Quality in Sport. 2026;50:68204. eISSN 2450-3118.

https://doi.org/10.12775/QS.2026.50.68204

Quality in Sport. eISSN 2450-3118

Journal Home Page
https://apcz.umk.pl/QS/index

HALIK, Paulina, JUSIAK, Justyna, GRABIŃSKA, Magdalena, KUBALA, Karolina, GOŁDYN, Mikołaj, PIETRUCHA, Tomasz and STUPNICKI, Szymon. Total hip arthroplasty in elderly patients: treatment-specific considerations, risk of complications, and functional outcomes. Quality in Sport. 2026;50:68204. eISSN 2450-3118. https://doi.org/10.12775/QS.2026.50.68204

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).
The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 13.01.2026. Revised: 30.01.2026. Accepted: 30.01.2026. Published: 03.02.2026.

Total hip arthroplasty in elderly patients: treatment-specific considerations, risk of complications, and functional outcomes

Paulina Halik

Hospital The Monument of the Baptism of Poland, ul. Świętego Jana 9, 62-200 Gniezno, Poland

https://orcid.org/0009-0008-8660-3481

E-mail: paulinahalik@gmail.com

Justyna Jusiak

Hospital The Monument of the Baptism of Poland, ul. Świętego Jana 9, 62-200 Gniezno, Poland

https://orcid.org/0009-0006-6992-9303

E-mail: justynajusiak98@gmail.com

Magdalena Grabińska
Józef Struś Multi-Speciality Municipal Hospital, ul. Szwajcarska 3, 61-285 Poznan, Poland
https://orcid.org/0009-0005-6374-0158
E-mail: grabimagump@gmail.com

Karolina Kubala
https://orcid.org/0009-0002-3394-5265
Provincial Specialist Hospital named after J. Gromkowski, ul. Koszarowa 5, 51-149 Wrocław, Poland
E-mail: karolina.kubala00@gmail.com

Mikołaj Gołdyn
https://orcid.org/0009-0003-2555-1212
Beskid Oncology Center – Municipal Hospital of John Paul II, ul. Wyzwolenia 18, 43-300 Bielsko-Biała, Poland
E-mail: goldynmikolaj@gmail.com

Tomasz Pietrucha
https://orcid.org/0009-0001-6234-4605
Wrocław Medical University, Wybrzeże Ludwika Pasteura 1, 50-367 Wrocław, Poland
E-mail tomek.pietrucha97@gmail.com

Szymon Stupnicki
https://orcid.org/0009-0002-2263-5691
Provincial Multispecialty Hospital in Leszno, Jana Kiepury 45, 64-100 Leszno, Poland
E-mail: ssymon0303@gmail.com

Abstract

Introduction

Total hip arthroplasty (THA) is a widely used and effective procedure for treating advanced hip disorders. With population aging, the number of THA procedures in elderly patients is steadily

increasing. Advanced age is associated with comorbidities and reduced physiological reserve, which may influence perioperative risk and postoperative outcomes.

Aim

This review aimed to summarize current evidence on total hip arthroplasty in elderly patients, focusing on surgical management, perioperative care, rehabilitation, and clinical outcomes.

Materials and methods

A narrative review of the literature was conducted using PubMed, Scopus, and Web of Science databases. Publications between 2001 and 2025 were included. The review focused on adults aged ≥65 years and synthesized findings narratively across surgical indications and management, perioperative care, risk of complications, rehabilitation, and functional outcomes following total hip arthroplasty.

Results

Available evidence indicates that THA provides significant pain relief and functional improvement in elderly patients, including those aged 80 years and older. Cemented implants are associated with lower early revision rates and better implant survival in patients with poor bone quality, while uncemented and hybrid prostheses may be appropriate in selected cases. Elderly patients have a higher risk of perioperative complications, such as cardiopulmonary events, delirium, and periprosthetic fractures. Early mobilization and structured rehabilitation significantly improve functional recovery and reduce complication rates.

Conclusion

Total hip arthroplasty is a safe and effective treatment option for elderly patients when individualized surgical planning, comprehensive perioperative management, and multidisciplinary rehabilitation are applied. Advanced age alone should not be considered a contraindication to surgery.

Keywords: Total hip arthroplasty; elderly patients; geriatric orthopedics; hip osteoarthritis; perioperative complications; rehabilitation outcomes; functional recovery

Materials and methods

This study was conducted as a narrative review of the available literature addressing total hip arthroplasty (THA) in elderly patients.A comprehensive literature search was performed using the electronic databases PubMed/MEDLINE, Scopus, Web of Science, and Cochrane Library, Google Scholar. The search included articles published from January 2000 to May 2025. The review focused on adults aged ≥65 years undergoing total hip arthroplasty and synthesized findings narratively across epidemiology, surgical indications, implant selection, perioperative risk factors, postoperative complications, rehabilitation, and functional outcomes.

Introduction

Total hip arthroplasty (THA) is a surgical intervention in which a damaged or diseased hip joint is excised and replaced with a prosthetic implant. The primary objectives of the procedure are to alleviate chronic pain and restore joint function, thereby improving overall mobility and quality of life. THA is widely recognized as one of the most effective orthopedic procedures, demonstrating substantial benefits in pain reduction, functional recovery, and long-term patient satisfaction. [1, 2]

Epidemiologically, total hip arthroplasty (THA) demonstrates increasing prevalence among older adults, reflecting both the substantial burden of hip osteoarthritis and the extended life expectancy characteristic of aging populations [3, 4]. In an analysis of elective primary THA procedures performed in the United States from 2018 to 2021, individuals aged 65 years and older accounted for over half of all cases, with the Medicare-eligible cohort (≥65 years) consistently representing approximately 55–57 % of the total THA population annually [5].
Similarly, across EU countries, nearly 1 million hip replacements were performed in 2022, corresponding to approximately 202 procedures per 100 000 population on average, representing a 20 % increase since 2012. OECD data further indicate that, prior to the COVID-19 pandemic, rates of hip replacement were steadily increasing, driven primarily by the rising prevalence of osteoarthritis, which is closely associated with population aging [4].
Poland is undergoing a pronounced demographic transition toward an aging society, with individuals aged 60 years and older comprising approximately 25 % of the total population. This shift has resulted in a growing geriatric population in which functional limitations in activities of daily living are highly prevalent. Disability among older adults is largely attributable to the increasing burden of age-related degenerative joint diseases, which significantly contribute to mobility impairment and loss of independence. Analysis of Polish

National Health Fund data from 2017 indicate that in 2017 a total of 83 525 hip or knee arthroplasties were performed in adults, of which 66.6 % were hip replacements, with a mean patient age of approximately 68.4 years [6]. These findings underscore the strong association between advancing age and the need for joint replacement surgery in Poland, consistent with trends observed in other high-income countries.

In elderly patients, however, treatment planning requires careful consideration of age-related physiological changes, comorbidities, and the increased risk of perioperative and postoperative complications. Advanced age has been consistently recognized as an independent risk factor for perioperative and postoperative complications following both total hip and knee arthroplasty. Common complications in geriatric population include cardiopulmonary events, venous thromboembolism, infections, and postoperative delirium [7]. The ongoing demographic shift toward an aging population has focused increasing attention on the oldest patient cohorts. In studies of total hip and knee arthroplasty, perioperative mortality rates in the most elderly patients were reported to range from approximately 1.09 % to 1.54 % in octogenarians and from 2.6 % to 2.9 % in nonagenarians [8]. Additionally, age-related physiological changes such as sarcopenia - common in geriatric patients - have also been linked with increased rates of significant postoperative complications and delayed functional recovery after elective THA [9]. Understanding these elderly-specific factors is essential for optimizing outcomes and guiding clinical decision-making.

This paper aims to review the current evidence regarding hip replacement surgery in the elderly, focusing on indications, surgical considerations, perioperative challenges, and clinical outcomes.

Results

Indications for total hip arthroplasty in the elderly

Advanced hip osteoarthritis (OA) is a frequent indication for total hip arthroplasty (THA) in the geriatric population and represents a major contributor to chronic pain, functional limitation, and disability in older adults [10]. The prevalence of OA increases with age, and according to the Global Burden of Disease 2021 study, it was the seventh leading cause of years lived with

disability (YLDs) in adults aged 70 years and older in 2020, affecting approximately one-third of individuals in this age group [11].

In the early stages of hip osteoarthritis (OA), management is primarily non-surgical and focuses on symptom control and functional preservation. This conservative approach includes patient education, activity modification, weight management in overweight or obese individuals, structured exercise programs, physical therapy interventions, use of assistive devices as needed, and pharmacologic management with agents such as non-steroidal anti-inflammatory drugs and steroid injections for relief of symptoms [12].
Surgical intervention with THA is indicated when conservative treatment fails to achieve adequate symptom control and the disease progresses to an advanced stage [10]. According to the German guideline project "Evidence-based and consensus-based indication criteria for total hip replacement (EKIT Hip)", criteria for surgery include radiologically confirmed advanced hip osteoarthritis (Kellgren–Lawrence grade III or IV), persistent pain and functional limitations of the hip joint despite a minimum of three months of non-surgical management, and clinically significant impairment in activities of daily living that negatively affect quality of life. The guideline emphasizes shared decision-making, ensuring that the anticipated clinical benefit exceeds the potential surgical risks. [13]. Among the listed contraindications are comorbidities, underscoring the importance of considering the high prevalence of chronic diseases in the elderly when evaluating surgical candidacy [13, 14].

Displaced acetabular fractures in older patients represent another indication for THA. A systematic review of 601 patients aged over 60 years found THA to be a feasible and effective strategy, particularly for dome impaction, irreducible articular comminution, femoral head injury, or pre-existing osteoarthritis and avascular necrosis. THA is most often performed for specific fracture patterns defined by the Letournel–Judet classification, including anterior column posterior hemitransverse, posterior wall, both-column, and T-type fractures.. In contrast to THA, open reduction and internal fixation (ORIF) in this population is associated with high failure rates, reported between 20% and 45%, often necessitating early conversion to THA. [15] Consequently, acute THA represents a reliable alternative that offers the added advantage of early postoperative weight bearing compared with ORIF [15, 16].

Femoral neck fractures in elderly patients may also be managed with THA, with the choice between fixation and arthroplasty primarily determined by fracture displacement and bone

quality. Fractures classified as Garden type III and IV are generally unsuitable for osteosynthesis due to a high risk of disruption of the femoral head blood supply, predisposing to fixation failure. Additionally, osteoporosis and age-related structural bone changes increase the likelihood of non-union in this population. Accordingly, THA is often preferred for displaced femoral neck fractures in geriatric patients, whereas osteosynthesis is typically reserved for younger individuals with non-displaced fractures [17, 18].

In elderly patients, THA is commonly performed for osteoarthritis, reflecting age-related degenerative changes, whereas in younger patients, THA is indicated for rheumatoid arthritis, avascular necrosis, or developmental hip disorders [19, 20].

Characteristics of surgical management in geriatric patients

Total hip arthroplasty (THA) is one of the most frequently performed orthopedic procedures in geriatric patients with advanced hip osteoarthritis, femoral neck fractures, and other disorders of the hip joint [10, 17, 21]. With the aging of societies and increasing expectations regarding quality of life, the number of THA procedures in elderly patients continues to rise steadily [22]. Optimization of treatment in this patient group requires a comprehensive approach, including appropriate selection of the prosthesis type, surgical technique, anesthesia, as well as proper preoperative preparation and perioperative care [23, 24].

Types of Hip Prostheses

Depending on the method of fixation to the bone, hip prostheses are classified as cemented, uncemented, or hybrid.

Cemented prostheses provide immediate implant stability, which is particularly important in patients with osteoporosis or reduced bone quality [25]. Randomized studies and registry analyses have demonstrated that cemented prostheses in elderly patients are associated with a lower risk of early revision and better 10-year survival compared to uncemented prostheses (26).

Uncemented prostheses achieve stability through press-fit and bone integration within the femur and acetabulum. This stability can be further augmented using adjunctive techniques, such as screw fixation [1]. However, uncemented prostheses are associated with a higher risk of periprosthetic fractures [27].

Hybrid prostheses combine cemented fixation of one component with uncemented fixation of the other, allowing for individualized treatment based on anatomical conditions and bone quality [1].

In the analysis of 347,899 total hip replacements from the combined Nordic Arthroplasty Register Association database, cemented implants had higher 10-year survival than uncemented implants in patients aged 65–74 and ≥ 75 years [26].

Selection of Surgical Technique

The choice of surgical technique includes both the type of prosthesis and the surgical approach (anterior, lateral, or posterolateral). This decision depends on the patient's anatomy, the degree of joint deformity, preoperative activity level, and the surgeon's experience [27]. Proper selection of the surgical technique is crucial for reducing the risk of prosthesis dislocation and for optimizing hip joint biomechanics [28].

Anesthesia in Elderly Patients

In geriatric patients, the safe selection of anesthesia is of particular importance. Comparative studies indicate that regional anesthesia is associated with a lower risk of respiratory complications and odds of mortality, whereas no significant differences have been observed in the incidence of cardiovascular complications [29].

Perioperative Care

Perioperative care emphasises effective analgesia, early mobilisation, and prevention of thromboembolic, respiratory, and neurological complications. Early mobilisation supports faster functional recovery and reduces thromboembolic risk. Preoperative anaemia is common in older patients and is associated with increased postoperative morbidity after total hip or knee arthroplasty. Postoperative delirium and cognitive dysfunction are recognised complications and are linked to pain, opioid exposure, sleep disturbance, and inflammatory stress responses. Evidence from 220 fast-track hip and knee arthroplasties indicates that multimodal analgesia with reduced opioid use and shorter hospital stays is associated with a negligible incidence of postoperative delirium [35].

Risk factors and types of complications following total hip arthroplasty

Elderly patients undergoing total hip arthroplasty THA are at increased risk for perioperative complications. In a retrospective analysis of 401 patients aged ≥ 65 years undergoing hip or knee arthroplasty, the overall postoperative complication rate was 30.4%, with lower extremity venous thrombosis (13,97%), cardiopulmonary complications (12.47%) , and postoperative delirium (3.74%) being the most common adverse outcomes. Advanced age emerged as an independent risk factor for complications following THA in the elderly, alongside other contributory factors such as elevated body mass index and hypertension. Moreover, the risk of adverse events increases progressively with age: each additional 10 years of age was associated with higher odds ratio (OR) of overall complications (OR 1.90), cardiopulmonary complications (OR 2.30), postoperative delirium (OR 2.38), and the occurrence of multiple complications (OR 3.87) [7].

Furthermore, sarcopenia has been identified as a significant modifiable risk factor that exacerbates postoperative complications in elderly patients undergoing elective total hip arthroplasty (THA). In a cohort of 198 elderly patients undergoing THA and stratified according to skeletal muscle index (SMI), 178 patients (89.9%) were classified as sarcopenic, while 20 patients (10.1%) were non-sarcopenic. Patients with sarcopenia exhibited a substantially higher incidence of Clavien–Dindo grade II or higher postoperative complications compared with non-sarcopenic matched controls (54.41% vs. 15%, P = 0.002). In addition, sarcopenic patients demonstrated poorer early functional outcomes, with a significantly greater reliance on walking assistance at hospital discharge compared with non-sarcopenic patients (86.96% vs. 60%). Sarcopenia was associated with higher mortality risk, whereas a higher body mass index (BMI) was associated with a lower risk of mortality in elderly patients undergoing hip arthroplasty [9].Beyond its impact on survival, sarcopenia contributes to impaired wound healing, increased susceptibility to postoperative infections, and delayed functional recovery following THA. Moreover, diminished respiratory muscle strength in sarcopenic elderly patients predisposes them to pulmonary complications such as aspiration and atelectasis during the postoperative period [31].

Periprosthetic fractures (PPFs) represent a serious and increasingly recognized complication following THA, particularly among elderly patients and those with osteoporosis [32, 33, 34]. Advanced age has been consistently identified as a significant predictor of PPFs [33]. Low bone mineral density, commonly observed in older adults, further predisposes patients to mechanical

failure around the implant Recent analyses in osteoporotic populations undergoing THA indicate that several comorbid conditions further exacerbate the risk of PPFs and aseptic loosening. Specifically, alcohol abuse (ETOH), chronic kidney disease (CKD), cerebrovascular disease (CVD), obesity, and rheumatoid arthritis (RA) have been consistently identified as independent predictors of these complications [34]. These findings underscore the multifactorial nature of postoperative risk in elderly patients with compromised bone quality, highlighting the need for comprehensive preoperative assessment and optimization of both systemic health and bone integrity prior to arthroplasty.

Rehabilitation management after total hip arthroplasty in geriatric patients

Total hip arthroplasty is one of the most effective treatments for advanced hip disorders in elderly patients. However, the final clinical outcome of the surgery largely depends on properly conducted postoperative rehabilitation [21]. In older patients, rehabilitation is especially important due to common chronic diseases, reduced physical fitness, sarcopenia, and an increased risk of complications caused by immobility [35, 36]. Comprehensive rehabilitation after hip arthroplasty aims not only to improve joint function but also to restore the highest possible independence and quality of life for the patient.

Goals and Principles of Rehabilitation

The main goal of rehabilitation after total hip arthroplasty is to restore the functional ability of the operated limb, reduce pain, and prevent local and systemic complications [37]. The rehabilitation process includes improving the range of motion in the hip joint, strengthening muscles that stabilize the pelvis and hip, learning proper walking techniques, and practicing balance and coordination, which is especially important for fall prevention in older adults [38,8]. Patient education on safe movement, daily activity ergonomics, and adherence to postoperative recommendations is also a key part of rehabilitation, reducing the risk of prosthesis dislocation and other complications [38].

Early Postoperative Rehabilitation

Rehabilitation should start as early as possible, usually on the first day after surgery [40]. Early postoperative rehabilitation includes breathing exercises, thrombosis prevention, isometric exercises for the lower limb muscles, and gradual standing under the supervision of a

physiotherapist [39]. In the following days, patients are trained to sit, stand, and walk using assistive devices such as crutches or a walker.

Clinical studies show that early mobilization after hip arthroplasty leads to faster recovery of movement, less pain, shorter hospital stay, and a reduced risk of thromboembolic and respiratory complications [40,9]. In geriatric patients, early rehabilitation also helps prevent cognitive disorders and postoperative delirium [36].

Long-term Rehabilitation

After hospital discharge, rehabilitation should continue in outpatient or home settings and may last from several months up to one year, depending on the patient's general condition and preoperative activity level [37, 42]. The goals of long-term rehabilitation are further muscle strengthening, improving endurance, balance, and coordination, as well as training more complex movements. The rehabilitation program may include resistance exercises, proprioception training, stabilization exercises, and low-impact activities such as walking, swimming, or cycling [37].

Randomized clinical trials confirm that structured long-term rehabilitation in elderly patients after hip surgery leads to significant improvement in functional ability, reduces the risk of repeated falls, and increases independence in daily life [35, 42].

Importance of the Rehabilitation Team

Effective rehabilitation after total hip arthroplasty in elderly patients requires close cooperation of a multidisciplinary team, including an orthopedic surgeon, physiotherapist, and nurse [36, 41]. The surgeon monitors the treatment process, evaluates wound healing, and supervises potential complications. The physiotherapist plans and conducts the rehabilitation program, adjusting intensity and exercise range according to the patient's abilities. The nurse plays a key role in daily care, patient education, and prevention of complications such as infection, thrombosis, or pressure sores.

Studies show that a multidisciplinary care model in geriatric patients after hip surgery results in better functional outcomes, fewer complications, and reduced postoperative mortality [36, 41].

Functional outcomes of total hip arthroplasty in elderly

With the aging of the global population, the number of elderly patients requiring total hip arthroplasty (THA) is increasing, necessitating evaluation of age-related effects on functional outcomes. Evidence indicates that geriatric patients aged 80 years and older, experience significant improvements in hip-specific function, mobility, and health-related quality of life following THA. In a large retrospective cohort comparing patients aged ≥80 years with those aged 65–75 years, both age groups achieved clinically meaningful and statistically significant improvements in postoperative patient-reported outcome measures (PROMs) as measured by the Oxford Hip Score (OHS) and EuroQol-5D (EQ-5D). Although the younger cohort exhibited a statistically greater improvement in OHS after adjustment for confounding variables, the absolute difference of approximately 1.9 points compared with the ≥80-year group remained below the minimal clinically important difference, indicating a lack of clinical relevance [43]. While patients over 80 achieve functional improvements comparable to younger cohorts, they face higher perioperative risks. A retrospective review of the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database from 2008 to 2014 found that, in patients over 80 undergoing THA, major complications were rare, occurring in 4.2% of cases, whereas minor complications affected 25.1% of patients. Additionally, 22.9% experienced postoperative bleeding requiring transfusion, and 4.9% had an unplanned hospital readmission within 30 days. Among comorbidities, congestive heart failure was the only condition significantly associated with major complications and was also linked to a higher risk of postoperative mortality. Furthermore, procedures lasting longer than 120 minutes and an ASA score greater than 2 were independently correlated with increased rates of minor complications and postoperative bleeding [44] .These findings highlight that, while advanced age does not preclude meaningful functional recovery after THA, careful preoperative assessment and perioperative management are essential to minimize complications in elderly patients.

Discussion

The present narrative review synthesizes current evidence regarding total hip arthroplasty (THA) in elderly patients and highlights that advanced age, although associated with increased perioperative risk, does not preclude substantial clinical benefit from surgery. Across multiple

domains—including indications, surgical management, perioperative care, rehabilitation, and functional outcomes—THA consistently demonstrates significant pain relief, functional improvement, and enhanced quality of life in geriatric populations, including octogenarians and nonagenarians.

One of the central findings of this review is that osteoarthritis remains the predominant indication for THA in elderly patients, reflecting age-related degenerative changes and cumulative joint loading. Fracture-related indications, particularly displaced femoral neck and acetabular fractures, are also highly relevant in this age group. Importantly, evidence suggests that in selected elderly patients, primary THA for fractures may offer advantages over internal fixation or hemiarthroplasty by allowing early weight-bearing, reducing reoperation rates, and improving functional recovery. These observations support a more proactive surgical approach in older adults when functional demands and general health status permit.

Implant selection and surgical strategy play a critical role in optimizing outcomes in elderly patients. Consistent with registry-based and randomized data, cemented fixation appears to confer superior implant survival and lower early revision and periprosthetic fracture rates in patients with reduced bone quality. While uncemented and hybrid implants remain viable options in carefully selected individuals, particularly those with adequate bone stock, the higher fracture risk associated with uncemented stems underscores the need for individualized decision-making. These findings reinforce the principle that chronological age alone should not guide implant choice; rather, biological age, bone quality, comorbidities, and functional expectations should inform surgical planning.

Perioperative management represents a major challenge in geriatric THA. Advanced age is consistently associated with higher rates of cardiopulmonary complications, venous thromboembolism, postoperative delirium, and transfusion requirements. The reviewed literature emphasizes the importance of comprehensive preoperative assessment, including optimization of anemia, cardiovascular status, nutritional state, and frailty-related factors such as sarcopenia. Sarcopenia, in particular, emerges as a key modifiable risk factor, strongly associated with increased postoperative complications, delayed functional recovery, and higher mortality. These findings highlight the potential value of prehabilitation strategies, including nutritional support and resistance training, in reducing postoperative morbidity in elderly patients.

The role of perioperative pathways tailored to older adults is increasingly evident. Multimodal analgesia, regional anesthesia when feasible, early mobilization, and fast-track protocols have been shown to reduce length of hospital stay, opioid consumption, and the incidence of postoperative delirium without compromising safety. Such approaches align with the broader concept of geriatric co-management, in which orthopedic surgeons collaborate closely with anesthesiologists, geriatricians, nurses, and physiotherapists to address the complex needs of elderly patients.

Rehabilitation is a cornerstone of successful THA in the geriatric population. Early postoperative mobilization and structured, progressive rehabilitation programs are consistently associated with improved functional outcomes, reduced complication rates, and greater independence in activities of daily living. In elderly patients, rehabilitation extends beyond joint-specific recovery and must also address balance, coordination, fall prevention, and cognitive function. The evidence reviewed supports the effectiveness of multidisciplinary rehabilitation models, which not only improve physical outcomes but also reduce postoperative mortality and institutionalization rates.

Functional outcomes following THA in elderly patients are particularly noteworthy. Despite higher perioperative risk, patients aged 80 years and older achieve clinically meaningful improvements in pain, mobility, and health-related quality of life comparable to those observed in younger cohorts. Although absolute gains in some patient-reported outcome measures may be slightly smaller in the oldest patients, these differences are generally below thresholds of clinical relevance. This reinforces the concept that advanced age alone should not be viewed as a contraindication to THA, provided that patients are appropriately selected and optimized.

Several limitations of the available evidence should be acknowledged. Much of the literature consists of retrospective studies and registry analyses, which are subject to selection bias and confounding. Elderly patients undergoing THA are often carefully selected, potentially underestimating complication rates in frailer populations. Additionally, there is heterogeneity in how “elderly” is defined across studies, as well as variability in outcome measures and follow-up duration. High-quality prospective studies focusing specifically on the oldest and most frail patients, including those with cognitive impairment or severe comorbidities, remain limited.

In summary, the findings of this review support total hip arthroplasty as an effective and generally safe intervention for elderly patients when embedded within an individualized, multidisciplinary care framework. Optimal outcomes depend on careful patient selection, appropriate implant choice, meticulous perioperative management, and comprehensive rehabilitation. As populations continue to age, future research should focus on refining risk stratification tools, developing targeted prehabilitation and geriatric co-management strategies, and identifying interventions that further reduce complications while preserving the substantial functional benefits of THA in this growing patient population.

Conclusion

Total hip arthroplasty is a highly effective treatment for elderly patients with advanced hip pathology, providing substantial pain relief, functional improvement, and enhanced quality of life, even in patients aged 80 years and older. Although advanced age is associated with an increased burden of comorbidities and a higher risk of perioperative and postoperative complications, current evidence indicates that these risks can be mitigated through careful patient selection, individualized surgical planning, and comprehensive perioperative management.

Cemented fixation remains the preferred option for many elderly patients, particularly those with compromised bone quality, due to its superior implant survival and lower early complication rates. Equally important is the implementation of optimized perioperative pathways, including appropriate anesthesia selection, multimodal analgesia, early mobilization, and proactive prevention of complications such as delirium, thromboembolism, and cardiopulmonary events. Structured, multidisciplinary rehabilitation is essential for maximizing functional recovery, maintaining independence, and reducing morbidity and mortality in this population.

Overall, chronological age alone should not be considered a contraindication to total hip arthroplasty. With a patient-centered, multidisciplinary approach that addresses geriatric-specific risks and functional goals, THA can be performed safely and successfully in elderly patients, offering meaningful and durable improvements in mobility and quality of life.

Author's contribution

Conceptualization: **Tomasz Pietrucha**
Methodology: Justyna Jusiak, Paulina Halik
Software: not applicable;
Verification: Tomasz Pietrucha,
Formal analysis: Szymon Stupnicki
Research: Karolina Kubala, Magdalena Grabińska
Resources: Mikołaj Gołdyn
Writing- rough preparation: Szymon Stupnicki, Justyna Jusiak
Writing- review and editing: Karolina Kubala, Magdalena Grabińska
Visualization: Mikołaj Gołdyn
Project administration: Paulina Halik
Funding acquisition: not applicable.
All authors have read and agreed with the published version of the manuscript.
Founding Statement: The study did not receive funding.
Institutional Review Board Statement: Not applicable.
Informed Consent Statement: Not applicable.
Data Availability Statement: Not applicable.
Conflict of Interest Statement: The authors declare no conflicts of interest.
Acknowledgments: Not applicable

Reference:

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