CLS® Spotorno® Hip Stem
A Milestone in the History of Hip Replacements
The Original CLS Cementless Spotorno Hip Stem
The Creation of CLS 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.

Essentially unchanged since its creation, 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 Registry¹. With more than 700,000 stems implanted², it has helped to restore mobility to hundreds of thousands of patients.

Over the years, the concept has been copied many times, but its clinically documented outcomes remain unmatched.

¹ http://www.shpr.se
² Data on file at Zimmer
Key Principles

**Ribs in the Proximal Region**
Large contact area for osseointegration. Increased primary and rotational stability

**Distally Tapered Stem**
Proximal transmission of the loads into the bone

**Rounded Tip**
Rounded edges help to reduce stress risers and thigh pain

**Slim Neck and Short Taper**
Increased range of motion

**Osseointegration**
Grit-blasted osteophilic titanium alloy (Ti6Al7Nb) to promote secondary stability

**3D Taper and Trapezoidal Cross-section**
Immediate press-fit. Excellent primary and rotational stability
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®-64 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 intended 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 help 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
**25th Anniversary**
The CLS Spotorno Hip Stem celebrates its 25th birthday. The revolution of 1984 is still state of the art in 2009!

2008
**500,000 Implants**
The 0.5 millionth CLS Spotorno Stem is successfully implanted. The CLS Spotorno Stem sets yet another milestone and proves its tried and tested concept once again.
2011

CLS® Brevius™ Stem with Kinectiv® Technology

The best of two proven technologies:
- **CLS Spotorno Stem:**
  25 years of successful clinical history is preserved
- Kinectiv Technology: safe and simple modular neck technology

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™.
### Successful Clinical History – Literature

<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Published in</th>
<th>N. Of cases</th>
<th>F-up (years)</th>
<th>Survival rate (End point: rev for aseptic loosening)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Biedmond et al</td>
<td>Long-Term survivorship analysis of the cementless Spotorno femoral component in patients less than 50 years of age. JOA 26 (3): 386-390, 2011</td>
<td>93</td>
<td>13</td>
<td>97.9%</td>
</tr>
<tr>
<td>2010</td>
<td>Müller et al</td>
<td>Seventeen-year survival of the cementless CLS Spotorno stem. Arch Orthop Trauma Surg 130, 269-275, 2009</td>
<td>80</td>
<td>17</td>
<td>100%</td>
</tr>
<tr>
<td>2009</td>
<td>Aldinger et al</td>
<td>Uncemented Grit-Blasted Straight Tapered Titanium Stems in Patients Younger than Fifty-five Years of Age Fifteen to Twenty-Year Results JBJS AM 91: 1432-1439, 2009</td>
<td>154</td>
<td>20</td>
<td>95%</td>
</tr>
<tr>
<td>2004</td>
<td>Grappiolo, Spotorno</td>
<td>Eighteen years follow-up of the CLS uncemented stem. AAOS, 2004</td>
<td>300</td>
<td>16</td>
<td>98%</td>
</tr>
<tr>
<td>1996</td>
<td>Schramm et al</td>
<td>First long-term results with the cementless CLS Spotorno stem. OP-Journal 2/12, 1996</td>
<td>207</td>
<td>7 to 10</td>
<td>97.9%</td>
</tr>
<tr>
<td>1993</td>
<td>Bläsius et al</td>
<td>CLS multicenter study, review after eight years. Z Orthop 131, 1993</td>
<td>352</td>
<td>4 to 8</td>
<td>98%</td>
</tr>
</tbody>
</table>
Successful Clinical History – National Data
Swedish Hip Arthroplasty register

2010
97.6% at 17 Years

2006
99% at 13 Years

2002
100% at 10 Years

All diagnoses and all reasons for revision

Red curve = change of cup
Blue curve = change of stem

1992–2008, 16y = 93.1% (89–97.2), n = 1,085
1992–2008, 16y = 97.5% (95.1–100), n = 1,085

1992–2006, 13y = 95.9% (92.9–98.8), n = 823
1992–2006, 13y = 99.0% (98.0–100), n = 823

Osteoarthritis and aseptic loosening

1979–1991, to few and no observations
1992–2002, no revision, n = 314

Successful Clinical History – National Data
Australian Hip Arthroplasty Annual Report

Revision Rates of Primary Total Conventional Hip Replacement Femoral Components with 10 Years Data (Primary Diagnosis OA)

<table>
<thead>
<tr>
<th>Femoral Component</th>
<th>N Revised</th>
<th>N Total</th>
<th>1 Yr CPR</th>
<th>5 Yrs CPR</th>
<th>10 Yrs CPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS</td>
<td>64</td>
<td>1588</td>
<td>1.5 (1.0, 2.3)</td>
<td>3.8 (2.9, 4.9)</td>
<td>6.4 (4.2, 9.8)</td>
</tr>
</tbody>
</table>

UK National Health Service

NHS Supply Chain designed the ODEP (Orthopaedic Data Evaluation Panel) ratings for stems and cups to ensure consistency and to enable easy data presentation and comparison for NHS hospitals during orthopaedic tender processes. **CLS Stem received a 10A** in 2010, currently the greatest possible achievable ranking in UK.

5 http://www.supplychain.nhs.uk/odep/
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\(^6\), 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 Noble\(^7\), 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.

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\(^{6}\) Analysis performed by L. Spotorno & G. Grappiolo, Pietra Ligure, Italy

Precise Instrumentation

The Evolution

<table>
<thead>
<tr>
<th>Type</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>1984–94</td>
</tr>
<tr>
<td>Type II</td>
<td>1994–98</td>
</tr>
<tr>
<td>Type III</td>
<td>1998–2004</td>
</tr>
<tr>
<td>Type IV</td>
<td>2004–present</td>
</tr>
<tr>
<td>Type MIS</td>
<td>2004–present</td>
</tr>
</tbody>
</table>

**Zone 1:** Cutting edges on the medial/lateral sides. Cancellous bone on the anterior/posterior sides is only compressed and prepared for the sharp ribs.

**Zone 2:** Due to the antecurvation of the femur, the rasp come into contact with cortical bone. The metaphyseal part of the rasp has cutting edges on all sides.

**Zone 3:** Morphology of femur changes from oval to round cross section. The rasp teeth cut the bone just where it is needed, on the edges.

**Zone 4:** Contact between implant and bone is avoided thanks to distal oversizing of the rasp.

**Zone 5:** Centralization tip.
The Designer

**Education**

Born in Finale Ligure (Savona, Italy) on December 19th, 1936, he graduated in 1965 in medicine and surgery at the University of Genova, where he also took the specialization in Orthopedic and Traumatology in 1969.

**Career**

Chief of the hip prosthetic and articular rheumatism department at Istituti Ospedalieri Santa Corona in Pietra Ligure (Savona, Italy) in 1981, he became chief of the orthopedic department in the same hospital in 1987. Since 2001 he has been Responsible of the prosthetic department at Istituto Clinico Humanitas di Rozzano (Milano, Italy) and scientific coordinator of the orthopedic and traumatology department at Santa Corona.

**Scientific Activity**

Holder of more than 30 patents, in 1974 he designed the first cemented prostheses and in 1982 he collaborated with Protek in Bern designing the *CLS Spotorno* Stem. In 1986 he first implanted his revolutionary *CLS Spotorno* Expansion Cup, implanted more than 230,000 times so far. In 1989, together with Prof. Morsher, he designed another clinical successful stem with 3D taper philosophy: *MS-30*®, which in 2012 celebrates its 200,000th implantations. Collaborating with important surgeons all around the world, giving several lectures at the Müller foundation in Bern, being visited by thousands of surgeons from all around the world and helping several surgeons in their decision-making process thanks to the protocol established in 1984, Lorenzo Spotorno strongly influenced the orthopedic culture of his time.

Author of dozens of scientific publications and founder of Scienza e Vita foundation for searching and storing clinical data, he made more than 15,000 surgeries, of which 13,500 hip prostheses.

The “hip magician”, as often called by his patients and colleagues, passed away in 2009.

"Few surgeons can be counted among the big names of Orthopedics like John Charnley and Maurice Müller: Lorenzo Spotorno is definitely one of them."
The CLS Spotorno Hip Stem

- 700,000 implants
- 25+ years of clinical history
- 3D taper design for a proven proximal anchorage
- Natural reconstruction of the offset
- Precise instrumentation

Disclaimer

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