Long term outcomes of Charnley THA in patients under the age of 50: an editorial comment on recently published article by Warth *et al*.

Emilios E. Pakos, Dimitrios Tsiampas, Theodoros Xenakis

Laboratory of Orthopaedics and Biomechanics, Medical School, University of Ioannina, Ipiros, Greece

Correspondence to: Emilios E. Pakos, MD, PhD. Lecturer in Orthopaedics and Biomechanics, Laboratory of Orthopaedics and Biomechanics, Medical School, University of Ioannina, University Campus, 45110 Ioannina, Greece. Email: epakos@yahoo.gr.

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Fifty three years have passed from 1962 when Sir John Charnley developed the procedure of total hip arthroplasty (THA) in UK (1). Since then the principles of total joint replacement remain very similar to those advocated by Charnley. Moreover, the Charnley low friction arthroplasty represents the most classical cemented arthroplasty that has been used and currently used in several orthopaedic centers with minor changes regarding the initial procedure and implant design and the only implant where long term outcomes exceeding 30 years have been reported. The published literature is dominated by a large amount of studies reporting on outcomes of Charnley THA (2-5). The vast majority of these studies report on outcomes not exceeding follow-up periods longer than 30 years and usually involve a wide range of ages among the included patients. Although THA was initially developed to treat end-stage arthritic conditions in older patients, the need for the procedure in younger, more active patients is increasing. However, despite the improvements in the design of the implants and the surgical techniques THA in younger patients has not showed comparable outcomes to those performed in older patients, rising from the increased biomechanical demand of patients under 50 due to the higher activity levels (2,6).

Warth *et al*. (7) recently published on long term outcomes regarding the most classical THA in patients under the age of 50. From the initial population of 69 patients (93 hips), 32 patients (41 hips) had available 35 years of follow up. The overall revision rate for any reason was 54% at 35 years (22 hips). The commonest reason for revision was aseptic loosening. Among these patients, 14 hips were revised due to aseptic loosening, 5 due to infection, 2 due to femoral fracture and 1 due to recurrent dislocation. The present study compared the outcomes of the 35-year follow-up periods with those reported at the 25 years of follow-up. The acetabular loosening had progressed over the additional period of 10 years (8 additional revisions). In contrast the durability of femoral cement fixation seems better, despite the early cement technique that was used, as only 18% of the femoral stems failed. The functional scores (Haris Hip Score, SF-36) and the 6-minute walking performance at the 35-year follow-up interval significantly decreased compared to the 25-year follow-up. The authors comment that this decrease in functional scores and walking distance was associated with the presence of co-morbid diseases. As far as the radiographic evidence of loosening is concerned (combined prevalence of definite or possible loosening and aseptic loosening) the values for acetabular loosening and femoral stem loosening were 49% (20 hips) and 24% (10 hips) respectively among patients with available 35 years of follow-up.

This cohort study, illustrates the importance of an exceptionally long term follow-up (35 years), in combination to the effectiveness and durability of Charnley THA in a young patient population. The most often criticism on cohort studies concerns matters such as, the length of follow-up required to determine outcomes and the absence of data on potential confounding factors if the data was not previously recorded. The magnitude of the 35 years follow-up and the comparison of the present data, to the data of the 25 years follow-up, diminishes the aforesaid disadvantages of the cohort study and documents long term durability and safety, as well as its functionality in the still living patients. The study grants its primary purpose, which

was the evaluation of the patients with Charnley THA, after 35 years. The survival of the implant is well documented by combining the rate of the revision of the primary THA and the radiographic evidence of loosening with regard to the radiolucency between the prosthesis and the cement in zone 1 of Gruen *et al*. (8), regardless of the width and the quantification of debonding, according to the Berry *et al*. system (2). The functional outcomes as they extracted from the Index (WOMAC) test, the Harris Hip Scores, the 6-minute walk test and the monitoring of the Step Watch Activity represent reliable tools for evaluating the durability of the implant and the quality of life of patients living at the time of the 35-year follow up.

To our knowledge, this is the largest study published up to date reporting on outcomes of THA after 35 years of follow-up. Callaghan *et al*. reported on long term outcomes as well of the Charnley THA, but only 15 patients had available 35 years of follow-up. Limited evidence exists in the published literature reporting on less than 35 years outcomes of the Charnley THA. Wroblewski *et al*. (9) has published the largest study up to date reporting on outcomes of the Charnley THA with a minimum follow-up of 30 years. The overall survival among the 110 hips included in the study was 88%. Goto *et al*. reported a survival of 54% and 75% of the acetabular cup and the femoral stem respectively at 30 years. Mullins *et al*. (10) reported a 30-year survivorship of the prosthesis of 73%. Particularly, in young patients under the age of 50 the Charnley THA was associated with high rate of acetabular loosening. Keener *et al*. (6) in a study of 69 hips reported a 34% rate of cup failure after a minimum of 25 years follow-up. These results resemble those of Berry *et al*., who noted that the survivorship of the implant ranged from 68.7% for patients who were less than 40 years of age, to 100% for patients who were 80 years of age or older (2).

Despite the fact that several studies have reported on long term outcomes of the Charnley THA, the vast majority of the reported outcomes are not predictable and reproducible due to several reasons. Firstly, most studies do not include young patients at the time of index arthroplasty, so the follow-up does not exceed 25 years. Moreover, most of the studied groups are characterized by intragroup variability and the functional outcomes do not take into account individual agents (MBI, comorbidity and functional demands) (11) and they concern retrospective cohort studies, which are designed to use data, not available for long term analysis (12). Finally, the published evidence does not use a regular follow-up, which is essential after hip replacement surgery (3).

In conclusion, the durability and the function of the implant, after so many years, are well documented in this study as a large group of young population with Charnley THA was available for reevaluation. The study demonstrated satisfactory long term function and durability of the implant. The main value of the present well designed study is that the results should be considered a valuable index for the comparison with the outcomes of modern designs used in this particular group of patients. Since, the study of Warth *et al*. reports on the initially designed Charnley implant and the use of first generation cement, the remaining question regards the impact of stem surface texture on cement fixation, the nature or quality of the head, the quality and the hardness of the acetabular socket and the choice of newest cement techniques impaction. Will all the above improve the Charnley THA durability and function in young patients long-term? It is clear that a further long term research that will include the cited above parameters, as well as the influence of individual pathological characteristics or comorbidities could provide further evidence in the evaluation of THA.

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