There has been an ongoing debate over the use of cemented versus non-cemented fixation in total knee arthroplasty (TKA) in terms of functional outcomes and survivorship for mechanical failures.1-9 The long-term results of TKA, to a very large extent, depend on the design of the prosthesis,1,4,5 the restoration of mechanical alignment, soft-tissue balancing,2,3 and the type of fixation.10,11 Other factors influencing outcomes are the patient age, body weight and activity level.12

While cementless fixation is gaining wider acceptance, there is considerable evidence in several meta-analyses and national registry data supporting the superiority of cemented fixation in TKA in terms of improved survivorship.6-9,13 Non-cemented fixation may be more sensitive to malalignment, especially on the tibial side, since sheer forces caused by varus or valgus tibial base plate positioning will alter the compressive forces distributed across the implant-bone interface.14,15

The aim of this investigation was to review and critically evaluate the published literature to defend the clinical superiority of cemented fixation in TKA.

Published literature and level of evidence
We reviewed the literature based on the level of evidence, including case series, prospective case control studies, meta-analyses, registry data, and prospective randomised studies.16

Since 1974, many case series have been published to document safety, efficacy and reliability of cemented fixation in TKA. Various studies have shown that the survivorship for mechanical failure of cemented TKA is between 90% to 97% at 10 to 15 years,2,17-19 and is between 85% and 98% at 15 to 20 years follow-up.3,20-26 The results of various case series studies (Level IV evidence) on survivorship of non-cemented fixation for mechanical failure is 76.4% to 98.6% at 10 to 20 years.12,25,27-39 In one such case series, cemented fixation was found to show better results at 15-year follow-up as reported by Baker et al.40 While the sum total of the results of Level III and IV evidence between cemented and non-cemented survivorship rates is not so dissimilar, the Level I and II evidence strongly suggests the superiority of cemented fixation in TKA.

Registry data
The failure rate for cemented and non-cemented fixation is 3.81% and 4.75% in the UK registry, 5.6% and 6.2% in the Australian registry, 9% and 23% in the Sweden registry, and 4.28% and 6.93% in the New Zealand registry, respectively6-9 (Table I). In addition, registry data on the usage of non-cemented versus cemented TKA supports a trend of preference in use of cemented fixation by surgeons (Table II). According to the National Joint Registry (NJR) in England, cemented fixation...
is used 85% of the time, whereas non-cemented is used only 5% of the time.6 The Australian registry report shows that the usage of cemented fixation is 55% compared to 29% for non-cemented fixation.7 The Swedish registry up to 1994 shows the greatest usage of cemented fixation at 95% as opposed to only 3% for non-cemented fixation.8 According to the New Zealand registry, cemented fixation is preferred 89% of the time compared to their non-cemented usage rate of only 4%.9

**Level I and II studies**

Two prospective, randomised studies further document superior results for cemented fixation in TKA. Park et al41 showed better results for cemented fixation over non-cemented fixation at 14-year follow-up. A recent meta-analysis concluded that cemented fixation has better survivorship.12

**Functional outcomes**

In our own case series on a Quality of Life Analysis after Cemented TKA, excellent functional outcomes were found for cemented fixation. We identified 81 matched-pairs of rotating-platform versus fixed-bearing metal-backed designs in patients matched for age, BMI, and gender.42 Our results indicated an improved range of motion (ROM) from 110° prior to surgery to 125° following cemented fixation. A total of 50% of patients were able to participate in various types of sporting activities, based on a validated self reported patient administered questionnaire (PAQ), confirming that quality of function is excellent following cemented fixation in both fixed and rotating-platform TKA (Table III). In our most recent study of rotating platform TKA, 117 patients were followed prospectively for ten years. The mean Knee Society pain score had improved from 44.1 points pre-operatively to 94.3 points post-operatively, and the mean Knee Society function score had improved from 39.4 to 90.2 points.17

**Comparative survivorship**

In a comparative case series survivorship analysis of cemented versus non-cemented Press Fit Condylar TKAs at ten years follow-up, Duffy et al29 found a significantly higher revision rate in the non-cemented group. They found 72% survivorship for femoral or tibial aseptic loosening or osteolysis (10 revisions) in the non-cemented versus 94% (2 revisions) in the cemented group.

**Patellofemoral complications**

The long-term results of cemented all-polyethylene patellar buttons have demonstrated excellent long-term survivorship.43 However, patellofemoral complications are different in cementless patellar resurfacing. Whereas most cementless TKA procedures incorporate cementless femoral and tibial component fixation with cemented all-polyethylene buttons, some make use of a metal-backed component that is either fixed to the polyethylene articular surface or permits rotation of a polyethylene bearing that is a snap-fit onto the metal prosthesis. The polyethylene thickness on a metal-backed prosthesis is thinner, making the implant more susceptible to wear over the long term. Wear-through of the polyethylene surface causes eventual metal-on-metal wear of the femoral and patellar components. Rotating polyethylene-on-metal patellar implants are also associated with component dissociation of the polyethylene from the metal backing. If later revision is necessary, removal of a metal-backed cementless component is associated with greater patellar bone-stock loss.44

**Conclusion**

Based on level I and II studies, registry data and meta-analyses, cemented fixation in TKA has superior and more durable fixation with better survivorship for mechanical failure as compared to non-cemented fixation. Moreover, registry data clearly indicates a greater usage of cemented TKA. Further advancements in non-cemented implant design are needed to achieve better and more reproducible biologic fixation. At present, cemented fixation in TKA is the gold standard.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

This paper is based on a study which was presented at the Winter 2011 Current Concepts in Joint Replacement meeting in Orlando, Florida, 7th – 10th December.
References


