
In 2009, the CLS Spotorno Hip Stem celebrates 25 years of successful clinical history. Its creation marked a milestone in the history of hip replacements. Until the 1980’s, prosthetic hip replacement using cement had been considered the standard. Driven by innovation and the mission to constantly improve patient outcomes, numerous scientists explored cementless fixation concepts. The original CLS Spotorno Hip Stem, with its characteristic three-dimensional wedge shape and sharpened ribs in the proximal region, is one of the most remarkable results of this research. Since 1984 the CLS Spotorno Hip Stem, developed by Prof. Lorenzo Spotorno, has become one of the most successful implants of the Swedish National Hip Arthroplasty Registry. With more than 500,000 stems implanted, it has restored mobility to hundreds of thousands of patients. Over the years, the concept has been copied many times, but its clinically documented outcomes remain unmatched.

- Grappiolo G, Spotorno L: Eighteen years follow-up of the CLS uncemented stem. AAOS, 2004

1 www.jru.orthop.gu.se
2 Zimmer internal data

Winterthur, April 2009

This brochure is dedicated to Professor Lorenzo Spotorno and his family in acknowledgement of his life-long commitment to the further improvement of Orthopaedics and patient's care. His pioneer work in total hip replacement has changed life of thousands of patients and will continue for years to come.
Proven Design Features

1 Ribs in the proximal region:
- Large contact area for osseointegration
- Increased primary and rotational stability

2 Distal tapered stem
- Proximal transmission of the loads into the bone
- Rounded edges to avoid stress risers and thigh pain

3 Three-dimensional taper and trapezoidal cross-section
- Immediate press-fit
- Excellent primary and rotational stability

4 Slim neck and short taper
- Increased range of motion

5 Osseointegration
- Grit-blasted osteophilic titanium alloy to promote osseointegration

History

1980 - “The shaved porcupine prosthesis”
- Initial implant design attempted to achieve proximal anchorage by means of a spinous macrostructure in the proximal region and was nicknamed the “shaved porcupine prosthesis”. This stem served as a model for the CLS Spotorno Hip Stem.

1983 - Birth of the CLS Spotorno Hip Stem: The Macrostructure
- With the introduction of Protasul®-100 Titanium Alloy, the stem was given a tri-tapered shape with a trapezoidal cross-section, which implemented the theoretical prerequisites for press-fit. The proximal design, consisting of longitudinal ribs was to optimize the transmission of loads and increase bone contact in the proximal region.

1984 - Official introduction
- The CLS Spotorno Hip Stem was launched with patient safety as the top concern. To help surgeons in their decision-making process, a protocol was established based on the assessment of four clinical and radiological parameters: age, gender, osteoporosis and anatomy of the femur.

1992 - Changes to the rib structure
- The new rib structure with proximally sharpened edges was introduced to enhance stem penetration and reduce the risk of fissures.

1997 - Extended implant selection
- In addition to the first CLS Spotorno Hip Stem design with a CCD angle of 145°, a version of the stem with an angle of 135° was introduced.

2004 - Meeting an expanded range of indications
- The CLS Spotorno Hip Stem with a CCD angle of 125° was introduced to further expand the range of indications and to better restore human anatomy.

2004 - Adjustments to neck and taper
- Shortened taper length and smaller neck diameter help increase range of motion and reduce the risk for impingement.

2009 - Instrument advancements
- Based on 25 years of experience, the instrumentation was refined to assist surgeons in precisely preparing the medullary canal. Perfect matching of rasps and implants, and the development of rasps with designated cutting and compression zones, enable excellent primary implant stability. Specialized instruments, combined with state-of-the-art training available through the Zimmer Institute, give surgeons the option of implanting the CLS Spotorno Hip Stem using Zimmer® Minimally Invasive Solutions™.
CLS Spotorno Hip Stem – The Offset Philosophy

Natural Reconstruction of the Anatomy

The surgeon’s objective in hip reconstruction is to rebuild anatomy by restoring optimal muscular tension without modifying the length of the limb. In an anthropometric study conducted on 353 standardized X-rays in the Santa Corona hospital in Pietra Ligure, the offset and the CCD angle were measured. The offset distribution in the examined population follows a bell-shaped curve, as documented in the work of Noble2, where the extreme values should be considered as pathological (offset values < 30 mm and > 55 mm).

Thanks to its offset concept, the CLS Spotorno® Hip Stem is able to reproduce almost the entire range of physiological offsets while offering excellent control for restoring the correct leg length. The study conducted in Pietra Ligure as well as the work carried out by Noble on the geometry of the proximal femur describes the correlation between the CCD angle and the offset when using the same neck length. This correlation has been taken into account in the offset concept of the CLS Spotorno Hip Stem.

Ratio between Offset and CCD Angle

<table>
<thead>
<tr>
<th>Femur offset (mm)</th>
<th>CCD angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>125°</td>
</tr>
<tr>
<td>55</td>
<td>135°</td>
</tr>
<tr>
<td>50</td>
<td>145°</td>
</tr>
<tr>
<td>45</td>
<td>&lt; 115° Pathological Varus</td>
</tr>
<tr>
<td>40</td>
<td>115°</td>
</tr>
<tr>
<td>35</td>
<td>125°</td>
</tr>
<tr>
<td>30</td>
<td>&lt; 115° Pathological Valgus</td>
</tr>
<tr>
<td>25</td>
<td>125°</td>
</tr>
</tbody>
</table>

Its three CCD angles allow for a high number of morphotypes. Thanks to the tri-tapered shape, each stem acts as a wedge, so that at least 3 different sizes of each version of the CLS Spotorno Hip Stem can be inserted into the intramedullary canal. Along with the various sizes of femoral heads, it is therefore possible to offer at least 36 different offsets for the same intramedullary canal. With the CLS Spotorno Hip Stem, it is also possible to rebuild the offset and the length of the limb independently, taking into account the four main parameters: offset, trochanteric obstruction, center of the ball head and CCD angle (± varus).

Osseointegration and Design Optimisation

The rough-blasted Protasul-100 Titanium Alloy of the CLS Spotorno Hip Stem is highly osteophilic. The material and the surface conditions play an important role in bone regeneration in the area directly surrounding the prosthesis. Generally speaking, the new bone formations accumulate preferentially on prominent parts such as the ribs or the sharp edges of the prosthesis. The rearrangement of the trabeculae, which are subjected to a microtrauma upon surgery, is particularly rapid and plays a part in the osseointegration process.

Healthy lamellar bone, remodelled after initial press-fit contact with primary bone

Increased ROM with different neck diameter and taper designs with ball heads of various diameters and lengths.

* 28mm and 32mm XL ball heads are skirted heads

1984–2009: From monobloc to multizone modular rasps. Bone substance is removed only when it is absolutely necessary and compressed in the remaining areas where the primary stability needs to be increased.
Excellent Clinical Results

Through 25 years of clinical history, and in numerous published studies, the CLS Spotorno Hip Stem has demonstrated excellent stability, forgiveness and osseointegration. Long-term clinical results do make the difference!

Case study: CLS Spotorno Hip Stem 145° with CLS Spotorno Expansion Cup

Independent registry data such as the Swedish National Hip Arthroplasty Register have also documented the reliability of the CLS Spotorno Hip Stem. Indeed, it is the only uncemented stem to have 100% survivorship at 10 years postoperative in this registry in 2003. The report published 3 years later confirms the outstanding performance: 99% survival rate in 823 cases at 13 years postoperative by 2006.

CLS Spotorno Hip Stem: Excellent survival rate at 13 years (all diagnoses and all reasons for revisions)

Excellent Survival Rate

The original CLS Spotorno Hip Stem continues to be carefully followed up by many surgeons across the globe. Examples of the many studies published over the years:

■ 98% Survival rate in 352 cases at 4–8 years

■ 97.9% Survival rate of the first 207 cases at 7–10 years

■ 98.2% Survival rate in 335 cases at 8.9 years

■ 100% Survival rate in 98 cases at 10 years

■ 98% Survival rate in 141 cons. cases at 10–15 years

■ 94% Survival rate in 326 cases at 15–20 years

■ 98% Survival rate in 300 cases at 16 years
  Grappiolo G, Spotorno L.: AAOS – eighteen years follow-up of the CLS uncemented stem, 2004

Note that the survival rates refer to aseptic loosening as endpoint.

Excerpts from Clinical Studies

“After 10 to 15 years, we found a very low revision rate due to aseptic loosening with the CLS stem after proximal intertrochanteric osteotomy, no femoral osteolysis and favourable results on radiographic examination.” Breusch, et al: Ten-year results of uncemented hip stems for failed intertrochanteric osteotomy. Arch Orthop Trauma Surg 125: 304–309, 2005


“Even in femoral deformities and in the hands of surgeons with differing level of surgical training the long-term results have been demonstrated to be outstanding.” Aldinger, et al: The uncemented CLS femoral component, long-term results, indications and limitations. Akt Traumatol 35: 320–327, 2005

At a first glance, they look identical. But one of them has been implanted for 25 years.