Exeter Short Stems Compared With Standard Length Exeter Stems

Experience From the Australian Orthopaedic Association National Joint Replacement Registry

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Abstract: The standard Exeter stem has a length of 150 mm with offsets 37.5 to 56 mm. Shorter stems of lengths 95, 115 and 125 mm with offsets 35.5 mm or less are available for patients with smaller femurs. Concern has been raised regarding the behavior of the smaller implants. This paper analyzed data from the Australian Orthopaedic Association National Joint Replacement Registry comparing survivorship of stems of offset 35.5 mm or less with the standard stems of 37.5 mm offset or greater. At 7 years, there was no significant difference in the cumulative percent revision rate in the short stems (3.4%, 95% CI 2.4-4.8%) compared with the standard length stems (3.5%, 95% CI 3.3-3.8%) despite its use in a greater proportion of potentially more difficult developmental dysplasia of the hip cases. **Keywords:** exeter, short stem, small stem, stem survivorship, registry.

The Exeter hip implant was first introduced into clinical practice in 1970 [1]. Its basic design of a collarless, double tapered cemented stem has remained unchanged [2]. Minor modifications to its design, surface finish, alloy construction, and modularity of the range led to the release of the Exeter Universal stem in 1988 [3].

The highly polished double tapered stem has a predictable subsidence within the cement mantle allowing load transmission dominated by compression at the bone-cement interface. This favorable property protects the cement mantle, leading to a low failure rate [4]. Survivorship at 17 years has been reported at 100% with revision for aseptic loosening as an end point [3].

Initially stems were available in various sizes in 37.5- and 44-mm offset options with a standard length of 150 mm. However, in small femurs, this led to oversizing of the femoral components, resulting in an incomplete or insufficient cement mantle of less than the recommended 2 mm [5]. Particularly in an Asian population [6-9] with a higher prevalence of smaller femoral geometry, use of standard sized stems has led to higher failure rates [10] when compared with the first series of Exeter Universal hips.

Subsequently smaller and shorter "CDH" stems with a 35.5-mm offset and 125-mm length were introduced followed by even shorter stems (Fig. 1) with smaller offsets of 33 mm (115-mm length) and 30-mm (length 95 mm).

With regard to smaller sized stems, concerns of stem breakage and implant failure have been raised [11] and small changes in design variables can significantly influence outcome [12]. However, a series of 47 Exeter small stems by Tai et al [11] and of 45 Exeter small stems by Chiu et al [13] in an Asian population has demonstrated comparable survivorship to previous series with standard sized stems in a white population.

The aim of this study was to analyze data from the Australian Orthopaedic Association National Joint

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Submitted May 3, 2012; accepted June 13, 2012.
Supplementary material available at www.arthroplastyjournal.org.
The Conflict of Interest statement associated with this article can be found at http://dx.doi.org/10.1016/j.arth.2012.06.016.

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0883-5403/2801-0017$36.00/0
http://dx.doi.org/10.1016/j.arth.2012.06.016

Fig. 1. Short and Standard Length Exeter Stems. Left to right: 95-mm length with 30-mm offset, 115-mm length with 33-mm offset, 125-mm length with 35.5-mm offset, and 150-mm length with 37.5-mm offset.

Replacement Registry (AOA NJRR) to investigate the survivorship of short (≤125 mm in length) Exeter stems compared with standard length stems (≥150 mm in length) in over 40 000 implants.

Materials and Methods

Deidentified data analysis was obtained from the AOA NJRR and included data collected from September 1, 1999, until December 31, 2010.

The AOA NJRR is a Commonwealth Government–funded AOA initiative with the purpose of improving the care of patients undergoing joint arthroplasty, providing accurate demographic information, and establishing a reliable method of audit for both hospitals and individual surgeons [14,15]. Before its establishment, the outcomes of joint replacement surgery were unknown. Data collection commenced in September 1999, with staged state implementation leading to nationwide data collection in mid 2002.

Data obtained at the time of surgery include patient details, hospital, type of procedure, joint replaced, side, diagnosis, and component details. All public and private hospitals in Australia performing joint replacement surgery provide information to the Registry, leading to a capture rate of 95% by 3 months [14]. Validation with State Health Department data is performed to further increase the capture rate.

Data for Exeter stems used in primary hip replacement were obtained. These were divided into stems with offset 35.5 mm or smaller and length of less than 150 mm (short stems) and offset greater than 35.5 mm and length of 150 mm (standard stems). Due to the classification system, short stems (125, 115, and 95 mm) are classified as offset 35.5, 33, and 30 mm, respectively, and standard stems (length of ≥150 mm) as offset 37.5 mm or greater. Revision cases were excluded. All acetabular components including cemented or press fit components were included.

Statistics

The cumulative percent revision (CPR) of primary conventional Exeter total hip replacements up to 7 years from time of implantation using the Kaplan-Meier method was reported.

The main aim of the study was to compare revision rates between the short stems (≤125 mm) and standard stems (≥150 mm) across all diagnoses and for a primary diagnosis of osteoarthritis.

Unadjusted CPR values are reported with 95% confidence interval (CI). Revision rates over the entire period are compared using hazard ratios from Cox proportional hazards models, adjusting for age and sex. Tests were 2 tailed at the 5% level of significance.

Descriptive analysis of primary diagnosis, revision diagnosis, type of revision, and revision rate by offset/length are also reported.

Results

From the 2011 registry report, 294,329 hip procedures were performed between September 1, 1999, and December 31, 2010, including primary partial, primary total, and revision hip replacements. Of these 211 114 (71.7%) were primary hip replacements, of which 196 582 were conventional hip replacements.

Comparison—All Primary Diagnoses

When all primary diagnoses were included, 39 956 standard-length Exeter stems were implanted compared with 1898 short Exeter stems.

Osteoarthritis was the primary diagnosis in 87% in the standard stems compared with 80.2% in the short stems ($P < .001$, χ^2 test). The distribution across the other diagnoses is similar between the 2 groups (Table 1), but of particular note, developmental dysplasia of the hip (DDH) was more prevalent in the short stem group (5.0%) compared with the standard stem group (0.6%) ($P < .001$). Within the subgroup of short stem sizes, 16% of the 30-mm stems, 19.2% of the 33-mm stems, and 4.2% of the 35.5-mm stems were for dysplasia.

There was no significant difference in revision rates between short stems (≤125-mm length) and standard stems (≥150 mm length) (adjusted HR 1.22, 95% CI 0.90-1.65; $P = .191$) when all primary diagnoses were included (Fig. 2). At 7 years, the CPR of short stems was 3.4% (95% CI 2.4-4.8%) compared to 3.5% (95% CI 3.3-3.8%) in the standard stems (Table 2). The revisions per 100 observed component years were 0.69 (95% CI