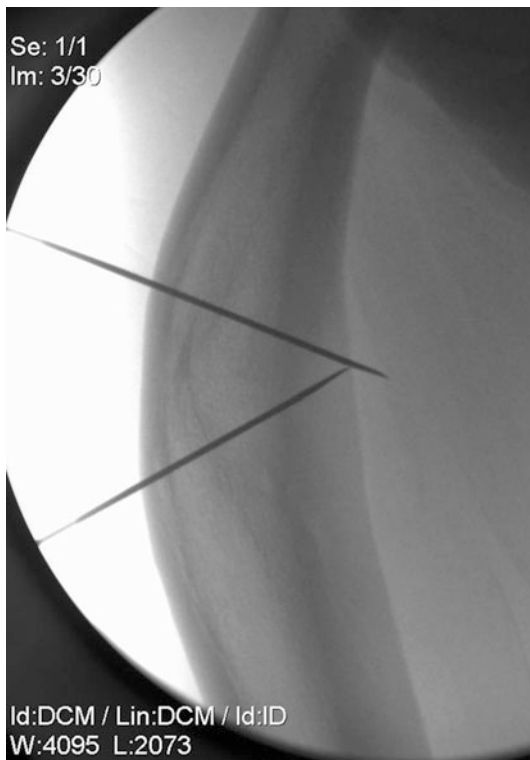
1. Plan pre-operatively your closing wedge resection according to the deformity.



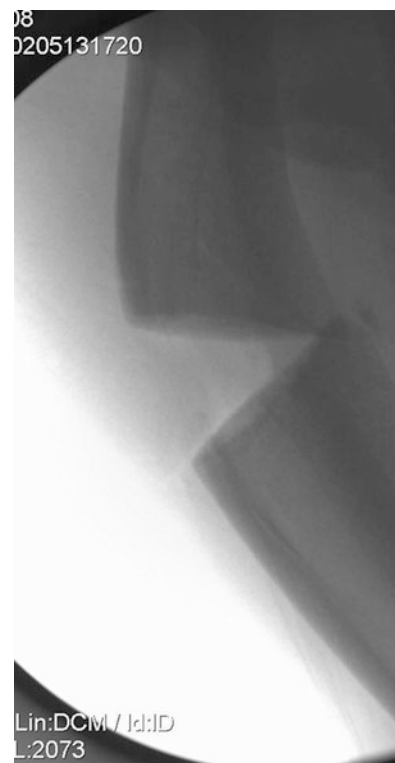
**Fig. 3** Intra-operative location of apex



**Fig. 5** Clinical picture of wedge resection



**Fig. 4** Wedge design



**Fig. 6** Wedge resected

2. Perform a peroneal nerve release, and do not close the wound until the end of the procedure. This helps monitor the sciatic nerve tension during the reduction maneuver.
3. Ream the distal bone segment through the osteotomy site in case of sclerotic bone. If not, a regular antegrade reaming can be performed.



**Fig. 7** Closing wedge

4. Countersink the nail 0.5 cm in the insertion site proximally. Then, place the distal locking screws. After the locking screws are in place, perform a backslapping of the nail using the extractor jig of the nail. This will help compress the osteotomy site.

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## 8 Outcome Clinical Photos and Radiographs

See Figs. 9, 10, 11, and 12.

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## 9 Avoiding and Managing Problems

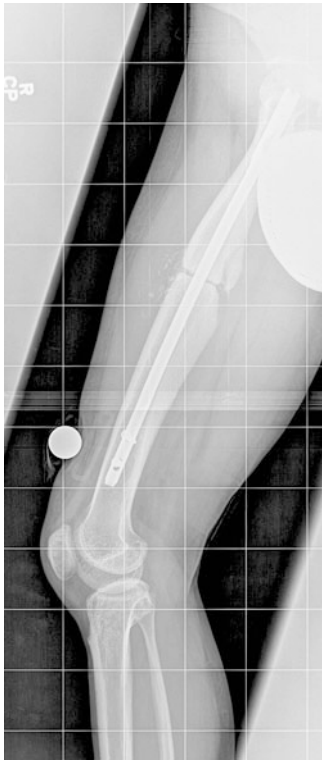
Doing a closing wedge resection is less likely to cause nerve damage. In cases of severe long-term deformity, it is advisable to perform peroneal nerve release at the proximal tibia at the beginning of the surgery to decompress and monitor the nerve tension. If there is a concern of sciatic nerve palsy, locate the apex of the bone wedge at the posterior thigh soft tissues to ensure that the sciatic nerve



**Fig. 8** Nail insertion



**Fig. 9** Right AP femur 1-month post-operative



**Fig. 10** Right lateral femur 1-month post-operative



**Fig. 12** Right lateral femur 1-year post-operative



**Fig. 11** Right AP femur 1-year post-operative

is not changing its length. With this planning, a trapezoid instead of a triangle will be removed from the femur. This will slightly shorten the extremity.

## 10 Cross-References

- ▶ [Case 6: A 10 cm Traumatic Femoral Defect Treated with a Transport Technique Followed by a Lengthening Procedure. Sequential Use of a Monotube External Fixator and an Intramedullary Rod](#)
- ▶ [Case 7: A 12 cm Traumatic Femoral Defect Treated with a Long Oblique Diaphyseal Femoral Osteotomy and Lengthening Over a Nail](#)

## References and Suggested Reading

- Boopalan PR, Sait A, Jepeganram TS, Matthai T, Varghese VD (2014) The efficacy of single-stage open intramedullary nailing of neglected femur fractures. *Clin Orthop Relat Res* 472(2):759–764
- Gahukamble A, Nithyananth M, Venkatesh K, Amritanand R, Cherian VM (2009) Open intramedullary nailing in neglected femoral diaphyseal fractures. *Injury* 40(2):209–212
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