The optimal solution for today’s new patient
Conventional polyethylene demonstrated high oxidation levels while Prolong polyethylene remained very resistant to oxidation.

*In vitro wear simulator testing demonstrated an 81% reduction in total volumetric wear of CR articular surface components and a 78% reduction in total volumetric wear in PS articular surface components compared to conventional polyethylene.

Prolong Highly Crosslinked Polyethylene is formulated specifically to resist wear under the conditions found in knees and represents a significant scientific advancement in wear reduction. In wear and damage mechanism studies, Prolong polyethylene consistently resisted oxidation and delamination, thereby decreasing surface wear and subsurface fatigue that lead to delamination or pitting.
**Why Prolong Highly Crosslinked Polyethylene...**

*Prolong* Highly Crosslinked Polyethylene represents a significant advance in wear reduction as compared to conventional polyethylene used in Total Knee Arthroplasty (TKA). *Prolong* polyethylene’s proven resistance to wear makes it the optimal solution for all TKA patients, especially today’s more active, physically-demanding patient.

...*Because Polyethylene Can Fail.*

While TKA has proven successful, tibial insert wear and damage are often cited as primary causes for an estimated 55,000 revision knee surgeries each year.\(^1,2,3,4\) One recent study identified polyethylene wear as the most common cause for knee revisions.\(^5\) In this study, 44% of knees revised more than two years after the index arthroplasty were directly attributed to polyethylene wear.

**The Prolong Polyethylene Solution**

*Prolong* polyethylene is specifically designed to reduce wear compared to conventional polyethylene. This includes enhancements in a number of wear factors:

- Reduced insert surface wear\(^6\)
- Improved resistance to articular subsurface and Posterior Stabilized (PS) spine/post delamination, pitting, and cracking\(^7,8\)
- Significant resistance to oxidative degradation\(^9\)
- A dramatic reduction in backside wear\(^10\)
How Knee Inserts Fail

Delamination, pitting, cracking, and wear in conventional polyethylene knee components occur from the combined effects of surface stress, subsurface fatigue, and oxidation. Prolong polyethylene is proven to resist oxidation and reduce surface wear and subsurface fatigue.11

In laboratory testing, conventional polyethylene components exhibited almost 14x more wear than the Prolong polyethylene samples.

Delamination, Pitting & Cracking

When compared with conventional polyethylene, Prolong polyethylene proves superior in its ability to resist subsurface fatigue and related delamination, pitting, and cracking.

A recent study compared highly crosslinked polyethylene with conventional polyethylene in an accelerated wear simulator test. After two million cycles, no evidence of delamination or pitting was shown in the highly crosslinked samples, while half of the conventional samples showed evidence of pitting.13

In head-to-head testing, conventional polyethylene inserts repeatedly showed signs of early delamination, as compared to Prolong polyethylene, which showed no evidence of delamination after 8 million cycles.
**Backside Wear**

The reduced thickness of conventional polyethylene by backside wear is indicated by the depth change of engraved letters and the burnished wear of the central, load-bearing section. Conversely, Prolong polyethylene effectively resists backside wear.16

A number of retrieval studies have shown that tibial backside wear can occur in modular knee designs using conventional polyethylene inserts.15, 16, 17 Relative micro-motion between the tibial insert and baseplate, for example, can produce backside wear in modular tibial components.14 In laboratory testing, Prolong polyethylene demonstrated a marked reduction in backside wear versus conventional polyethylene.19

**BACKSIDE VOLUMETRIC WEAR RATES**

| Wear Area | Depth Change |
|-----------|--|---|
| Conventional Poly | 5.0 | 4.0 |
| Prolong Poly | 1.0 | 0.0 |

In joint simulator testing, conventional polyethylene exhibited more than 9X the amount of backside wear compared to Prolong polyethylene.10, 14

**PS Post Strength/Spine Wear**

In PS knee designs, femoral component contact at the anterior base of the polyethylene post has been shown to cause cold flow, wear, and delamination.21,22,23 Several factors may contribute to this damage, including operative factors such as mal-alignment or instability, and component design.

In vitro wear and PS post fatigue strength were compared for both conventional polyethylene and Prolong polyethylene.8 In wear simulator testing, the majority of conventional polyethylene samples showed some evidence of delamination at the anterior post by five million cycles. The Prolong polyethylene samples exhibited no delamination.

PS post fatigue strength testing concluded that the Prolong polyethylene PS post performed as well as the conventional polyethylene post. Since clinical failure of PS posts with conventional polyethylene is rare, it can be concluded that the Prolong polyethylene post has adequate fatigue strength relative to conventional polyethylene.

Testing has shown that the Prolong polyethylene PS post is at least as strong as the conventional polyethylene post.

**PS POST FATIGUE STRENGTH TEST**

<table>
<thead>
<tr>
<th>Loads (lb)</th>
<th>Cycles to Fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Poly</td>
<td>300</td>
</tr>
<tr>
<td>Prolong Poly</td>
<td>250</td>
</tr>
</tbody>
</table>

Delamination pattern shown on PS post of conventional polyethylene test sample. No delamination occurred on the Prolong polyethylene post test samples.
The New Patient

Today’s total knee replacement candidates lead more active, physically-demanding lives. Due to its vastly increased wear and delamination resistance, Prolong Highly Crosslinked Polyethylene is an ideal solution for these patients.

Zimmer provides superior technologies like minimally invasive TKA solutions, high flexion designs, and Prolong Highly Crosslinked Polyethylene in both CR and PS applications. These solutions give you the confidence to provide your patients with superior, clinically-proven implants.

References

1. NO INFO (Reference 55,000 knee surgeries.


8. Zimmer Technical Memorandum Wear Test of 58 and 72 KGY E-Beam Crosslinked UHMWPE LPS-Flex Articular Surfaces, June 16, 2004


19. Yao, et al: Backside wear of conventional and highly...


For more information about Zimmer Prolong™ Highly Crosslinked Polyethylene, talk with your Zimmer representative or visit us at www.zimmer.com.