ADVANCE STATURE™

Femoral Components

TECHNICAL MONOGRAPH

Designed for the Man or Woman
with a Narrow Femur.

WRIGHT.

The Science of Total Knee Sizing

Gender differentiated knee implant design is a new trend in Orthopaedics. Several large companies have marketed men and women have different bony anatomy that requires specialized knee prostheses. Throughout the marketplace it is believed there are three main disparities between men and women relating to implant design: women have a greater trochlear groove angle, a narrower distal femur, and are more prone to anterior overstuffing.

There are several studies demonstrating an anatomic difference between men and women.[1,2,3] However, few of these studies have taken into account the physical stature of individuals. Those studies that have examined other factors besides gender have found patient size is more of a determinant of implant size than gender. It is important to note that although over 6,000 total knee arthroplasty studies have been performed, none demonstrate a clinical issue with overhang of the femoral component.[4]

Research has shown the Q-angle is not different due to gender, but is actually dependent on the height of the individual.[5] If a man and a woman of equal height were measured, their Q-angles would be the same. Studies demonstrating a gender difference have not recognized men are on average taller than women. The studies simply separate the samples by gender; not stature. Other studies have shown there is no difference in the morphologies of the trochlear grooves of male and female fetuses. Furthermore, these morphologies do not change in adulthood.[6,7]

One of the most referenced studies on gender sizing was performed by Kirby Hitt, MD.[2] Distal femora were compared to the dimensions of several knee systems (**Figure 1**). It was determined that most knee components were on average 4.9mm too wide for the female population. However, this study did not examine other factors such as patient height. **Figure 2** shows the Hitt data incorporated with the dimensions of several other systems including the ADVANCE® Primary, ADVANCE STATURE™, Zimmer® Gender Solutions™ (GSK), and Stryker® Triathlon® Knees.[2,8]

Figure 1

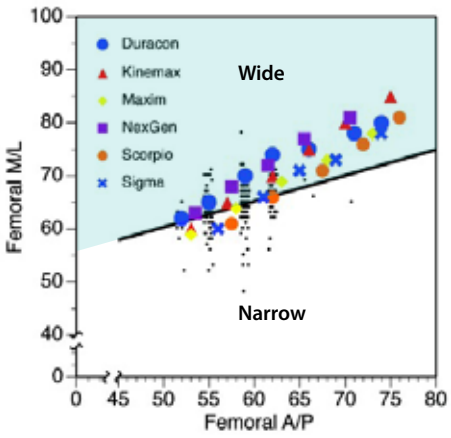
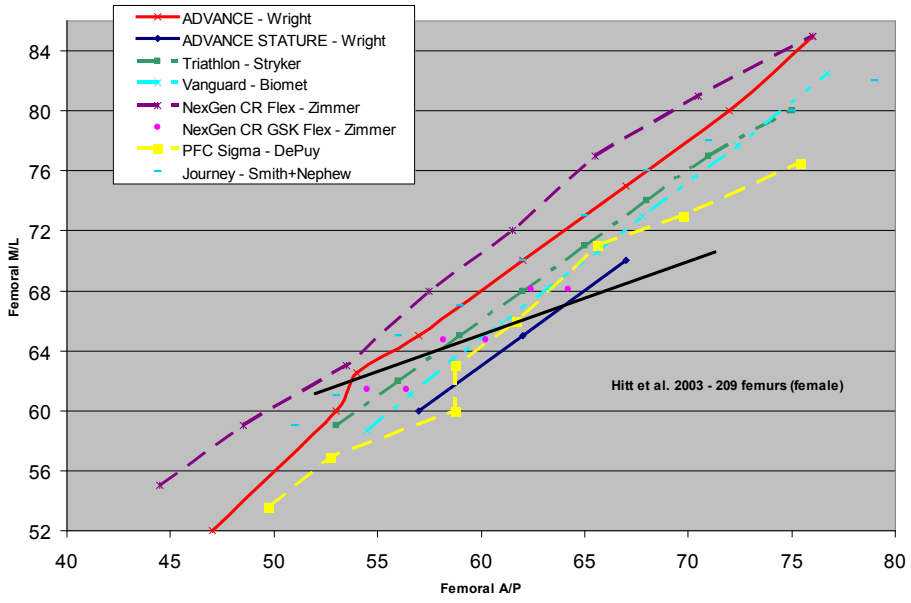


Figure 2



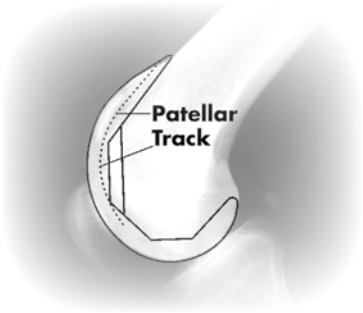


Figure 3 | Anatomic constant radius of ADVANCE® trochlear groove.

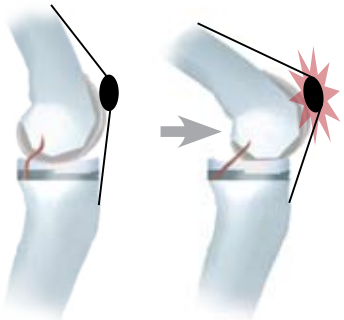


Figure 4a | Anterior slide of j-curve knee contributing to anterior patellar stresses

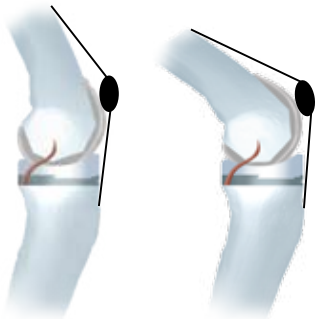


Figure 4b | ADVANCE® Medial-Pivot Knee System exhibits minimal anterior sliding and protects extensor mechanism by keeping the femur in the posterior one-third of the tibia.

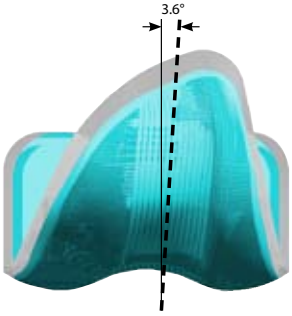


Figure 5 | Reduced width of ADVANCE STATURE™ implant represented in teal. Features 3.6° trochlear groove of standard ADVANCE® Knees.

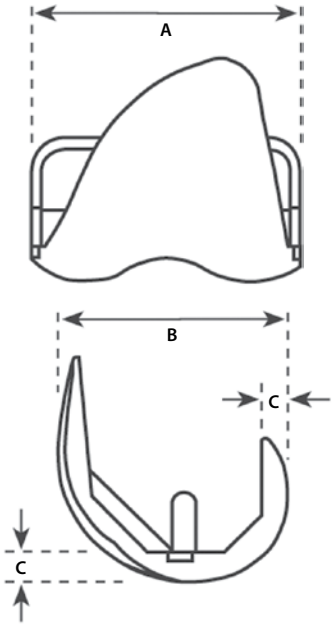
Due to stature differences, it is common for the female patella to be thinner than the male. Once again, research has found this is not due to gender, but to the differences in average height between men and women.[9] A correlation has been identified between height and increased kneecap thickness. Therefore women may not be more prone to anterior overstuffing than men. To resist overstuffing, the ADVANCE STATURE™ Femoral Component features a reduced anterior flange and replicates the constant sagittal radius of the normal trochlear groove (**Figure 3**). These features work in conjunction to reduce stress on the extensor mechanism.

Anterior overstuffing is further avoided through a lack of anterior sliding due to the anterior stability of the ADVANCE® Medial-Pivot and Double-High Knees[10] (**Figures 4a, 4b**). Femoral components with a j-curve and traditional articulation experience anterior sliding (termed paradoxical motion) in flexion. This anterior sliding can place excess stress on the extensor mechanism of the knee.

ADVANCE STATURE™ femoral components are designed to accommodate those male or female femora with a larger A/P dimension than M/L. Due to the finding in the Hitt study, the M/L dimension has been reduced by 5mm from the standard ADVANCE® Knee. The components utilize the ADVANCE® 3.6˚ trochlear groove angle that replicates the sulcus morphology of both males and females[11] (**Figure 5**). This trochlear groove has demonstrated excellent clinical results regardless of gender.[10]

ADVANCE® Femoral Component Dimensions

SIZE	A	B	C
1	60	52	8
2 – ADVANCE STATURE™	60	57	8
2	65	57	8
3 – ADVANCE STATURE™	65	62	8
3	70	62	8
4 – ADVANCE STATURE™	70	66	8
4	75	66	8
5	80	71	8
6	85	76	9



References

1. Poilvache PL, Insall JN, Scuderi GR, Font-Rodriguez DE. Rotational landmarks and sizing of the distal femur in total knee arthroplasty. *Clin Orthop Relat Res*. 1996 Oct;(331):35-46.
2. K Hitt, *et al*. Anthropometric Measurements of the Human Knee: Correlation to the Sizing of Current Knee Arthroplasty Systems. *JBJS* 85:115-122 (2003).
3. Chin KR, Dalury DF, Zurakowski D, Scott RD. Intraoperative measurements of male and female distal femurs during primary total knee arthroplasty. *J Knee Surg*. 2002 Fall;15(4):213-7.
4. Query on www.pubmed.com. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed. Jan 4 2006.
5. Grelsamer *et al*. Men and women have similar Q angles: a clinical and trigonometric evaluation. *J Bone Joint Surg Br*.2005; 87-B: 1498-1501.
6. Garron E, *et al*. Anatomic study of the anterior patellar groove in the fetal period *Rev Chir Orthop Reparatrice Appar Mot*. 2003 Sep;89(5):407-12.
7. Glard *et al*. An anatomical and biometrical study of the femoral trochlear groove in the human fetus. 2005. *J Anat*. Apr;206(4):411-3.
8. Goldstein W, et al. Implant Sizing and Female Gender in Total Knee Artroplasty: Differences between US Manufacturers. AAHKS. November 2006, Poster #463.
9. Sulaiman AS, Nordin S. Measurement of patellar thickness in relation to patellar resurfacing. *Med J Malaysia*. 2005 Jul;60 Suppl C:41-4.
10. Pritchett JW. Patient preferences in knee prostheses. *J Bone and Joint Surgery* (BR). 2004 Sept;(86-B): 979-982.
11. Eckhoff D, *et al*. Sulcus morphology of the distal femur. *Clin Orthop Relat Res*. 1996 Oct;(331):23-8.

Wright Medical Technology, Inc.
5677 Airline Road
Arlington, TN 38002
901.867.9971 phone
800.238.7188 toll-free
www.wmt.com

Wright Medical Europe SA
Rue Pasteur BP 222
83089 Toulon Cedex 09
France
011.33.49.408.7788 phone
www.wmt-emea.com

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