

# Can We Afford Total Joint Replacements in Jamaica?

KD Vaughan

## INTRODUCTION

Total hip replacement was successfully introduced in November 1962 in England by the late Sir John Charnley with the expressed intention of relieving the pain and suffering of those afflicted with severe osteoarthritis of the hip joint. A significant amount of engineering and bio-engineering work went into the production of the final articulating surfaces of metal on high molecular weight polyethylene. This was meant to simulate the low coefficient of friction in normal articular joints. It was not long before this innovation spread throughout the world and today, most joints can be replaced by artificial equivalents. Over the five decades since its introduction, there have been changes in designs of implants with the use now of additional bearing surfaces, for example, metal on metal, ceramic on polyethylene and ceramic on ceramic. Joint replacement has been heralded as one of the greatest orthopaedic innovation of the 20<sup>th</sup> century. Initially, more hip than knee replacements were done; however, that trend has been reversed in most parts of the world (1).

Numerous studies have reported excellent long-term results in relieving pain and improving the quality of life in patients who otherwise would have had an arthrodesis of their hips for debilitating arthritis (2–4). Worldwide, the demand for total joint replacement has risen as the technology has improved and successful outcomes have been published. There is wide international variation in the number of total hips performed, with figures ranging from 50–130/100 000 population with the higher figures in the Scandinavian countries (5). In the United States of America (USA), the situation is no different and there is a high demand for joint replacement, especially knees. Approximately 135/100 000 total knees as opposed to 50/100 000 hips were done in 2002 (6). In Jamaica, less than 150 hip replacements are done annually, making for a rate of 5.3/100 000 population. This puts us in the same bracket as Singapore which has a rate of 8/100 000 (5).

Using plain radiographic changes of the hip as the criterion for diagnosing osteoarthritis, it is estimated that approximately 15% of people over 65 years have arthritis of the hip joint (7). The prevalence of osteoarthritis in Jamaica

is unknown. Assuming we have a similar prevalence locally, using recent population statistics, the age group 65 years and over accounted for 217 606 individuals or 7.8% of the population (8). This would equate to 32 000 individuals who are suffering from osteoarthritis of the hip alone. There is therefore a need for joint replacement locally.

## Funding sources and cost

Funding the cost of total joint replacement varies widely across the globe and even within countries, there is variation. In the United Kingdom (UK) for example, funding for a joint replacement is through the National Health Service (NHS) and the cost to the patient is virtually free. A similar situation exists in Canada. There are, however, waiting lists in both countries. In the USA, the situation is different with insurance companies and Medicare for the most part covering the cost of these replacements and Medicaid for those with no insurance coverage.

In Jamaica, the situation is completely different. Only 20% of our population has health insurance (9) and of those with insurance coverage, the insurance companies do not for the most part cover the cost of the implant which is approximately a third of the cost for doing a joint replacement. This therefore means that the majority of patients who present for a joint replacement will have to fund their surgery out of pocket.

The cost of a joint replacement varies from country to country depending on the healthcare system in place. Accurate data are therefore difficult to come by. The quoted mean cost of a primary hip replacement in the USA is in the region of US\$32 299 (10). Although there are no published data on the cost of a joint replacement in Jamaica, estimates of true cost are in the region of JA\$1.2–1.5 million. Not very many people can afford this and in many instances, the input of family along with social groups has to be relied upon. The foregoing cost assumes that everything goes well doing the primary surgery. If, however, there are complications, which do arise from time to time, then this cost increases tremendously.

Dislocations can ruin an otherwise successful operation and hence diminish its cost effectiveness. Dislocations will need to be reduced and if unstable, will ultimately need to be revised. Dislocation rates following primary hip replacements vary from 2–4% (11, 12). Whereas information on hospital cost for other complications is readily available, hospital cost for dislocation after primary total hip arthroplasty is not readily available. Sanchez-Sotelo *et al* calculated that one or more closed reduction plus revision can increase the hospital cost by as much as 148% of the initial cost (11).

**Keywords:** Bone, hip, hip replacement, joint

---

From: Department of Surgery, Radiology, Anaesthesia and Intensive Care, Division of Orthopaedics, The University of the West Indies, Kingston 7, Jamaica.

Correspondence: Dr K Vaughan, Division of Orthopaedics, Department of Surgery, Radiology, Anaesthesia and Intensive Care, The University of the West Indies, Kingston 7, Jamaica. E-mail: vaughankenneth@hotmail.com

A fracture around an implant may spell disaster for the patient. These fractures may occur intra-operatively at the time of insertion of the femoral component or post-operatively as a result of trauma, which is rare, or more likely due to aseptic loosening. The mean cost of treating periprosthetic fractures has been calculated at £23 469 per patient [range £615 – £223 000; median £18 031] (13). This wide variation in cost is due to the treatment options available depending on whether the implant is stable or loose. A loose implant will require revision which is a much more costly undertaking.

Bone loss due to osteolysis may eventually lead to, in the case of hip replacement, loosening of both the femoral and acetabular components. On the acetabular side, this may be so extensive as to result ultimately in pelvic discontinuity which is an increasing complication of total hip replacements. Addressing pelvic discontinuity may involve complex reconstructive operations requiring bone grafting and specialized implants. The costs of the custom triflange implant and a trabecular metal cup-cage construct for reconstruction of the acetabulum as a result of pelvic discontinuity was found to be US\$12 500 and US\$11 250, respectively. This does not include the cost of the implant on the femoral side, hospital costs or, indeed, surgical costs (14).

Infection is perhaps the most devastating complication that can occur post total joint replacement. The revision rates for infection vary in the literature. Bozic *et al* (15) noted that 14.8% of their revisions were for infection. The cost for treating infection after a primary hip in the USA is in the region of US\$100 000 (16). Revision for infection in total hip replacement has been estimated to cost 3.6 times the cost for a primary operation (17). This increased cost is due to the preoperative investigations, the prolonged hospital stay, the cost of prolonged antibiotic therapy, whether intravenously or orally, which may be for as long as six weeks. Oftentimes, infection is dealt with in a two-stage manner. The first stage involves removal of the implant, debridement and curettage and insertion of antibiotic spacers within the joint. After an interval period of up to six weeks, during which antibiotics are given, the second stage is undertaken which involves removal of the spacer and reinsertion of the revision pattern implants. The average cost in France for a single stage revision for sepsis was €31 133 (US\$42 185) and €54 098 (US\$73 303) for two-stage revision (17). Here, the cost of treating a patient with an infected hip replacement was reported to be 2.6 times greater than the cost for an aseptic revision and 3.6 times that for a primary arthroplasty (17).

The average total hip/knee replacement will last 10–15 years. The longevity of an implant is dependent on a number of factors such as activity, weight, gender and age. Once a hip or knee replacement becomes loose, it has to be replaced as loosening has important consequences on the remaining bone stock. Wear particles produced by the respective components including metal, polyethylene, ceramic and cement

in those cases where it is used, all incite an inflammatory reaction resulting in the production of inflammatory cytokines which induce osteoclast formation with the net result being destruction of bone. If left untreated, the bone will be weakened to the point of a periprosthetic fracture. Once a fracture has occurred, it adds an entirely different set of problems to the management of the loose implant. It is therefore imperative that revision be conducted in a timely fashion. Revision total hip replacement more often is done in the older population (15), most of whom are pensioners and therefore can ill afford the cost of revisions.

Revision surgery is more difficult and technically demanding than a primary arthroplasty, with inferior outcomes (1). Revision also often requires special prostheses much different from the primary implants. These implants are also much more costly. The local cost for revision knee implants alone is in excess of JA\$1.3 million dollars. This does not include hospital, surgical and rehabilitation costs, all of which are increased. If the bone stock is deficient, which it often is in revision surgery, then bone graft will be needed and in some cases an allograft of the proximal femur may be required. The cost of a femoral head is currently JA\$300 000 and for a proximal femoral allograft, it is well over a million dollars. All these implants and bone grafts have to be imported. The cost of revision surgery is therefore outside the reach of most patients having a primary joint replacement at the moment. While a hip is functioning, most people do not think of planning for revision surgery and so are often caught unprepared financially for a revision. Having had total joint replacements over the years, there are now patients requiring revision who cannot afford to have it done due to severe financial constraints. This often results in periprosthetic fractures which compound the problem and further increase the cost.

As part of the local strategy to decrease the cost of joint replacements, we need to look at different markets from which to source quality implants. Additionally, we need to establish a bone bank where the femoral heads taken at a primary hip replacement can be processed and used for grafting purposes rather than be discarded as is the current practice. A concerted effort is also needed to have more of the population covered by health insurance and lobby the health insurance companies to cover the cost of the implants required in these complex cases.

## REFERENCES

1. Burns AW, Bourne RB, Chesworth BM, MacDonald SJ, Rorabeck CH. Cost effectiveness of revision total knee arthroplasty. *Clin Orthop Relat Res* 2006; **446**: 29–33.
2. Wroblewski BM, Fleming PA, Siney PD. Charnley low-frictional torque arthroplasty of the hip. 20-to-30 year results. *J Bone Joint Surg Br* 1999; **81**: 427–30.
3. Wroblewski BM, Siney PD, Fleming PA. Charnley low friction arthroplasty: survival patterns to 38 years. *J Bone Joint Surg Br* 2007; **89**: 1015–18.
4. Berry DJ, Hamsen WS, Cabanella ME, Morrey BF. Twenty-five-year survivorship of two thousand consecutive primary Charnley total hip

- replacements: factors affecting survivorship of acetabular and femoral components. *J Bone Joint Surg Am* 2002; **84**: 171–7.
5. Merx H, Dreinhöfer K, Schröder P, Stürmer T, Puhl W, Günther KP et al. International variation in hip replacement rates. *Ann Rheum Dis* 2003; **62**: 222–6.
  6. Kurtz S, Mowat F, Ong K, Chan N, Lau E, Halpern M. Prevalence of primary and revision total hip and knee arthroplasty in the United States from 1990 through 2002. *J Bone Joint Surg Am* 2005; **87**: 1487–97.
  7. Ingvarsson T, Hägglund G, Lohmander LS. Prevalence of hip osteoarthritis in Iceland. *Ann Rheum Dis* 1999; **58**: 201–7.
  8. Statistical Institute of Jamaica. Population census 2001, Jamaica. Vol. 1: country report. Kingston, Jamaica: STATIN; 2001.
  9. Statistical Institute of Jamaica. Economic and social survey Jamaica. Kingston, Jamaica: STATIN; 2001.
  10. Costhelper. How much does hip replacement cost? [Internet]. 2014 [cited 2014 Jan 2014]. Available from: <http://www.health.costhelper.com/hip-replacement>
  11. Sanchez-Sotelo J, Haidukewych GJ, Boberg CJ. Hospital cost of dislocation after primary total hip arthroplasty. *J Bone Joint Surg Am* 2006; **88**: 290–4.
  12. Blom AW, Rogers M, Taylor AH, Pattison G, Whitehouse S, Bannister GC. Dislocation following total hip replacement: the Avon Orthopaedic Centre experience. *Ann R Coll Surg Engl* 2008; **90**: 658–62.
  13. Phillips JR, Boulton C, Morac CG, Manktelov AR. What is the financial cost of treating periprosthetic hip fractures? *Injury* 2011; **42**: 146–9.
  14. Taunton MJ, Fehring TK, Edwards P, Bernasek T, Holt GE, Christie MJ. Pelvic discontinuity treated with custom triflange component: a reliable option. *Clin Orthop Relat Res* 2012; **470**: 428–34. doi: 10.1007/s11999-011-2126-1.
  15. Bozic KJ, Kurtz SM, Lau E, Ong K, Vail TP, Berry DJ. The epidemiology of revision total hip arthroplasty in the United States. *J Bone Joint Surg Am* 2009; **91**: 128–33. doi: 10.2106/JBJS.H.00155.
  16. Bozic KJ, Ries MD. The impact of infection after total hip arthroplasty on hospital and surgeon resource utilization. *J Bone Joint Surg Am* 2005; **87**: 1746–51.
  17. Klouche S, Sariali E, Mamoudy P. Total hip arthroplasty revision due to infection: a cost analysis approach. *Orthop Traumatol Surg Res* 2010; **96**: 124–32.