Total Hip and Knee Replacement in the Mature Athlete

Michael R. Bloomfield, MD,*† and William J. Hozack, MD‡

Context: Total hip replacement and total knee replacement are among the most successful and common surgical procedures in orthopaedics. These operations were traditionally reserved for older, sedentary patients. However, these are now being increasingly performed in patients expecting to return to athletic activities.

Evidence Acquisition: The peer-reviewed medical literature was searched via PubMed from the years 2000 to 2013. Those studies pertinent to modern hip and knee replacement in an athletic population were selected for inclusion.

Study Design: Literature review.

Level of Evidence: Level 4.

Results: There is a lack of high-quality evidence in the peer-reviewed literature relating to the replacement of hips and knees in younger athletic patients. Although many patients undergoing joint replacement are active in recreational activities, a minority engage in high-impact sports. Following surgery, overall activities tend to increase, but high-demand athletic activities may be limited by pain, functional outcome, or activity restrictions imposed by health care providers.

Conclusion: Patients receiving hip and knee replacements should be counseled in that returning to high-impact and repetitive-loading athletic activities after surgery may shorten the life span of their implant.

Strength-of-Recommendation Taxonomy (SORT): C.

Keywords: total hip arthroplasty; total knee arthroplasty; mature athlete; functional outcome

What Proportion of Patients Undergoing TJA Are “High Demand”? Responded that returning to athletic activities was their primary indication.7 Although a majority of TJA patients participate in recreational activities, the proportion of patients expecting to continue strenuous activities is unclear. In a large cohort of more than 1600 total knee replacement patients, despite high overall recreational activity levels, only 11% participated in high-demand sports or manual labor before joint replacement.8 Huch et al11 reported that 36% of hip and 42% of knee replacement patients participated in sports preoperatively, although the intensity of this participation was not reported.

Do Patients Return to Athletic Activity After TJA?

Patients who engage in sports and other athletic activities are understandably eager to return to these recreations following surgery. Several studies have attempted to elucidate which types of activities patients resume and at what level they are able to participate.
A review of 33 total knees in 31 patients who participated preoperatively in high-impact activities, such as singles racquet sports, downhill skiing, and basketball, at a minimum of 4 years postoperative showed encouraging results. Thirty-two of 33 knees had successful clinical and radiographic outcomes, with a mean patient satisfaction rating of 9.2 out of 10. Sporting activities after surgery were not specified. One patient who continued to be active with jogging and racquetball underwent a revision for aseptic loosening of the tibial component at 4 years postoperative. However, a larger study found that only 61.4% of 726 patients who participated in sports returned to their activity following joint replacement or resurfacing. Cultural differences in the United Kingdom may have led to lower high-impact sport participation. Many patients switched to participation in lower impact sports on the advice of physicians or physical therapists. The most common abandoned activities were singles racquet sports. Several studies have suggested that playing tennis does not decrease implant implantation.24 Similarly, in an autopsy study of knee replacement patients, increased polyethylene creep and deformation were seen in more active patients. Athletic activities, particularly those involving impact loading, place larger forces through the prosthesis and the prosthesis-bone interface. Although catastrophic implant failures are rare with the current generation of prosthetic materials, large forces may lead to increased aseptic loosening of cemented components. Periprosthetic fractures are also a risk in an athletic situation. Limited evidence is available regarding the risks to implant longevity with athletic activity. A comparison of 70 hip replacement patients in high-impact sports with 140 matched patients with low activity levels at 10 years postoperative showed that linear wear rates and risk of revision were greater in the high-demand group. However, the patients in this study received a conventional polyethylene liner. Contemporary highly cross-linked polyethylene materials may show considerably better wear properties.

WHAT ARE THE RECOMMENDED SPORTING ACTIVITIES AFTER TJA?

Surgeons have traditionally imposed activity restrictions after TJA. In the absence of high levels of evidence on this subject, subjective recommendations remain.

Surveys of the Hip Society and Knee Society in 1999 and again in 2005 revealed that several traditional activity restrictions had been relaxed in the intervening years. All low-impact athletic activities were recommended in both surveys. High-impact activities, such as soccer, jogging, basketball, and football, were not recommended in any of the surveys. However, restrictions on skiing, weight lifting, hockey, gymnastics, and singles tennis were increasingly considered as "allowed with experience" or "no consensus."

CONCLUSION

Athletic motivated patients usually expect to recover quickly from TJA. Despite the rapid gains made in the early
postoperative period, the return of normal muscle strength after THA and TKA usually takes many months. In general, hip patients recover faster than knee patients. Every patient should be reminded that his or her arthritic joint has caused significant atrophy of the muscles around that joint; complete strength recovery requires time, hard work, and patience. The activities that require more strength and coordination take the longest time to resume. Patients who put the highest demands on their hips and knees often notice improvements in function for at least 1 year after the surgery.

REFERENCES

1. Banerjee M, Bouillon B, Banerjee C, et al. Sports activity after total hip resurfacing. J Am Soc Orthop Surg. 2010;18:1229-1236.
2. Bozic KJ, Kurtz SM, Lau E, et al. The epidemiology of revision total knee arthroplasty in the United States. Clin Orthop Relat Res. 2010;468:45-51.
3. Bozic KJ, Kurtz SM, Lau E, Ong K, Vail TP, Berry DJ. The epidemiology of revision total hip arthroplasty in the United States. J Bone Joint Surg Am. 2009;91:128-135.
4. Bradbury N, Borton D, Spoo G, Cross MJ. Participation in sports after total knee replacement. Am J Sports Med. 1999;27:550-555.
5. Chatterji U, Ashworth MJ, Lewis PL, Dobson PJ. Effect of total hip arthroplasty on recreational and sporting activity. ANZ J Surg. 2004;74:446-449.
6. Cowie JG, Turnbull GS, Ker AM, Breusch SJ. Return to work and sports after total hip replacement. Arch Orthop Trauma Surg. 2013;133:695-700.
7. D’Antonio JA, Capello WN, Ramakrishnan R. Second-generation annealed highly cross-linked polyethylene exhibits low wear. Clin Orthop Relat Res. 2012;470:1696-1704.
8. Dahm DL, Barnes SA, Harrington JR, Sayeed SA, Berry DJ. Patient-reported activity level after total knee arthroplasty. J Arthroplasty. 2008;23:401-407.
9. Healy WL, Sharma S, Schwartz B, Iorio R. Athletic activity after total joint arthroplasty. J Bone Joint Surg Am. 2008;90:2245-2252.
10. Hopper GP, Leach WJ. Participation in sporting activities following knee replacement: total versus unicompartimental. Knee Surg Sports Traumatol Arthrosc. 2008;16:973-979.
11. Huch K, Muller KA, Sturmer T, Brenner H, Puhl W, Gunther KP. Sports activities 5 years after total knee or hip arthroplasty: the Ulm Osteoarthritis Study. Ann Rheum Dis. 2005;64:1715-1720.
12. Jones DL, Bhungamantkar AJ, Billinge AA, et al. Differences between actual and expected leisure activities after total knee arthroplasty for osteoarthritis. J Arthroplasty. 2012;27:1289-1296.
13. Klein GR, Levine BR, Ho Zack WJ, et al. Return to athletic activity after total hip arthroplasty: Consensus guidelines based on a survey of the Hip Society and American Association of Hip and Knee Surgeons. J Arthroplasty. 2007;22:171-175.
14. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. J Bone Joint Surg Am. 2007;89:780-785.
15. Lavertia C, Sierra RJ, Hungerford DS, Krackow K. Activity level and wear in total knee arthroplasty: a study of autopsy retrieved specimens. J Arthroplasty. 2004;19:446-453.
16. McGrory BJ. Periprosthetic fracture of the femur after total hip arthroplasty occurring in winter activities: report of two cases. J Surg Orthop Adv. 2004:13:119-123.
17. Meneghini RM, Russo GS, Lieberman JR. Modern perceptions and expectations regarding total knee arthroplasty [published online June 17, 2015]. J Knee Surg.
18. Mont MA, Marker DR, Seyler TM, Jones LC, Kolosek FR, Hungerford DS. High-impact sports after total knee arthroplasty. J Arthroplasty. 2008;23:suppl 1:S80-84.
19. Naal FD, Maffiuletti NA, Munzinger U, Hersche O. Sports after hip resurfacing arthroplasty. Am J Sports Med. 2007;35:705-711.
20. Ollivier M, Frey S, Parratte S, Fletcher X, Angerson JN. Does impact sport activity influence total hip arthroplasty durability? Clin Orthop Relat Res. 2012;470:5060-5066.
21. Ranawat AS, Tsulis P, Mefrah M, Koob TW, Todriguez JA, Ranawat CS. Minimum 5-year wear analysis of first-generation highly cross-linked polyethylene in patients 65 years and younger. J Arthroplasty. 2012;27:354-357.
22. Reynolds SE, Malkani AL, Ramakrishnan R, Yakkanti MR. Wear analysis of first-generation highly cross-linked polyethylene in primary total hip arthroplasty: an average 9-year follow-up. J Arthroplasty. 2012;27:1064-1068.
23. Salek KJ, Lee IW, Gandhin R, et al. Quadriceps strength in relation to total knee arthroplasty outcomes. Instr Course Lect. 2010;59:119-130.
24. Schmalzlried TP, Shepherd EF, Dorey FJ, et al. The John Charnley Award: athletic activity influence total hip arthroplasty: specific recommendations concerning tennis. Sports Med. 2006;36:571-583.
25. Sharkey PF, Hoazzak WJ, Rothman RH, et al. Insall Award paper: why are total knee arthroplasties failing today? Clin Orthop Relat Res. 2002;400:7-13.
26. Trousdale RT, McGrory BJ, Berry DJ, et al. Patients’ concerns prior to undergoing total hip and total knee arthroplasty. Mayo Clin Proc. 1999;74:978-982.
27. Walten NP, Jahromi I, Lewis PL, et al. Patient-perceived outcomes and return to sport and work: TKA versus mini-meniscion unicompartimental knee arthroplasty. J Knee Surg. 2006;19:112-116.
28. Weiss JM, Noble PC, Condill MA, et al. What functional activities are important to patients with knee replacements? Clin Orthop Relat Res. 2002;404:172-188.
29. Williams DH, Greidanus NV, Masri BA, et al. Predictors of participation in sports after hip and knee arthroplasty. Clin Orthop Relat Res. 2012;470:555-561.
30. Wyley V, Blom A, Dieppe P, et al. Return to sport after joint replacement. J Bone Joint Surg Br. 2008;90:920-925.
31. Wyley V, Livesey C, Blom AW. Restriction in participation in leisure activities after joint replacement: an exploratory study. Age Ageing. 2012;41:246-249.