Triathlon and the single radius are designed to work with the patient’s body. Studies have shown that Triathlon and the single radius offer:

- Stability
- Satisfaction
- Survivorship

**Stability**
The Triathlon single radius is designed to restore the knee’s single center of rotation during active flexion, where most motion occurs. This allows for constant ligament tension and stability in flexion.

**Normal gait patterns**
In a study from 2015, Triathlon patients exhibited gait that closely mimicked that of healthy control subjects. However, the multi radius knee differed from controls in important knee kinetic and kinematic properties.

**Fit and function**
The Triathlon FlexRod aids in placement of the femoral component to match the individual patient anatomy. The FlexRod has been shown to allow more downsizing and improve KSS function compared to the rigid rod.

**PS kinematics**
The Triathlon PS femur is designed to engage the post of the tibial insert at approximately 45°, where natural PCL loading occurs.

<table>
<thead>
<tr>
<th>Flexion degree of post engagement</th>
<th>Normal knee</th>
<th>Triathlon</th>
<th>Attune</th>
<th>Sigma</th>
<th>NexGen</th>
<th>GEN II/Legion</th>
</tr>
</thead>
<tbody>
<tr>
<td>45°</td>
<td>45°</td>
<td>87°</td>
<td>70°</td>
<td>90°</td>
<td>60-70°</td>
<td></td>
</tr>
</tbody>
</table>
Satisfaction
A 2014 investigation of Triathlon patients showed that all patients were satisfied with their implant and surgical results, even when a small amount of residual pain was reported.5

<table>
<thead>
<tr>
<th>Do you have pain in the knee which was replaced?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Percentage of patients</td>
</tr>
</tbody>
</table>

Results of patient reported pain score at 7 year follow up.

Survivorship
Multiple studies7,8 and joint registries9,10 from around the world consistently show high rates of survivorship with Triathlon.

<table>
<thead>
<tr>
<th>Source</th>
<th>Survivorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harwin et al.7 2013</td>
<td>99.7% at 7 years</td>
</tr>
<tr>
<td>Scott et al.9 2014</td>
<td>99.5% at 5 years</td>
</tr>
<tr>
<td>2014 National Joint Registry (UK/Wales)8</td>
<td>97.6% at 7 years (including infection)</td>
</tr>
<tr>
<td>2014 Australian Orthopaedic Association Joint Registry10</td>
<td>96.6% at 7 years (including infection)</td>
</tr>
</tbody>
</table>

References:
5. Bhawanik Stoker et al. Mid-Term Results of Patient Satisfaction Following Total Knee Arthroplasty. ICJR (2014).
10. Australian Orthopaedics Association National Joint Replacement Registry. (2014), Table KT10: Cumulative Percent Revision of Primary Total Knee Replacements with Cement Fixation.

X3’s patented11 sequential irradiation and heat process, without the use of additives, allows for the following:

Mechanical strength
X3 and Triathlon PS showed no mechanical failures at minimum 5 years in a clinical study.12

Wear resistance
X3 demonstrated 30% less wear than the “30 Year Knee” in laboratory testing.13

Oxidation resistance
X3 has demonstrated similar oxidation resistance to virgin polyethylene.14

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Acclade® II clinical evidence

Total Hip Intraoperative Femur Fracture: Does a Tapered Wedge Design with a Size Specific Medial Curvature Reduce the Incidence of Intraoperative Femur Fracture?

Nicholas D Colacchio MD, Claire E Robbins, PT, Mehran Aghazadeh, MD, Carl T Talmo, MD, James V Bono, MD
[New England Baptist Hospital, Department of Orthopaedics. Grand Rounds Presentation 2017]

Study objective: This study investigates intraoperative femur fracture (IFF) between a system featuring a standard uncemented tapered wedge femoral stem and a system using a size specific medial curvature uncemented femoral stem.

Introduction:

- Intraoperative femur fracture is a well-known complication in primary uncemented total hip arthroplasty (THA).
- Prior studies have shown a second-generation proximally coated cementless tapered wedge stem has demonstrated:
  - significantly higher proximal and distal canal fit (62% vs 54%)\(^1\)
  - better canal fill ratio in the middle (90.6% vs. 85.3%) and distal (88.1% vs. 78.6%) sections\(^1\)
  - increased proximal engagement with reduced distal fixation\(^2\)
  - reduction in micromotion\(^2\)
- Key design enhancements of the second-generation stem\(^3\):
  1) size-specific increasing radius of curvature of medial stem flare
  2) proportional incremental stem growth
  3) modest reduction in stem length (~15mm)
  4) distal lateral relief

- All procedures were performed using soft tissue preserving anatomic capsule repair and posterior approach.
- The primary outcome measure was IFF.
- A two-sample t-test was performed to determine significant difference between the two stems with respect to IFF.
- Patient demographics, native femoral neck angle, and implant characteristics (size, offset) were also examined.

Results:

- 41 of 1,255 patients (3.27%) who received a standard tapered wedge femoral stem sustained an IFF.
- 5 of 823 patients (0.61%) who received a size specific medial curvature stem incurred an IFF.
- t-statistic was significant at 0.05 critical alpha level, t(2078)=3.067, p=0.0037.
- No other significant associations were found with patient demographics or implant characteristics.
- The native femoral neck angle of patients with IFF were: 7% (3/45) coxa vara (<120°), 46.5% (21/45) normal (120-135°), 46.5% coxa valga (>135°) (21/45).

Conclusions:

- A size specific tapered wedge femoral stem system resulted in greater than five times lower incidence of IFF than a standard medial curvature femoral stem system used for primary uncemented THA.
- Native femoral neck angle did not appear to be a significant independent risk factor for IFF.
- Identifying risk factors for IFF is necessary to facilitate implant system enhancements and help maximize patient outcomes.

Materials and methods:

- A single experienced surgeon’s patient database was retrospectively queried for IFF occurring during primary uncemented THA using a standard tapered wedge femoral stem system or a size specific medial curvature stem system.
References:

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