

Outcomes Following Sequential Internal Lengthening of the Femur

Christopher August Iobst, Bicheng Yong, Anirejuoritse Bafor

INTRODUCTION:

With internal bone lengthening techniques being extensively used over the past ten years for patients with limb length discrepancies, some patients have now had the opportunity to undergo multiple lengthening procedures using this technique. We are not aware of any study comparing sequential internal bone lengthening. Our objective was to evaluate treatment outcomes in patients who underwent more than one internal lengthening procedure in the same long bone.

METHODS:

We present a retrospective review of a series of seven patients who underwent two consecutive internal lengthening procedures on the same femur. This series included four patients with congenital femoral deficiency, one patient with fibula hemimelia, and two patients with physeal growth arrest (one traumatic and one post-infective). We documented patient demographics at the time of surgery and compared the bone healing index (BHI) at both surgeries.

RESULTS:

There were four male and three female patients with a mean age at the time of first surgery of 9.9 ± 5.1 years. The median (and Interquartile range, IQR) duration between the two surgeries was 46 (25) months. There was no significant difference in the amount of length discrepancy before the first and second lengthening procedures or the amount of length gained ($p = 0.9062$ and 0.6250 , respectively). (See Table) We also found no significant difference between the median bone healing index for the first and second lengthening procedures ($p = 0.2969$). We did, however, note that the duration of regenerate bone maturation appeared to be less predictable after the second surgery, as represented by a wider range of the bone healing index (12.5 vs. 42.8 days/cm). (See Figure)

DISCUSSION AND CONCLUSION:

Although the median bone healing index (BHI) between both surgeries was not significantly different, the duration of healing following the second internal bone lengthening procedure appeared to be less predictable. This information will help surgeons guide the expectations of patients potentially undergoing multiple internal femoral bone lengthenings.

Table. Summary of patient demographics and results of the internal bone lengthening procedure. S1 = first surgery; S2 = Second surgery

s/n	Age	LLD at S1	Length gain (cm) at S1	BHI for S1	Duration (months) between S1 and S2	LLD at S2	Length gain (cm) at S2	BHI for S2	Follow-up duration (months)
1	17	5	3.5	30.57	24	3	2.2	61.36	21
2	6	9	3.1	32.26	49	11	4.9	26.12	9
3	9	4	3.2	25.63	54	5.5	4.9	28.16	12
4	17	13	5	24.80	15	8	4.4	37.72	10
5	5	7	4.5	19.78	44	7.5	3.7	44.05	5
6	6	3	4	27.25	46	4	4.8	18.54	16
7	9	6	4.5	24.89	47	5	4.7	25.53	42

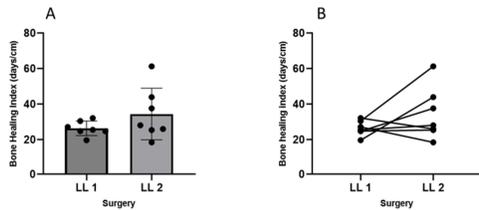


Figure. Comparison of bone healing index following sequential internal limb lengthening (LL 1 – first lengthening procedure, LL 2 – second lengthening procedure). A. Histogram showing comparison of the mean BHI for both lengthening procedures. B. Line graph showing the direction of change in BHI between the two lengthening procedures for each patient.