Lengthening & Deformity correction with Fixator Assisted Nailing
External Fixation

Used as

* Intra-Op Alignment tool
* for lengthening

with the main intention of reducing External fixation time!
Advantages

Less interruption of ADL
less duration of fixation
less chances of pin related problems
less chances of joint stiffness
Lengthening Over Nails

Published reports
Bost..............1954
Paley .............1997
Kocaoglu.........2004
Kristiansen
Simpson
Chaudhary..... 2009
26 yr old farmer with 7 cm shortening of the femur.

Lengthening with external fixation would have needed at least 9 months of fixation time.
LON method uses suitable IM nails that can be passed in the marrow canal. The nail is locked at one end and kept free at the other end. Ilizarov fixator in this case motored the lengthening.
Leg lengths are equal. Full hardening of bone needed 3 more months. Early removal of fixator allowed earlier return of full movements in the knee.
As soon as lengthening phase is over the nail is locked at the second end and external device is removed—in 4 months in this case. The nail maintains the length and allows hardening of the regenerate bone. Some protection like braces or crutches are needed.
18 yr old JJ had childhood septic arthritis leading to growth arrest and severe shortening of the femur and tibia. At age 9 yrs we had performed lengthening of femur and tibia by 15 cm with external fixation. He presented again at age 16 yrs with 14 cm shortening.
Xray at left shows planning. Straight nail carefully measured. Tibia had lengthening at two levels with deformity correction of distal varus. This was done using Ilizarov external fixation.
Distal entry of nail not possible due to malunion of condyles. Antegrade nailing done with distal corticotomy and distal locking of nail. Nail kept free proximally and LRS fixator used for lengthening.
3 levels of lengthening simultaneously progressed. Length achieved in 3 months. LRS fixator allowed comfort and early movements of the knee.
Limb lengths are equal. Femur external fixation removed in 3 months. Early & full movements in knee were possible.
Treatment of shortening caused by Malunion
38 yr old Textile engineer had polytrauma and suffered from a shortening malunion of the comminuted fracture femur. Femur was 7 cm short.
Old IM nail replaced with straight nail after reaming. Corticotomy performed just above level of malunion. LRS fixator permitted ease of movements and return to work in 4 weeks.
External fixation came off in 4 months. Nail locked distally. Poller screws used to add stability to the construct. Leg lengths are equal. There is full Movement in the knee.
Deformity Correction with FAN method.
Special Instruments
We have a KODAK Long Length imaging system which allows us to take high resolution full length X-rays. They help us in proper sizing of length and diameter of implant and deciding on the levels of osteotomy.
The author has designed special instruments to permit accurate entry point selection. An error or just 2 mm at the entry point of the nail can lead to no less than 8 to 10 degrees of deformity! Hence, accuracy is a hallmark of this new method.
The curved marrow canals have to be converted to straight ones using straight rigid reamers. These have been specially developed. The normal flexible reamers cannot do this special job. Similarly straight nails are specially made with extra locking holes.
NJ is a cool high school kid who had this unfortunate bowing deformity due to growth arrest. She has 3 cm shortening on left Tibia with varus and internal rotation deformity. The femur is in significant varus.
We performed Varus deformity correction in the femur using a FAN technique with distal entry of the nail. She had a lengthening, varus and Internal rotation correction in the tibia with external fixation.
Finally what remained to correct was only a mild varus deformity in the Right tibia which was easily done using ilizarov external fixation. The tibia tolerates external fixation relatively easily. The Femur however benefits the most from FAN method. NJ has perfect alignment in both her legs now and can wear pretty skirts to college!
57 yr old mother of a Med Rep had severe valgus in the R knee causing osteoarthritis of the lateral compartment. Mechanical axis line (in Red) is displaced laterally and shows the severe valgus. Corrective Osteotomy with Internal fixation Using plates would have been a big surgery with risk of infection etc.
FAN technique was used to perform a corrective osteotomy of the distal femur. Through tiny incisions, the nail was inserted and using Poller screws and minimum lateral translation of the distal fragment, the nail achieved complete correction of the valgus. Her knee pain is gone and she has complete movements in the knee enabling squatting and cross leg sitting.
MK is a tall teenager from New York who developed a severe valgus with her growth spurt. On analysis of her x-rays, she has valgus deformity mostly in the tibiae. Since she could be in India only for 4 weeks, we chose to perform correction with FAN on one side and Ilizarov on another so that she could walk immediately.
The ilizarov fixator on Left side allowed her full weight bearing and the FAN method of correction on Right gave her full correction of her deformities and her mechanical axis is completely corrected.
JP is a Mumbai teenager with severe valgus deformities in both her femora. The mechanical axis can be seen passing significantly lateral to knee. Correction should be ideally done with minimum scars!
X-rays taken during surgery show how we first pass External fixation pins proximally and distally, away (posterior) to the intended track of the IM nail. Poller screws passed from front to back limit the track of the nail and aid in deformity correction. The osteotomy is in distal femur done through a tiny incision and nail inserted from below.
Complete correction of the mechanical axis and deformities is seen. Close up of femur shows how a minimum lateral translation of distal fragment is needed and poller screws around osteotomy site. The axis of femur is fully corrected.
With only tiny scars, her deformities are fully corrected and she has full movements in the knee. Her pain and deformities, both are corrected. She is happily married now.....
Double Level correction
Varus & Procurvatum
AK has severe Rickets and deformities in all 4 bones of her legs. We tackled the Right side first with Femur varus and Procurvatum being corrected by FAN method and tibia with ilizarov.
The femur was corrected with two osteotomies. The distal osteotomy corrected the varus (with mild medial translation of distal fragment) and the procurvatum corrected with a proximal osteotomy. Nail is fixed at 3 levels. Stable fixation with full correction is achieved in femur with early rehab.
Valgus & Procurvatum
Rickets has caused this severe valgus deformity with short stature in this teenager. We chose to perform correction and lengthening with Ilizarov LRS fixators.
7 cm length was achieved with full correction of deformities. Fixation duration was 7 months.
We analysed the Left side deformity in the femur and tibia in this manner and chose to perform correction with FAN method to reduce fixation duration.
Pictures in surgery reveal the steps of this minimally invasive method. Ex Fix Pins passed posterior to track of nail. Special starting instruments being inserted for accuracy.
Guide wire passed aiming for the accurate location of osteotomy. Poller screws passed to limit track of nail. Reamers passed over Guide wire maintain accuracy. Nail passed thru this track.
Double osteotomy in femur to correct valgus and procurvatum. Good correction seen.
Tibia valgus correction along with lengthening seen in progress.
Full correction of all her deformities with increase of height by 7 cm is achieved. With FAN method, the external fixation time is reduced and knee movements gained earlier. This is a significant advance for patient comfort and accuracy of correction of deformities.
Thank You!

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