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Review

Total hip replacement: a systematic review and meta-analysis on mid-term quality of life

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SUMMARY

Objective: Total hip replacement (THR) is one of the most successful and frequently performed operations worldwide. Health-related quality of life (HRQOL) is a key outcome measure of surgery. We investigated mid-term HRQOL after THR in patients with osteoarthritis (OA).

Design: A systematic review of clinical studies published after January 2000 was performed using strict eligibility criteria. Quality appraisal and data tabulation were performed using pre-determined forms. Data were synthesised by narrative review and random-effects meta-analysis using standardised response means. Tau^2 and I^2 values and Funnel plots were analysed.

Results: 20 studies were included. Mid-term post-operative HRQOL is superior compared to pre-operative status on qualitative and quantitative analysis. Pooled response means of total Harris Hip Score (HHS) ($P < 0.00001$) and combined pain ($P = 0.00001$) and physical function ($P < 0.00001$) domains of Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and HHS improved markedly up to 7 years. Medical Outcomes Survey Short Form 36 shows physical functioning (PF) ($P < 0.00001$), bodily pain (BP) ($P < 0.00001$), role physical ($P = 0.001$), role emotional ($P = 0.04$), and social functioning (SF) ($P = 0.03$) were improved up to 7 years. General health (GH) ($P = 0.29$), mental health (MH) ($P = 0.43$), and vitality ($P = 0.17$) was similar. HRQOL is at least as good as reference populations in the first few years and subsequently plateaus or declines. Patient satisfaction and functional status was favourable. There was significant heterogeneity amongst all studies, but publication bias was low in pooled analysis.

Conclusion: THR confers significant mid-term HRQOL benefits across a broad range of health domains. Further studies based on consistent guidelines provided in this review are required.

Introduction

Rationale

Total hip replacement (THR) is one of the most successful surgical procedures and has been identified as the "operation of the century"[1]. Greater than one million operations are performed every year worldwide and this is anticipated to double within the next decade[2]. In the USA alone, the number of operations is projected to rise to 572,000 per year by 2030[3]. An estimated 93% of operations are performed for severe osteoarthritis (OA) with intractable pain and functional limitations[2]. For these patients who are refractory to conservative measures, THR is currently the recommended and most effective treatment[4].

OA is a serious public health issue with symptomatic disease prevalent in 9% of men and 11% of women[5,6]. It is a major cause of pain and disability[7]. Age is one of the largest risk factors for developing OA[8]. According to the United Nations, the world's population is ageing rapidly with the number of people older than 60 years of age projected to double from 11% to 22% (2 billion) by 2050[9]. This will fuel an increasing incidence of OA and demand for THR[10–12].

THR achieves excellent technical outcomes with 10-year survival exceeding 95%, 25-year implant survival greater than 80%, and significant benefits for pain, mobility, and physical function[3,13,14]. However, these traditional indicators of surgical success may not mirror the patient's post-operative experience or healthcare efforts[15–18]. Patients' expectations after THR have also changed with

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many patients anticipating an active lifestyle in the years after surgery[19]. Hence interest in patient-derived assessments of healthcare and health-related quality of life (HRQOL) has increased significantly.

Post-operative HRQOL is now the key goal of surgery and measure of operative outcome[20]. HRQOL is so important in orthopaedics that it even constitutes a requirement for publication in some journals[18]. Modern series demonstrate good short-term HRQOL after THR for up to 2 years[18,21–23]. However, mid-term HRQOL has been an important issue in THR that remains unanswered[24–26].

Despite the ageing population, the mean age of THR has not changed from 70 years in developed countries[27,28]. Coupled with excellent long-term patient and prosthesis survival, increasing life expectancy will lead to more patients living for longer with their implants. In addition, a greater number of younger patients are undergoing surgery with 20% of operations being performed in those under 60 years of age[14,29,30]. These factors emphasise the need to analyse HRQOL beyond the early post-operative period. A thorough evaluation of surgical outcomes is also necessary for effective resource utilisation[31].

Objectives

We conducted a systematic review and meta-analysis of articles published after January 2000 on mid-term HRQOL after THR to (1) investigate post-operative HRQOL compared to respective patients' pre-operative status and reference populations, (2) outline subjective post-operative function and satisfaction, (3) clarify strengths and weaknesses of current evidence, and (4) outline guidelines for future research.

Methods

The structure of this review followed previously recommended guidelines[32] and was written in accordance with the PRISMA checklist for systematic reviews and meta-analysis[33].

Definition and measurement of HRQOL

HRQOL encapsulates an individual's physical, emotional and psychological health as well as social and functional status[34]. The assessment of these dimensions of health is necessary to evaluate broad health-related implications of OA and its treatment[21]. Since HRQOL is not a tangible entity, a standardised method of measurement is required which is reliable, valid, responsive, sensitive, and covers all health domains[34]. This can be achieved by assessing disease-specific and generic HRQOL.

Disease-specific HRQOL measures aim to accurately reflect a patient's experience of a specific illness or treatment. Western Ontario and McMaster University Osteoarthritis Index (WOMAC)[35], Harris Hip Score (HHS)[36–38], McMaster University Osteoarthritis Index (MACTAR)[39], Osteoarthritis Knee and Hip Quality of Life questionnaire (OAKHQOL)[40], Merle d'Aubigne-Postel (MAP)[41], and Functional Comorbidity Index (FCI)[42] were used in this study.

Generic HRQOL instruments are required to facilitate holistic assessment of health dimensions[43]. Medical Outcomes 36-item Short-Form Health Survey (SF-36)[44,45], Medical Outcomes 12-item Short-Form Health Survey (SF-12)[46], Nottingham Health Profile (NHP)[47], Sickness Impact Profile (SIP)[48], and World Health Organisation (WHO) Quality of Life Short Version Instrument (WHOQOL-BREF)[49] were used in this study. Detailed descriptions of each instrument can be found in Table III.

Selection criteria

Studies considered for review had the following pre-determined inclusion criteria: (1) all patients over 18 years of age, (2) OA as the primary indication for surgery, (3) THR as a primary procedure, (4) mid-term outcomes with a mean or final post-operative follow-up of at least 3 years, (5) disease-specific and/or generic HRQOL data recorded. These studies were restricted according to the following report characteristics: (1) published after January 2000, (2) English language, and (3) original research only. The search period was restricted to be more representative of modern post-operative outcomes.

Information sources and search strategy

On December 2012 a literature search was conducted using MeSH keyword search on PubMed (MEDLINE) for all studies published after January 2000 (Fig. 1). Strict inclusion criteria for study characteristics were applied as described above. An additional manual search of OVID (MEDLINE) and EBSCOhost (EMBASE) as well as reference lists of each included study was conducted to identify studies not covered by the initial MeSH Keyword search. All identified articles were retrieved from the aforementioned databases.

Study selection

Following the search, two reviewers independently performed the first stage of screening titles and abstracts. Studies were excluded if they did not meet eligibility criteria. If the information required to determine eligibility was not in the abstract, a second stage screen was run after data extraction. Consensus for studies to be included was achieved by discussion between the two reviewers based on the pre-determined selection criteria mentioned above. Reviewers were not blinded to any study characteristics including journal, authors and study institution.

Data items and extraction

All data items were pre-determined and specified as shown in Tables I & II. Data extraction was then performed in two parts by two reviewers using standardised pilot forms. Study quality was first assessed using sample size, study design, use of both disease-specific and generic HRQOL measures, follow-up consistency and variability of results (Table I). Overall level of evidence applicable to orthopaedic surgery was also assessed[50]. These were derived from previously described guidelines[32,33]. Secondly, HRQOL results of the studies reviewed were tabulated (Table II).

Synthesis of results

The generic inverse variance method using a random-effects model was used to estimate the standardised response mean for continuous data across studies. The pooled response means (estimated overall mean difference [95% confidence interval (CI)]) are expressed on Forest plots. Low quality studies were analysed, but excluded from the pooled response means analysis. Disease-specific HRQOL instruments were pooled together and likewise generic HRQOL instruments were pooled together. Some studies split HRQOL data by characteristics such as gender and cement or cementless procedures. These separate results were pooled together to avoid any bias and allow inclusion in meta-analysis. In order to perform sub-group analyses to elicit outcomes for specific health domains, similar health domains within each instrument were pooled together. Where necessary, HRQOL results were