The Journal of Arthroplasty 40 (2025) S72–S74

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

World Expert Meeting in Arthroplasty 2024

Is There a Difference in the Outcomes Between Cemented and Uncemented Primary Total Knee Arthroplasty?

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ARTICLE INFO

Article history:
Received 16 September 2024
Received in revised form
11 October 2024
Accepted 14 October 2024
Available online 25 October 2024

Keywords:
cemented
uncemented
TKA
BMI
aseptic loosening

Is there a difference in the outcomes between cemented and uncemented primary total knee arthroplasty?

Response/Recommendation: In all studies, more than two years of follow-up, the survival, and aseptic loosening rates are similar in cementless and cemented TKA regardless of the demographic characteristics including age, sex, and body mass index (BMI). There is no significant difference between the two groups in major complications and functional results.

Level of Evidence: Moderate.

Expert Vote: Agree: 74.5%, Disagree: 15.3%, and Abstain: 10.2%.

Rational

Concerns about the risk of osteolysis with cemented total knee arthroplasty (TKA) in the 1980s spurred the development of cementless designs. Cement fixation is still used for the majority of TKAs, but the use of cementless fixation continues to increase, with a 2021 report stating that 14% of all primary TKAs are performed without cement in the United States. Although cemented TKA is still referred to as the gold standard of fixation, but the reported results of cementless TKA are promising [1–3].

To compare the results of these two fixation methods, all studies with mid-term and long-term (up to 25 years) follow-ups included meta-analyses of randomized controlled trials and retrospective and prospective cohort studies published in reputable journals. Based on this systematic review, both fixation methods are similar in survival and aseptic revision rate [2,4–30]. There were no differences identified between the two groups concerning functional scores [2,7,8,12,13,21–23,25–27,30–36]. Age and sex also had no significant effect on the results [13,15,16,33,37,38]. However, according to the American Joint Replacement Registry, while cementless TKA can yield favorable outcomes with low revision rates, surgeons should exercise caution with cementless fixation when using a posterior-stabilized (PS) design and also for women aged more than 65 years [1]. Most studies reported similar outcomes with respect to BMI < 40 [4,20,33,34], but in morbidly obese patients (BMI > 40), the cementless PS TKA may have superior results compared to cemented PS TKA [39]. In reviewing the literature, there were no strong data to support the superiority of either fixation method with respect to the revision rates due to infection [15,18,40]. The other major complications such as periprosthetic fractures and component migration are similar with cemented and

No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to https://doi.org/10.1016/j.arth.2024.10.083.

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https://doi.org/10.1016/j.arth.2024.10.083

cementless TKA, although in one study there was some concern for tibial component migration in cementless fixation [15,41–44]. In most studies, the different component designs (cruciate-retaining, PS, and mobile bearing) all had the same results [12,27,34–36]. There is no strong evidence regarding the results of patellar component fixation but in limited studies, the rate of migration or loosening of patellar component with cementless designs is higher than with a cemented counterpart [9,18,35]. While the cost of cementless components is higher than cemented designs, the cost-benefit has not been formally evaluated in the current literature [45,46]. Most published randomized controlled trials also report similar clinical outcomes regardless of cementless or cemented fixation [2,11,16,22,23,25,30,42,43,47].

References

[1] Siddiqi A, Levine BR, Springer BD. Highlights of the 2021 American joint replacement registry annual report. Arthroplast Today 2022;13:205–7. https://doi.org/10.1016/j.artd.2022.01.020.

[2] Nugent M, Wyatt MC, Frampton CM, Hooper GJ. Despite improved survivorship of uncemented fixation in total knee arthroplasty for osteoarthritis, cemented fixation remains the gold standard: an analysis of a national joint registry. J Arthroplasty 2019;34:1626–33. https://doi.org/10.1016/j.arth.2019.03.047.

[3] Newman JM, Sodhi N, Dekis JC, Khlopas A, Piuzzi NS, Sultan AA, et al. Survivorship and functional outcomes of cementless versus cemented total knee arthroplasty: a meta-analysis. J Knee Surg 2020;33:270–8. https://doi.org/10.1055/s-0039-1678525.

[4] Goh GS, Fillingham YA, Sutton RM, Small I, Courtney PM, Hozack WJ. Cemented versus cementless total knee arthroplasty in obese patients with body mass index≥ 35 kg/m2: a contemporary analysis of 812 patients. J Arthroplasty 2022;37:688–693.e1. https://doi.org/10.1016/j.arth.2021.12.038.

[5] Duffy GP, Berry DJ, Rand JA. Cement versus cementless fixation in total knee arthroplasty. Clin Orthop Relat Res 1998;356:66–72. https://doi.org/10.1097/00003086-199811000-00011.

[6] Chockalingam S, Scott G. The outcome of cemented vs. cementless fixation of a femoral component in total knee replacement (TKR) with the identification of radiological signs for the prediction of failure. Knee 2000;7:233–8. https://doi.org/10.1016/s0968-0160(00)00060-0.

[7] Bassett RW. Results of 1,000 Performance knees: cementless versus cemented fixation. J Arthroplasty 1998;13:409–13. https://doi.org/10.1016/s0883-5403(98)90006-7.

[8] Goldberg VM, Kraay M. The outcome of the cementless tibial component: a minimum 14-year clinical evaluation. Clin Orthop Relat Res 2004;428:214–20. https://doi.org/10.1097/01.blo.0000148572.95121.f0.

[9] Schrøder HM, Berthelsen A, Hassani G, Hansen EB, Solgaard S. Cementless porous-coated total knee arthroplasty: 10-year results in a consecutive series. J Arthroplasty 2001;16:559–67. https://doi.org/10.1054/arth.2001.23565.

[10] Hardeman F, Vandenneucker H, Van Lauwe J, Bellemans J. Cementless total knee arthroplasty with Profix: a 8-to 10-year follow-up study. Knee 2006;13:419–21. https://doi.org/10.1016/j.knee.2006.06.007.

[11] Khaw F, Kirk LMG, Morris RW, Gregg PJ. A randomised, controlled trial of cemented versus cementless press-fit condylar total knee replacement: ten-year survival analysis. J Bone Joint Surg Br 2002;84:658–66. https://doi.org/10.1302/0301-620x.89b12.19363.

[12] Rassir R, Puijk R, Singh J, Sierevelt IN, Vergroesen DA, de Jong T, et al. Long-term clinical performance of an uncemented, mobile bearing, anterior stabilized knee system and the impact of previous knee surgery. J Arthroplasty 2022;37:2041–8. https://doi.org/10.1016/j.arth.2022.04.039.

[13] Kim Y-H, Park J-W, Jang Y-S. The 22 to 25-year survival of cemented and cementless total knee arthroplasty in young patients. J Arthroplasty 2021;36:566–72. https://doi.org/10.1016/j.arth.2020.08.001.

[14] Kamath AF, Siddiqi A, Malkani AL, Krebs VE. Cementless fixation in primary total knee arthroplasty: historical perspective to contemporary application. J Am Acad Orthop Surg 2021;29:e363–79. https://doi.org/10.5435/jaaos-d-20-00569.

[15] Mohammad HR, Judge A, Murray DW. A comparison of the periprosthetic fracture rate of cemented and cementless total knee arthroplasties: an analysis of data from the national joint registry. J Arthroplasty 2024;39:1505–11. https://doi.org/10.1016/j.arth.2023.11.039.

[16] Baker P, Khaw FM, Kirk LMG, Esler CNA, Gregg PJ. A randomised controlled trial of cemented versus cementless press-fit condylar total knee replacement: 15-year survival analysis. J Bone Joint Surg Br 2007;89:1608–14. https://doi.org/10.1302/0301-620x.89b12.19363.

[17] Miller AJ, Stimac JD, Smith LS, Feher AW, Yakkanti MR, Malkani AL. Results of cemented vs cementless primary total knee arthroplasty using the same implant design. J Arthroplasty 2018;33:1089–93. https://doi.org/10.1016/j.arth.2017.11.048.

[18] Yazdi H, Choo KJ, Restrepo C, Hammad M, Sherman M, Parvizi J. Short-term results of triathlon cementless versus cemented primary total knee arthroplasty. Knee 2020;27:1248–55. https://doi.org/10.1016/j.knee.2020.05.010.

[19] Behery OA, Kearns SM, Rabinowitz JM, Levine BR. Cementless vs cemented tibial fixation in primary total knee arthroplasty. J Arthroplasty 2017;32:1510–5. https://doi.org/10.1016/j.arth.2016.12.023.

[20] Bagsby DT, Issa K, Smith LS, Elmallah RK, Mast LE, Harwin SF, et al. Cemented vs cementless total knee arthroplasty in morbidly obese patients. J Arthroplasty 2016;31:1727–31. https://doi.org/10.1016/j.arth.2016.01.025.

[21] Fricka KB, McAsey CJ, Sritulanondha S. To cement or not? Five-year results of a prospective, randomized study comparing cemented vs cementless total knee arthroplasty. J Arthroplasty 2019;34:S183–7. https://doi.org/10.1016/j.arth.2019.02.024.

[22] Batailler C, Malemo Y, Demey G, Kenney R, Lustig S, Servien E. Cemented vs uncemented femoral components: a randomized, controlled trial at 10 years minimum follow-up. J Arthroplasty 2020;35:2090–6. https://doi.org/10.1016/j.arth.2020.03.043.

[23] Fricka KB, Sritulanondha S, McAsey CJ. To cement or not? Two-year results of a prospective, randomized study comparing cemented vs. cementless total knee arthroplasty (TKA). J Arthroplasty 2015;30:55–8. https://doi.org/10.1016/j.arth.2020.03.043.

[24] Bingham JS, Salib CG, Hanssen AD, Taunton MJ, Pagnano MW, Abdel MP. Clinical outcomes and survivorship of contemporary cementless primary total knee arthroplasties. JBJS Rev 2020;8:e20. https://doi.org/10.2106/jbjs.rvw.20.00026.

[25] Hampton M, Mansoor J, Getty J, Sutton PM. Uncemented tantalum metal components versus cemented tibial components in total knee arthroplasty: 11-to 15-year outcomes of a single-blinded randomized controlled trial. Bone Joint J 2020;102:1025–32. https://doi.org/10.1302/0301-620x.102b8.bjj-2019-1448.r1.

[26] Park J-W, Kim Y-H. Simultaneous cemented and cementless total knee replacement in the same patients: a prospective comparison of long-term outcomes using an identical design of NexGen prosthesis. J Bone Joint Surg Br 2011;93:1479–86. https://doi.org/10.1302/0301-620x.93b11.27507.

[27] Choy W-S, Yang DS, Lee KW, Lee SK, Kim KJ, Chang SH. Cemented versus cementless fixation of a tibial component in LCS mobile-bearing total knee arthroplasty performed by a single surgeon. J Arthroplasty 2014;29:2397–401. https://doi.org/10.1016/j.arth.2014.03.006.

[28] Forlenza EM, Serino 3rd J, Terhune EB, Weintraub MT, Nam D, Della Valle CJ. Cementless total knee arthroplasty is associated with early aseptic loosening in a large national database. J Arthroplasty 2023;38:S215–20. https://doi.org/10.1016/j.arth.2023.02.058.

[29] Chiou D, Li AK, Upfill-Brown A, Arshi A, Hsiue P, Chen K, et al. Cementless compared to cemented total knee arthroplasty is associated with more revisions within 1 year of index surgery. Arthroplast Today 2023;21:101122. https://doi.org/10.1016/j.artd.2023.101122.

[30] Nam D, Lawrie CM, Salih R, Nahhas CR, Barrack RL, Nunley RM. Cemented versus cementless total knee arthroplasty of the same modern design: a prospective, randomized trial. J Bone Joint Surg Am 2019;101:1185–92. https://doi.org/10.2106/jbjs.18.01162.

[31] Helm AT, Kerin C, Ghalayini SRA, McLauchlan GJ. Preliminary results of an uncemented trabecular metal tibial component in total knee arthroplasty. J Arthroplasty 2009;24:941–4. https://doi.org/10.1016/j.arth.2008.06.018.

[32] Beaupré L, al-Yamani M, Huckell JR, Johnston DWC. Hydroxyapatite-coated tibial implants compared with cemented tibial fixation in primary total knee arthroplasty: a randomized trial of outcomes at five years. J Bone Joint Surg Am 2007;89:2204–11. https://doi.org/10.2106/jbjs.f.01431.

[33] Goh GS, Fillingham YA, Ong CB, Krueger CA, Courtney PM, Hozack WJ. Redefining indications for modern cementless total knee arthroplasty: clinical outcomes and survivorship in patients> 75 years old. J Arthroplasty 2022;37:476–481.e1. https://doi.org/10.1016/j.arth.2021.11.031.

[34] Boyle KK, Nodzo SR, Ferraro JT, Augenblick DJ, Pavlesen S, Phillips MJ. Uncemented vs cemented cruciate retaining total knee arthroplasty in patients with body mass index greater than 30. J Arthroplasty 2018;33:1082–8. https://doi.org/10.1016/j.arth.2017.11.043.

[35] Tanariyakul Y, Kanitnate S, Tammachote N. Cementless and cemented total knee arthroplasties have similar outcomes but cementless patellar component migration was observed in a paired randomized control trial. J Arthroplasty 2024;39:1266–72. https://doi.org/10.1016/j.arth.2023.10.055.

[36] Meding JB, Meding LK. Cementless and cemented dual-pivot total knee arthroplasty: a matched comparison with a minimum two-year follow-up. J Arthroplasty 2023;38:S151–6. https://doi.org/10.1016/j.arth.2023.03.043.

[37] Whiteside LA, Viganò R. Young and heavy patients with a cementless TKA do as well as older and lightweight patients. Clin Orthop Relat Res 2007;464:93–8. https://doi.org/10.1097/blo.0b013e31815a052c.

[38] Maniar AR, Howard JL, Somerville LE, Lanting BA, Vasarhelyi EM. Cementless total knee arthroplasty: does age affect survivorship and outcomes? J Arthroplasty 2024;39:S95–9. https://doi.org/10.1016/j.arth.2024.04.027.

[39] Sinicrope BJ, Feher AW, Bhimani SJ, Smith LS, Harwin SF, Yakkanti MR, et al. Increased survivorship of cementless versus cemented TKA in the morbidly obese. A minimum 5-year follow-up. J Arthroplasty 2019;34:309–14. https://doi.org/10.1016/j.arth.2018.10.016.

[40] Anis HK, Ramanathan D, Sodhi N, Klika AK, Piuzzi NS, Mont MA, et al. Postoperative infection in cementless and cemented total knee arthroplasty: a propensity score matched analysis. J Knee Surg 2019;32:1058–62. https://doi.org/10.1055/s-0039-1678678.

[41] Henricson A, Wojtowicz R, Nilsson KG, Crnalic S. Uncemented or cemented femoral components work equally well in total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc 2019;27:1251–8. https://doi.org/10.1007/s00167-018-5227-5.

[42] Van Hamersveld K, Marang-van de Mheen PJ, Tsonaka R, Valstar ER, Toksvig-Larsen S. Fixation and clinical outcome of uncemented peri-apatite-coated versus cemented total knee arthroplasty: five-year follow-up of a randomised controlled trial using radiostereometric analysis (RSA). Bone Joint J 2017;99:1467–76. https://doi.org/10.1302/0301-620x.99b11.bjj-2016-1347.r3.

[43] Nivbrant NO, Khan RJK, Fick DP, Haebich S, Smith E. Cementless versus cemented tibial fixation in posterior stabilized total knee replacement: a randomized trial. J Bone Joint Surg Am 2020;102:1075–82. https://doi.org/10.2106/jbjs.19.01010.

[44] Laende E, Richardson C, Dunbar M. Predictive value of short-term migration in determining long-term stable fixation in cemented and cementless total knee arthroplasties. Bone Joint J 2019;101:55–60. https://doi.org/10.1302/0301-620x.101b7.bjj-2018-1493.r1.

[45] Lawrie C, Schwabe M, Pierce A, Nunley RM, Barrack RL. The cost of implanting a cemented versus cementless total knee arthroplasty. Bone Joint J 2019;101:61–3. https://doi.org/10.1302/0301-620x.101b7.bjj-2018-1470.r1.

[46] Gwam CU, George NE, Etcheson JI, Rosas S, Plate JF, Delanois RE. Cementless versus cemented fixation in total knee arthroplasty: usage, costs, and complications during the inpatient period. J Knee Surg 2019;32:1081–7. https://doi.org/10.1055/s-0038-1675413.

[47] McCaskie A, Deehan DJ, Green TP, Lock KR, Thompson JR, Harper WM, et al. Randomised, prospective study comparing cemented and cementless total knee replacement: results of press-fit condylar total knee replacement at five years. J Bone Joint Surg Br 1998;80:971–5. https://doi.org/10.1302/0301-620x.80b6.8558.