



# Fitness and Sports After Total Joint Arthroplasty



Michael AB Naafs\*

*Dutch Internist-Endocrinologist, Health Consultant at Naafs International Health Consultancy, Netherlands*

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\***Corresponding author:** : Michael AB Naafs, Dutch Internist-Endocrinologist, Health Consultant at Naafs International Health Consultancy, Netherlands, Tel: +31681589079; Email: [naafs.healthconsultancy@gmail.com](mailto:naafs.healthconsultancy@gmail.com)

## Abstract

In this review the possibilities of physical activity (PA) or resuming sports after total joint arthroplasty (TJA) are discussed. Despite the total number of TJAs exceeding soon 1million procedures/year in the U.S. alone, Orthopedic Societies still have no scientific based answers for younger TJA patients, regarding resuming PA and sports after any type of TJA. Research in this subject has been of an underpowered nature both in trial design as well as in interest of orthopedic surgeons in patient's needs.

**Abbreviations:** PA: Physical Activity; TJA: Total Joint Arthroplasty; TKA: Total Knee Arthroplasty; OA: Osteoarthritis; THA: Total Hip Arthroplasty; AHA; American Heart Association; RTS: Return to Sports

## Introduction

Total joint arthroplasty (TJA) is one of the most successful treatment options for patients with painful degenerative joint disease [1]. Pain relief has historically been the primary indication for total joint replacement and there are expected and relatively predictable gains in functional activities of daily living. Worldwide, more than 500.000 total joints are implanted yearly [2], with approximately 300.000 knee replacements performed in the U.S. alone [3]. Pain relief is no longer the main goal for TJA and more and more patients also ask for surgical interventions to restore their ability to participate in various athletics [4]. Higher levels of physical activities are associated with reduced risk of metabolic disease [5-7]. Patients have higher expectations nowadays for an active lifestyle. However, defining reasonable levels of activity is difficult and depends on the type of TJA.

Little evidence is available regarding TJAs on recreational and objectively aerobic fitness. The extent of symptoms or limitations during physical activity (PA) and the long-term effects of such problems are unclear. Valid predictions of return to recreational sports or other aerobic PA cannot be made [8]. Evidence of the long-term benefits of physiotherapy guidance is also lacking [9]. Nevertheless, your orthopedic surgeon will tell you the operation went okay, and you can go for another 10-15 years. In this mini-review some matters and expectations will be placed in perspective in relation to the type of TJA.

## Total Knee Arthroplasty (TKA)

TKA is successful for decreasing pain and functional performance, but less is known about the influence of TKA on restoring overall physical activity [10-12]. Functional

performance strongly influences quality of life and is limited by osteoarthritis (OA) and following TKA [13-15]. Paxton et al. [16] reviewed the literature concerning physical activity after TKA. Eighteen studies were published since 2002 that met their selection criteria. Several studies utilizing self-reported outcomes indicate that patients perceive themselves to be more physically active after TKA then they were before surgery. Accelerometry- based outcomes indicate that physical activity for patients after TKA remains at or below pre-surgical levels. Differences in the use of instruments, duration of follow-up and characteristics of the subjects studied all contributed to these variable results [16]. In addition, these studies failed comparison of daily physical activity with healthy controls.

Another review by Arnold et al. looked at physical activity after TKA or total hip arthroplasty (THA) [17]. Eight studies were included with a total of 373 participants (238 TKA, 135 THA) were included. The best available evidence indicates negligible changes in physical activity at 6 months after TKA or THA, with limited evidence for larger changes at 1 year after surgery. In the 4 studies that reported control group data, postoperative PA levels were still considerably less than those of healthy controls. The authors concluded improved perioperative strategies to instill behavioral changes that are required to narrow the gap between patient-perceived functional improvement and actual amount taken after THA and TKA [17].

Barber-Wetsin and Noyes determined physical activity (PA) and recreational sports resumed after primary TKA, symptoms or limitations with these activities, and the effect of postoperative rehabilitation of achieving fitness and sports

goals [8]. A systematic review of the literature from 2005-2015 was conducted using the PubMed database. There were 5179 TKAs (mean age 67,5 years) followed for a mean 4, 8 years, postoperatively. Marked variability was present between studies regarding the percentage of patients who resumed recreational activities (34%-100%), most of which were low impact. Only 2 studies used accelerometers to measure PA. These reported a low range (0%-15,5%) of patients who met American Heart Association (AHA) guidelines. Few studies determined whether symptoms or limitations were experienced during PA. None described rehabilitation exercises or factors that would influence patients' ability to return to recreational or fitness activities. The authors concluded there is little evidence available regarding the effect of TKA on return to recreational activities and objectively measured aerobic fitness. The extent of symptoms or limitations during PA and the long-term effects of such problems remain unclear. Valid predictions cannot be made on factors that may affect return to recreational sports or other aerobic PA after TKA [8]. Could physiotherapy guided exercise help? May be.

### Physiotherapy After TKA

Rehabilitation with an emphasis on physiotherapy and exercise is widely promoted after TKA. During the hospital stay, physiotherapy targets mobilization and achievement of functional goals relating to hospital discharge. Further post-discharge physiotherapy and exercise-based interventions promote re-training and functional improvement. However, provision of these services varies in content and duration.

Arzt et al. [9] performed a systematic review and meta-analysis of physiotherapy exercise following TKA. Searches identified 18 randomized trials including 1739 patients with TKA. Interventions; compared were physiotherapy exercise and no provision, home and outpatient provision, pool and gym-based provision, walking skills and more general physiotherapy, and general physiotherapy exercise with and without balance exercises or ergometer cycling. Compared with controls receiving minimal physiotherapy, patients receiving physiotherapy exercise had improved physical function at 3-4 months (SMD -0,37;95% CI -0,62,-0,12) and pain (SMD -0,45;95% CI -0,85,-0,06). Benefit up to 6 months was apparent when considering only higher quality studies. There was no difference for outpatient exercise compared with home-based provision in physical function or pain outcomes. There was a short-term benefit favouring home-based physiotherapy exercise for range of motion flexion. There were no differences in outcomes when the comparator was hydrotherapy, or when additional balancing or cycling components were included. In one study, a walking skills intervention was associated with a long-term improvement in walking performance. However, all these studies were underpowered individually and in combination [9]. Future research should target improvements to long-term function, pain and performance outcomes in appropriately powered trials. So, indeed a maybe.

### Recommended Sports and PA after TKA

In a large review Witjes et al. [18] showed that return to sports (RTS) and physical activity is possible after both TKA and unicompartmental knee arthroplasty (UKA), with percentages varying from 36% to 100%. Participation in sports seems more likely, including higher impact types, after UKA than after TKA, although after both surgeries patients tend to return to lower-impact types of sports. Time to RTS took 13 weeks after TKA and 12 weeks after UKA, respectively, with low-impact sports making up more than 90% of cases. However, overall study quality of the included studies was limited due to confounding factors being insufficiently taken into account in most studies.

### Total Hip Arthroplasty (THA)

A marked increase in participation in four common types of recreational exercise, such as walking, cycling, cross-country skiing and swimming after THA was shown by Visuru et al. [19]. Preoperatively only 2% performed regular walking, and this increased to 55% postoperatively. Cycling increased from 7% preoperatively to 29% postoperatively, swimming from 13% preoperatively to 30% postsurgery and cross-country skiing increased from 0% to 9% postsurgery [19].

Athletic activities may pose, however, special risks to an arthroplasty patient. These include acute injuries, such as periprosthetic fractures and dislocations, as well as more insidious problems that arise from repetitive loading and wear of the joint, such as osteolysis, a leading cause of aseptic loosening. Consequently, high impact activities have, traditionally prohibited by surgeons after TJA, unlike low-impact activities, which are typically encouraged for maintenance of good health [2,4]. While general recommendations can be helpful when counseling patients regarding safe athletic participation following arthroplasty, ultimately, each case has to be evaluated on an individual basis [4,20].

The most important determinant of the likelihood of sport participation after both THA and TKA is preoperative participation in the sport itself [21,22]. Bradbury et al. reported that no preoperatively sedentary patients took up athletics after TKA, while 65% of those, who participated in athletics preoperatively returned to athletics after TKA. The investigators also noted that participation in athletics the year before surgery was specifically predictive of a return to athletics after TKA [21].

Surgical factors may affect athletic performance. In hip arthroplasty two important surgeon-controlled factors are the type of surgical approach and the amount of soft tissue dissection. Anterolateral and direct lateral approaches require partial detachment of the abductors from the greater trochanter, which may result in temporary or permanent abductor weakness. This factor may affect athletic participation, because the abductor muscles are important in many sporting activities. On the other hand, the low rate of dislocations after anterolateral and direct lateral approaches makes these techniques an attractive option

for THA in patients who plan to return to athletics [22,23]. The posterior surgical approach to the hip is less used due to earlier reports of a 4, 6% risk of dislocation, but capsular repair reduced this risk to less than 1% [23-25]. However, the discussion about the various procedures is still going on. In a recent small study (n=30) Petis et al. [23] found no difference in 3D measured gait analysis after THA between the various procedures 6 and 12 weeks postoperatively.

Polyethylene wear is another major concern after THA, as polyethylene spacers are used in most traditional joint arthroplasties. These materials are built to withstand large cyclical forces, but the wear rate of this plastic is related to the amount of use, which has been established by *in vitro* [26] and *in vivo* studies [27]. Therefore activities that potentially expedite the wear through increased frequency or magnitude of loading, such as high impact sports, stays a primary concern. To date, there is limited information on the specific relationship between wear and sporting activities [28].

There is a lack of empirical data to support the type of activities that are safe and feasible for patients after THA. In general low-impact activities such as swimming, bowling, stationary biking, dancing, rowing and walking were allowed. Downhill and cross-country skiing, weight lifting, iceskating and pilates were activities that were allowed with experience. There was a general consensus that raqueball/squash, jogging, contact sports, high impact aerobics, baseball/softball and snowboarding were not allowed. All 169 surgeon surveyed admitted there was no scientific base for these recommendations [4].

In 2012, Delasotta et al. [29] evaluated whether patients who underwent THA adhered to these recommended activities of the 62 patients surveyed only 2 patients said they participated in activities that were discouraged by their surgeon (jogging and squash). When the other 60 patients were asked why higher-impact activities were not resumed, the main reasons were fear (28,6%) and physician recommendation. Pain, fatigue and lack of interest were not the primary reasons for stopping higher level activities. The impact of fear was also reported by Abe et al. [30]. Sixty-one percent of patients did not return to jogging after THA because of anxiety, while only 15% reported that pain kept them from returning. Huch et al. [31] found that 56% of 285 patients stopped participating in sports "as a precaution, to go easy on the artificial joint". So, fear of movement and patient education are important considerations in postoperative rehabilitation. Factors other than endurance and pain need to be considered when evaluating patients who wish to return to sports.

The number of THAs continues to increase and it is estimated that the annual incidence of primary and revision THA will exceed 575.000 by the year 2020 with the number of patients younger than 60 steadily increasing [32]. With the burgeoning "baby boomer" generation and older athletes, who wish to return to competitive levels of sports, understanding how sporting

activity affects THA outcomes is becoming more and more important. Conversely, understanding how undergoing THA may reduce or increase an individual's likelihood of continuing sports is equally important.

In this world of social media there has been considerable press about athletes who return to sports after this invasive procedure. The list includes professional ballet dancers, world-ranked tennis players and master-level golfers [33]. Some of these professional athletes have been able to return at levels of function that met or exceeded preoperative ability [34,35], while other athletes have been significantly less successful [36]. British (Scottish) Andy Murray, aged 31 and two-times Wimbledon winner, had hope to play at Wimbledon again this year after THA in January 2018, but did not manage, despite high training intensity of greater importance, however, is how the hip responds when Murray starts up the intensity of his on-court sessions and begins to play practice sets against other ATP-players [37].

### Total Shoulder Arthroplasty (TSA)

Many patients want to return to sports following shoulder replacement surgeries, including total shoulder arthroplasty, reverse total shoulder arthroplasty and hemiarthroplasty. While activity levels after THA and TKA are somewhat defined without a scientific base, studies in the field of shoulder arthroplasty are even more limited [38]. Information about activity levels and the rate of return to sports following shoulder arthroplasty would help both patients and surgeons more accurately manage expectations [38]. TSA has been shown to be a highly effective treatment for degenerative shoulder disease, with good medium -and long -term outcomes [39-41].

The number of TSAs has risen rapidly over the last decade. Since 2004, TSA has increased by approximately 3000 cases each year in the U.S., compared with an annual increase of fewer than 400 cases each year period [41]. There is however little literature focusing on return to sports after TSA [43-45]. The largest study by Bülhoff et al. [46] examined return to sports in 154 TSA patients at an average follow-up of 6,2 years. This cohort included 105 TSA patients who had participated in sports preoperatively (group 1) and 49 TSA patients who had never sported (group 2). At the time of final follow-up 60 patients (39%) were participating in sports, and all 60 patients were from the first group. The authors concluded that patients who had not recently participated in sports are unlikely to do so after surgery. Among patients who had participated in sports preoperatively the rate to return to sports was 57% in their cohort. Furthermore, of the 45 patients who participated preoperatively and did not resume the activity postoperatively, only 18% cited shoulder problems as the reason [46]. Other studies used a mailed self- questionnaire or are all small and underpowered [44,47-49]. Sports allowed after TSA are following therefore the recommendations discussed above [4].

## Conclusion

It is obvious that the orthopedic society has a lot to do answering questions regarding starting or resuming physical activity (PA) or sports after TJA. The statement “everything went okay and you can go for another 10-15 years” is not enough anymore. TJA patients are getting younger and want answers to the possibilities of PA and sporting after any type of TJA and discussing this before and after surgery. Despite the number of these procedures will exceed more than 1million/year in the U.S. alone, the Orthopedic Societies still cannot provide valid scientific based answers. Research concerning this subject has been of an underpowered nature, both in trial design as well as in interest of orthopedic surgeons in patient needs.

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