

Anatomical compliance of T2 Alpha

Background

The T2 Alpha Femur Antegrade GT/PF* Nailing System is the latest intramedullary femoral nailing system developed by Stryker. A primary goal during development of this system was to enhance the anatomical compliance of the nails. Several publications indicate that a reduced radius of curvature (ROC) of the implant is desirable when compared to conventional designs. This better reflects the femoral ROC and may avoid distal anterior cortical encroachment [1,2]. Consequently, a detailed analysis of femur length and ROC was conducted.



Figure 1: T2 Alpha nail portfolio: increase of ROC with increase of nail length

Material

CT-data sets of 1232 patients ranging from 18 to 109 years of age and from multiple ethnic groups were segmented into precise 3D femur models [3]. The anatomical measurements were conducted in 3D using SOMA [4].

Method

- Femoral ROC was measured as the radius of a 3D circle defined through three points (intramedullary canal center points at 20%, 50% and 80% of femur length).
- Femur length was measured between the 'Greater Trochanter' and the 'Facies Patellaris Saddle Point', as defined in SOMA.

References:

- [1] Schmutz, Beat, et al. "3D Computer graphical anatomy study of the femur: a basis for a new nail design." *Archives of orthopaedic and trauma surgery* 137.3 (2017): 321-331.
- [2] Bazylewicz, Daniel B., et al. "Cortical encroachment after cephalomedullary nailing of the proximal femur: evaluation of a more anatomic radius of curvature." *Journal of orthopaedic trauma* 27.6 (2013): 303-307.
- [3] SOMA report SAAT_2017_09: internal document, Stryker's Trauma & Extremities division, 2017. Publisher: Stryker Trauma GmbH, Prof.-Küntschers-Str. 1-5, 24232 Schönkirchen, Germany
- [4] Schröder, Manuel, et al. "Automated morphometric analysis of the femur on large anatomical databases with highly accurate correspondence detection." *Open Medicine Journal* 1.1 (2014).

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Results

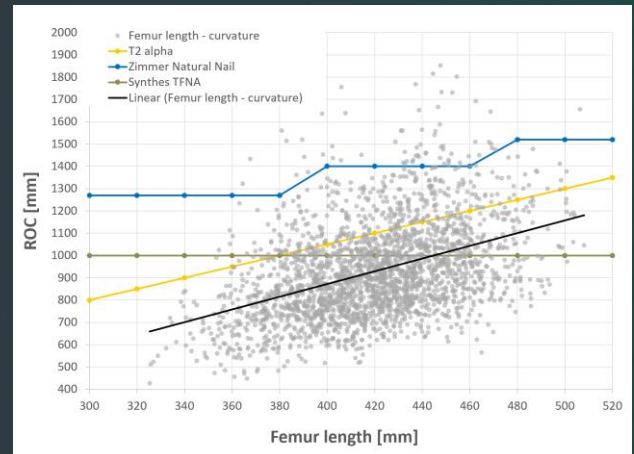


Figure 2: significant correlation (black line) between femur length and ROC ($r=0.44$ with Spearman's ρ , $p < 0.0001$)

Conclusions

- A significant correlation between Femur length and ROC was observed [3].
- This anatomic correlation was implemented into the design of the T2 Alpha femur nail portfolio.
- In order to position the nail tip as close as possible to a preferable location of between the inner anterior cortex and the center of the intramedullary canal, the ROC of the nails was increased by 150-200 mm compared to the linear regression line (see Figure 2).
- This new design addresses the need for different curvatures in different populations [1,2]: straighter nails for longer femurs (e.g. predominantly larger Caucasian population) vs. more curved nails for shorter femurs (e.g. predominantly smaller Asian population) [3].

