
REVISION RATES AND CAUSES IN TOTAL HIP REPLACEMENT: A SYSTEMATIC REVIEW

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ABSTRACT

Total hip replacement is a common surgery to treat severe hip joint pain and dysfunction. Although total hip replacement is generally safe and effective, complications, including revision, are risks. This study aimed to systematically review the literature to analyze revision rates and causes of total hip replacement. This research uses a systematic literature review method following PRISMA guidelines. The data collection technique in this research uses literature study techniques. Literature searches were conducted in electronic databases such as PubMed, Scopus, and Google Scholar. The data that has been collected is then analyzed in three stages, namely data reduction, data presentation, and conclusion. The results showed that factors such as infection, dislocation, limb length discrepancy, and other complications play an important role in determining the revision rate and success of replacement. Precautions include using a povidone-iodine mouthwash before treatment to reduce the risk of infection and implementing better blood management protocols to optimize total hip replacement results. This study implies an in-depth understanding of the risk factors associated with revision total hip replacement, which is essential in managing patients undergoing this procedure. By paying closer attention to these factors, medical practitioners can increase the success of total hip replacement and reduce the number of revisions required, thereby improving patients' quality of life.

Keywords: Revision Hip, Hip Replacement, Total Hip.

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INTRODUCTION

Total hip replacement is a surgical procedure often performed to treat severe pain and functional disorders of the hip joint. Total hip arthroplasty (THA) is a frequently chosen treatment option for hip pathology in younger patients (Karachalios et al., 2018). Data from the arthroplasty registry show an increase in the use of THA to treat hip pathology in patients under 50 years of age in the last two years (Kahlenberg et al., 2019).

Although this surgery is generally considered safe and effective in restoring normal pelvic function and reducing pain, there is still a risk of associated complications, one of which is revision. Revision refers to a follow-up surgical procedure that is required if problems or failure occur with the first total hip replacement performed (Khatod et al., 2015). Various studies have investigated epidemiological trends related to THA failure in the general population. Bozic and colleagues reported that more than 50,000 THAs were performed in the United States. They found that the most common reason for revision was instability, followed by mechanical loosening and infection (Gwam et al., 2017).

THA failure imposes a high economic burden, as well as causing significant levels of morbidity for patients. The importance of minimizing the risk of THA failure is especially emphasized in patients

who are young and require implants that can survive decades of use throughout their lifetime (Kahlenberg et al., 2019). The frequency of THA revisions is projected to double by 2026, likely due to increased demand for higher activity and increased implant durability. Despite advances in implant design and surgical techniques over the past 40 years, the revision burden has remained unchanged. Therefore, orthopedists must understand the factors contributing to these challenges (Gwam et al., 2017).

In an era of innovation in surgical approaches for total hip arthroplasty (THA), there is concern for increasing trends of early failure. Based on this background description, researchers are interested in conducting research titled "Revision Rates and Causes in Total Hip Replacement: A Systematic Review." A deeper understanding of the factors influencing THA revision rates can assist medical practitioners in planning more effective prevention strategies, including identifying high-risk patients and implementing appropriate preventive measures. This study aimed to systematically review the literature to analyze revision rates and causes of total hip replacement.

METHOD

This research uses a systematic literature review method following PRISMA guidelines. The PRISMA method consists of 5 stages: 1) defining eligibility criteria, 2) determining information sources, 3) data selection, 4) data collection, and 5) data retrieval. The systematic literature review (SLR) method is a structured and organized research approach to investigate and synthesize the evidence available in the scientific literature on a particular topic. This approach involves systematic searching, selecting, assessing, and analyzing literature relevant to predetermined research objectives. The data collection technique in this research uses literature study techniques. Literature searches were conducted in electronic databases such as PubMed, Scopus, and Google Scholar. The data used in this research has several inclusion criteria, including being in Indonesian or English, with a publication period of 2014-2024. Based on the established criteria, the research flow and results that will be used in this research are depicted in the following PRISMA diagram:

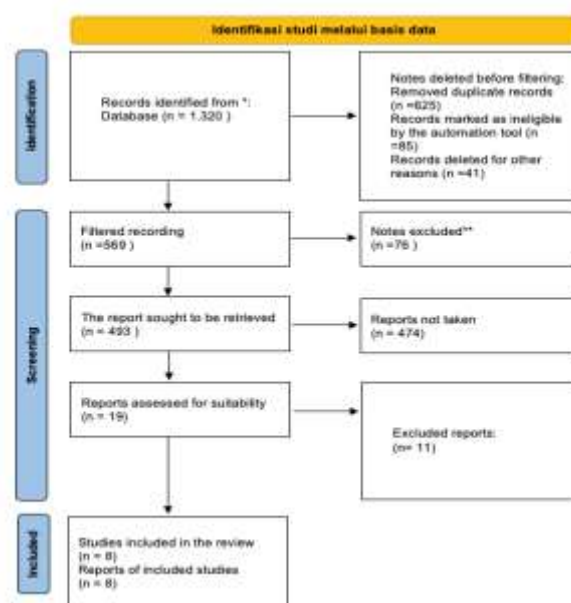


Figure 1. PRISMA Diagram

The data that has been collected is then analyzed in three stages, namely data reduction, data presentation, and conclusion.

RESULTS AND DISCUSSION

This result is extracted from the data and relevant sources that meet the eligibility criteria (Liberati et al., 2009).

Table 1. Research Results

No	Name and Year of Research	Research Title	Research Result
1	(Dilogo, 2019)	Realizing Breakthroughs and Independence in Reparation, Restoration, Regeneration, Reconstruction, and Replacement of Bones, Pelvic Joints, and Knees in Indonesia	The increasing cases and complexity of fractures and degenerative diseases of the hip and knee joints require a comprehensive and innovative approach. For this reason, the Department of Orthopaedics and Traumatology, SCTE-RC IMERI, UPT PTK Stem Cell FKUI-RSCM has conducted basic, translational, clinical research and innovation to medical services. With these efforts, it is hoped that the Indonesian people will be pain-free, free to move, have no bone and joint defects, function well, and continue to be productive.
2	(Balato et al., 2021)	Management of septic arthritis of the hip joint in adults. A systematic review of the literature	<i>Staphylococcus aureus</i> was the most common microorganism isolated, followed by culture-negative infections. Arthroscopic, single- and two-stage procedures can effectively treat septic arthritis of the hip if the indications are consistent with the type of infection picked up. Eradication rates for two-stage revision arthroplasty range between 85 and 100%, for the single-stage approach between 94 and 100%, and arthroscopic debridement/lavage, between 89 and 100%.
3	(Chaudhry et al., 2022)	Transfusion Rates in the Operative Treatment of Prosthetic Hip and Knee Infection	ABT rate and number of units transfused were assessed. Factors associated with ABT were evaluated with a multilevel mixed-effects regression model. Of all cases, 77 (54%) required ABT. The highest ABT rates occurred during explantation (74%) and spacer exchange (72%), followed by reimplantation (36%) and modular component exchange (33%). Lower preoperative haemoglobin levels were associated with a higher likelihood of ABT. Explantation, reimplantation, and spacer exchange were associated with a greater likelihood of ABT. Antibiotic spacer exchange and explantation were associated with greater odds of multiple unit transfusion. ABT rates remain high in the surgical treatment of PJI. Antibiotic spacer exchange and explantation procedures have high multiple-unit transfusion rates, and additional blood units should be available. Preoperative anaemia should be treated if possible, and further refinement of blood management protocols for prosthetic joint infections is needed.
4	(Nafisah et al., 2022)	Hip Abduction Pillow untuk Menurunkan Resiko Dislokasi pada Pasien Pasca Operasi Total Hip Replacement	Dislocation is the most common complication in patients after total hip replacement surgery. Factors leading to dislocation or re-revision of THR consist of patient factors (number of previous revision surgeries, abductor muscle deficiency/non-union trochanterica,

No	Name and Year of Research	Research Title	Research Result
			history of at least one episode of instability before revision surgery, osteonecrosis of the femoral head (ONFH), severe acetabular and femoral bone loss, age, BMI, and usual activity level). Procedure factors (small femoral head diameter, single component revision, use of standard rim liner).
5	(Tikhilov et al., 2022)	Standard Custom-Made Acetabular Implants in Revision Total Hip Arthroplasty	Versus The incidence of aseptic loosening of the acetabular component after RTHA in unfilled acetabulum bone stock loss (type III-IV as per Gross and Saleh classification) using CMAI was less than that using SAI (2.4% and 10.0%, respectively). The most significant difference in aseptic loosening rate was noted after CMAI and SAI implantation in pelvic discontinuities with uncontaminated bone defects (0% and 60.0%, respectively; $P<.001$).
6	(Descamps et al., 2023)	Managing early complications in total hip arthroplasty: the safety of immediate revision	No infections were observed within two years after index arthroplasty. Limb length discrepancy (88%, $n=37$) and dislocation (7.1%, $n=3$) were the leading causes of immediate revision. In most mismatched cases, the limb was clinically and radiologically longer before immediate revision. The mean operative time was 48 ± 14 minutes for the primary procedure and 23.6 ± 9 minutes for revision. The time between the first incision and the last skin closure they were ranged from 1 to 3 hours. No patient was extubated between the two procedures. Two patients had a National Nosocomial Infection Surveillance score of 2, 13 had a score of 1, and 27 had a score of 0. Immediate revision is safe for correcting clinical and radiological abnormalities. It may not be associated with increased complication or infection rates.
7	(Southgate & Li, 2022)	Registry Data Show Complication Rates and Cost in Revision Hip Arthroplasty	Overall, 46.3% of patients presented due to infection. Patients presenting with infection were 5.6 times more likely to have recurrent rTHA than aseptic patients. Septic cases (4.3 days) had a longer length of stay than aseptic cases (2.4) ($P<.0001$). However, 31% of patients were discharged to a skilled nursing facility. The highest direct cost was for a two-stage exchange (\$37,642), and the lowest was for liner revision (\$8,979). Septic revision (\$17,696) was more expensive than aseptic revision (\$11,204) ($P<.0001$). The 90-day re-hospitalization rate was 21.8%. Septic revision had more re-hospitalizations (13.5%) than aseptic revision (8.3%).
8	(Israel et al., 2023)	Preclosure povidone-iodine lavage in total hip replacement surgery: Infection outcomes and cost-benefit analysis	Pre-treatment povidone-iodine rinses appear to be efficacious in decreasing THR infection rates and safe for this use based on the 102 cases we reviewed. PrePIL costs are minimal compared to addressing THR infection and the potential effect on hip function prognosis. The developed mathematical formulas can be used by surgeons to calculate cost-effectiveness and break-even costs based on THR infection rates and

No	Name and Year of Research	Research Title	Research Result
			to compare them with the expenses of THR revision and infection resolution.

Hip replacement is a joint and effective surgery. However, patients undergoing this intervention are at risk of hip replacement failure, requiring expensive and often complicated revision surgery with poorer outcomes than primary surgery (Deere et al., 2021). Total hip replacement is a long-lasting operation for most people who undergo this surgery. A hip replacement is an implanted mechanical device with components commonly called a "ball and socket" - assembled before and during surgery. After surgery, the ball-and-socket prosthesis (implant) restores hip movement throughout the life of the prosthesis.

The main indication for total hip replacement is pain. Patients who are unable to sleep due to pain will generally have great results from THA and will most likely wake up after surgery and realize that their pain has been resolved. Pain in the hip joint is usually located in the groin or buttocks, radiating to the thigh and often to the knee. Hip arthritis may only present with symptoms of knee pain, a common finding in elderly patients. All patients with knee pain should undergo a physical examination of the hip, and appropriate radiographs should be obtained if abnormalities are found during the hip examination (Ashman et al., 2016). The accepted indications for total hip replacement changed and expanded over the years. An operation intended as a salvage procedure in elderly patients with low need has evolved into the operation of choice for various pathological conditions of the hip. The main indication for THR is end-stage osteoarthritis (Bucholz, 2014).

The location of the pain may give a clue as to the problem. Groin pain is characteristic of hip pathology and may stem from acetabular problems, whereas thigh pain may indicate trunk loosening. Pain in the trochanter may result from tendinopathy, tendon rupture, or bursitis, and buttock pain may radiate from the back. Posterior pseudotumors or collections that irritate the sciatic nerve can also cause buttock pain. If pain is present early on, it may indicate an infection or periprosthetic fracture. Impingement or early failure of osseointegration may also cause pain from the first day of surgery. Pain-free intervals followed by pain may indicate loosening or late infection. Acetabular loosening is often asymptomatic. Night pain or persistent pain suggests infection or malignancy. Early onset pain occurs when the patient rises from a seated position and starts walking. A typical history of the patient banging/striking the foot firmly on the ground several times to relieve the pain is characteristic of loosening. Progressive loss of length may indicate a weakening of the trunk and subsidence (Aqil & Shah, 2020).

SimBTHA is associated with lower total blood loss, length of hospital stay, and total surgery cost. Reduced hospital length of stay and total cost of surgery are essential advantages of simBTHA over stgBTHA, and they may attract the attention of healthcare providers and policymakers. However, simBTHA remains non-inferior to stgBTHA on most postoperative outcomes. However, we recommend that a well-designed randomized controlled trial be conducted to elucidate the advantages of each operation to help surgeons choose the correct surgical method based on their point of view and the patient's benefit (Mittal et al., 2020).

Many factors contribute to dislocation after primary THA, and its prevention requires individualized therapeutic strategies to reduce the risk of instability. Low-volume surgeons, in particular, must be aware of skill limitations and appropriately refer at-risk patients. In particular, inexperienced operators can use intraoperative assistive techniques to ensure proper placement of

acetabular and femoral components. Intraoperative assistive techniques facilitate accurate placement, thereby reducing the risk of dislocation. The surgical goal of THA is to recreate the natural hip centre of rotation with an appropriate combination of offset and leg length (Takahashi et al., 2023). The implant must remain firmly attached to the bone for a total hip replacement to function correctly. During the initial surgery, the hip replacement components are cemented in place or "press fit" into the bone to allow the bone to grow over it. However, the bone may fail to grow into the press-fit component. In addition, the cemented or pressed component that was once firmly attached to the bone may eventually loosen, causing hip pain. The cause of loosening is only sometimes clear. However, repetitive high-impact activities, excessive body weight, and wear of the plastic lining between the ball and metal housing are possible contributing factors (Khatod et al., 2015).

The leading cause of hip revision in our centre for the past seven years has been Prosthetic Joint Infections. Due to inadequate microbiological support and unstructured use of empirical antibiotic regimens, no causative organism is found in many septic revisions, complicating their management. Even in cases with positive cultures, unlike in Western countries, the predominant organisms are hospital-acquired gram-negative microorganisms, thus making treatment more difficult (Mittal et al., 2020).

This study presents a systematic review of the revision rates and causes of total hip replacement (THR) based on several recent studies. The research findings highlight the increasing cases of fractures and degenerative diseases of the hip and knee joints, encouraging a comprehensive and innovative approach to management. Factors such as infection, dislocation, limb length discrepancy, and other complications are essential in determining revision rates and replacement success. Research also highlights the importance of preventive measures such as using pre-treatment povidone-iodine rinses to reduce the risk of infection and implementing better blood management protocols to optimize total hip replacement outcomes.

CONCLUSION

The results showed that infection, dislocation, limb length discrepancy, and other complications significantly influence total hip replacement revision rate and success. To overcome the risk of infection, preventative measures such as using a povidone-iodine mouthwash before treatment can be effective. Additionally, implementing better blood management protocols can help optimize the outcomes of total hip replacement procedures. Thus, these preventive measures are essential to consider in clinical practice to increase the success of total hip replacement surgery and reduce revision rates.

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