PROXIMAL FEMUR LENGTHENING IN POST-TRAUMA RECONSTRUCTION

Analysis of factors that cause Axial Deviation.

Post Trauma reconstruction after fresh fractures and NonUnions always need upper femoral lengthening to compensate for shortening and bone gaps.

DR.HARISH. C. R.,

DR.MILIND CHAUDHARY.

Centre for Ilizarov Techniques

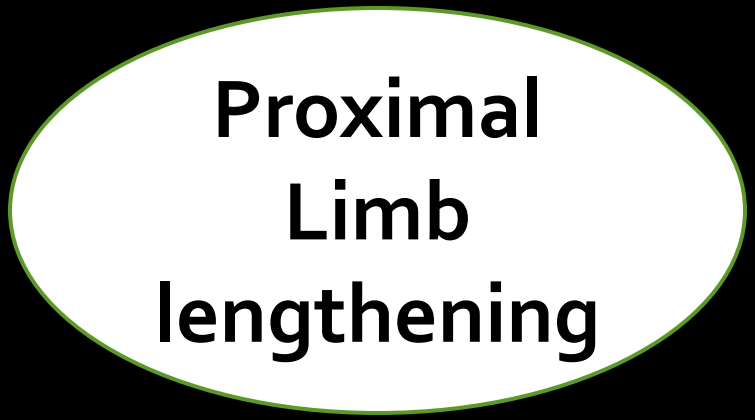
AKOLA

Bone Loss in Femur

- Traumatic Infection Debridements

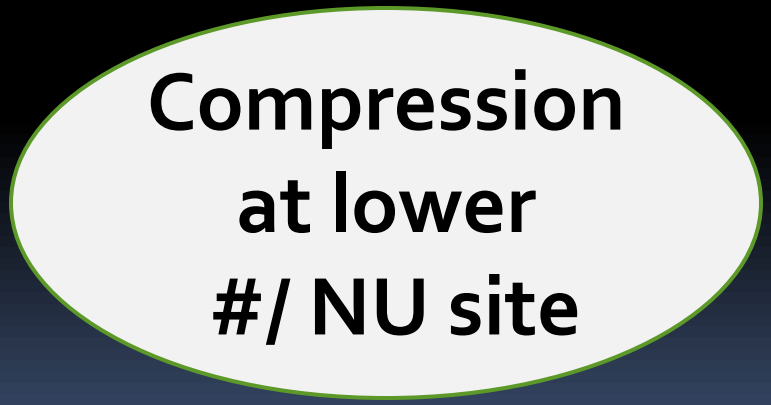



Bone Loss can be due to loss of a large chunk of bone at site of trauma, or it may result due to florid infection or may result due to multiple debridements or growth arrest.



Ilizarov

External



Fixator

The Ilizarov external fixator is ideal for any or all of these conditions as it permits compression at the lower NonUnion site as well as permits femur lengthening at the upper subtrochanteric level.

Prox.Femoral lengthening

- Bone Transport
- Bifocal Simultaneous

(with compression at NU site)

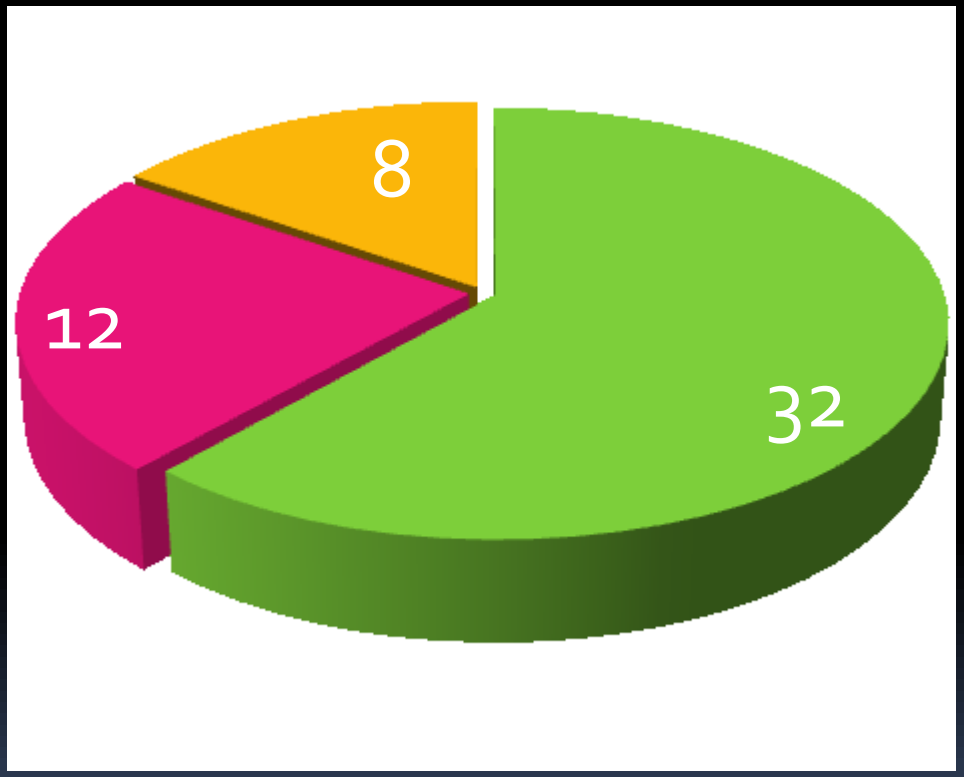
Femur lengthening can be done either as part of Bone Transport (Bifocal Consecutive Distraction Compression) where the lengthening occurs first and compression after docking of bone ends occurs later.
In small gaps a Bifocal SIMULTANEOUS Compression Distraction Osteosynthesis is done where compression at NonUnion site occurs along with simultaneous distraction at the proximal site.

Patients & Methods:

- 52 proximal femoral lengthenings were performed in 52 patients for lower femoral Nonunions at our institute over the last 9 years.

We studied 52 consecutive patients who had a femur lengthening for post trauma reconstruction.

Etiology



Majority of the cases had significant infection which required a separate stage of debridement and antibiotic impregnated cement beads.

Shortening

- ≤ 5 cms → 3
- 6-10 cms → 38
- ≥ 10 cms → 11

The vast majority (49 of 52)had shortening and gap of more than 6 cm

Regenerate Bone in prox. femur

- **Excellent**
- **No need for BG or rescue in any case**

Our most interesting and emphatic finding was that all of the regenerate bones formed excellently without any delays or any need for augmentation with bone grafts or similar.

Premature Consolidation

- 25 % cases had exuberant bone formation



- Needed REPEAT CORTICOTOMY

In fact we had 13 cases of Premature consolidation (25%) This signifies that the bone forms exuberantly and is in excess. This contrasts significantly with the literature where surgeons from korea and other places have recorded very poor bone formation and regenerate formation issues even in diseases like Achondroplasia (which should have excellent bone formation anyway.

Axial deviation Common

The main problem we came across was axial deviation at the regenerate bone site, or "bending" of the regenerate bone.

Variables Studied

- Lengthening
- Age
- Shape of Osteotomy
- Distance of osteotomy below lesser trochanter
- Direction of proximal pins
- Loosening of pins
- Shape of the distal non union

We studied all the above mentioned variables with a view to establish a corelation.

Age

Minimal 10yrs

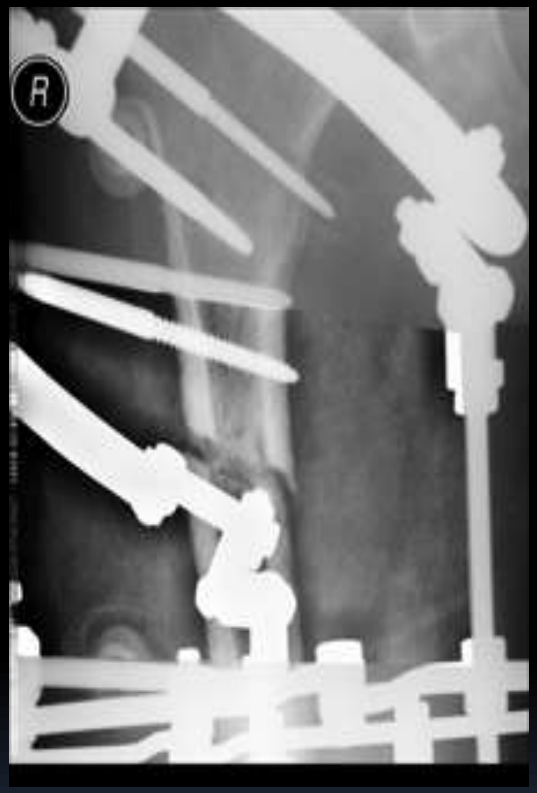
Maximum 65

Mean 36.3

Shape of osteotomy

Transverse 37

oblique 15



Level of osteotomy

≤ 3cm = 26

≥ 4cms 26

Proximal fixation

Trochanteric 35 LRS 14 Neck type 3

3 different types of proximal fixation were studied. Trochanteric type which had 3 or 4 pins running obliquely from gr trochanter to lesser trochanter direction. LRS type had 3 parallel pins & NECK type which had 2 pins going up the neck and 2 more obliquely. The differing stability offered by these constructs could certainly have an impact on axial deviation.

Shapes of nonunions

- Oblique 15 ObC 12 Transverse 16 TC 9




Since we relied on Closed Compression treatment of the Nonunions, we did not make any efforts to convert them into reciprocally matching shapes. Hence we found that they were of 4 different types.

Site of non union	**L3 = 36**	**ML3 jn = 13**	**M3 = 3**
Lengthening	**Min. 2 cm**	**Max. 18 cm**	**Mean 7.13**

These were some other

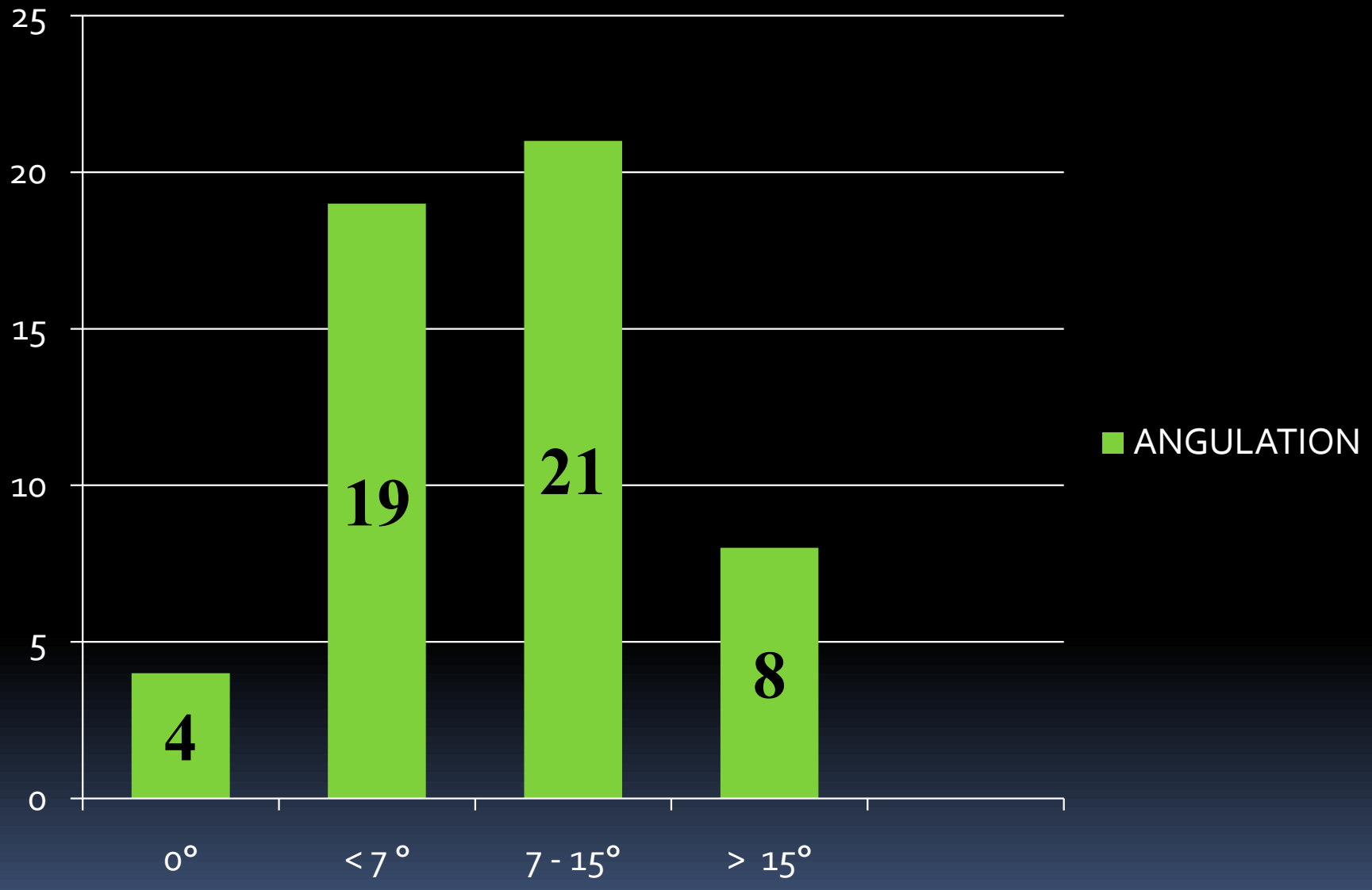
No of Pins	≤3 = 25	≥4 = 27

Pin loosening	36 -no loosening	12 -proximal fragment	4-middle fragment

Premature Consolidation = 13 cases (25%).

No corelation betn
Premature Consolidation & angular deformity.

ANGULATION



23 cases(44.2%) had angulation less than 7 degrees which is considered excellent. Only 8 cases(15.3%) had an angulation of more than 15 degrees.

Statistical Analysis

- A clear corelation of angulation was observed only with age (p=0.034)

- Regression equation

A (Angulation) = 4.315 + 0.1643 x Age

None of the variables studied corelated with angulation except AGE. The Higher the age the more was the angulation.

Results:

- Regenerate bone consolidated well before the consolidation of the NU site.

- In all of our cases the regenerate bone consolidated well before healing of the NonUnion site. This contrasts with teh tibia where regenerate takes much longer to mature.

Residual LLD

Mean shortening .....1.8 cm

Minimum.....1.3 cm longer

Maximum shortening.....12.5cm

35 cm shortening with Gap. FL + TL . NU healed.

Gopal gadbail




This patient had an acure traumatic bone loss of 23 cm. We lengthened 18 cm in the femur and 5 cm in the tibia and performed a sound arthrodesis.

Varus is compensated





Sometimes the varus axial deviation of the regenerate compensates for the valgus deviation present at the NonUnion site.

Persistent Varus

However in some cases, when there is varus both in lengthening site as well as at lower NonUnion site, the mechanical axis can deviate significantly.

No deformity despite Comminution

In Oblique Comminuted defects, a careful and minimal compression regime will permit healing of nonunion ends with point contact and not result in axial deviation at NU site.

Bone formation

- 13 Premature consolidations were seen in 10 patients.
- None required augmentation of Bone formation.
- Only 1 pt sustained # @ regenerate site .

Overall the performance of the regenerate bone was excellent with very few problems.

Axial Deviation

0°.....4 pts

0-7° (Excellent ASAMI score).....23 (44%)

7-15°..... .....21 (40%)

>15°..... ....8 15.3%

Age

- only age corelates well with angular deviations
  inelasticity of tissues with increasing age causing the angulation. .

The possible explanation for the corelation of age with axial deviation is that inelasticity of tissues would cause greater angular deviation of the soft regenerate in older patients.

Shape of nonunion

- cases with oblique and comminuted NU more angular deviation.

- transverse and Comminuted ones slightly less
- (though not statistically significant)

We did notice an effect of some corelation of axial deviation at nonunion site with higher grades of comminution at Nonunion site but this was not statistically significant.

Conclusion:

- Lengthening is very successful in proximal femur in Post Traumatic cases
- More precautions to be taken in elderly patients to watch for axial deviations
- Efforts should be made to convert the shape of the NU at the distal end into as transverse as possible. (though this may increase shortening)

- Thank you for your attention.