# Antegrade Femur: Step by Step

**Internal Lengthening Nail Course**
**Baltimore Deformity Precourse**
**Baltimore, MD; August 27, 2015**


**S. Robert Rozbruch, MD**

Chief, Limb Lengthening & Complex Reconstruction Service
Professor of Clinical Orthopedic Surgery

# Disclosures

Ellipse: Consultant

Stryker: consultant and royalties

Smith and Nephew: consultant

# Technical Details:

### Intramedullary Nails

Diameter 8.5, 10.7 and 12.5 mm
Sizes 215–365 mm

### Telescoping Rod Diameter (Male)

3.5 mm = 6.5 mm
10.7 mm = 8.5 mm
12.5 mm = 10.0 mm

### Locking Screws

3.5 mm Locking Screws
Length = 20–60 mm

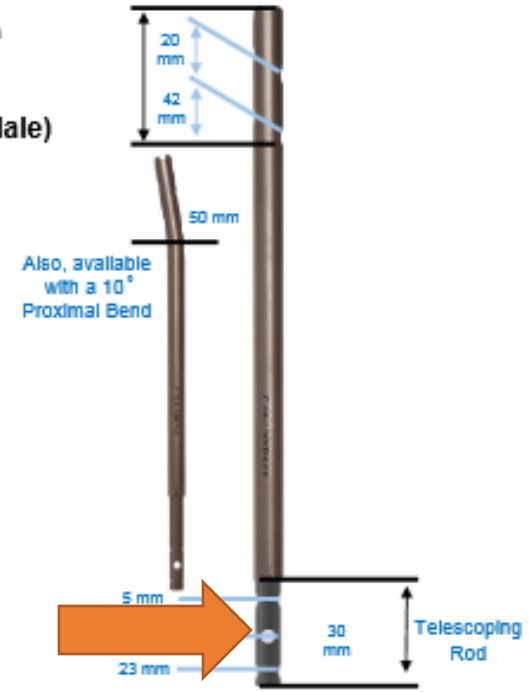
4.0 mm Locking Screws
Length = 20–60 mm

5.0 mm Locking Screws
Length = 20–75 mm

### End Cap

Sizes Standard

**Antegrade Femur**




**Retrograde Femur**


- 8.5 mm nails have a proximal geometry of 10.7 mm located 40 mm from the top of the nail.
- 10.7 mm and 12.5 mm nails have a consistent diameter throughout.

PRECICE

# Implant Selection

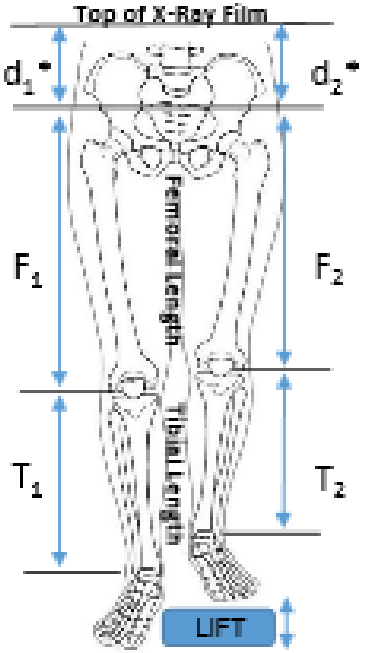

**2 Options:**

1. Trochanteric Entry
2. Piriformis Fossa Entry

Piriformis for greater than age 18

Trochanteric entry for less than 18

# Limb Length Discrepancy Calculation



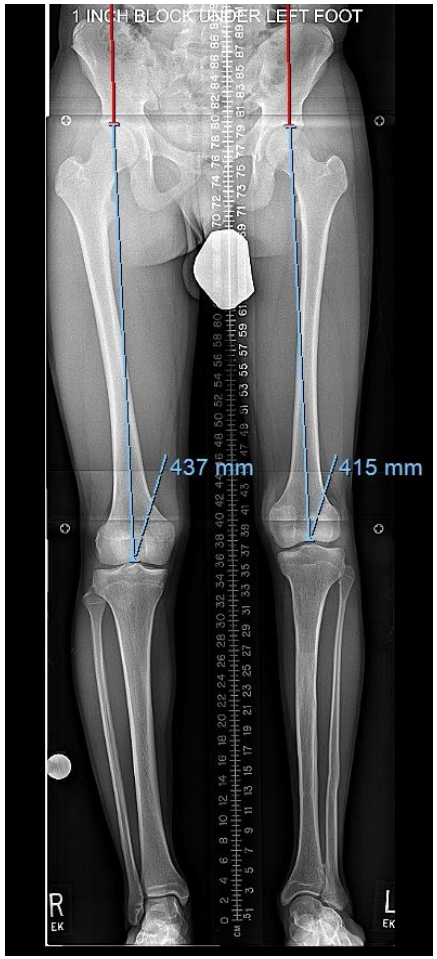

| Contralateral Limb (mm) | | Treatment Limb (mm) | |
|---|---|---|---|
| $d_1$= | | $d_2$= | |
| $F_1$= | | $F_2$= | |
| $T_1$= | | $T_2$= | |

* $d_1$ and $d_2$ are measured from the sacroiliac (SI) joint line reference line to the top of the x-ray image; use a magnification marker on x-ray to ensure accurate measurements

Limb Length Discrepancy = ($d_2$-$d_1$) + LIFT =

Assess LLD

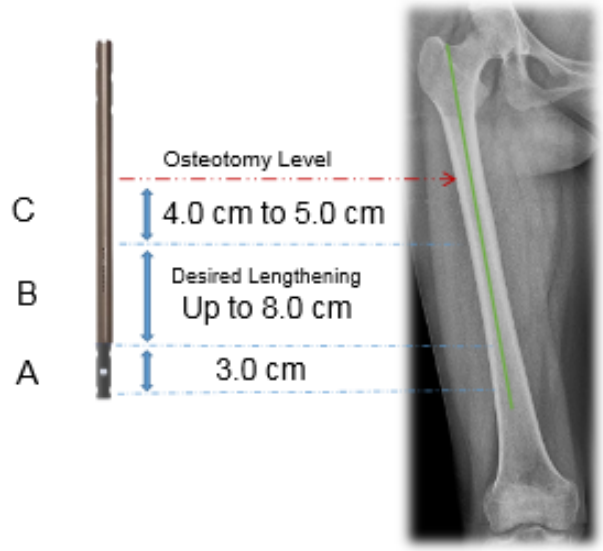
Understand source Of LLD




LLD 30 mm

Femur LLD= 22 mm

# Osteotomy Calculation




Calculate the following to determine the measurement from the distal end of the implant.

A) 3.0 cm (distal distraction rod length).
B) The desired amount of bone lengthening (up to 8.0 cm).
C) Add an additional 4.0 cm to 5.0 cm.

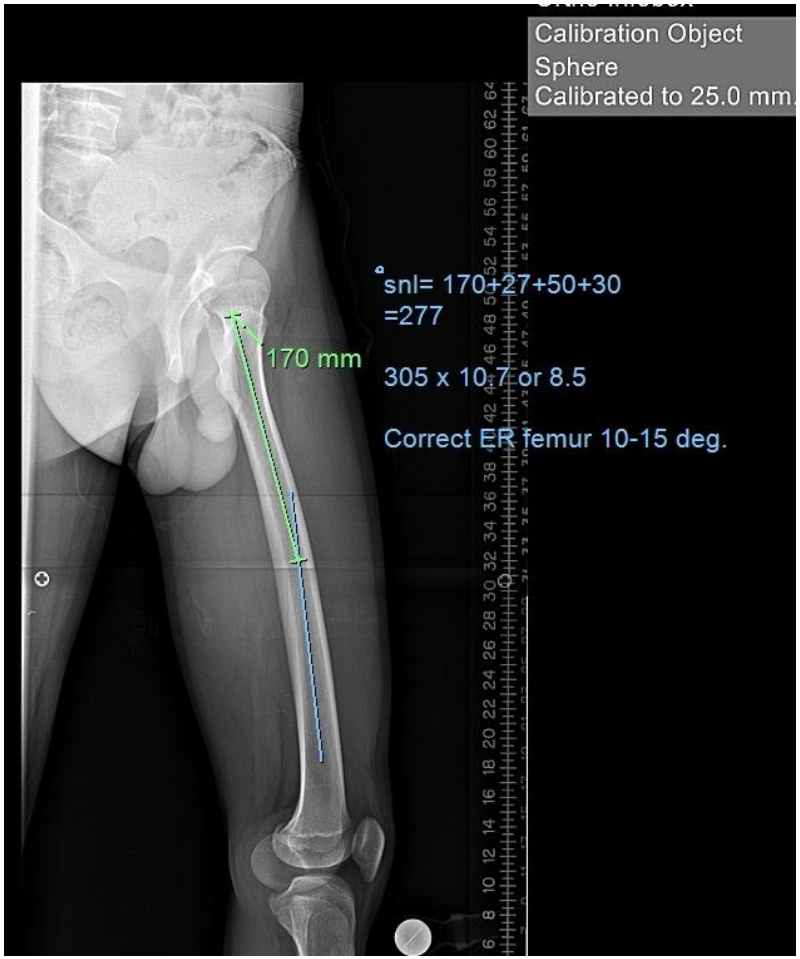
**A + B + C = Measurement from the Distal End of the Implant to Perform Osteotomy.**

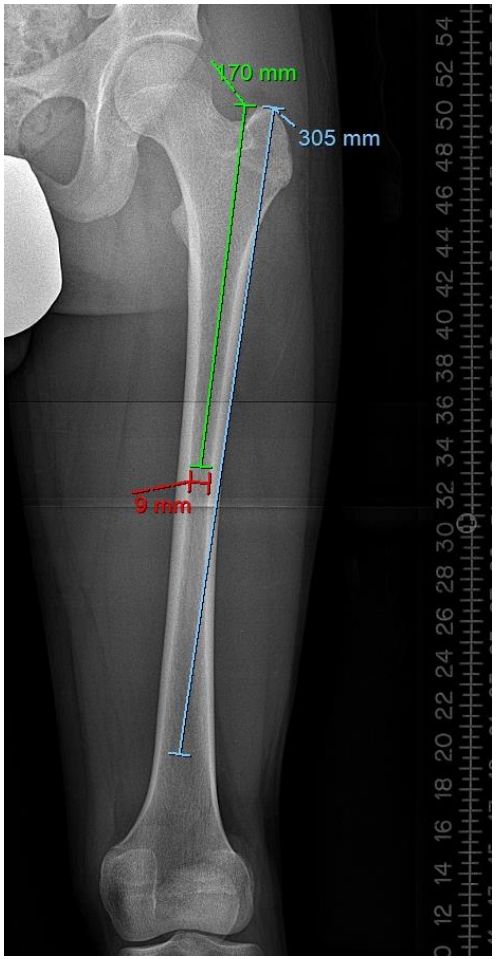
This measurement determines the suggested level of the osteotomy.

Rod is pulled out of Distal fragment as Lengthening proceeds

Goal is to have 5 cm in Distal segment at end of Lengthening

Distal thin tip starts At 3 cm




SNL= osteotomy + lengthening + 50 + 30

# STEP : Patient Positioning


Supine on a radiolucent table with a bump under the ipsilateral buttock

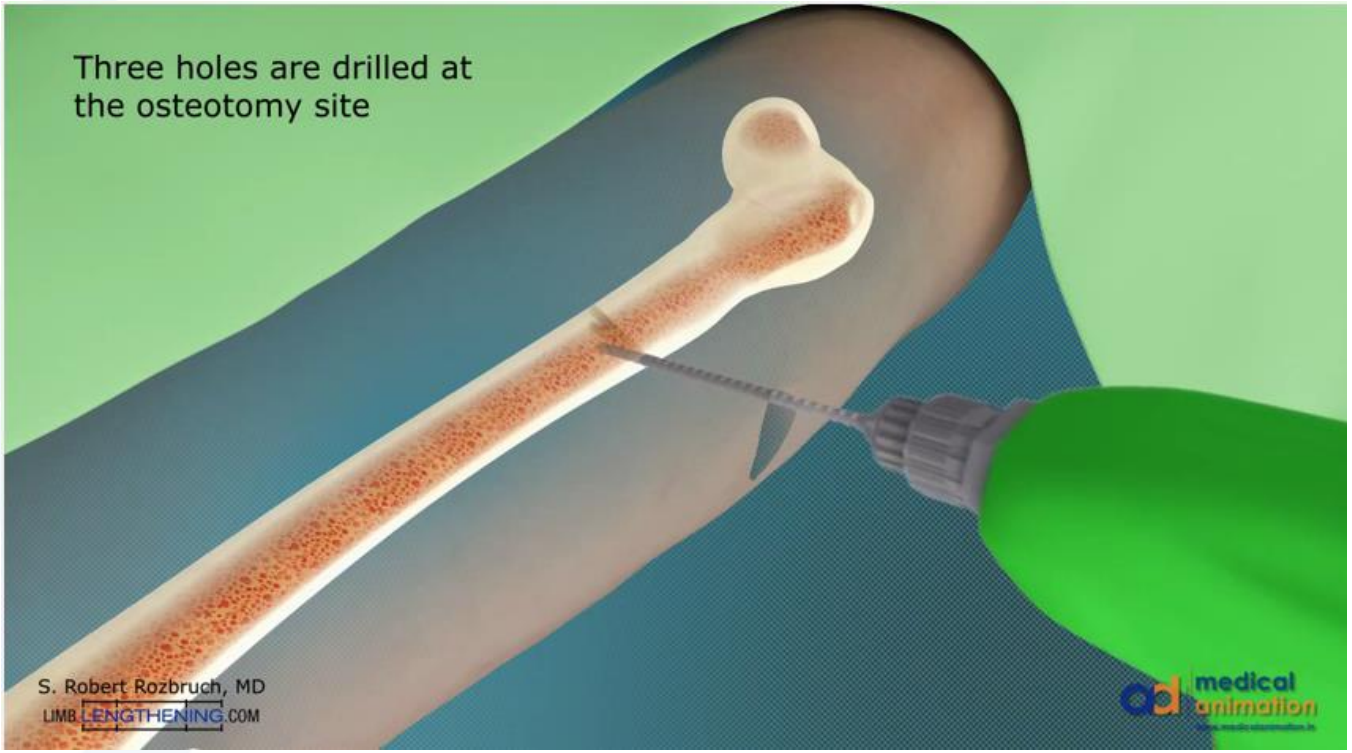
# STEP : Surgical Incision

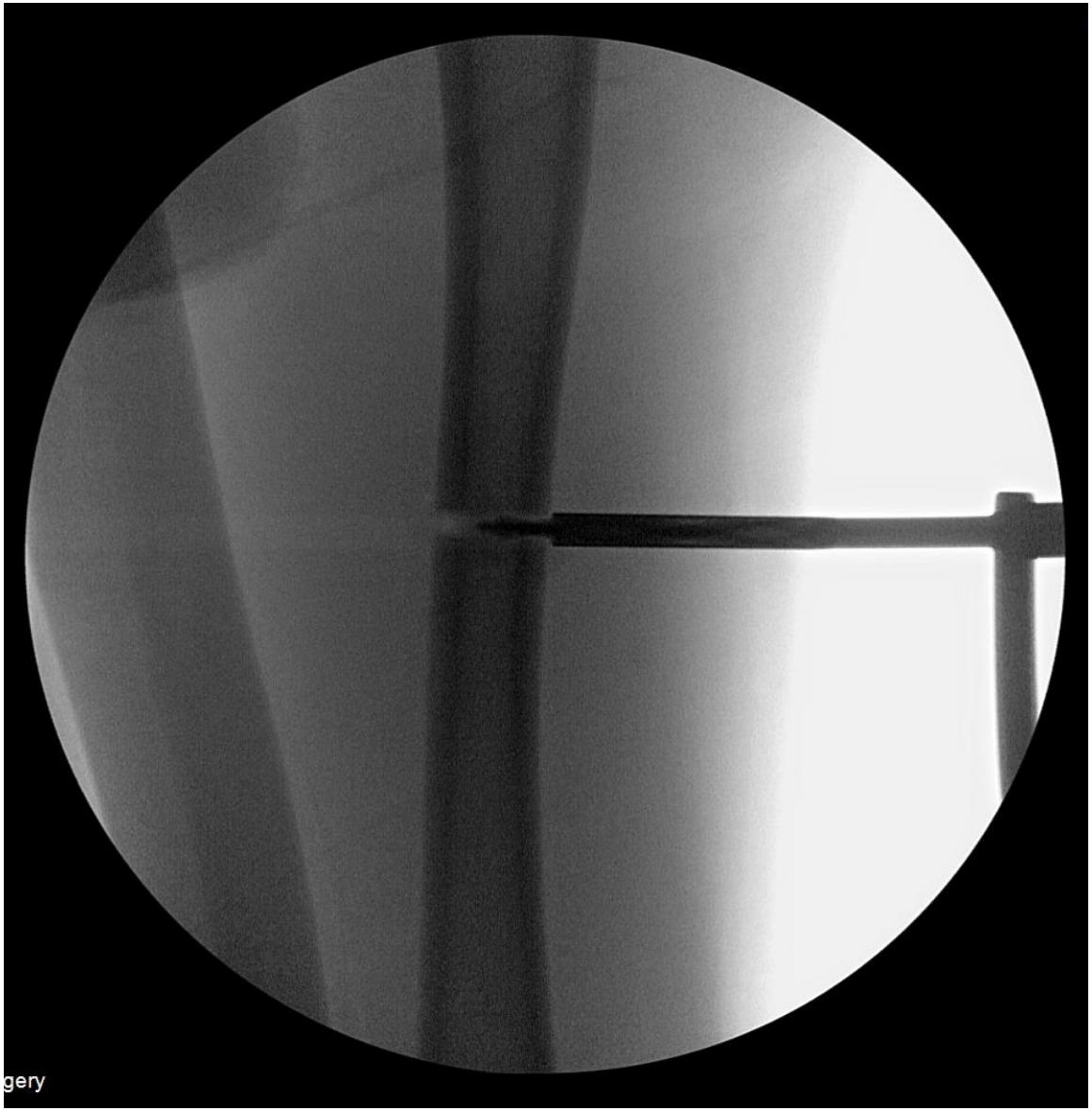


Locate entry point and make 1.5 cm longitudinal incision for drill bit venting*.

*Drill bit venting is conducted at the level of the coriticotomy to decrease intramedullary pressures during reaming as well as facilitate bone grafting of the corticotomy site with bone reamings

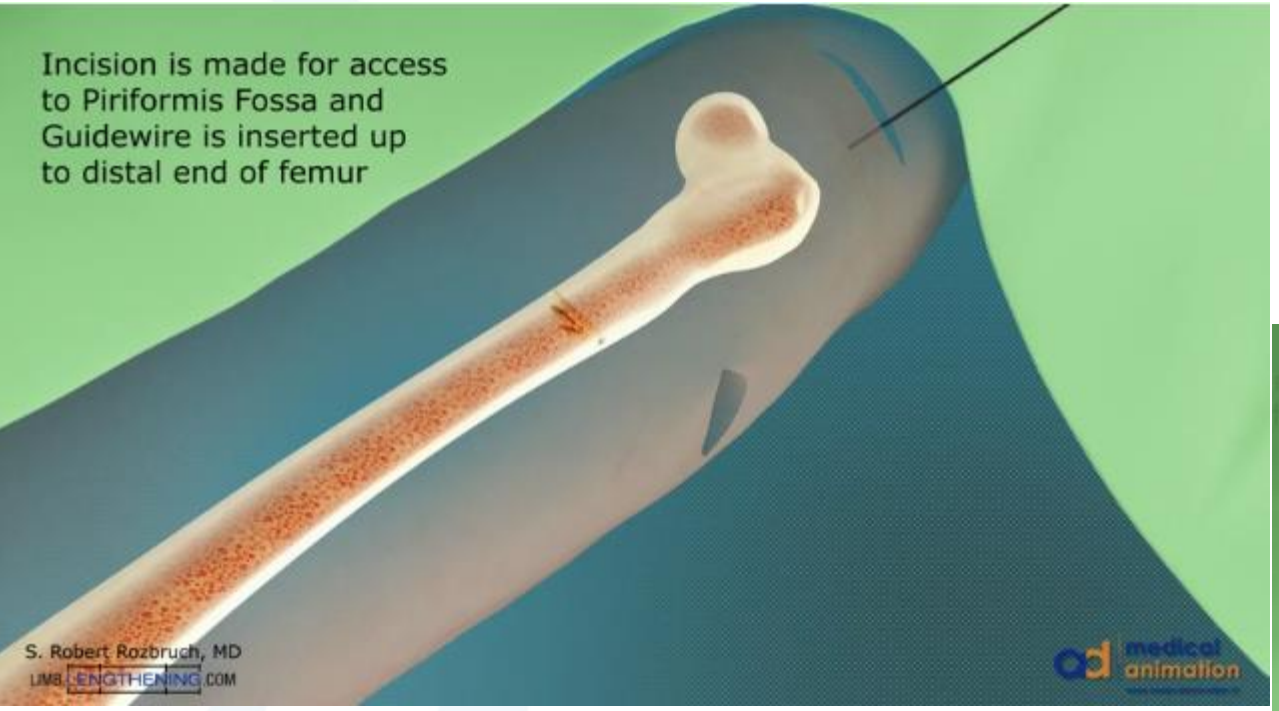
# STEP : Venting of the Femoral Intramedullary Canal and First Step of the Osteotomy

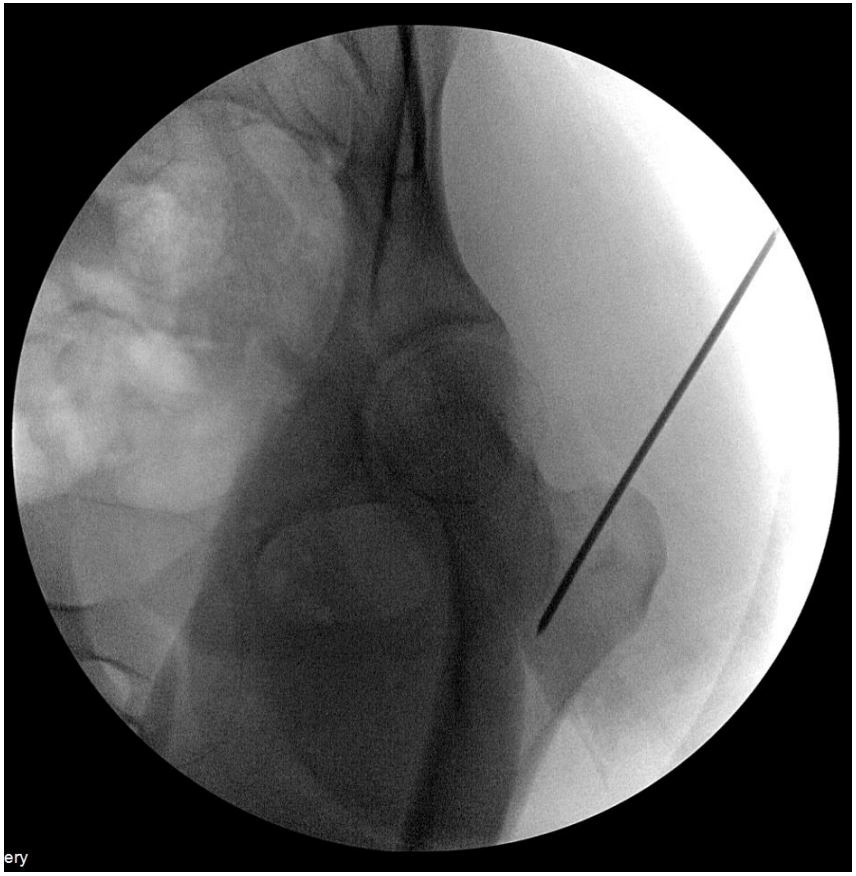




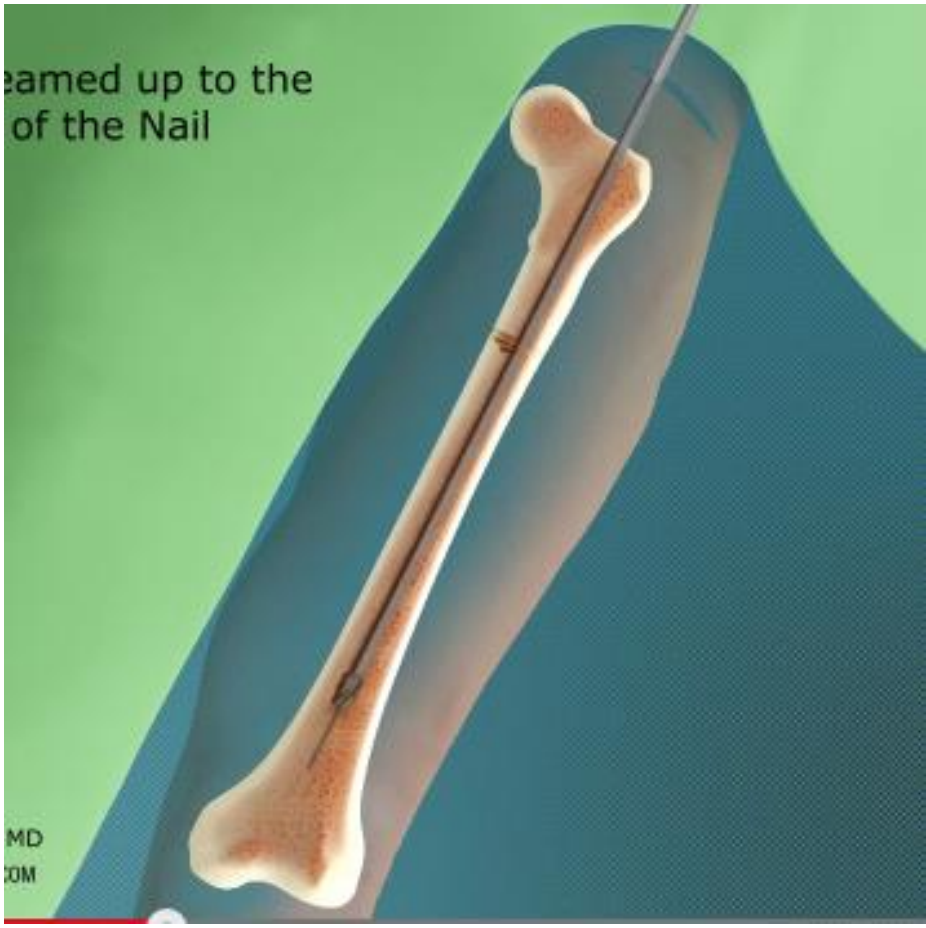

4.8 mm
New drill

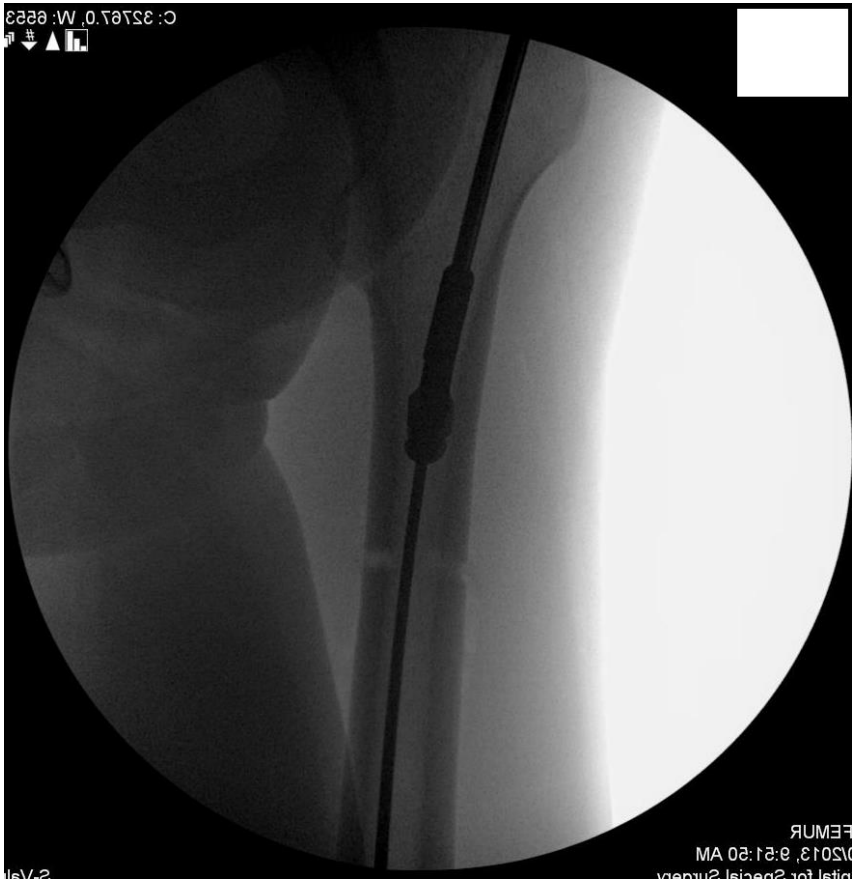
# STEP : Guidewire Insertion



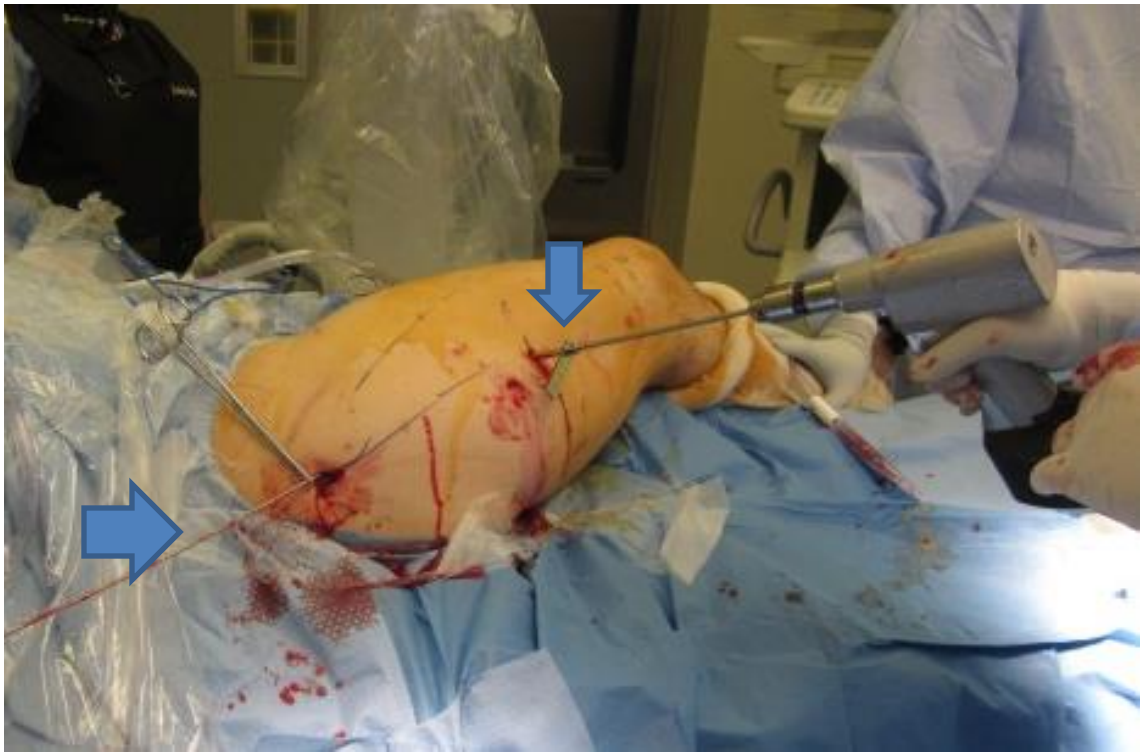



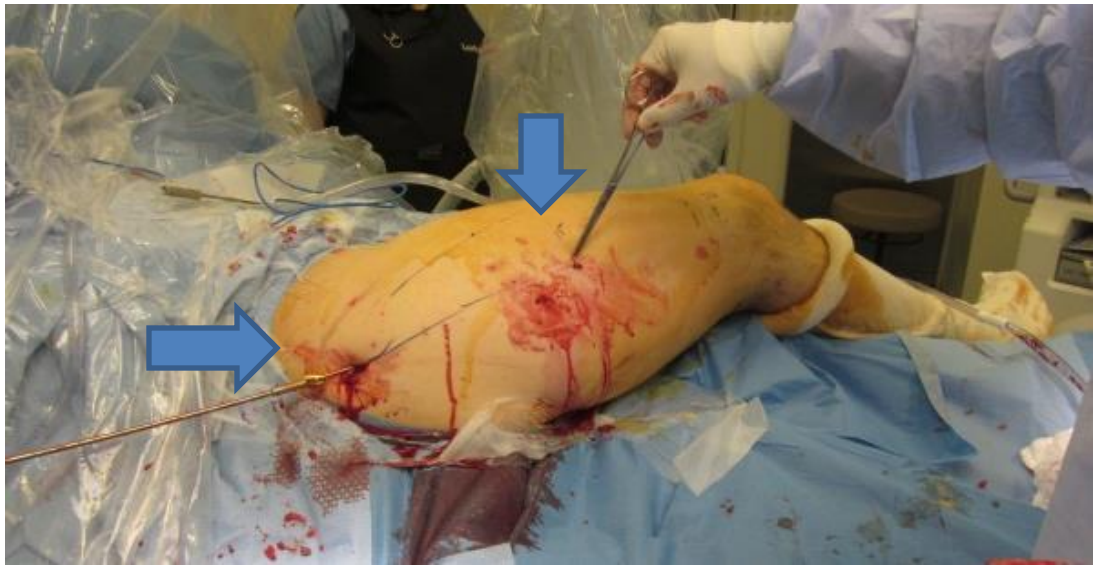
# STEP : Intramedullary Reaming

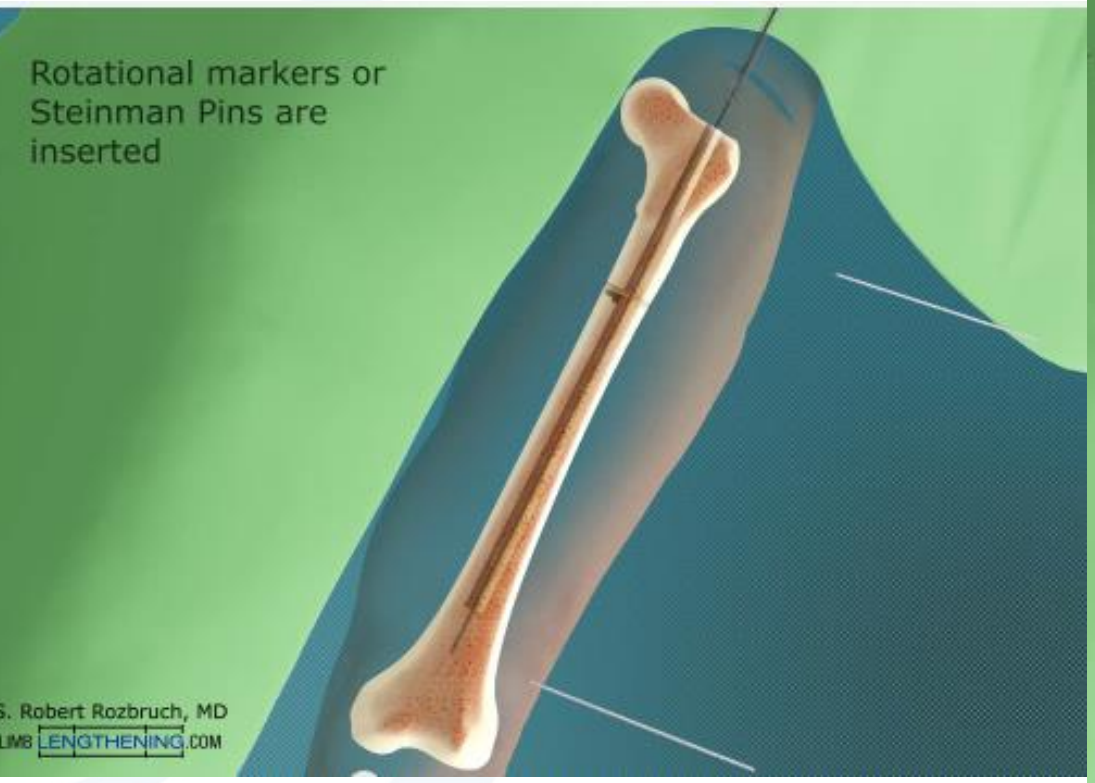


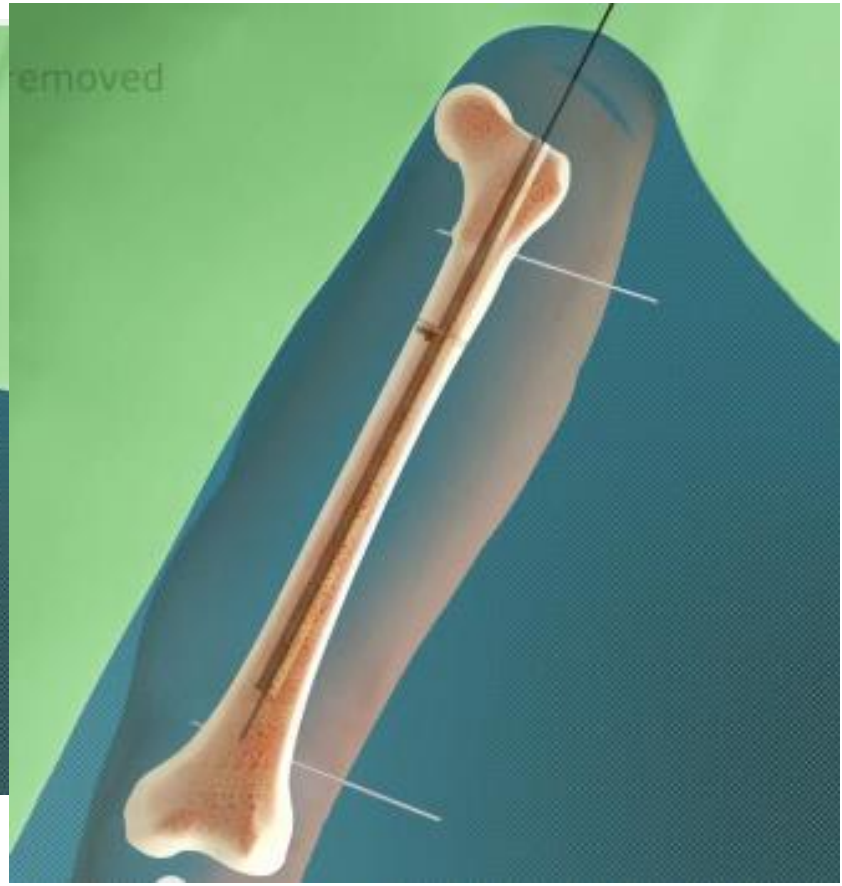
Ream 2 mm larger than nail diameter





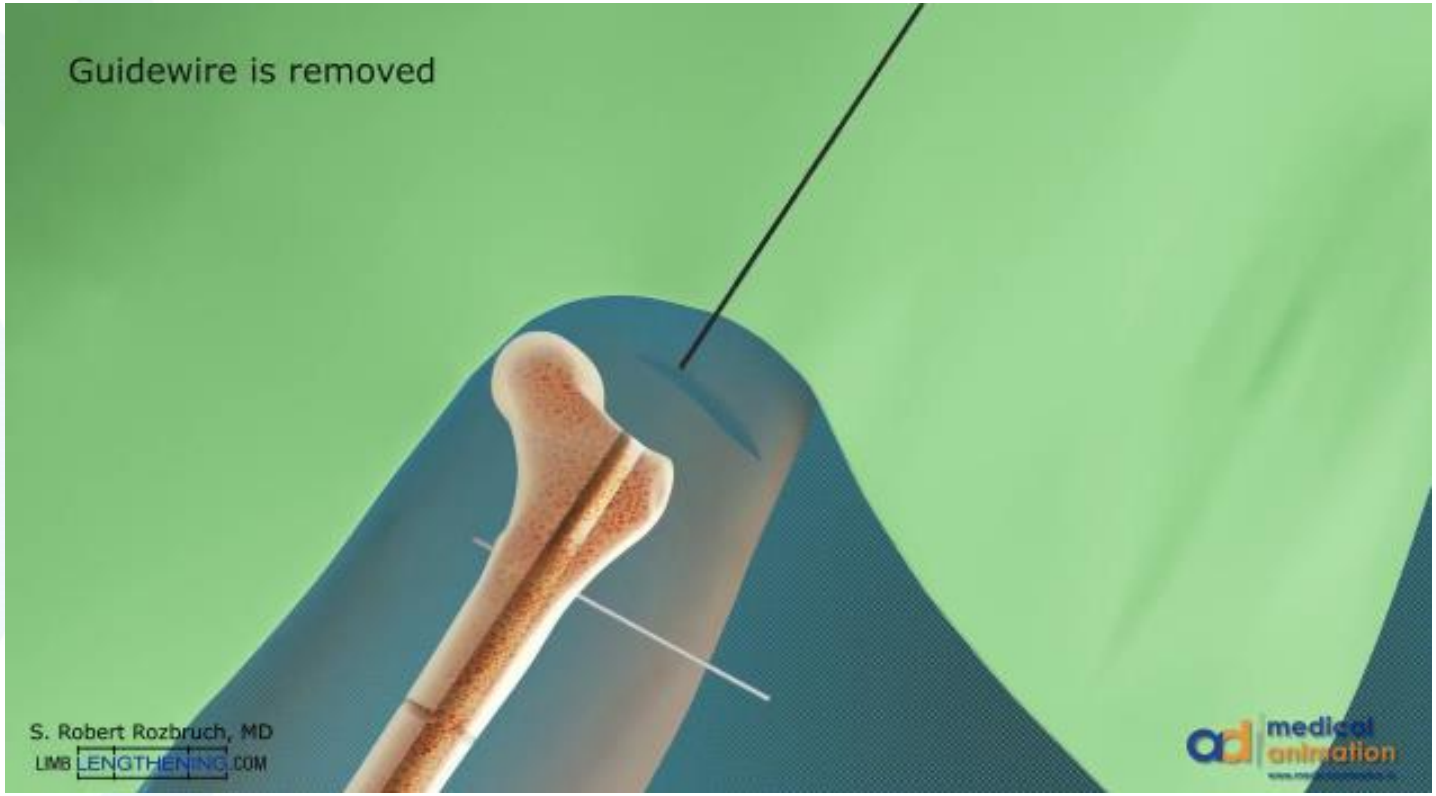
# STEP : Rotational Markers Insertion



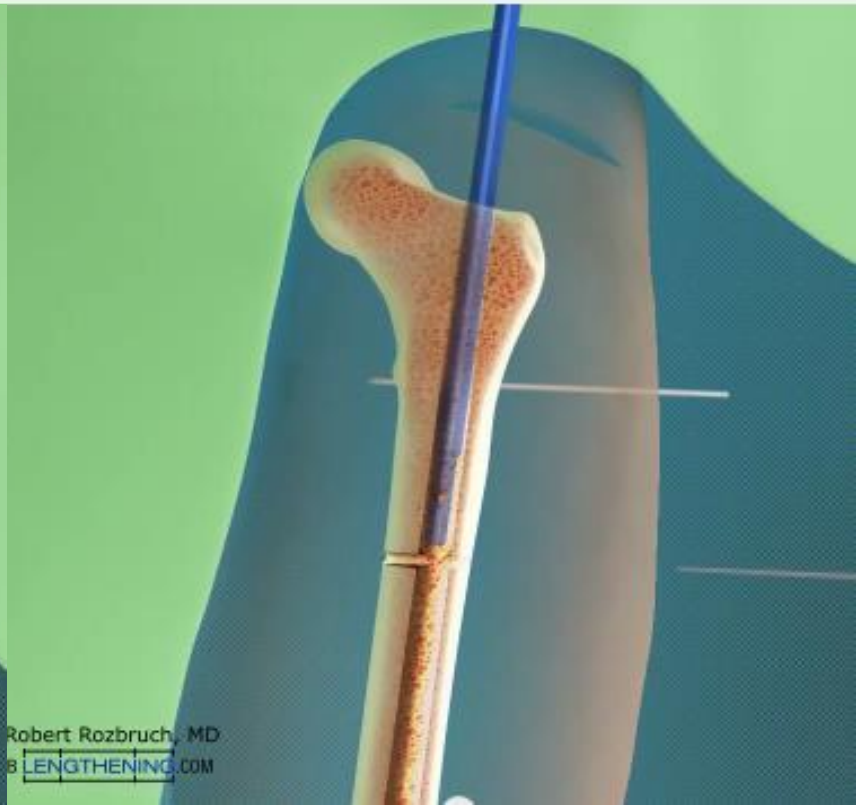

Rotational markers or Steinman Pins are inserted out of the path of the nail.

# STEP : Guidewire Removal



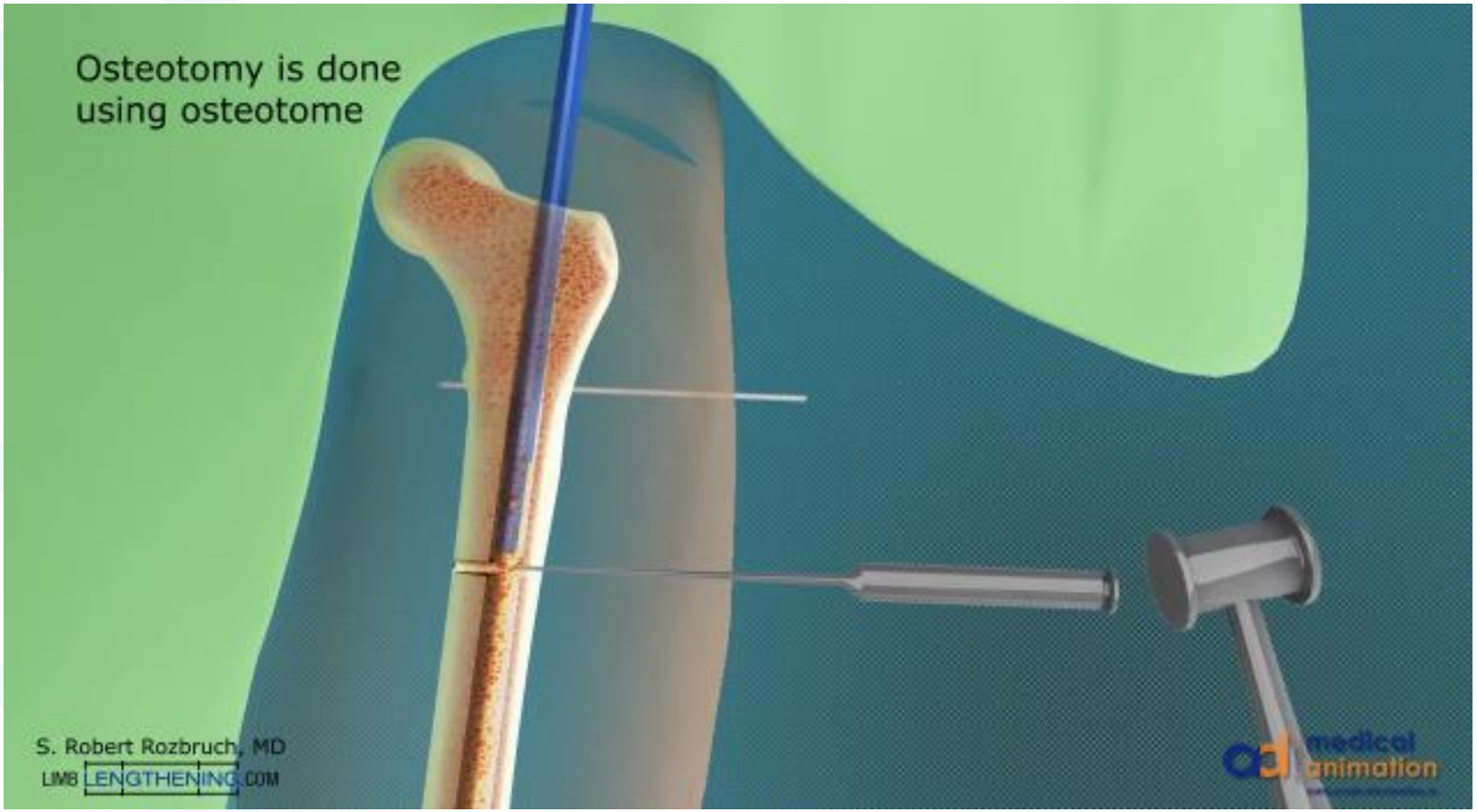

Lengthening nails is solid

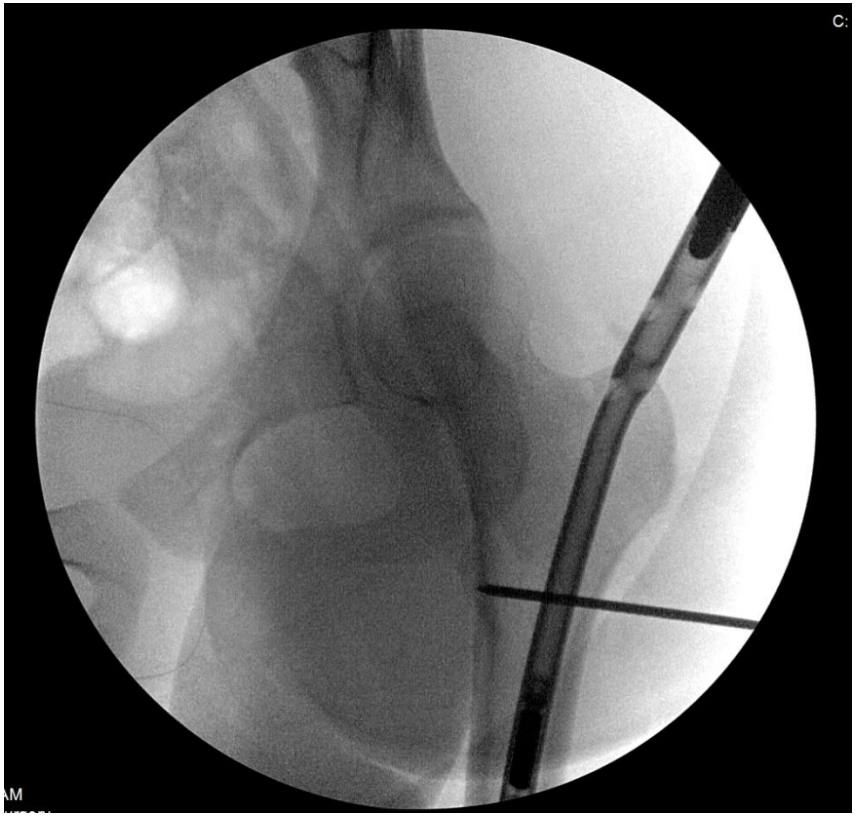
# STEP : PRECICE Nail Insertion

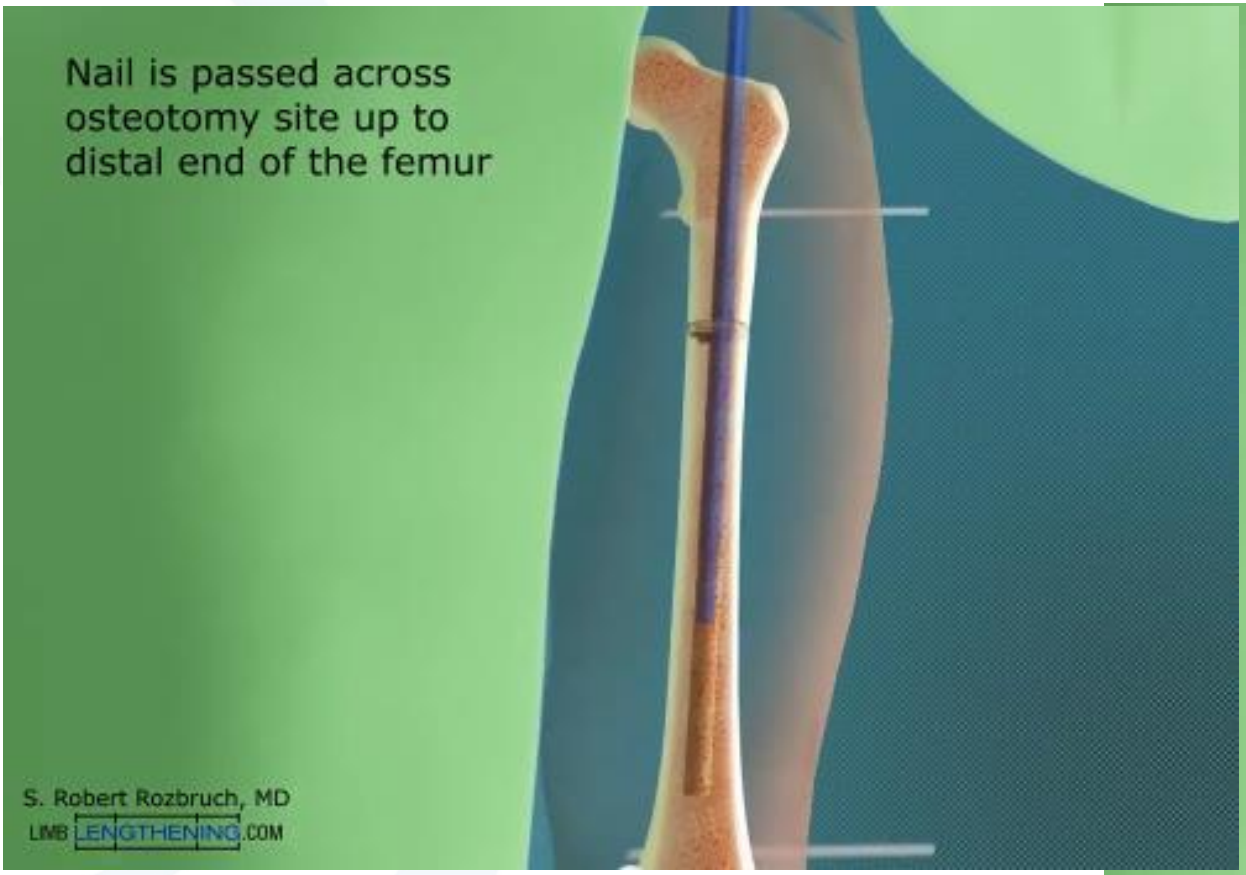

Insert PRECICE Nail with use of assembled Antegrade Femoral Guide Arm

# STEP : Complete Osteotomy of the Femur





# STEP : Complete PRECICE Nail Insertion



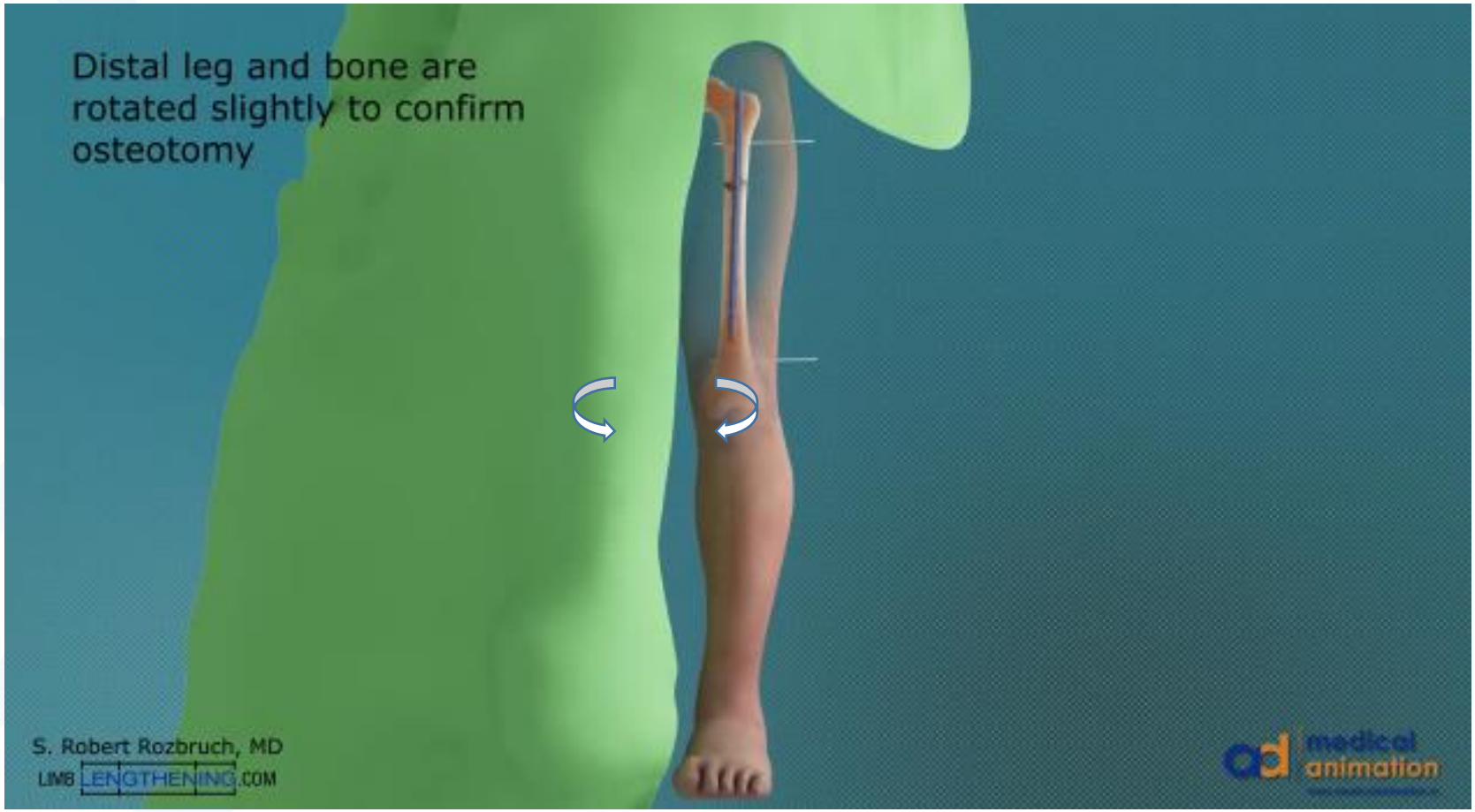

Advance PRECICE implant across gap and into distal femur


C: 32

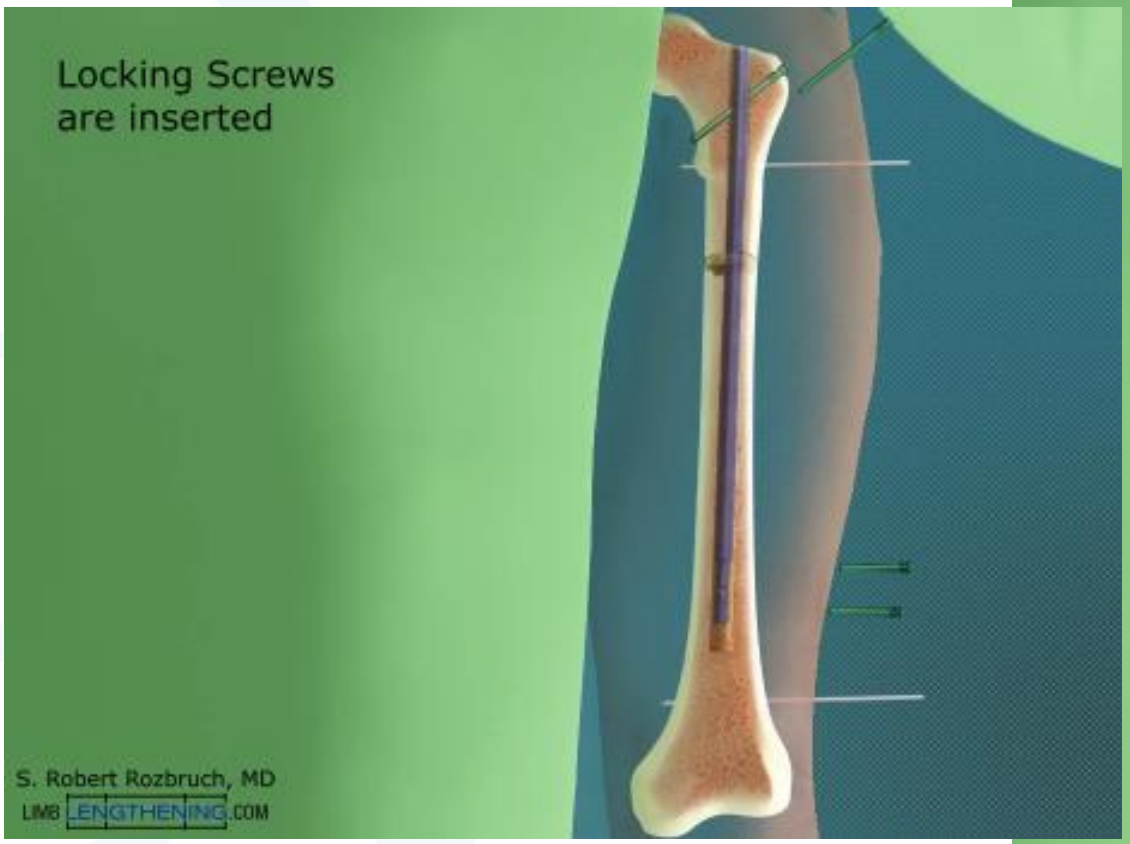
Straighten anterior bow by lifting leg

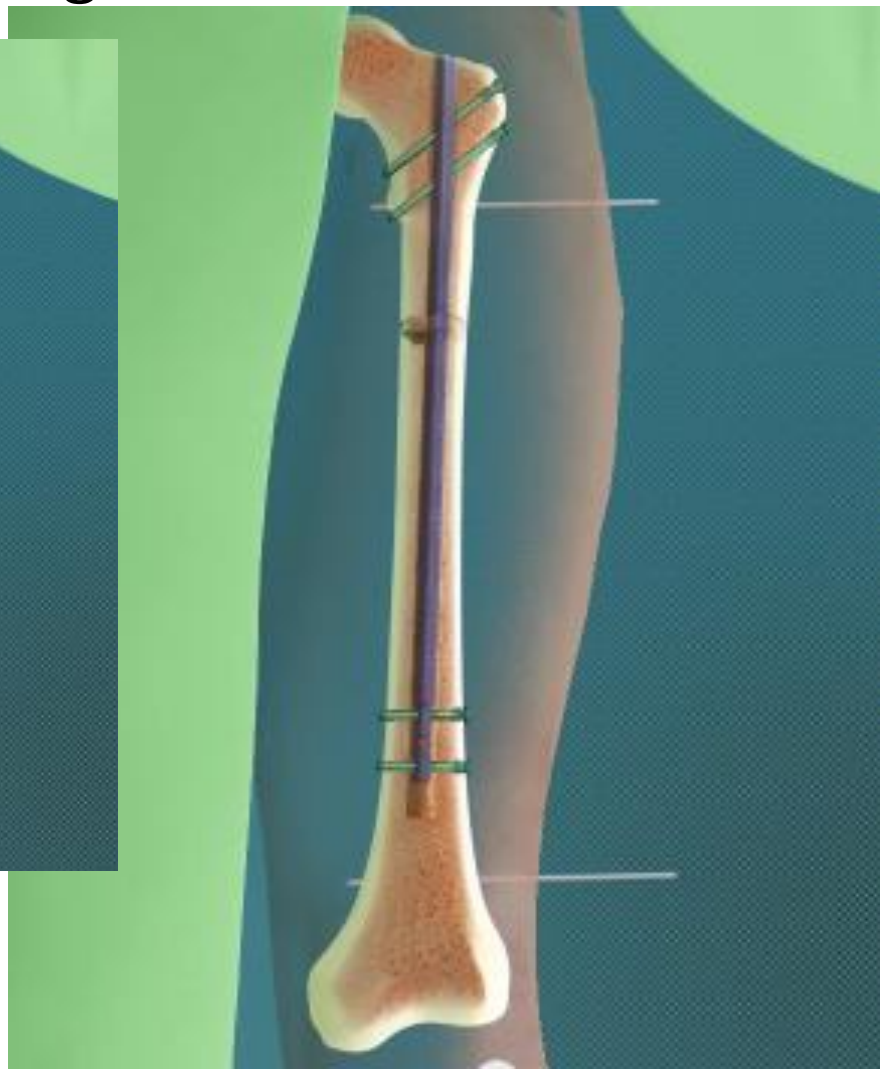
Resist tendency for femur to go into varus with Manual pressure

# STEP : Osteotomy Confirmation

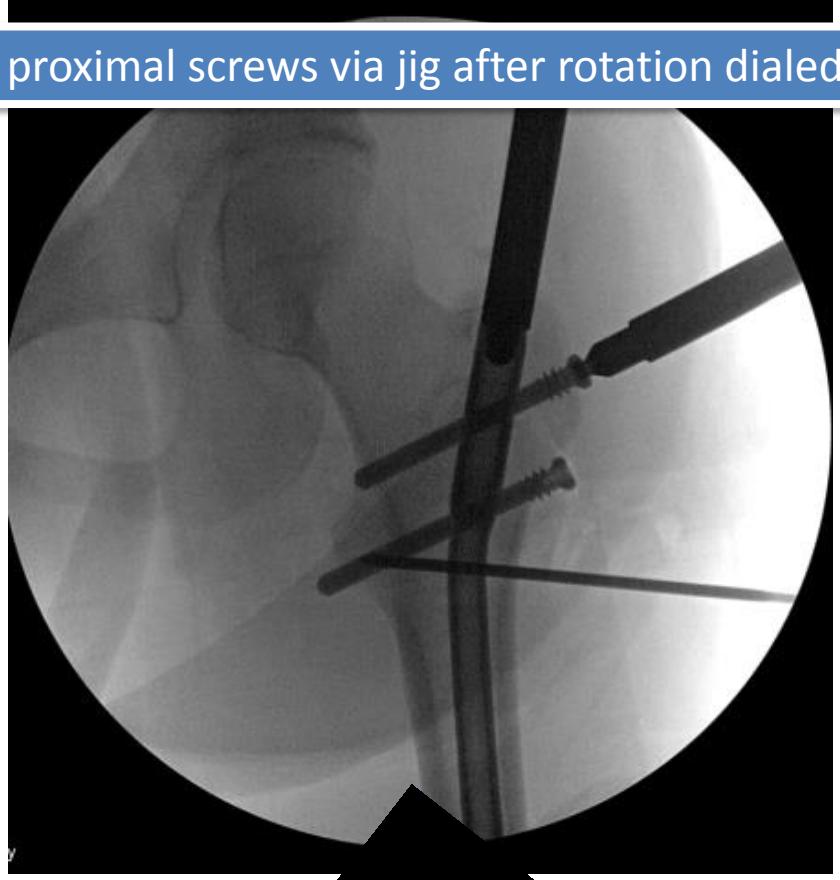


# Proximal and Distal Locking Screws Insertion

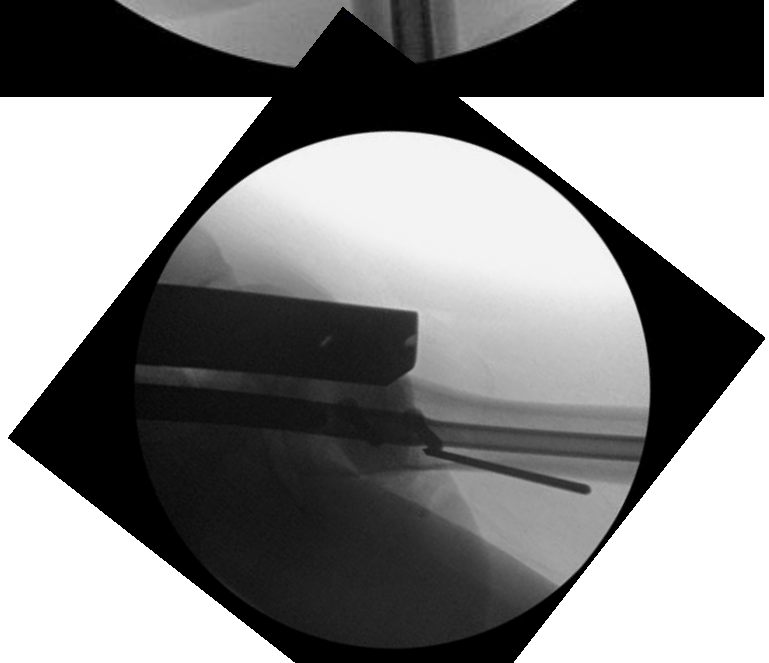


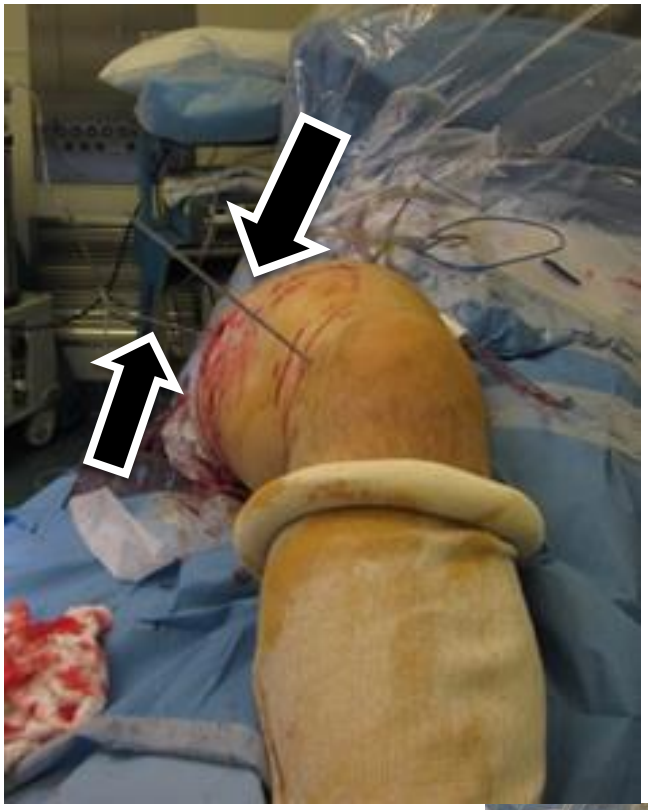



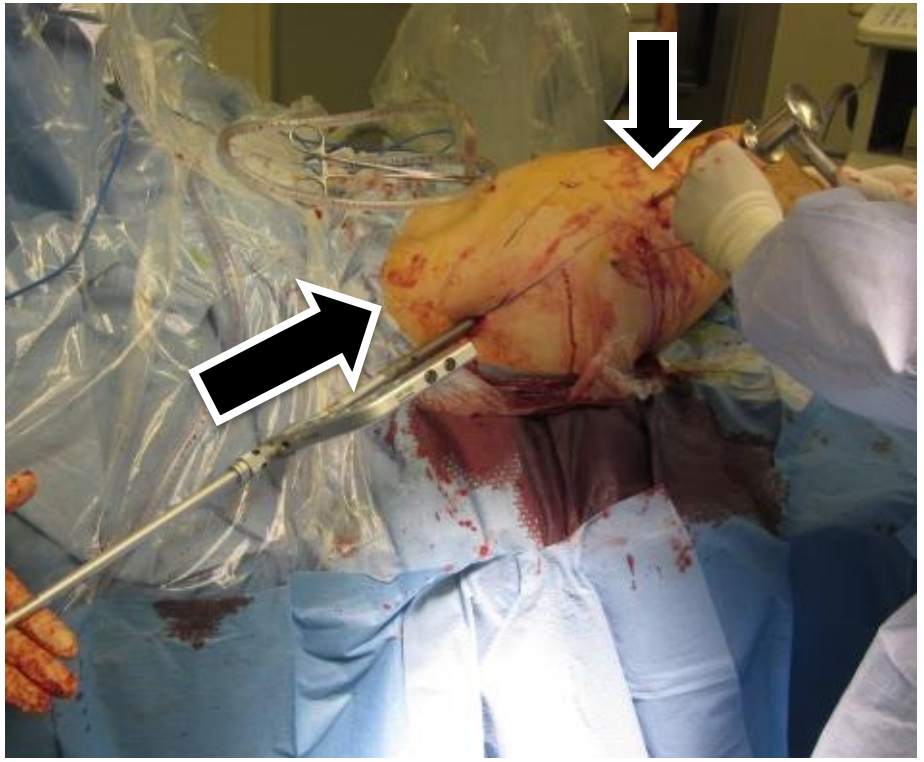
Insert proximal screws via jig after rotation dialed in

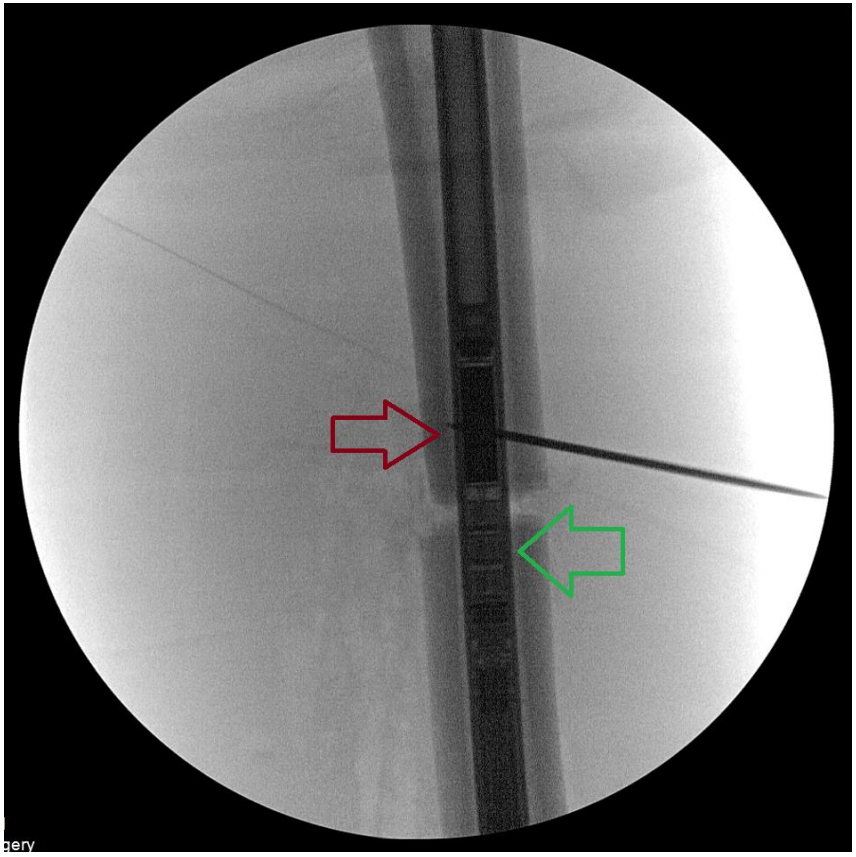


Insert distal screws first



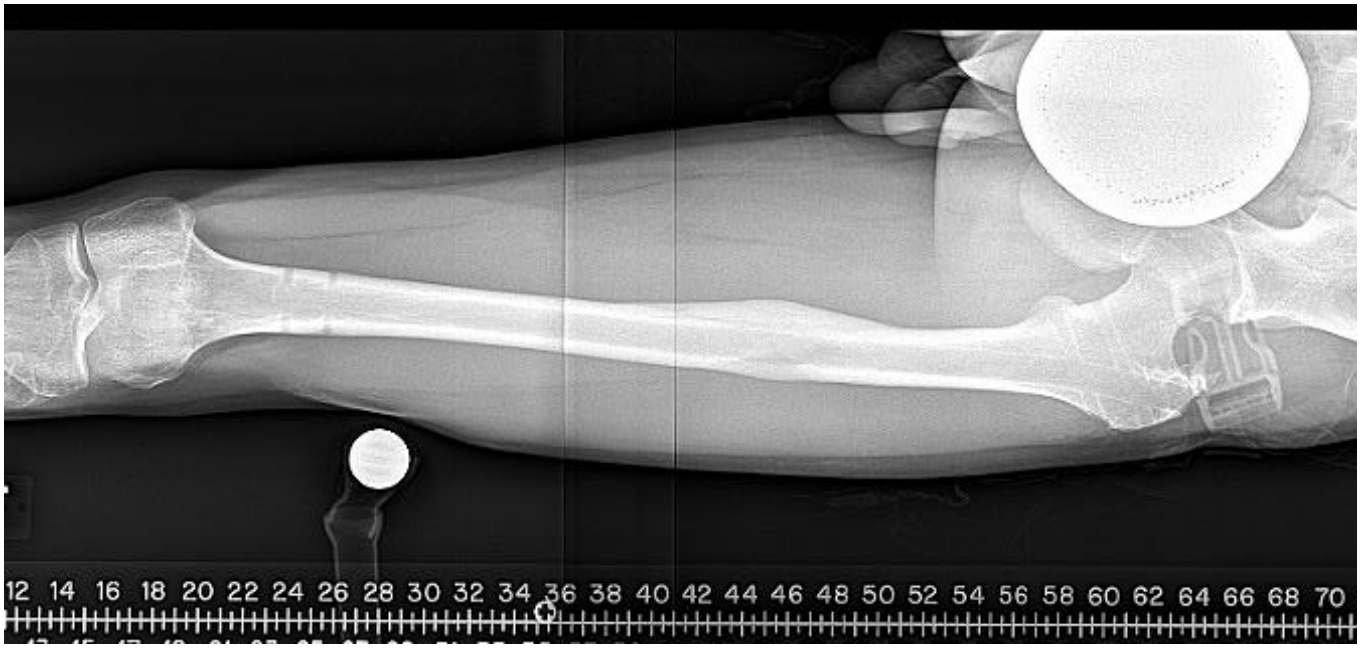


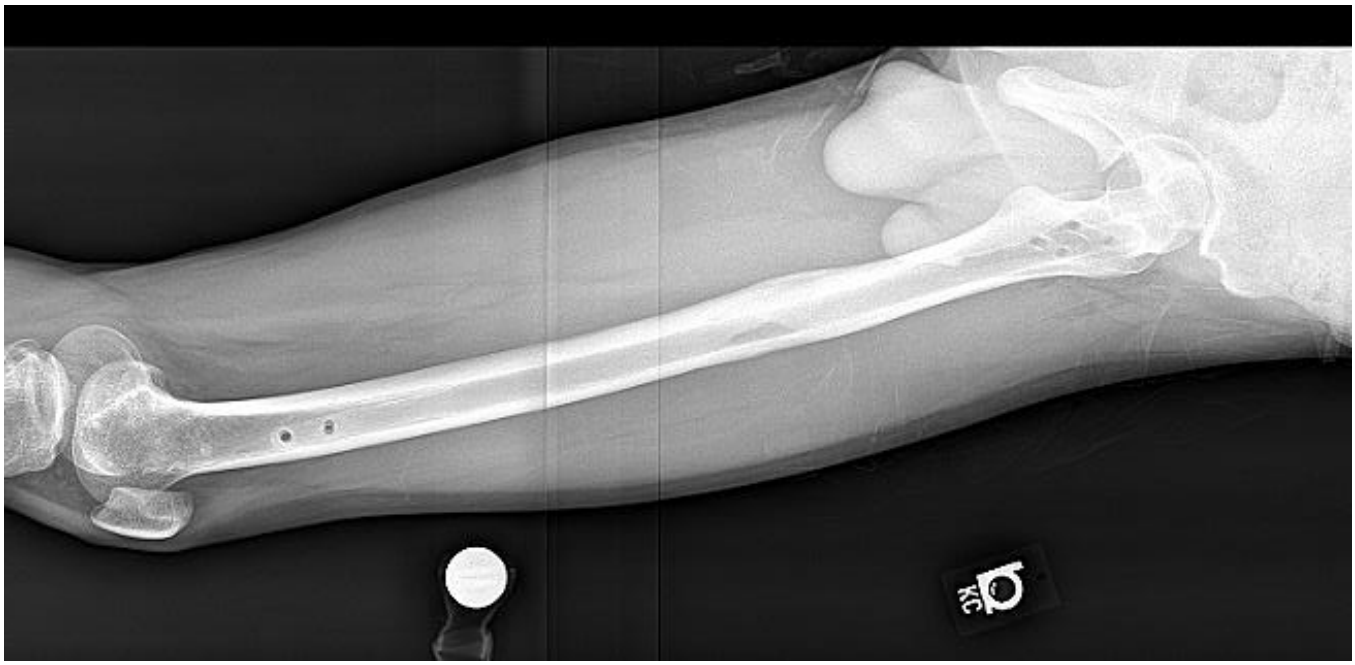


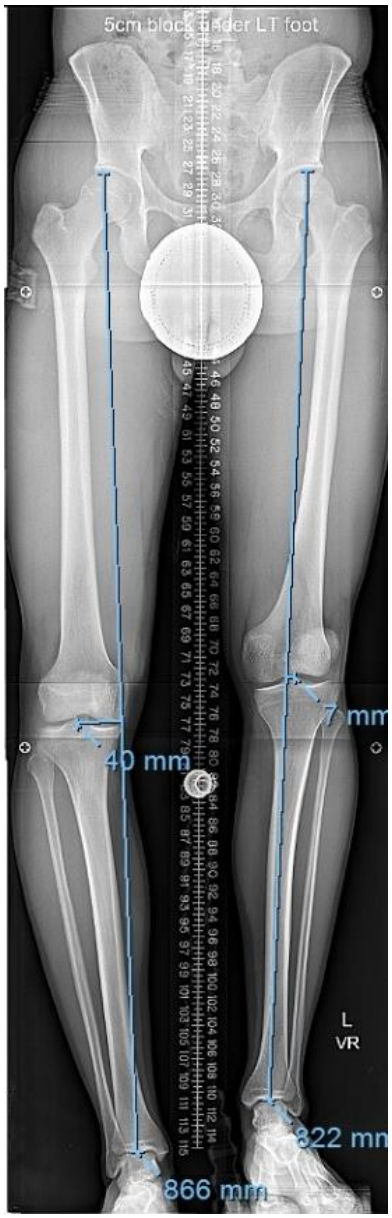


# 16 y/o male with congenital LLD 45 mm


L V R


12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70

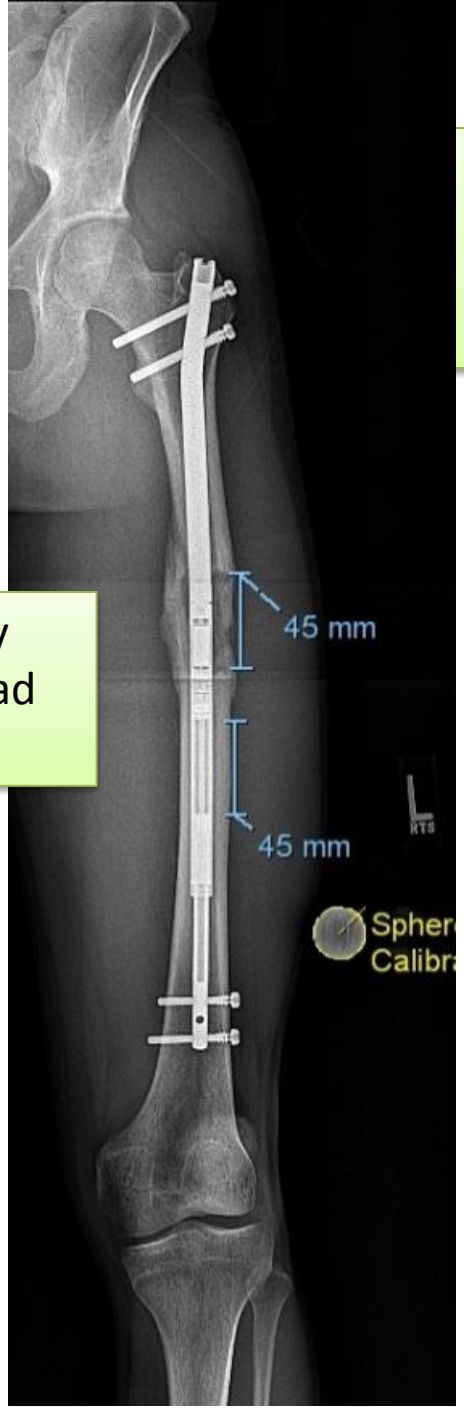


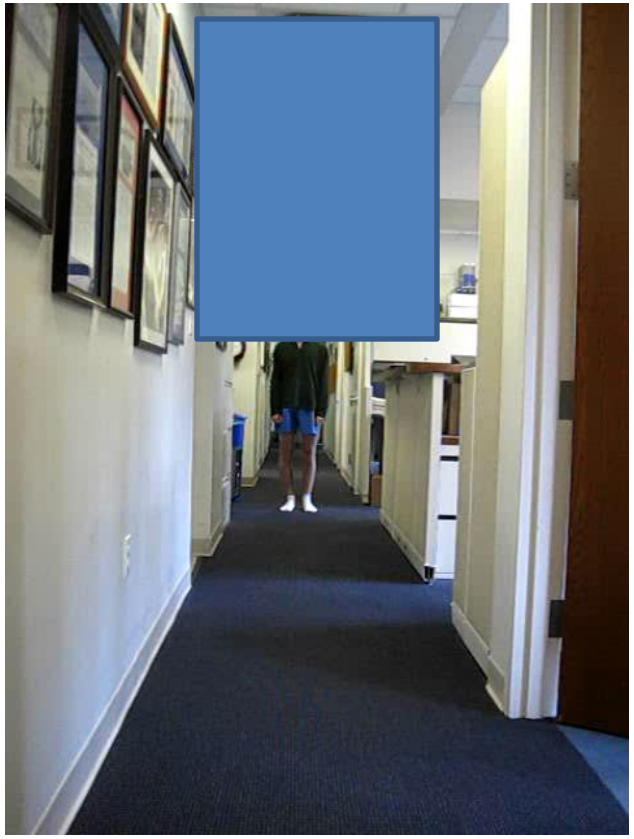



LLD = 4.5 cm
25 y/o male
Congenital LLD

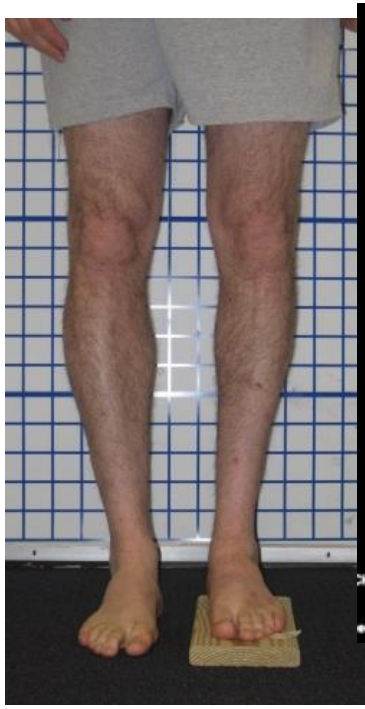
# 3 months postop!

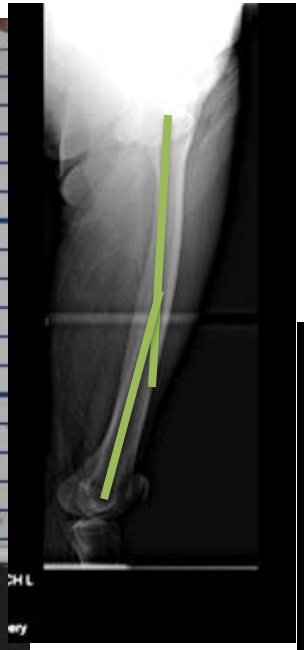
Troch entry
Nail can lead
To varus




TRIT N
BY CHATTANOOG



Clubfoot, LLD 1 inch

Piriformis Entry- my preference
In adult



LLD 40 mm





SNL= 170 + 40 + 50 + 30
SNL= 290

Nail choice is 305

Expect 6.5 cm of thick nail in Distal segment

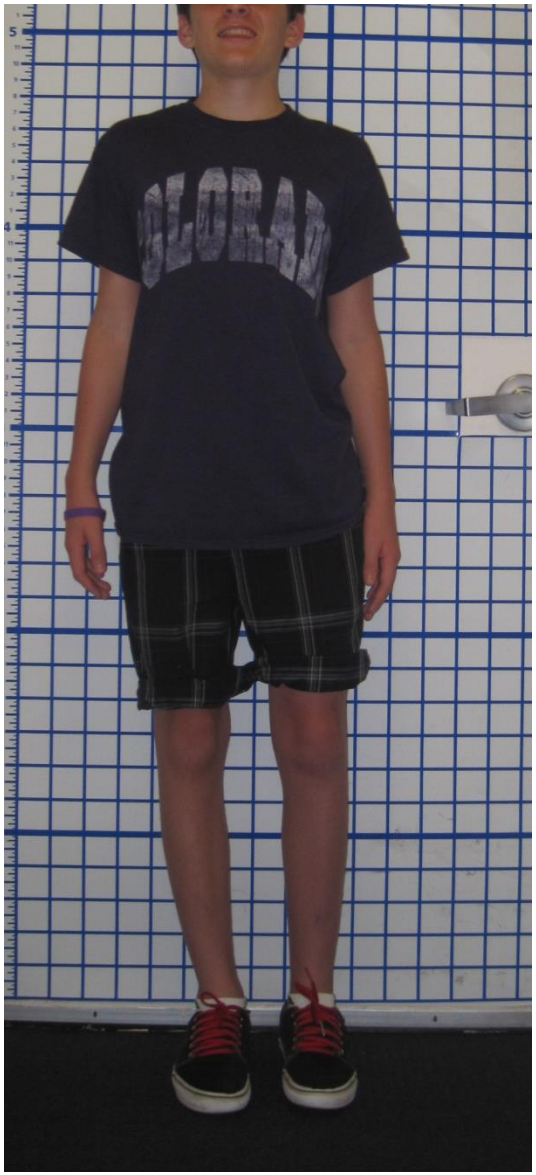

AJP
ITCH L
S
M
urgery


AJP
STITCH L
VS
PM
Surgery

# 12 year old male with congenital LLD


H: 0.3
F: 0.5
STE: 5


LEFT
H: 0.30
F: 0.50
STE: 5



# Technical Points

- Trochanteric for age 18 and younger
- Piriformis for adult
- Reaming
  - 10.5  for 8.5 nail
  - 12.5-13 for 10.7 nail
- Rotate around nail to complete osteotomy
- Insert distal locking first and then dial in rotation and then insert prox locking with jig
- Distraction
  - 0.33 mm 4x per day for 4 days
  - Then decrease to 0.33 mm 3x per day

# Thank You


LIMB LENGTHENING.COM

www.hss.edu/limblengthening

HOSPITAL FOR SPECIAL SURGERY