# Cemented Total Hip Replacements: Current Practice in Malaysia

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## ABSTRACT

To assess the current practice of cemented total hip replacements (CTHR) in Malaysia, questionnaires were sent by post to all '**Members**' of the Malaysian Orthopaedic Association (MOA). 76 replies were received from the 191 members. The results are presented as the percentage of surgeons.

76% performed 10 or less CTHR per year whilst only 9% performed more than 20. 52% do not discharge their patients from follow-up. At follow-up, 45% perform yearly radiographs. 11 different types of prostheses were used. 29% used Charnleys and 38% used Exeters exclusively. The most popular femoral head size was 28mm, accounting for 37%. In cementing the femur, 33% attempt to remove as much cancellous bone as possible, 75% use pulsed lavage, 53% use an intra-medullary brush, 93% plug the distal femur, 97% dry the femoral shaft prior to cementing, 88% use a cement gun and 94% pressurize the cement prior to insertion of the prosthesis. For the acetabulum, 90% aim to retain subchondral bone, 96% use anchor holes, 99% dry the acetabulum prior to cementing, 73% use pulsed lavage, 20% use controlled hypotension and 76% pressurize the cement prior to cementing. The most popular cement was CMW (32%) and Simplex (31%). 49% used low viscosity cement for the acetabulum whilst 62% for the femur. 94 % do not chill the monomer nor centrifuge the bone cement. 13% vacuum mixed the cement.

Whilst CTHRs are not regularly performed by most Malaysian orthopaedics surgeons, their choice of implants appears sound. Only second generation cementing techniques are generally well accepted and this may reflect attention to cost benefits based on present literature evidence.

## INTRODUCTION

Total hip replacements are amongst the most successful operations introduced this century[1], improving the quality of life of millions of patients around the world. There are now a few prostheses on the market with excellent long-term follow-up results[2-6]. The use of modern cementing techniques has also led to improvements in the long-term survivorship of total hip replacements[7]. Therefore, if the choice of implants and the cementing technique is good and up to date, the likelihood of long term survivorship of the total hip replacement would be improved. This naturally also requires good surgical technique as no implants or cementing technique can compensate for the surgeons' skills.

The first total hip replacement was performed in Malaysia in 1969[8]. Despite its success and being performed for over 30 years in Malaysia, there has been very little published in the literature regarding its practice here in Malaysia. A National Arthroplasty Register, which could act as a data collection and study centre, has not yet been established and is unlikely to be established in the foreseeable future. Thus, we do not know the 10-year survival rate of cemented total hip replacements in Malaysia. The reasons are likely to be multi-factorial and include patients not attending or being lost to follow-up, a lack of research funding and expertise and the lack of time and a proper hospital base for the government surgeons to conduct proper studies due to the uncertainty of transfers.

This postal questionnaire survey was conducted to assess the current practice of cemented total hip replacements amongst Malaysian orthopaedic surgeons.

## MATERIALS AND METHODS

To assess the current practice of cemented total hip replacements in Malaysia, we sent a questionnaire (Figure 1) together with a stamped self-addressed envelope to all the '**Members**' of the Malaysian Orthopaedic Association (MOA). The questionnaires were sent on our behalf by the MOA, as it is the policy of the MOA not to disclose the corresponding addresses of its members. We also took the opportunity to ask some members who attended the 1999 Malaysian Orthopaedic Association Annual Scientific Meeting to complete the questionnaire. The questionnaires were finally re-sent to all the members to try to increase the response rate in order that a truer representation of current practice may be obtained. We took the opportunity to improve the clarity of some of the questions that had caused some uncertainty amongst the members who had replied, by rephrasing these questions, before the questionnaires were re-sent.

The questionnaire we sent was largely modeled on that used by Hashemi-Nejad et al[9] as we wanted to compare our findings with published literature from studies based in hospitals from the British National Health Service. The questionnaire was divided into 5 parts: Surgeon and Practice, Femoral Prostheses, Femoral Cementing Techniques,

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Acetabular Cementing Techniques and Cement Preparation (Figure 1).

## RESULTS

The MOA had a total of 191 members at the time the survey was conducted. We received a total of 47 replies by post from the initial survey, 7 replies by direct enquiries to the members during the Malaysian Orthopaedic Association Annual Scientific Meeting and 3 more by direct enquiries from colleagues at work. That left us with a total of 57 replies out of a possible 191, representing a response rate of 30%. 19 members responded to the second survey, giving a total of 76 replies and a total response rate of 39%. In some replies, not all the questions were answered and some questions were answered incorrectly.

The results of the survey are analysed in respect to the percentage of surgeons who replied to that question. The number of hips performed by each surgeon was taken to be the mean of the ranges quoted or the number if the respondent gave an exact figure.

### Surgeon and Practice

Of the surgeons who replied, 32% were in the Ministry of Health, 22% were in the universities and 46% were in private practice. The percentage of cemented total hip replacements performed was 24% in the government hospitals, 25% in the university hospitals and 50% in the private hospitals.

76% of the surgeons performed 10 or less cemented total hip replacements per year whilst only 9% of the surgeons performed more than 20 (Figure 2). The average age of the surgeons who stated their age in the survey was 41.6 years (range 30-63) whilst the average age of the surgeons regularly performing cemented total hip replacements (more than 20 per year) was 43 years (range from 36-56). Of the 7 surgeons performing more than 20 total hip replacements per year, 1 was with the Ministry of Health, 2 in the universities and 4 in private practice.

The most common pathology encountered in the patients requiring total hip replacements were primary osteoarthritis in 60% and secondary osteoarthritis in 26%. Secondary osteoarthritis was most commonly due to avascular necrosis of the femoral head and hip dysplasia. Rheumatoid arthritis was uncommon, accounting for less than 5%.

52% of the surgeons do not discharge their patients from follow-up after a cemented total hip replacement. 11% follow the patients up for 5 years, 13% for 2 years, 16% for 1 year and 7% for only six months. At follow-up, 45% perform yearly radiographic evaluation, 32% perform six monthly radiographs, 13% only if the patients were symptomatic, 2.6% perform 2 yearly radiographs and 2.6% perform six-monthly initially followed by yearly radiographs.

### Femoral Prostheses

11 different types of prostheses were used by the surgeons (Figure 3). Of the 50 surgeons who stated their prosthesis of choice, 29% used Charnleys and 38% used Exeters exclusively. Of the 9% who used 2 types of prostheses, 3% were Charnleys and Exeters and 5% used either Charnleys or Exeters respectively in combination with another prosthesis.

The most popular femoral head size was 28mm, accounting for 37% of the surgeons. 22.25mm accounted for 20% whilst 32mm was not used at all by any of the surgeons (Figure 4).

### Femoral Cementing Techniques

Of the surgeons, 33% attempt to remove as much cancellous bone as possible, 75% use pulsed lavage, 53% use an intra-medullary brush to clear bone debris, 88% use a cement gun and 94% pressurize the cement prior to insertion of the prosthesis.

93% plug the distal femur. Of these, 45% use high-density polyethylene (HDP), 40% use a cancellous bone plug, 10% use HDP and/or cancellous bone plug, 2% use a cement plug and 3% use other methods. 97% dry the femoral shaft prior to cementing. Of these, 55% dried the femur using a swab, 41% used a swab in combination with hydrogen peroxide and/or suction and 4% used a swab and adrenaline.

### Acetabular Cementing Techniques

Of the surgeons, 90% aimed to retain subchondral bone, 73% use pulsed lavage, 20% used controlled hypotension prior to cementing and 76% pressurize the cement prior to cementing. 96% use anchor holes of which 39% of these use 'classical' holes consisting of ilial, ischial and pubic drill holes, 57% multiple small anchor holes and 6% use a combination of the 2 methods.

99% dry the acetabulum prior to cementing. Of these, 64% use a swab, 4% use a swab soaked in adrenaline whilst 29% use a swab usually in combination with hydrogen peroxide and suction.

### Cement Preparation

Of the surgeons, the most popular cement used for the femur was CMW (32%) and Simplex (31%). Palacos (11%) and Palacos with gentamicin (10%) were the next most popular. 7% used 2 types of cement and 2% more than two types. The types of cement used for the acetabulum was almost identical to the femur.

49% of the surgeons used low viscosity cement for the acetabulum whilst 62% used it for the femur. 94% of the surgeons do not chill the monomer nor centrifuge the bone cement prior to insertion. 13% vacuum mixed the cement.

## DISCUSSION

Whilst the Malaysian Health System (MHS) was initially modelled on the National Health System (NHS) of the British government, it has gradually evolved over the years due to the rising costs of the modern healthcare system. The NHS continues to provide free healthcare to patients who require total hip replacements. However, these patients would need to go on a waiting list, the length of which may range from a few months to nearly 2 years. On the other hand, in the MHS, the patients will have to pay for the costs of the implants regardless of whether surgery was performed in the government, university or private hospitals. The cost of a cemented total hip replacement to a patient in the government hospital would be the lowest as the cost of hospitalisation is subsidised by the government and the

surgeons' fees are free. At present, most of the cost of the implants and the surgery in total hip replacements is often borne by the patients or their family rather than medical insurance. This may have an effect on the use of modern cementing techniques.

Using the method discussed earlier to estimate the number of cemented total hip replacements performed by each individual surgeon, the total number of cemented total hip replacements performed in the past year by the 76 surgeons who responded to this survey was therefore 617. This is likely to be an over-estimate, as most surgeons tend to over-estimate the number of operations that they perform. Extrapolating the total number of cemented total hip replacements performed by all the orthopaedic surgeons from the above figures will mean that 1,550 cemented total hip replacements were performed in Malaysia in the past year. This figure is considerably lower than those in the United Kingdom[10] even after taking the population into account. The reasons are likely to include a lower incidence of primary osteoarthritis in the Asian population compared to the Caucasian population, a relatively younger population in Malaysia, the high costs of total hip replacements, lower health expectations of the population, a preference for alternative medicine and the inability to accept the necessary precautions to prevent dislocations, such as not sitting on the floor in some patients.

Worldwide, the Charnley hips remain the most popular hips and are regarded as the gold standard to which all other prostheses must be compared[12]. The Charnley hips were used by 50% of the British surgeons[9] and were implanted in 49% of all primary hips in Norway[12]. However, the Exeter hips were the most popular hip prosthesis amongst the Malaysian orthopaedic surgeons although it was used by only 10% of the British counterparts[9]. 60% of the surgeons used either a Charnley or an Exeter cemented total hip replacements exclusively. These 2 prostheses have probably the longest published results and both have consistently produced excellent results. It is therefore very encouraging to note that whilst most surgeons do not perform total hip replacements regularly, their choice of implants are sound.

28mm femoral head was the most popular size amongst the surgeons and was also the most commonly implanted. None of the surgeons use 32mm femoral heads. This choice may reflect in part the smaller build of the Asian population, which would therefore require smaller size acetabular cups. A smaller femoral head size allows for a thicker polyethylene, which has better wear characteristics. 28mm femoral head have a significantly lower linear and rate of linear wear compared to 22.25mm and 32mm whilst 32mm heads had a significantly greater volumetric and rate of volumetric wear compared to 22.25mm and 28mm[13]. Both higher linear and volumetric wear was positively correlated with increased resorption of the proximal part of the femoral neck and increased lysis of the proximal femur. 32mm heads were also associated with a higher revision rate of the acetabular component compared to 22.25mm heads[14].

Regular long-term radiographic follow-up has been advocated to prevent massive bone loss by early detection of asymptomatic loosening and wear[15,16]. Early surgical intervention for asymptomatic osteolysis was found to be cost-effective[17]. 52% of the Malaysian surgeons followed-up their patients indefinitely whilst only 14% of the British surgeons do so. On the other hand, 23% of the Malaysian surgeons followed-up their patients for a year or less compared to 50% of the British surgeons[18]. This contrast is striking and is likely to reflect the differences in the health systems that were discussed earlier, with the British surgeons feeling that their practice were being constrained by limited clinic resources[18]. At follow-up, 87% of Malaysian surgeons perform regular radiographs regardless of the presence of symptoms.

Using multivariate Poisson analysis, Malchau and Herberts[6] were able to rank the performance of the cement and found that the best performing cement were Palacos with or without gentamicin and Simplex. Rimnac et al[19] found that Palacos (with or without antibiotics) had higher fracture toughness than either Simplex or Zimmer. The use of antibiotics in the cement has resulted in a lower rate of revision for infection and aseptic loosening[6,20,21]. However, the practice of using antibiotics in the cement was not popular, with only 10% of the surgeons choosing Palacos with gentamicin as their cement of choice. There may be concerns that antibiotics in the cement may lead to a more resistant form of organism when infection does develop but this has not been found to be the case[21]. Ultra clean laminar flow air in the operating theatres is still uncommon in Malaysia and hence any avenue, which may reduce the rate of septic loosening, should be encouraged. The addition of antibiotics has not significantly adversely affected the strength of the cement and the addition of gentamicin to Palacos in fact increased the fracture toughness of the cement[19].

Modern (3$^{rd}$ generation) cementing techniques in the femur includes the use of pulsed lavage and intra-medullary brush to clear bone debris, plugging the distal femur to enhance pressurisation of the cement and to obtain a cement mantle distal to the stem, drying the femur to allow better contact between the cement and bone, reduction of porosity of the cement, the introduction of the cement retrogradely under pressure using a cement gun and pressuring the cement prior to the insertion of the prosthesis[22]. However, not all these techniques have been equally successful towards achieving a lower revision rate or preventing radiographic loosening. Using multivariate Poisson analysis, Malchau and Herberts[6] found that the use of a distal femoral plug, retrograde introduction of the cement into the femur using a cement gun, the use of a proximal seal and pressurisation of the cement (2$^{nd}$ generation) all contributed to the reduction of revision compared to finger-packing of the cement. The improvements in the revision rate and radiographic loosening using the second generation cementing techniques described above were also found by other authors[23,24]. None of the surgeons in this survey practised modern cementing techniques in its truest sense but the aspects stated above, which were found to be particularly important by Malchau and Herberts were widely practised and compared very favourably and in fact were often more widely practised compared to the British surgeons.

In terms of cement preparation, chilling of the monomer and centrifuging of cement were uncommonly practised (6%) whilst vacuum mixing was performed by 13%. These showed remarkable similarity to the British surgeons.

**Surgeon and Practice**

1. Age of surgeon :
2. Employment: Ministry of Health ❑ University ❑ Private practice ❑
3. How many cemented THRs was done in your name in the last year?
   0 ❑ 1-5 ❑ 6-10 ❑ 11-20 ❑ if >20, please specify ____
3. What is the commonest pathology in your patients undergoing a cemented THR?
   primary OA ❑ secondary OA ❑ (please give detail)
   rheumatoid arthritis ❑ others ❑ (please give detail)
4. How long do you follow up your cemented THRs ?
   6 months ❑ 1 year ❑ 2 years ❑ 5 years ❑ Not discharged ❑
5. How frequently do you perform check X-rays?
   6 monthly ❑ yearly ❑ 2 yearly ❑ Only if symptomatic ❑

**Prostheses**

1. What is your usual femoral component?
   Charnley ❑ Exeter ❑ Stanmore ❑ Mueller ❑
   Howse ❑ Others, please specify : ____________________
2. What head size do you generally use?
   22.25mm ❑ 25mm ❑ 26mm ❑ 28mm ❑
   29mm ❑ 32mm ❑ Others, please specify __________

**Acetabular Cementing Techniques**

1. Do you :
   a) aim to retain the subchondral bone? Y ❑ N ❑
   b) use anchor holes? If 'yes', please specify N ❑
      'Classical' large ilial, ischial + pubic ❑
      Multiple small anchor holes ❑
      *Other* ______________________________________
   c) use pulsed lavage? Y ❑ N ❑
   d) dry the acetabulum prior to cementing? If 'yes', please specify N ❑
      Swab ❑ Swab + adrenaline ❑ Other ________________________

   e) use controlled hypotension prior to cementing? Y ❑ N ❑
   f) pressurize the cement prior to insertion of the socket? Y ❑ N ❑

**Femoral Cementing Techniques**

1. Do you :
   a) attempt to remove as much cancellous bone as possible? Y ❑ N ❑
   b) use pulsed lavage? Y ❑ N ❑
   c) use an intra-medullary brush to clear bone debris? Y ❑ N ❑
   d) plug the distal femur? If 'yes', please specify N ❑
      Cancellous bone plug ❑ Cement ❑
      HDP (e.g Hardinge, JRI) ❑ Other ________________________
   e) dry the femoral shaft prior to cementing? If 'yes', please specify N ❑
      Plug ❑ Swab ❑
      Swab + adrenaline ❑ Other ________________________
   f) use a cement gun? Y ❑ N ❑
   g) pressurize the cement prior to insertion of the prosthesis? Y ❑ N ❑

**Cement Preparation**

1. Which cement do you usually use for:

*Fig. 1*

Centrifugation of the cement increased the static strength and the mean fatigue life of cement when tested using the uniaxial tensile test[25] but not when tested using the static fracture-toughness test[19]. The latter test appears to be a better reflection of in vivo scenario and hence the clinical picture may be better reflected by the results of this test. Vacuum-mixing the cement has been shown to reduce the porosity of the cement[22] but Malchau and Herberts[6] found that it did not reduce the risk of revision. 62% of the Malaysian surgeons used low viscosity cement for the femur compared to 26% in the British surgeons. Low viscosity cement allows longer handling time and this might be helpful if the surgeon and the scrub nurse do not perform cemented total hip replacements regularly. It also allows greater penetration into the inter-trabecular spaces in the bone and as a result, has a greater shearing strength at the cement-bone interface in experimental study[26, 27]. However, clinical studies suggest that the low viscosity cement have inferior results compared to high viscosity cement[6, 20] and this likely to be due to its greater technical demands. Hence for the inexperienced surgeon, the high viscosity cement may in fact be the better choice of cement for the femur. There was no significant difference found in the survival rate between low and high viscosity cement at 5.5 years for the acetabulum[20] but as the loosening and failures in the acetabulum usually only becomes obvious after 10 years from surgery[2], no firm conclusions can be made until the results of longer follow-ups are reported.

The main limitation of our study was that the response rate to our survey was only 39 %, and this rate is considerably lower than surveys carried out in the United Kingdom [Hashemi-Nejad et al, (66%)[9]; Bankes et al, (69%)[18]; Newman (100%)[10] ]. This therefore, means that the results from this survey may not be a true representation of the current practice in cemented total hip replacements in Malaysia. However, several members who when asked if they had replied to the survey during the Annual Scientific Meeting of the Malaysian Orthopaedic Association said that they had not replied because they do not perform the operation. Therefore, it seems that although the response rate was not high, it may in fact, be a truer reflection than the response rate would suggest.

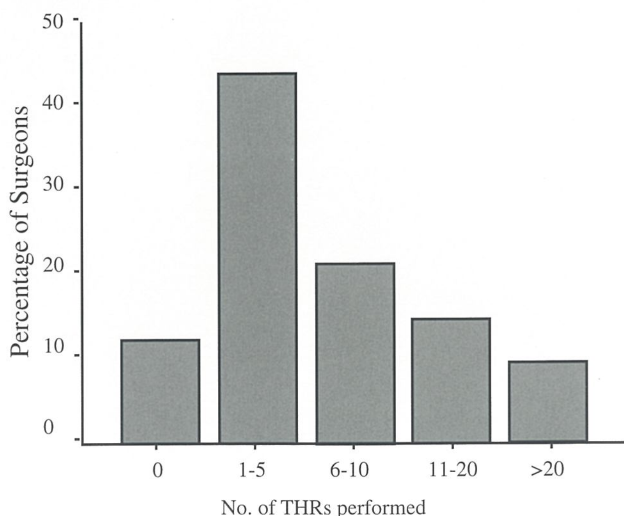


*Fig. 2 Number of cemented total hip replacements performed*

In an era where cost-justification is becoming fundamental to all aspects of clinical decisions, the relative conservatism of Malaysian orthopaedic surgeons in the choice of their prosthesis appears well founded. The theoretical and experimental benefits claimed by new innovations have often not been substantiated by clinical results and at times have proven to produce poorer results with loosening and revision being the outcomes. The costs of revision hip arthroplasty were estimated to be 1.5 times that of the primary procedure[28]. The costs of these early failures to a country therefore, are immense and in Norway, were estimated to be about 1.7 million USD per year to revise, for hips implanted between 1987 and 1993[29]. The onus must thus be to trust tried and tested methods with proven results until newer techniques have proven to provide conclusive benefit, which is also cost-effective. In this respect, it is encouraging to note that the aspects of 2nd generation cementing techniques, which have been shown consistently to improve outcomes, were well practised by the Malaysian orthopaedic surgeons. Whilst these refinements may only benefit the experienced surgeon moderately towards achieving an adequate cement mantle[23], they are likely to benefit the majority of the Malaysian surgeons who do perform hip arthroplasties, but who are relatively inexperienced at this technically demanding procedure.

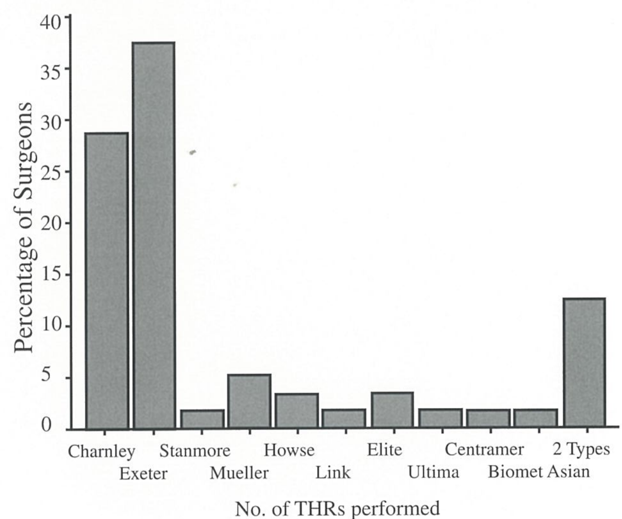


*Fig. 3 Types of prostheses used*

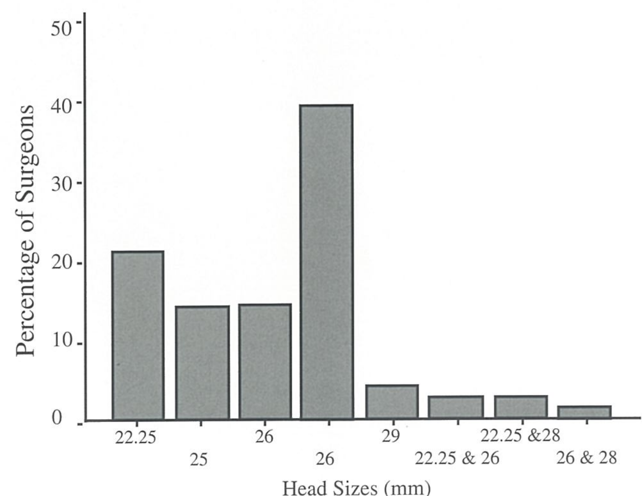


*Fig. 4 Size of femoral heads used in mm*

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