Zimmer® Prolong® Highly Crosslinked Polyethylene

Improved polyethylene performance

zimmer

Why Prolong Highly Crosslinked Polyethylene...

Prolong Highly Crosslinked Polyethylene represents a significant advance in wear reduction. *Prolong* polyethylene's proven resistance to wear provides a promising solution for TKA patients, especially today's more active, physically-demanding patient.

Typical wear associated with conventional polyethylene knee inserts.

...Because Polyethylene Can Wear.

While TKA has proven successful, tibial insert wear and damage are often cited as primary causes for an estimated 63,000 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 and delamination. This includes enhancements to a number of wear factors:

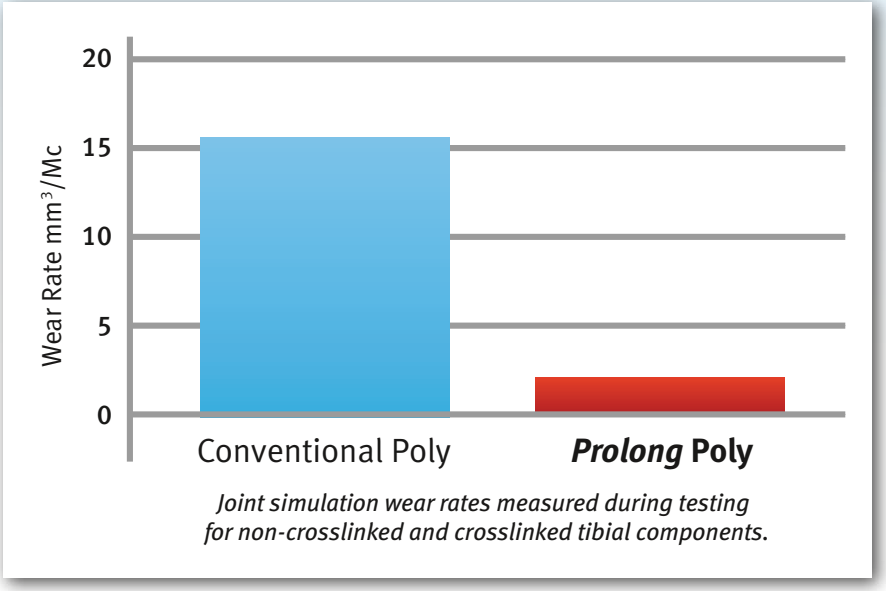
- Reduced topside wear[6]
- Improved resistance to articular subsurface and Posterior Stabilized (PS) spine/post delamination, pitting, and cracking[1,7]
- Resistance to oxidative degradation[9]
- Reduced backside wear[8]

How Knee Articular Surfaces Wear

Delamination, pitting, cracking, and wear in conventional polyethylene knee components occur from the combined effects of surface stress, subsurface fatigue, and oxidation. Due to the virtual elimination of free radicals, *Prolong* polyethylene has been shown to resist oxidation and reduce surface wear and subsurface fatigue and delamination.[9]

In laboratory testing, conventional polyethylene components exhibited almost 8x more wear than the Prolong *polyethylene samples.*

WEAR RATES

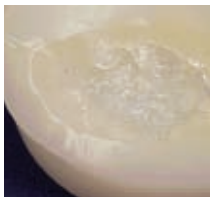


Joint simulation wear rates measured during testing for non-crosslinked and crosslinked tibial components.

Delamination, Pitting & Cracking

Prolong polyethylene offers improvements in its ability to resist subsurface fatigue and related delamination, pitting, and cracking.

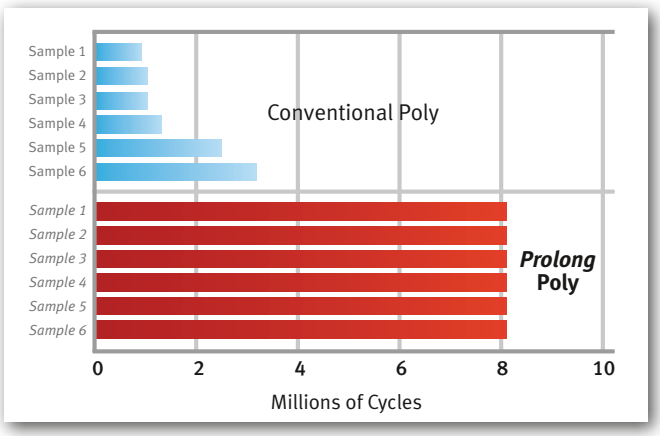
A recent study compared highly crosslinked polyethylene with conventional polyethylene in an accelerated delamination test. After two million cycles, no evidence of delamination or pitting was shown in the highly crosslinked samples, while half of the conventional samples showed evidence of pitting.[10]



Conventional Test Sample

Prolong Polyethylene Test Sample

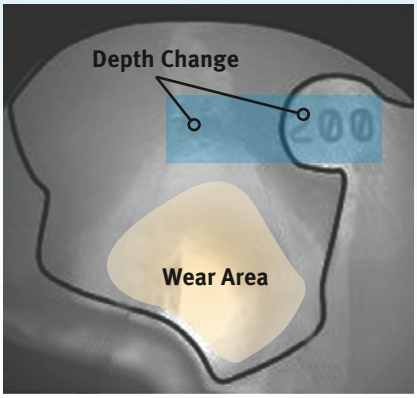
START OF DELAMINATION IN LABORATORY TEST SAMPLES



In head-to-head testing specifically designed to result in early onset of delamination, conventional polyethylene inserts repeatedly showed signs of delamination, as compared to Prolong *polyethylene, which showed no evidence of delamination.*

Rigorous laboratory delamination testing conducted at Zimmer demonstrated no delamination in any *Prolong* samples up to 8 million cycles.[1]

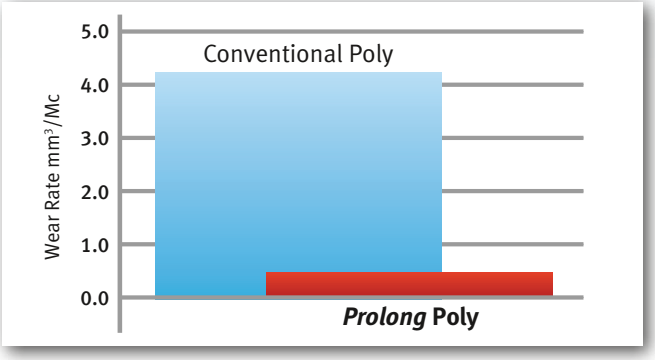
Backside Wear



The reduced thickness of conventional polyethylene by backside wear is indicated by the depth change of engraved numbers and the burnished wear of the central, load-bearing section. Conversely, Prolong *polyethylene effectively minimizes backside wear.*[11]

A number of retrieval studies have shown that tibial backside wear can occur in modular knee designs using conventional polyethylene inserts.[12,13,14] Relative micro-motion between the tibial insert and base plate, for example, can produce backside wear in modular tibial components.[11] In laboratory testing, *Prolong* polyethylene demonstrated a marked reduction in backside wear versus conventional polyethylene.[8]

BACKSIDE VOLUMETRIC WEAR RATES



In joint simulator testing, conventional polyethylene exhibited more backside wear compared to Prolong *polyethylene.*[8,11]

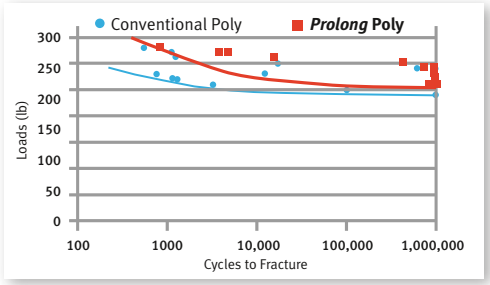
PS Post Strength/Spine Wear

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.[15,16,17] Several factors may contribute to this damage, including operative factors such as mal-alignment, instability, and component design.

In vitro wear and PS post fatigue strength were compared for both conventional polyethylene and *Prolong* polyethylene.[1] 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.

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

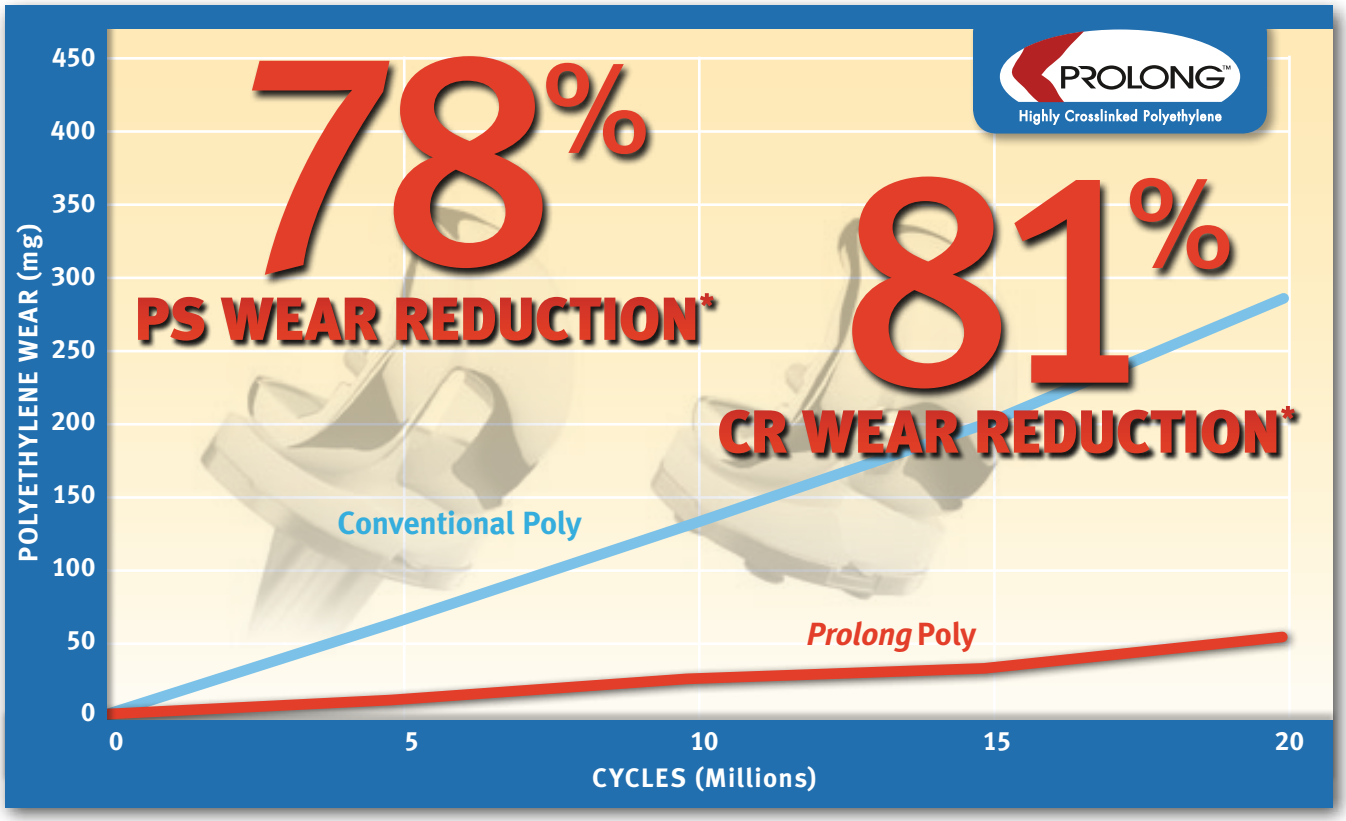
PS POST FATIGUE STRENGTH TEST



PS post fatigue strength testing concluded that the *Prolong* polyethylene PS post performed at least as well as the conventional polyethylene post.

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

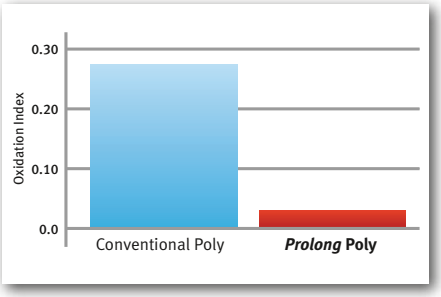
Significant Wear Reduction



**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. The results of in vitro wear tests have not been shown to correlate with clinical wear mechanisms.*

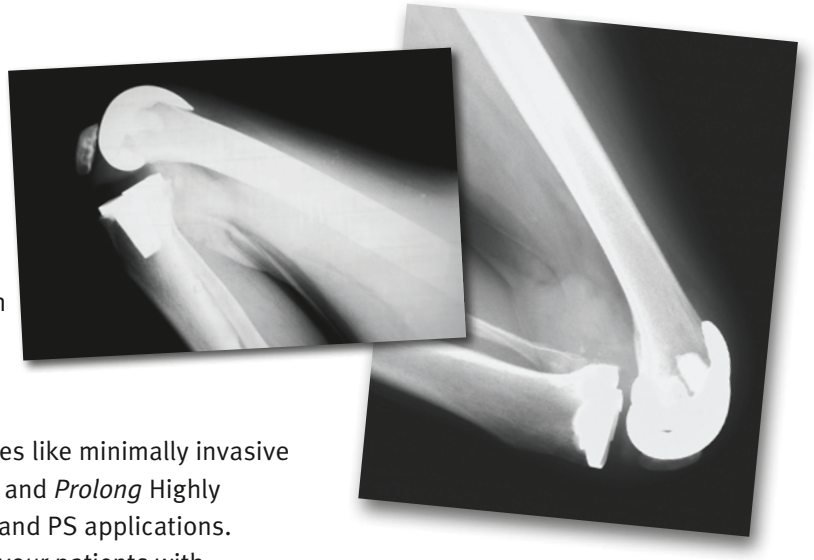
Prolong Highly Crosslinked Polyethylene is formulated specifically to resist wear under the conditions found in knees and represents a significant scientific advancement in wear reduction. In wear and damage mechanism studies, *Prolong* polyethylene consistently resisted oxidation and delamination, thereby decreasing surface wear and subsurface fatigue that can lead to delamination or pitting.[9]

OXIDATION



In laboratory testing Prolong *polyethylene effectively resisted oxidation.*

The New Patient



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

MIS™ minimally invasive solutions

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.

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