

Changes in the femoral osteotomy level coefficient and neck shaft angle during limb lengthening with an intramedullary magnetic nail

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Abstract

Background: The intramedullary magnetic IM nail enables bone graduated distraction. Proximal femur osteotomies for ante grade IM lengthening nails have a tendency towards varus-procurvatum malalignment. We examined the effect of the level of the osteotomy and of trochanteric versus piriformis entry points on the neck shaft angle (NSA) during lengthening with the PRECICE IM magnetic nail.

Methods: A novel parameter, the osteotomy level coefficient (OLC), was introduced as a guide to determine the level of an osteotomy at the proximal femur. The OLC was defined as the ratio between the distances from the tip of the greater trochanter to the osteotomy divided by the full length of the femur. A retrospective review of all femoral lengthening procedures with the PRECICE ante grade IM lengthening nail between 2013 and 2018 was carried out.

Results: 31 femurs were lengthened in 30 patients (16 males and 14 females, mean age at surgery years 17.1). The average amount of lengthening was 4.4 cm. Trochanteric entry points were used in 24 femurs, and piriformis entry points in seven femurs. The OLC values ranged from 0.16 to 0.34 (average 0.25). The average follow-up period was 10.15 months. The distraction index average 10.5 days/cm (Range 8.6-11.9), Consolidation index 32.1 days/cm (14.3-51.9). The average post-operative NSA was significantly reduced from 133.5° to 128.5° [t (31) = 5.57, p = 0.000]. There was no correlation between the OLC and the change in the NSAs. The trochanteric entry point showed a

greater tendency to reduce the NSA (Mdif = - 6, SD = 4.8) compared to the piriformis entry point (Mdif = - 0.86, SD = 2.27) [t (31) = -3.96, p = 0.001].

Conclusion: Proximal femur lengthening with the PRECICE IM nail significantly reduced the NSA and might cause Varus deformity. The level of osteotomy by OLC did not influence the amount of NSA reduction. The trochanteric entry points have a greater tendency to reduce the NSA compared to the piriformis entry points.

Keywords: Nail; Neck Shaft Angle; Piriformis; Precice; Trochanteric; Varus deformity.