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Sports Health: A Multidisciplinary Approach published online 20 November 2013

DOI: 10.1177/1941738113512760

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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

Total joint arthroplasty (TJA) of the hip and that of the knee are among the most commonly performed orthopaedic interventions, with nearly 1 million procedures performed annually in the United States.¹⁴ As the baby boomer generation ages, demand for joint replacement is expected to continue to increase. These procedures are increasingly being performed in more active patients, who frequently participate in recreational and competitive athletic endeavors. These high-demand patients often expect to continue or resume a vigorous, active lifestyle after joint replacement.

WHAT PROPORTION OF PATIENTS UNDERGOING TJA ARE “HIGH DEMAND”?

Return to sporting activity is one of the most frequently posed questions to surgeons,²⁷ and in a survey of postoperative knee patients, the desire for return to a specific athletic activity was a factor in deciding to have surgery for many patients.²⁹ The majority of knee replacement patients (81%) indicated that their main reason for surgery was pain relief, although 19%

responded that returning to athletic activities was their primary indication.¹⁷

Although a majority of TJA patients participate in recreational activities,⁴ 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.

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The following author declared potential conflicts of interest: William J. Hozack, MD, is the Editor-in-Chief for the *Journal of Arthroplasty*. He is a consultant for Stryker and receives payment for lectures and royalties.

DOI: 10.1177/1941738113512760

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A review¹⁸ 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.³¹ 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 life or lead to worsened clinical outcomes.²⁵ Nonetheless, 27% of patients decreased their activity secondary to pain, which led to the conclusion that patients should be cautioned against expecting to return to high-impact sports³¹ or valued leisure activities.³²

In a survey of 216 patients following total knee arthroplasty (TKA), patients increased their overall activity but abandoned jogging and singles tennis.⁵ Similar results were seen in 138 patients 2 years following hip resurfacing.¹ Physical activity levels and activity duration were both statistically increased following surgery. However, participation in high-impact sports, such as jogging, soccer, tennis, and downhill skiing, decreased significantly. Given that patients have high expectations regarding physical activity following joint replacement surgery,¹² patients should be counseled preoperatively that, although return to high-impact sport is not impossible,¹⁹ it may be difficult to achieve.

Patients are also concerned about when they can return to sports and leisure activities. In 239 patients younger than 65 years with 285 total hip replacements, most returned to sporting activities within 4 to 6 months.⁶ Patients with lower body mass indices returned to sport sooner. With hip resurfacing, half of interviewed patients ($n = 112$) returned to sport by 3 months. Williams et al³⁰ conducted a retrospective study of predictors of sport participation among 736 patients who had undergone primary total hip arthroplasty (THA; metal on metal, metal on polyethylene), revision THA, hip resurfacing, primary TKA, revision TKA, or partial knee replacement. Based on interview data collected 1 year following surgery, the type of procedure, the operator, and the materials did not significantly affect return to sport. Rather, patient-specific factors—namely, preoperative activity, body mass index, and male sex—had a positive correlation with higher UCLA activity scores.

In other studies, patients undergoing unicompartmental knee arthroplasty (UKA) had higher rates of athletic participation postoperatively than did those undergoing TKA.^{10,28} In a retrospective telephone survey of 110 patients, those with a UKA had a significantly higher rate of returning to low-impact sports,

including cycling, swimming, golf, and dancing, than did those undergoing TKA (96.7% vs 63.6%) and fewer complaints of pain with sport (24.1% vs 42.9%).¹⁰ This was corroborated by Walton et al,²⁸ who found statistically better Oxford knee scores and higher athletic participation rates with UKA than TKA; however, the time of return to activities was similar.

ARE PATIENTS WHO RETURN TO SPORT AT INCREASED RISK OF FAILURE?

The durability of any mechanical device, including THA or TKA, is limited. Wear of the polyethylene plastic bearing was historically one of the most common causes of failure of joint replacements.^{2,3,26} There is concern that participation in vigorous or high-impact activities can lead to earlier and increased implant wear and failures. Polyethylene wear in hip arthroplasty is a function of use, not the time from implantation.²⁴ Similarly, in an autopsy study of knee replacement patients, increased polyethylene creep and deformation were seen in more active patients.¹⁵ 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.¹⁶

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.²⁰ However, the patients in this study received a conventional polyethylene liner. Contemporary highly cross-linked polyethylene materials may show considerably better wear properties.^{7,21,22}

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.⁹ 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.¹³ 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.²³

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