Scientific Research Publishing

Open Journal of Orthopedics, 2025, 15(12), 483-490
https://www.scirp.org/journal/ojo
ISSN Online: 2164-3016
ISSN Print: 2164-3008

Comparison of the Revision Rate of Cemented vs Uncemented Acetabular Components in Total Hip Replacements in Patients Aged 50 and Under

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How to cite this paper: Kenny, F., Tiedt, L. and Cashman, J. (2025) Comparison of the Revision Rate of Cemented vs Uncemented Acetabular Components in Total Hip Replacements in Patients Aged 50 and Under. *Open Journal of Orthopedics*, **15**, 483-490.
https://doi.org/10.4236/ojo.2025.1512048

Received: November 26, 2025
Accepted: December 28, 2025
Published: December 31, 2025

Abstract

Objective: The primary objective of this investigation was to assess the survivorship of acetabular components in total hip arthroplasty in patients aged 50 and under when comparing cemented and uncemented implantation methods over a 10-year period. **Patients and Methods:** This prospective cohort study used data from a regional registry. The study identified all THRs performed on patients aged 50 and under, with 10-year postoperative follow-up data. Patients required a minimum 10-year follow-up, and the all-cause revision rate for the acetabular component was calculated. A follow-up rate of 92.6% was achieved. **Results:** A total of 364 THRs were identified from 2005 to 2010. The cases were categorised into two groups: those with cemented acetabular components (n = 93), and those with an uncemented acetabular component (n = 227). The observed revision rate of the cemented acetabular component THR was 5.4%, in contrast to the revision rate of the uncemented acetabular component, which was 4.4% ($p > 0.05$). The mean time to revision for these two groups was found to be 4.4 years and 4.6 years, respectively ($p > 0.05$). **Conclusion:** This study discerns no difference between cemented and uncemented methods in THRs conducted on patients aged 50 and under, with regard to all-cause revision rates for acetabular components.

Keywords

Young, Arthroplasty, Acetabulum, Cemented, Uncemented

1. Introduction

Primary Total Hip Replacement (THR) is a successful surgery, with revision rates

of less than 5% at 10 years [1]-[3]. Revision hip replacements have poorer outcomes, with increased mortality, infection, and dislocation rates [4]. Therefore, minimising the need for revision surgery should be the goal of every surgeon.

Cemented and uncemented acetabular fixation in THRs both remain in common use, but recently there has been a trend towards the use of uncemented acetabular fixation in the younger patient [5]. Survival of the acetabular component has been observed to be shorter in younger adults when compared to the older patient [6]. The same was not seen for the femoral stem.

We want to determine if there is a superior acetabular fixation method for the younger patient. To do this, we sought to evaluate the 10-year survivorship of cemented and uncemented acetabular components in patients aged 50 years and under.

2. Patients and Methods

This was a prospective study carried out at a large national tertiary referral orthopaedic hospital. All patients undergoing hip arthroplasty were captured in an institutional database and followed up prospectively. The inclusion criteria for this study were patients aged 50 and under who underwent a primary total hip replacement from 1 January 2005 to 31 December 2010. This allowed us to assess the 10-year survival rate of the implants. The exclusion criteria were metal-on-metal THRs and resurfacings. There was a follow-up rate of 92.6%. The review included the operative notes, the discharge summaries, and relevant radiographs. Patients with inconclusive data sets were contacted by phone for more complete data collection. Revision surgery in this study refers only to the acetabular component of the prosthesis. For the primary outcome of this study, a comparison was made between the revision rate at 10 years of the THRs with a cemented acetabular component and those with an uncemented acetabular component. The outcome was defined as removal of the acetabular component for any reason.

Of the 364 THRs, 44 were not included in our results for reasons outlined in the flowchart below (see **Figure 1**). Secondary outcomes of this study were the average length of implant survival before revision and the reason for revision.

Statistical Analysis

In this study, we conducted data analysis using STATA to assess the long-term performance of cemented and uncemented acetabular components in total hip replacement. To determine if there was a significant difference in revision rates at 10 years between the two groups, we performed a chi-squared test, yielding a p-value of 0.42 (>0.05). The p-value suggests no statistically significant difference in revision rates. To provide a more nuanced view, we calculated 95% confidence intervals for the acetabular component survival probabilities at 10 years. For the uncemented group, the 95% confidence interval ranged from 0.9120 to 0.9998, while for the cemented group, it ranged from 0.8658 to 1.0000 (truncated at 1). Additionally, Kaplan-Meier survival curves were created to visually depict the sur-

vival probabilities over time.

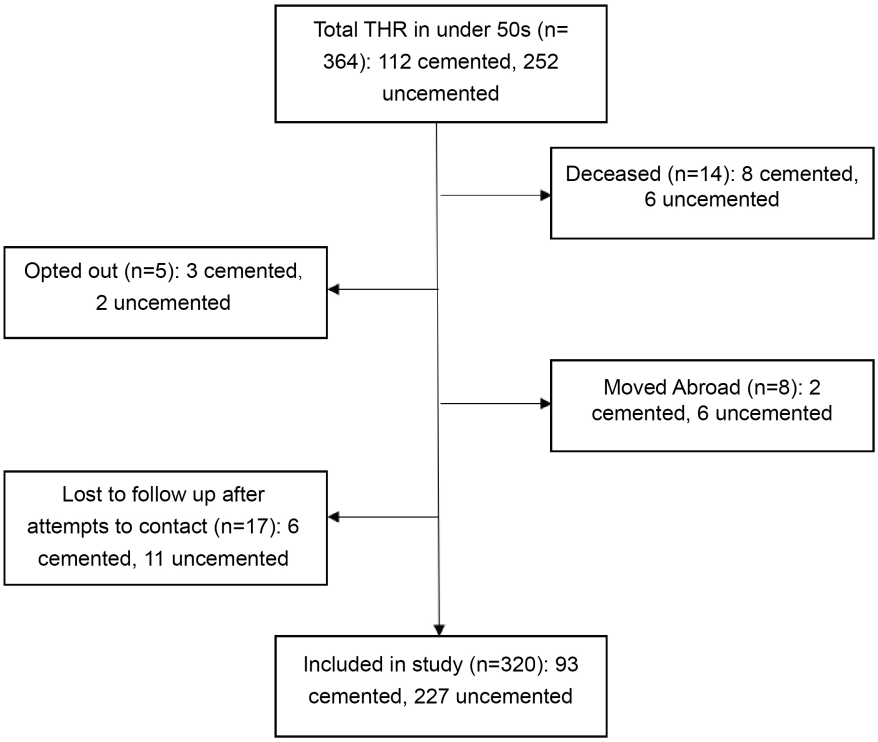

Figure 1. Exclusion criteria flow chart.

3. Results

In total, 320 primary THRs were included in the study (93 cemented, 227 uncemented). The THRs were carried out by a total of 18 different surgeons. The age range of the patients was 16-49 years, with an average age of 41.4 years. One hundred fifty-eight patients were male, and 162 were female. The overall mean time from primary arthroplasty to revision was 4.5 years.

The most common form of acetabular fixation was uncemented at 70.9%, and cemented at 29.1%. In the uncemented group of 227 patients, there were 10 revisions at 10 years post primary THR, giving a 10-year revision rate of 4.4%. The average time to revision was 4.6 years, ranging from 1 week to 9.9 years. The uncemented acetabular implants that were used consisted of 114 Pinnacle cups, 88 Trident cups, 17 Plasma cups, 12 others, and 21 undocumented cups. In the cemented group of 93 patients, there were 5 revisions at 10 years post primary THR, giving a revision rate of 5.4%. The average time to revision was 4.4 years, ranging from 1.2 years to 9.8 years (**Figure 2**). The cemented acetabular implants consisted of 84 Charnley, 13 Marathon, 6 Contemporary, and 9 undocumented cups. No single implant stood out as having particularly poor outcomes in the revised groups. The 5 revisions in the cemented group consisted of 4 Charnley and one Marathon acetabular component. The 10 revisions in the uncemented group consisted of 4 Pinnacle, 4 Trident, 1 ABG II, and 1 unknown acetabular

component. There was no difference between the two groups in terms of revision rates, as the p-value was 0.42 (>0.05). Overall, aseptic loosening and infection were the most common causes for revision. The indications for revision are demonstrated in the chart below (Figure 3).

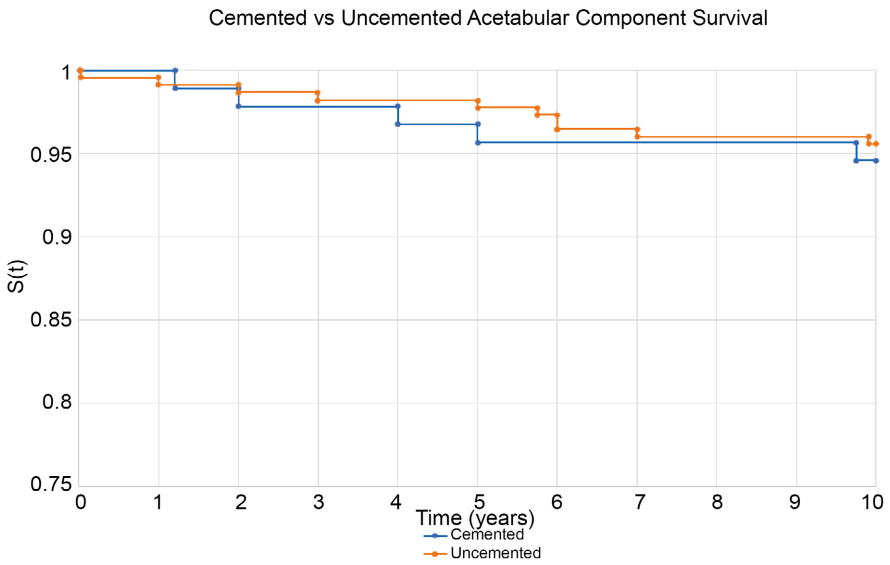

Figure 2. Kaplan-Meier chart comparing the survival rate of cemented vs. uncemented acetabular components in patients aged 50 and under.

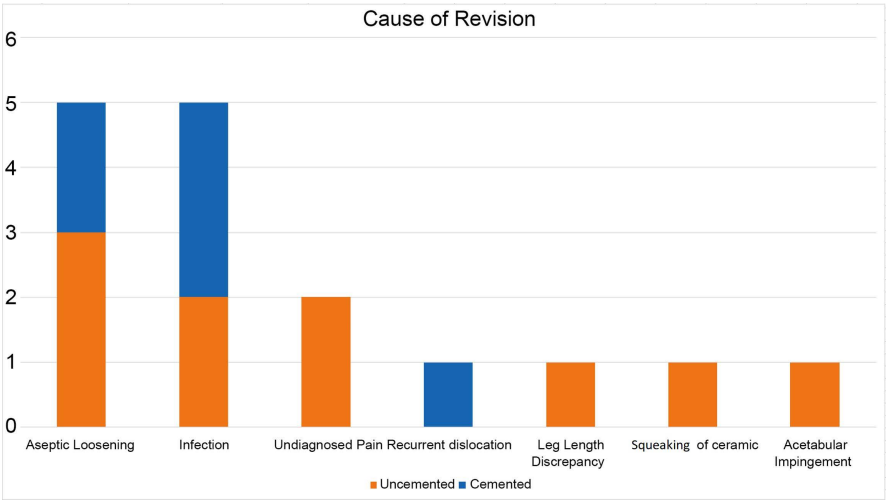

Figure 3. Bar chart demonstrating the indications for revision. Comparison of uncemented and cemented acetabular components.

4. Discussion

The most common underlying pathologies leading to total hip replacements in patients under 50 years old are osteoarthritis, avascular necrosis of the femoral head, and developmental dysplasia of the hip. The Joint Register was created in order to monitor the performance of implants, institutions, and surgical teams [7]. In this study of 320 total hip replacements, there was no significant difference

in revision rate between the cemented acetabular group and the uncemented acetabular group. It has been shown that THR in younger patients provides reliable outcomes at 10 years [8]. The findings in this present study suggest that, in terms of revision rates, neither method of acetabular fixation is superior. There is a clear preference in this study for uncemented acetabular fixation in the younger population. The reason for this is not clear, as it is not fully supported in the literature. It may be due to surgeon preference or the reduced theatre time in the uncemented option. The registry used for this study captures surgeon identifiers, but it does not contain detailed variables such as surgeon-specific preferences or hospital policies that would allow for a more robust analysis of practice patterns. Cemented revision THRs are a more extensive surgery, and with hip replacements having an overall predicted survival rate of 58% at 25 years [9], the probability of a young person needing a replacement later in life may be a factor in the surgeon's decision.

Prior research has compared different fixation methods in primary total hip replacements and the associated revision rates in the younger population. The national joint register in the UK found that in the <55 age group, the revision rate at 10 years was 5.1% for uncemented acetabular component implants (total uncemented and hybrid) and 5.7% in cemented acetabular implants (total cemented and reverse hybrid) [2]. Their definition of revision is "any removal or modification of either implant part with or without implant exchange", which is broader than the criteria for our study, which focuses on the replacement of the acetabular component only.

A study by G. J. Hooper *et al*. (2009) looking at the New Zealand joint registry found that patients under 55 years of age at the time of primary THR had a lower rate of revision if an uncemented acetabular prosthesis was used. The poorer results for the cemented acetabular component were present across all age groups [10]. This was contradictory to a study of the Swedish Registry [11], which showed that component survival was worse with uncemented THR compared to cemented in the under-50s age group. They also showed that in an uncemented THR, the acetabular cup appeared to be the component that was associated with increased risk of revision. The failure of the acetabular component is multifactorial, and further detailed studies are required to find out exactly what may be responsible.

When comparing our findings to international registry data, it is important to recognise differences in registry design. The Irish registry is relatively new and has lower national coverage compared with more mature registers such as the UK, New Zealand, and Sweden, which have near-complete capture and longer-term datasets. Additionally, international registries typically report fixation as a whole construct (cemented, uncemented, hybrid), whereas our study isolates the acetabular component. Variations in implant availability, national policies, and surgical training pathways may also influence fixation trends across countries.

Reducing the revision rate remains a priority among orthopaedic surgeons and is in the best interests of their patients. The best quality of life for the patient is

attained after their primary THR, when compared to the outcomes after their revision surgery [12]. The fixation method is one of the main predictors of revision [13].

This study showed that the most common cause of revision in both groups was aseptic loosening. This was consistent with N. Burke *et al.* (2018), which showed aseptic loosening as the most common cause of late failure in THR in under 50s [14]. The revision numbers were too low for this to have any clinical relevance between the two groups in our study. Aseptic loosening and undiagnosed pain are the failure causes in which the acetabular fixation method likely has the most influence. In contrast, leg length discrepancy, squeaking of ceramic, and acetabular impingement as causes of failure are more likely to be due to the positioning of the implant and the surgeon's technique. Patient factors influence the likelihood of dislocation and infection as causes of failure [15].

There have been previous reports comparing cemented and uncemented total hip replacements in younger patients [10] [11]. Some of these have a follow-up of 10 years or more [10] [11]. There is no worldwide consensus on the grouping of implants in registry reporting, but many reports examine both the femoral and acetabular components together. They view the entire implant as cemented, uncemented, hybrid, or reverse-hybrid. It is more common to count a revision as any amendment to either of the prosthesis parts [3] [11]. In the present study, the acetabular component is examined in isolation. Therefore, no previous studies are directly comparable with this study. This study aims to show more accurately the role the acetabular fixation method has in implant survival in younger patients. It is the acetabular component that has been shown to have a significant difference in failure in younger patients when compared to older patients. This was demonstrated in one study, which showed the revision rate for aseptic loosening of the socket was higher in the younger group (20%) than in the older group (4%). There was no significant difference in the same comparison of the femoral components [16].

5. Conclusions

This study analyses the survival of the acetabular component at 10 years in patients who received their primary THR aged 50 and under, comparing cemented implantation to uncemented. Based on the regional data, no significant difference was found in the failure rate between the two groups, p-value 0.42 (>0.05).

As neither cemented nor uncemented implantation of the acetabular component was proven to be statistically superior in this study, the surgeon can consider other factors such as patient bone quality, underlying diagnosis, and the likelihood of future revision when selecting the appropriate fixation method when choosing their preferred acetabular fixation method for the patient.

Ensuring the optimal survivorship of an implant is essential. The trends of THR failure in patients under 50 should be continuously reviewed to ensure that both the surgeon and the patient are aware of the optimal methods of fixation for that

age group.

Joint registries are used to collect data that can be used to help improve outcomes of orthopaedic surgery. Long-term follow-up is essential in assessing the durability of the implant. Future studies should aim to evaluate the outcome of THR in this population at 15 - 20 years' follow-up.

Limitations of This Study

- The main limitation of this research is that our primary focus was on implant survival, determined by whether the patients underwent revision surgery or not. Determination of the success of a THR is multifactorial, including patient satisfaction. Patient outcomes have not been included in this study despite having been identified as an essential indicator for measuring the quality of care [11].
- The value of this study is also limited as there is no differentiation regarding the reason for the primary THR in these patients. Hip pathology can often differ in patients, especially young patients, compared to the relative homogeneity of the traditional older cohort undergoing THR. The primary indication for THR could have an influence on the prognosis for implant revision.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Kandala, N.-B., Connock, M., Pulikottil-Jacob, R., Sutcliffe, P., Crowther, M.J., Grove, A., *et al.* (2015) Setting Benchmark Revision Rates for Total Hip Replacement: Analysis of Registry Evidence. *BMJ*, **350**, h756-h756. https://doi.org/10.1136/bmj.h756

[2] The National Joint Registry 18th Annual Report 2021. https://www.ncbi.nlm.nih.gov/books/NBK576858/

[3] The New Zealand Joint Registry (2021) The New Zealand Joint Registry 22 Year Report.

[4] Mahomed, N.N., Barrett, J.A., Katz, J.N., Phillips, C.B., Losina, E., Lew, R.A., *et al.* (2003) Rates and Outcomes of Primary and Revision Total Hip Replacement in the United States Medicare Population. *The Journal of Bone and Joint Surgery-American Volume*, **85**, 27-32. https://doi.org/10.2106/00004623-200301000-00005

[5] Kumar, A., Bloch, B.V. and Esler, C. (2017) Trends in Total Hip Arthroplasty in Young Patients—Results from a Regional Register. *HIP International*, **27**, 443-448. https://doi.org/10.5301/hipint.5000485

[6] Garcia-Cimbrelo, E., Cruz-Pardos, A., Cordero, J. and Sanchez-Sotelo, J. (2000) Low-friction Arthroplasty in Patients Younger than 40 Years Old. *The Journal of Arthroplasty*, **15**, 825-832. https://doi.org/10.1054/arth.2000.8097

[7] Irish National Orthopaedic Register First Report (2021) National Office of Clinical Audit.

[8] Mei, X.Y., Gong, Y.J., Safir, O., Gross, A. and Kuzyk, P. (2019) Long-Term Outcomes of Total Hip Arthroplasty in Patients Younger than 55 Years: A Systematic Review of

the Contemporary Literature. *Canadian Journal of Surgery*, **62**, 249-258. https://doi.org/10.1503/cjs.013118

[9] Evans, J.T., Evans, J.P., Walker, R.W., Blom, A.W., Whitehouse, M.R. and Sayers, A. (2019) How Long Does a Hip Replacement Last? A Systematic Review and Meta-Analysis of Case Series and National Registry Reports with More than 15 Years of Follow-Up. *The Lancet*, **393**, 647-654. https://doi.org/10.1016/s0140-6736(18)31665-9

[10] Hooper, G.J., Rothwell, A.G., Stringer, M. and Frampton, C. (2009) Revision Following Cemented and Uncemented Primary Total Hip Replacement. *The Journal of Bone and Joint Surgery. British volume*, **91**, 451-458. https://doi.org/10.1302/0301-620x.91b4.21363

[11] Hailer, N.P., Garellick, G. and Kärrholm, J. (2010) Uncemented and Cemented Primary Total Hip Arthroplasty in the Swedish Hip Arthroplasty Register. *Acta Orthopaedica*, **81**, 34-41. https://doi.org/10.3109/17453671003685400

[12] Patil, S., Garbuz, D.S., Greidanus, N.V., Masri, B.A. and Duncan, C.P. (2008) Quality of Life Outcomes in Revision vs Primary Total Hip Arthroplasty: A Prospective Cohort Study. *The Journal of Arthroplasty*, **23**, 550-553. https://doi.org/10.1016/j.arth.2007.04.035

[13] Sheridan, G.A., Kelly, R.M., McDonnell, S.M., Walsh, F., O'Byrne, J.M. and Kenny, P.J. (2019) Primary Total Hip Arthroplasty: Registry Data for Fixation Methods and Bearing Options at a Minimum of 10 Years. *Irish Journal of Medical Science*, **188**, 873-877. https://doi.org/10.1007/s11845-018-1948-1

[14] Burke, N.G., Gibbons, J.P., Cassar-Gheiti, A.J., Walsh, F.M. and Cashman, J.P. (2018) Total Hip Replacement—The Cause of Failure in Patients under 50 Years Old? *Irish Journal of Medical Science*, **188**, 879-883. https://doi.org/10.1007/s11845-018-01956-8

[15] Ahmed, S.S., Begum, F., Kayani, B. and Haddad, F.S. (2019) Risk Factors, Diagnosis and Management of Prosthetic Joint Infection after Total Hip Arthroplasty. *Expert Review of Medical Devices*, **16**, 1063-1070. https://doi.org/10.1080/17434440.2019.1696673

[16] Kobayashi, S., Eftekhar, N.S., Terayama, K. and Joshi, R.P. (1997) Comparative Study of Total Hip Arthroplasty between Younger and Older Patients. *Clinical Orthopaedics and Related Research*, **339**, 140-151. https://doi.org/10.1097/00003086-199706000-00019