Target Restoration of Hip Mechanics in THA
By: Tom Tkach, MD; Warren Low, MD; George B. Cipolletti, MS; Timothy McTigue, Dr. H.S. (hc)

Introduction: THA continues to improve but complications still occur. Dislocation continues to be a significant problem. The causes for dislocation can be multi-factorial, and include: mal-positioned components, soft tissue laxity, and impingement of component-on-component or on fixed obstructions such as osteophytes. Weakness of the abductor muscles due to improper reconstruction can also be a contributing factor. In counteracting these factors, stability is often achieved at the expense of limb lengthening.

To study the influence of implant geometry on tissue balancing and joint stability, the authors selected a stem system that permits the independent selection of lateral offset, version and leg length. This study presents the short term results of this experience.

Methods: 957 THAs were performed using the Apex Modular™ Stem, beginning in May 2001. 842 were primary and 115 were revision cases. All were performed using the posterior approach. Acetabular implants from a variety of manufacturers were employed. All cases were fully cementless. Data on stem, neck and head selection were available for 800 of these cases. Head centers were plotted in bubble chart format. The center of the bubble is head location; the diameter is an indication of frequency. Representative frequency values are given for several locations.

Results: In this clinical series, 3 stem’s locating pins failed, we observed 2 dislocations, 14 intra-operative fractures, no significant leg length inequalities (+/- 5mm), and no significant thigh pain. Approximately 10% were indexed to a position other than neutral version. Lateral offset data were tabulated and compared to data from the literature.

The head center location data clearly showed that a wide variety of offsets and lengths are required to properly balance the soft tissues. Further, when the data were sorted by distal stem diameter, it was clear that there is little correlation between head center location and stem size. Further, a significant number of small (10 mm or 11.5 mm) stems required large (>45 mm) offsets.**

Discussion: Restoration of normal joint biomechanics on a consistent basis was possible using the Apex Modular™ Stem because of the intra-operative versatility that stem system offers in regards to head center location when compared to monoblock stems. It combines the fit and fill features of today’s contemporary cementless stems with updated modular components that provide for independent offset, version and leg length adjustments. This unique modular design allows for a large selection of proximal bodies to enable targeted implant selection for the restoration of proper soft tissue tension and joint biomechanics. Continued long-term follow up will provide additional information to aid in validation of this design concept.

Conclusion: The head location data suggest that hip joint reconstruction benefits from the availability of many head centers for every stem size. This may be accomplished with a large inventory of sizes or with a modular device. Review of 957 hips implanted for both primary and revision cementless application leads the authors to conclude that this “Dual Press™” proximal modular stem design is safe, effective and provides for a more accurate approach for reconstructing the biomechanics of the hip. All current stems feature a larger, stronger locating pin and bolt.