TOTAL HIP REPLACEMENT AND SPORTS ACTIVITIES - WHERE ARE THE LIMITS

Total hip replacement (THA) predictably relieves the pain and improves function for the patients with painful arthritic hip joint. The long term clinical success of the THA has been documented and published through out the years (1,2,3). However, the patient's expectations regarding the hip arthroplasty have increased, with many expecting to participate in postoperative athletic activities(4,5,6).

Nevertheless, the issue of athletic participation after the hip replacement has become more relevant in recent years, and with a increase in the numbers of young and active patients receiving THA, it is a subject of significant importance.
Several epidemiological studies have produced data that show individuals who participate in athletics are at greater risk for developing osteoarthritis (OA) of the hip (7,8). Many of these active patients expect to continue to participate in athletic activities following joint replacement surgery.

The benefits of athletic activity following total joint arthroplasty are undeniable. In addition to the psychological satisfaction that patients derive from athletic activity, there are the benefits of improved muscle strength, coordination, balance, endurance, and proprioception, all of which contribute to better body control and may prevent injury from simple falls and other minor trauma. Furthermore, studies have shown that cardiovascular fitness is positively affected by exercise after joint arthroplasty, with significant improvements shown 2 years postoperatively (9).

Studies also support the conclusion that THA may allow people to return to high levels of activity and recreational exercise. Moreover, individuals who were relatively sedentary prior to joint arthroplasty sometimes begin to participate in activity after operation (10).

Athletic activities in presence of THA may be a cause of risks and complications. These include acute injuries such as periprosthetic fractures and dislocations, as well as more subtle problems that arise from repetitive loading: wear of the joint leading to osteolysis, a cause of aseptic loosening. Consequently, high-impact activities have traditionally been

prohibited by arthroplasty surgeons, unlike low-impact activities, which are typically encouraged for maintenance of general health (11).

Problem of sport in presence of Joint replacement can be seen from two different aspects:

1. There is a wide variation in patient's preoperative athletic experiences, as well their expectations regarding postoperative sport related life.

2. There is a little or no consensus among arthroplasty surgeons regarding sport related limitations or recommendations following the THA.

Ultimately, each patient has to be evaluated on an individual basis. In order to make appropriate recommendations to maximize the chance of a long-term, pain-free, complication-free prosthetic joint in an athletic patient, one must appropriately consider and address patient-, surgery-, implant-, and sports-related factors.

Patient related factors

The most important determinant of the likelihood of sport participation after joint replacement is preoperative participation in the sport itself (12). Pre operative education, as well as thorough preoperative physiotherapy preparation ("prehab") is of significant importance to minimize early post operative complications, and prepare such a athletic patient to return to sport in the safe way.

Surgical factors

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 postoperative

abductor weakness. This factor may affect normal daily activity, resulting in a Trendeleburg gait, never mind post operative athletic participation.

The posterior surgical approach to the hip may result in higher dislocation rates than the other approaches. However, with a appropriate capsular and external rotators repair, this risk of dislocation can be significantly reduced. A systematic review of the literature, in 2006, found that reported dislocation rates after a posterior approach with repair of the capsule and external rotators were comparable to those after anterolateral and direct lateral approaches (13).

The anterior approach is consider to be a muscle sparing approach. It was shown on post operative MRI studies that following the anterior approach, permanent muscle damage, fat degeneration, is non existing comparative to significant damage to abductors and external rotators with lateral and posterior approaches respectively (Dora).

Surgeon should be familiar with a approach chosen, and may not compromise the success of the operation for the sake of approach. When selecting a surgical approach, the most important goals are achieving appropriate component alignment, orientation and sizing, not to compromise longevity of the implant.

To date, no studies have shown improved ability to participate in athletics following any specific approach for hip or knee arthroplasty, and no differences in long-term outcomes have been documented when comparing newer, minimally invasive arthroplasty approaches with more traditional approaches. However, it is logical that surgical techniques that avoid or minimize compromise of musculotsceletal anatomy may afford some patients increased ability to participate in athletic activity after THA. As well, when certain muscle groups, such as the abductors, are particularly necessary for a sport, an approach that avoids those groups may be advisable for patients wishing to participate in that sport.

Implant factors

Implant failure was a major concern. The later introduction of stronger, biocompatible metal alloys, such as cobalt-chrome and titanium, minimized this particular complication. Furthermore, advances in preparation, sterilization and storage of polyethylene have significantly lowered the rates of volumetric wear and osteolysis (15, 16, PhD)

Studies have shown greater risk of failure of cemented acetabular components in younger, more active individuals, and this particular fixation method should be avoided in this patient (18).

There has been a renewed interest in using alternative bearings in order to lower rates of wear and aseptic loosening. These include metal-on-metal (MOM), ceramic on ceramic (CoC), and highly cross-linked polyethylene implants (CXL UHMWPE). However, MOM bearings generate ionically-charged debris particles, which remain a concern (ALVAL, 19). Ceramic-on-ceramic bearings have also demonstrated excellent wear rates, but there were early reports of catastrophic fracture and failure that could occur on high impact loading during athletic participation (20). Highly cross- linked polyethylene has shown low wear rates as well, but also carries an increased fracture risk, secondary to increased brittleness, compared with conventional polyethylene (21,22). These alternative bearings may lead to improved longevity and function of hip and knee prostheses in younger, more active individuals, but lower wear must be balanced against fracture risk that may be present with participation in impact athletics. Thus, the choice of which bearing surface to use should be tailored to each individual patient and their desired athletic activity and level of participation.

Sports factors

Surgeons must also carefully consider the demands of a particular sport when counseling patients about athletic participation after THA. The type (impact vs torsional) and magnitude of load that is imparted to the prosthetic joint by the athletic activity, the frequency of repetitive motion, and the risk of fall and heavy contact all influence implant survival in the athletic individual. Patients should be counseled regarding these risks before returning to a particular sport

While no consensus has developed to date, three separate surveys of arthroplasty surgeons have recommended relatively similar guidelines for a return to athletics after THA (23). A number of sporting and recreational activities were classified as “allowed-recommended,” “allowed with previous experience,” “not allowed-recommended,” and “no conclusion.” Athletic activities can also be classified by level of impact: high, intermediate, or low. Generally, low impact activities are permitted after THA, intermediate impact activities are allowed with limitations and with previous experience, and high impact athletic are discouraged (Table 1) (24).

Table 1: Activity After Total Hip Arthroplasty

Recommended-Allowed

Stationary bicycling

Croquet

Ballroom dancing

Horseshoes

Golf

Shuffleboard

Swimming

Doubles tennis

Walking

Allowed with Experience

Low-impact aerobics

Road bicycling

Bowling
Canoeing

Hiking
Horseback riding

Cross-country skiing

Not Recommended

High-impact aerobics

Baseball/softball

Basketball
Football

Gymnastics

Handball

Hockey

Jogging

Lacrosse

Racquetball

Squash
Rock climbing

Soccer

Singles tennis

No Conclusion

Jazz dancing
Square dancing

Fencing
Ice skating

Roller/inline skating

Rowing

Speed walking

Downhill skiing

Stationary skiing

Weight lifting

Weight machines

Jogging has been reported as one of the sports that improves health status and reduces mortality and is one of most common question regarding the return to sports activity (25). There have been some studies concerning a return to sports activities including golf, tennis and cycling after THA; however, there are few studies concerning jogging after THA (26.27.28.29). This may be because jogging after THA is “not recommended” as it is a high impact sport due to high peak hip contact force. However, THA is expected not only to relieve pain and to improve ROM, but also to allow patient participation in sports activities postoperatively. Jogging or running is one of the most popular and basic sports activities.

The peak hip contact force during jogging has been reported to be 5.5 times the body weight and 1.6 times peak hip contact force during walking (30). However, jogging is a basic sport that has been reported to improve both health and physical strength and to diminish mortality. Jogging has also been recommended for patients with cardiovascular disease (25). There are few studies concerning postoperative jogging after hip arthroplasty (29). The influence of patient activity on implant survival is controversial, and the influence of the high hip contact forces during jogging on the recent and improved implant survival is also not well known. The participation rate and parameters for post THA jogging and the reasons given for those who choose not to participate in jogging after surgery have not been well documented.

Overall Recommendations

In a 2005 review article, Clifford and Mallon (9) provided their guidelines, based on the available literature, on athletic and exercise participation after joint replacement, with some differentiation between total knee and total hip patients. “Low-impact“ activities are encouraged for all patients, as they help improve general health and cardiovascular fitness. These activities focus on conditioning and flexibility, rather than heavy loading for strengthening.

Activities classified as “potentially low impact,“ such as bicycling, speed walking, cross-country skiing, dancing, pilates, and rowing, require patients to have good balance and proprioception, and patients participating in these activities should be monitored by their surgeon and rehabilitation team regularly. For this class of activities, emphasis should be on a high number of repetitions with minimal resistance.

Activities that have been deemed as “intermediate impact” include tennis, hiking, downhill skiing and snow- boarding, weightlifting, ice skating and rollerblading, and low-impact aerobics. These may be allowed for a select group of patients. Excellent physical condition and previous experience with these sports are required to minimize risk of injury and accelerated implant wear.

Finally, most joint replacement patients should be strongly discouraged from participation in very high-impact athletics, including those with high risk of contact. This class includes such sports as racquetball, running, high-impact aerobics, most ball sports, martial arts,

and rock climbing. There is likely a higher risk of injury and need for revision with these activities.

Nevertheless, with the advent of newer implants and the inclusion of younger patients in the arthroplasty population, it is very likely that more and more patients with total joint replacements will be participating in these athletics. Patients should be counseled appropriately, as the effect of high-impact athletic participation remains to be determined.

Summary

Patients should be encouraged to be active after TJA, and this may include participation in athletic activity. Patient and surgeon should consider the patient's general health, previous athletic experience, surgical approach, implant characteristics, and the demands of a particular sport when determining whether participation in that sport is advisable.

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