Stanmore Hip System: 30 Years of Clinical Success

The Stanmore femoral stem is a trusted device with excellent long-term clinical success for over 30 years. The instrumentation enables a reproducible and easy technique, allowing optimal restoration of the joint biomechanics and reduced pain.

Introduction

Development of the Stanmore hip system

Following its development at the Department for Biomedical Engineering, Royal National Orthopaedic Hospital Stanmore, the Stanmore stem was first implanted in 1973. The original design was manufactured from cast CoCr alloy (Alivium™) which was supplemented by a forged titanium alloy (Tivaloy™) version in 1979. At this time both the CoCr and titanium alloy versions were monobloc components with the femoral head integral with the stems.

In the early 1990’s a modular version of the stem was introduced with Biomet Type 1 taper thus allowing the stem to be used with metallic and ceramic Biomet modular femoral heads. The stem manufactured from forged CoCr alloy has been supplemented in 2008 by a lateralised version to allow more lateral offset whilst minimising the effect on patients’ leg length.

Since its launch in 1973, the Stanmore stem has an unchanged collared geometry and vapour blast surface finish for cement fixation. It has been employed in primary hip arthroplasty with differing cementing techniques varying from the less than optimum “thumbing method” to the vacuum mixing/cement pressurisation systems afforded by the fourth generation cementing techniques.

The Stanmore cup designed for cement fixation has been developed and refined over the same period of time. The external geometry has remained the same however the sizes have been subject to change to incorporate an increasing number of femoral head sizes. Initially made by machining from slab moulded RCH1000 polyethylene, the current version is made from ArCom material.

In the late 1990’s a metal-on-metal version of the cup was introduced and used clinically. This utilised a CoCr bearing surface which was incorporated into a pre-form shape of moulded polyethylene, the external geometry of the cup being machined from this pre-form.

Table 1. Survivorship, National Joint registries

<table>
<thead>
<tr>
<th>Register</th>
<th>Numbers of hips</th>
<th>Survivorship % (C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Arthroplasty Reg. 2010 Annual Report</td>
<td>No information given</td>
<td></td>
</tr>
<tr>
<td>Danish Hip Register 2009 Annual Report</td>
<td>No Information given</td>
<td></td>
</tr>
<tr>
<td>Swedish Hip Register 2009 Annual Report Stanmore modular stem / Stanmore cup</td>
<td>636</td>
<td>97.5% at 10 years (96.10 – 98.9)</td>
</tr>
<tr>
<td>Stanmore Monobloc stem / Stanmore cup</td>
<td>105</td>
<td>89.9% at 10 years (83.0 – 96.6)</td>
</tr>
<tr>
<td>Stanmore modular stem / Trilogy® HA cup</td>
<td>97</td>
<td>99.0% at 5 years (97.5 – 100)</td>
</tr>
<tr>
<td>Stanmore modular stem / ZCA® cup</td>
<td>249</td>
<td>98.2% at 5 years (96.4 – 100)</td>
</tr>
<tr>
<td>UK National Joint Register 2010 Annual report Stanmore stem</td>
<td>2938</td>
<td>98.6% at 5 years (97.7 – 99.1)</td>
</tr>
<tr>
<td>Stanmore cup</td>
<td>1554</td>
<td>98.6% at 5 years (97.5 – 99.3)</td>
</tr>
</tbody>
</table>

Survivorship in peer reviewed publications

As indicated in the introduction, the Stanmore design has kept key design features over three decades. Although long-term survivorship papers encompass the follow-up of stems which may or may not be in use commercially at this date, the clinical survivorship from these publications is wholly in line with that being documented in National Joint registries.

Stanmore stem long-term survivorship

The longest published survivorship at 22 years is documented by Gerritsma-Bleeker et al. In this series 135 patients (146 hips) received Stanmore stems and cups between 1975 and 1976. From the surviving patients 22 years later the survivorship of the stem/cup combination was 85%, of the stem 91% and of the cup 88%.
Slightly inferior 20-year survivorship results with a greater patient population has been documented by Emery. In an initial population of 804 patients (839 hips) the survivorship at 10 years was 95% which declined to 73% at 20 years. The authors concluded that the Stanmore prosthesis is capable of producing satisfactory long-term results that compare favourably with those of other cemented prostheses.

This assertion has been validated by Britton in a comparison study of 208 Charnley® and 982 Stanmore stems all of whom were implanted by or under the supervision of one surgeon. The Stanmore implants have a better survivorship at 14 years (86% versus 79% p=0.004) but this difference only became apparent at 10 years. The later iterations of Stanmore implants used in the series did better than the earlier ones, (97% versus 92% at ten years p=0.005) and this was attributed to the later use of cementing techniques using a cement gun. The patients used in this study received Charnley® and Stanmore stems in the period from 1973 to 1987 however different results were obtained in a second comparative evaluation where the implants were used in 1982 to 1987. From a population of 213 Stanmore and 200 Charnley prostheses there was no statistically significant difference in revision rates at 10 years. However with reference to both types of stems, there was a greater revision rate for stems implanted by trainees compared to senior surgeons. The Charnley stems used had a head diameter of 22.2 mm whereas the Stanmore implants had multiple head diameters (25, 29 and 32 mm). No influence on revision rate of head size could be determined.

**Stanmore stem results in young patients**

The initial use of the Stanmore stem was focused on relatively elderly patients with predominantly osteoarthritic hips. However, evidence exists that suggests the Stanmore implant can provide good results in younger patients. Emery et al. documented the use of the Stanmore hip in a small series of 57 patients all of whom were under 50 years of age at the time of surgery (mean age 41 range 17 to 49). Of the original 57 patients, 22 (39%) had been revised at average of 12 since original surgery, the major reason being aseptic loosening. The survivorship was 90% at 10 years and 68% at 15 years.

**Stanmore stem results in rheumatoid arthritic patients**

The use of the Stanmore implant for the treatment of rheumatoid arthritis of the hip has been documented by van der Lugt. The Stanmore hip was implanted in a series of 288 patients (325 hips). At a mean follow up of 117 months (range 12 – 252), 18 hips had been revised. The mean survival of all hips was 82% at 18 years (95% C.I. 64 – 101); whereas for hips with rheumatoid arthritis the survivorship was 58%. This compares with a 18 year-survivorship of 95% for osteoarthritic hips. This difference in survivorship between the two etiologies was deemed to be due to the high proportion of acetabular loosening seen in the RA group.

**Stanmore stem use in other orthopaedic conditions**

The good documented long-term survivorship of the Stanmore hip had made it indicated for other orthopaedic requirements. Van de Lugt et al. have evaluated the Stanmore system in the managements of failed osteosynthesis of the femoral neck in a small series of 31 patients. The average age of the patients at insertion of the prostheses was 74 years (59 to 92 years) and previously the femoral neck fractures were reduced and stabilised by dynamic hip screws (25 patients), screws (4 patients), Enders nails (1) and a Gamma nail. The mean time from initial osteosynthesis to secondary THA was 5 months (range 1 to 127 months). At the time of clinical review 8 patients had a maximum follow up of 12 months whereas the remaining 23 patients had a median follow up of 30 months. Although one patient had radiographic signs of femoral loosening, none of the patients required revision of the total hip arthroplasty. Using the Merle d’Aubigne scoring system the authors found excellent results in 94% of the cases.

**Stanmore stem use with metal-on-metal articulation**

The major long-term failure mechanism for cemented stems articulating with polyethylene acetabular cups is polyethylene debris induced osteolysis. Advances in the manufacture and processing of UHMWPE have reduced the wear volume of debris produced, this occurring in parallel with a move to metal on metal bearing surfaces to eliminate it altogether.

This alternative “metal” bearing technology has been evaluated with the Stanmore stem in a randomised controlled trial conducted by Zijlstra et al. In this study 195 patients received Stanmore arthroplasties. All had Stanmore femoral stems, 102 receiving Stanmore metal on metal cups and 98 receiving Stanmore polyethylene cups. 28 mm diameter femoral heads were used in all patients. At 10-year follow-up, survivorship for the metal on metal articulation group was 95.5% and 96.8% for the metal on polyethylene group. This difference was not significant, p=0.402. The authors concluded that the absence of clinical superiority of the cemented metal on metal bearing and concerns over their biological effect has led them to favour the metal on polyethylene THA in their clinic.
Factors which influence Stanmore hip longevity

Aseptic loosening is the major reason for hip revision following primary total hip arthroplasty with osteolytic lesions around well fixed stems having been associated with defects in the surrounding cement mantle. Over its long clinical history, Stanmore stem has been used with a variety of cementing techniques and as such it would appear to tolerate cement defects and yet give excellent long-term survivorship. Finite element analysis of the cement mantles surrounding Stanmore stems has suggested that the overall cement mantle thickness, often cited as a critical factor affecting implant survival, may in fact be less important around smooth collared prostheses such as the Stanmore hip. This stem is designed to minimise cement stress, the collar prevents subsidence related hoop stresses and smooth corners minimise stress in the cement. This concept would appear to be confirmed by the very low stem migration figures for well fixed Stanmore and Charnley stems. Walker et al. measured stem migration for stems with a minimum of 8 years follow up and found similar mean migration figures of 1.45 mm (range 0.77 to 2.13) for both implant types. However for stems which had failed by aseptic loosening the mean migration figures were 4.32 (range 1.74 to 6.9).

The thickness of the cement mantle is influenced by the reaming employed and the surgical approach used. Mellor has suggested that broaches should be used to provide a minimum cement mean thickness of 1.7 mm for the Stanmore stem, this thickness resulting in 3% of cement defects. A posterior surgical approach also favours a more defect free cement mantle. Sanghrajka et al. in their retrospective radiographic review of 50 Stanmore hips noted that the anterior approach was associated with an increase in the frequency of deficiencies in the cement mantle. This surgical approach is more prone to producing a valgus/posterior oriented stem tip whereas the posterior approach generates a more uniform cement mantle. Neutral alignment of the stem providing the lowest failure rate.

Conclusion

The Stanmore hip system has over 30 years of clinical use. The clinical evidence gathered from peer reviewed publications and national joint registries continues to confirm and demonstrate the excellent long term performance of this cemented hip system.

References

8. Zijlstra W et al. No superiority of cemented metal on metal over metal on polyethylene THA ina Randomised Controlled Trial at 10 years follow up. Othopaedics 2010; 33 (3): 154.
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