

Systematic Review of Radiological Analysis of Total Hip Replacement Via Direct Anterior Approach in Comparison to Other Approaches – Study Protocol

Bartosz Maciąg (✉ bmaciag@wum.edu.pl)

Medical University of Warsaw <https://orcid.org/0000-0002-0311-3735>

Kuba Radzimowski

Medical University of Warsaw

Piotr Stępiński

Medical University of Warsaw

Jakub Szymczak

Medical University of Warsaw

Tomasz Albrewczyński

Medical University of Warsaw

Artur Stolarczyk

Medical University of Warsaw

Protocol

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Abstract

Background

Total hip arthroplasty (THR) is considered as the most effective available method of treatment of end-stage hip osteoarthritis (OA). This surgery can be performed via many different approaches. One of the newly developed technique is called direct anterior approach (DAA). It gains popularity and recognition as the least traumatic to the soft tissues, thus quickening rehabilitation and improving joint stability in the early postoperative period. There are no systematic reviews covering this subject in terms of potential differences in radiological prosthesis placement, and while there is still unsatisfactory evidence concerning long-term outcomes of DAA, such review may prove useful in the debate. The objective of our study was to systematically collect and review available data from randomized-controlled trials (RCTs) regarding radiographic assessment of prosthesis placement after total hip arthroplasty using direct anterior approach compared to other common approaches.

Methods

A systematic review of randomized controlled trials (RCTs) will be conducted. SciFinder, Scopus, ScienceDirect, PubMed, Embase, Clinical Key and The Cochrane Library databases will be searched without restriction to date up to June 2020. Primary outcomes will include measurements related with the radiological analysis of trials comparing use of DAA to other approaches used for THR, containing at least two of the following: femoral stem alignment, mean radiographic cup inclination, mean radiographic cup anteversion, mean radiographic cup abduction, position in Lewinnek's safe zone. Study selection will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, and the methodological appraisal of the studies will be assessed by the Cochrane Risk-of-Bias Tool for RCTs.

Discussion

This systematic review will provide missing information regarding influence of differences between DAA and other surgical approaches in total hip replacement on prosthesis implants placement in case of femoral stem and cup. This may result in improving knowledge and awareness of surgeons, improving patients satisfaction and functional outcome and lowering the risk of hip dislocations and other complications.

Trial registration

International Registration of Systematic reviews (PROSPERO) numberCRD42019122675

Background

Total joint arthroplasty is considered the most effective way of treating the end-stage osteoarthritis (OA) of hip and knee joints (1, 2). It is estimated that every year more that one million total joint replacements

are performed in Europe, while in Poland about 100000 annually. It is believed that our community is getting older and that is the reason why the number of total joint replacements will be growing, as well as patients expectations towards it. Even though total knee and hip replacement have wonderful outcome and are improving significantly patients, there is still place for improvement. This surgery can be performed via many different approaches. (3, 4) However, there is continuous dispute regarding the optimal choice of techniques, implants and approaches. The direct anterior approach (DAA) utilizes the intermuscular plane between sartorius and rectus muscles and tensor fascia lata, without the need to division of any tendon attachment of mentioned muscles. (5, 6). A direct anterior approach (DAA) gains popularity and recognition as the least traumatic to the soft tissues, thus probably quickening rehabilitation and improving joint stability in the early postoperative period and due to the shorter incision better cosmetic outcome. (4, 7–9) On the other side it is also considered to have steep learning curve and suspected to have higher risk of complications. (10) We believe that the difficulty of this approach might also have a negative effect on prosthesis placement, which could be assessed radiographically. It was previously proved, that proper prosthesis implants placement might be crucial for lowering the possibility of postoperative hip dislocations. (11, 12) Still, to our knowledge there are no systematic reviews covering this subject, and while there is still unsatisfactory evidence concerning long-term outcomes of DAA, such review may prove useful in the debate. There has been recently published meta-analysis of (13), in which authors analyzed outcomes of RCTs comparing DAA to other approaches in terms of postoperative analgesic requirements and pain scores, hospitalization time, length of incision, surgical time, complications such as: infection, wound healing problems, neurovascular damage, fractures, thrombosis, dislocations, component malpositioning, heterotopic ossification and death, but did not report analysis of radiological assessments in included studies. The objective of our study was to systematically collect and review available data regarding radiographic assessment of prosthesis placement after total hip arthroplasty using direct anterior approach compared to other common approaches.

Methods

Protocol design and registration

We will perform systematic review to summarize results from randomized controlled trials published with no restriction to date up to the June 2020. The development of this study protocol and the reporting of results will be performed accordingly to the Preferred Reporting Items for Systematic Reviews and Meta-analyses Protocol (PRISMA). (14) We used the PRISMA-P checklist when writing our report (15). This study protocol was previously registered with the International Registration of Systematic reviews (PROSPERO) and registration number CRD42019122675 was assigned.

(https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=122675)

Such registration lowers the risk of duplicating systematic reviews and allows researchers to keep up with proper review process, resulting in minimizing of reporting bias.

Search strategy

We will conduct an English-language literature search of SciFinder, Scopus, ScienceDirect, PubMed, Embase, Clinical Key and The Cochrane Library without restriction to date up to June 2019.. The following search terms will be used: „total hip replacement,” “total hip arthroplasty”, “THA,” “THR,” “anterior,” “direct anterior,” “anterior supine intermuscular,” “Hueter approach,” and “Smith-Petersen.” Search terms were combined using the Boolean operators “AND” or “OR.”

Eligibility criteria

We will include only randomized clinical trials involving patients over 18 years old (with primary hip osteoarthritis treated operatively), comparing DAA with other approaches and consisting of radiological analysis in at least of two of the following terms: femoral stem alignment, mean radiographic cup inclination, mean radiographic cup anteversion, mean radiographic cup abduction, position in Lewinnek's safe zone. We will exclude non-English studies, with full text not available, review or non-comparative studies, studies analyzing bilateral total hip replacement or hemiarthroplasty, and analyzing robot-assisted surgeries.

Data extraction (selection and coding)

A summary of the participants, interventions, comparators and outcomes considered, as well as the type of studies included according to PICOS strategy, is provided in Table 1. (16)

Two independent researchers (BM, KR) will evaluate final set of studies in terms of: first author's name, country, publication year, type of surgical approach being compared to direct anterior approach, any significant differences at baseline, sample size, radiographic analysis. Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) will be used (17). Disagreements between the review authors over the risk of bias in particular studies will be resolved by discussion, with involvement of a third review author (AS) where necessary. We will provide a narrative synthesis of the findings from the included studies, structured around the type of intervention, the target population characteristics, the type of outcome and the intervention content. Cohen's kappa coefficient will be calculated for interrater agreement between reviewers following assessment of study eligibility. (18) Kappa values ≤ 0 will be interpreted as indicating no agreement, 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as almost perfect agreement.

Data synthesis

We expect significant differences between studies in reporting radiological analysis with different values being assessed, therefore statistical data synthesis and exploration of consistency will probably be impossible to perform. However mean values of different prosthesis implant placement angles will be possible to analyzed between subgroups comparing DAA to single other approach.

Discussion

This systematic review will provide missing information regarding influence of differences between DAA and other surgical approaches in total hip replacement on prosthesis implants placement in case of

femoral stem and cup. This may result in improving knowledge and awareness of surgeons, improving patients satisfaction and functional outcome and lowering the risk of hip dislocations and other complications. To the strengths of this study protocol belong the fact that it is the first systematic review of radiological analysis, comparing direct anterior approach to other used approaches for total hip replacement. It offers the highest level of evidence as only randomized controlled trials will be included. Direct anterior approach as more innovative and younger technique for performing total hip replacement might be described and analyzed in small number of randomized controlled trials.

Abbreviations

THR – Total Hip Replacement

OA – osteoarthritis

DAA – Direct Anterior Approach

RCT – randomized-controlled trial

PROSPERO - International Registration of Systematic reviews

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-analyses Protocol

Declarations

Ethics approval and consent to participate

No institutional review board approval was required for this systematic review because the study included data that had been published previously. Results of this systematic review will be widely disseminated through publication in the valuable scientific peer-reviewed journal, concerning orthopaedic surgery.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study will be available from the corresponding author on reasonable request.

Competing interests

None declared.

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Authors' contributions

BM is the first and corresponding author; BM and AS conceived and designed the study, BM, KR, PS, JS, TW will acquire data; BM, KR, PS will analyze and interpret data; BM, KR and AS drafted the initial and final manuscripts, all authors performed critical revisions of the manuscript and approved the final version of the manuscript.

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Authors' information

Corresponding author: BM E-mail: bmaciag@wum.edu.pl, Telephone: +48 881 568 144

Międzyleski SpecialistHospital, Str. Bursztynowa 2, 04-749 Warsaw, Poland

Contact to authors:

KR: kuba@radzimowski.com

PS: Piotr.stepinski01@gmail.com

JS: jakubszymczak92@gmail.com

TA: talbrewczynski@paleyeurope.com

AS: drstolarczyk@gmail.com

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Tables

Table 1. PICO strategy

P - population	Patients with primary end-stage hip osteoarthritis (OA) treated operatively	Patients with osteoarthritis secondary to other disorders
I - intervention	Unilateral total hip replacement (THR) performed via Direct Anterior Approach (DAA)	Robotic-assisted surgeries Bilateral total hip replacements Hemiarthroplasty surgeries
C- Comparison	Unilateral total hip replacement (THR) performed via different approaches	Robotic-assisted surgeries
O - Outcome	Radiological analysis in terms of femoral stem alignment, mean radiographic cup inclination, mean radiographic cup anteversion, mean radiographic cup abduction, position in Lewinnek's safe zone	Studies, that did not report at least two radiological terms
S - Study design	Only Randomized controlled trials	Non-randomized controlled trials, All the non-primary literature, such as reviews, meta-analysis, etc.

Supplementary Files

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