CORRECTION OF LEG LENGTH DISCREPANCIES

STAGED DOUBLE-LEVEL LENGTHENING

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Disclosure

• Royalties

• Consultant
Introduction

- Limb lengthening is long and complicated process
- Patient’s discomfort and time in fixator remain the most restrictive factors
Introduction

• The average reported treatment time (Healing Index) is around 1.6 – 1.8 months per centimeter of lengthening.

• It depends on many parameters including amount of lengthening, patient age etc…

• Most of this time is spent awaiting consolidation and remodeling of the distraction regenerate after limb is gradually lengthened at the rate of 1 mm a day.
Healing Index & Lengthening

* Redrawn from J. Fischgrund et al. 1994
Double-level lengthening

- Ilizarov had introduced simultaneous lengthening of the limb at two levels to decrease the patient time in frame
Double-level lengthening

• Distraction regenerate increases blood supply to the extremity, improving regeneration…
Double-level lengthening

- Unfortunately, the overall speed of lengthening at 2 mm/day is usually not well tolerated by soft tissues and often results in patients discomfort and pain.

- Increased soft tissue tension may cause neurological and other complications.
Reducing the speed…

• To minimize impact of stretching on soft tissues it is usual to reduce overall speed in double-level lengthening.

• “Optimum Ratio of Distraction in Double Level Tibial Lengthening” by In Ho Choi, MD
Staged lengthening

- Over the last seven years we began offering sequential double-level lengthening (in the same frame) to patients with significant leg length discrepancy.

- A fixation period of 4-6 weeks follows the initial osteotomy for deformity correction and/or lengthening of 3 to 6 cm.

- And then second osteotomy for lengthening is performed.
Patient

- 17 y.o. female with 12-cm femoral shortening secondary to infected posttraumatic femoral nonunion
- Multiple debridements
- IM nailing
Femoral Lengthening

- 10° acute valgus correction in surgery
- Gradual lengthening 1mm/day
Femoral Lengthening

- 5-cm femoral lengthening
- 4.5 weeks of consolidation
Femoral Lengthening

- Second femoral osteotomy
Femoral Lengthening

- 12-cm femoral lengthening
- Total time in frame 264 days
- HI = 0.76
Outcome
Deformity correction & lengthening

- Most of our patients require some deformity correction – which is usually done during the first stage, prior to lengthening.

- Some of the patients had deformity corrected gradually as a first stage, followed by the lengthening through a separate osteotomy.
Patient

- 12 y.o. male
- Posterior-medial bow of the tibia
- 7 cm right tibial shortening
End of First Surgery
End of First Surgery
Undergoing distal correction
Second Surgery

Proximal tibial osteotomy
End of fixation

- Total time in frame
  187 days
- Lengthening
  total 6.6 cm
- HI = 0.94
Outcome
17 lengthenings in 16 patients

* deformity correction
Double-level lengthening

*Cx

Healing Index month/cm

1.6
1.4
1.2
1.0
0.8
0.6

100
80
60
40
20
0

1 2 3 4 5 6 7 8 9
Complications

- 2 patients (12%) had category III complications (the treatment goals were not achieved) – regenerate fracture/bending

- Both had additional surgeries which corrected the problem
Patient

- 16-year-old female
- S/p left septic hip @ 8 years of age
- Multiple irrigation & debridement
- Limited hip joint ROM, no pain
- 11-cm LLD (8.9 femur & 2.1 tibia)
Treatment Plan

- Application of True/Lok Ex-Fix
- Distal femoral osteotomy for 5-6 cm lengthening
- Possible second osteotomy for additional lengthening
Distraction 8 Weeks
Distraction
Second Femoral Osteotomy
Premature consolidation...
Preoperative Planning

- Distal femoral osteotomy
- True/Lok external fixation
- Gradual valgus deformity correction with lengthening
Angular Distraction 5 Weeks
Consolidation 10 Weeks
3-Month Follow Up

3/19/2009 - 6/12/2009
4-Month Follow Up

7/24/2009
4-Month Follow Up
4-Month Follow Up
1.5 years outcome

6/12/2009

1/22/2010
Our protocol

- Patient education @ preoperative stage including information on possibilities of two-stage lengthening, depending on patients' ability to comply
- Explanation that we may be able to achieve up to 5-6 cm in congenital and up to 7-8 cm in acquired shortening
Congenital (c) vs. Acquired (a)
Our protocol

• Depending on the overall patient condition, compliance and tolerance to the lengthening – second lengthening may be offered using the same external fixator

• The second osteotomy is performed 2-3 cm above or below initial bone cut and subsequent lengthening is resumed 5 days later with the same rate of 1 mm a day
Conclusions

• We offer this approach for most patients with acquired leg length discrepancy and some patients with congenital shortening

• The decision to proceed with the subsequent lengthening is made if patient is psychologically ready for the next stage and conditions of the frame and treated extremity allow continuation of treatment
Conclusions

- Second distraction regenerate increases overall blood flow to the extremity
- Faster consolidation and remodeling of the initial lengthening site
- Overall treatment time less than 30 day per cm of lengthening
Thank you!