

Hip Replacement and Return to Sports

Hüftgelenkersatz und die Rückkehr zum Sport

Summary

- › **Total hip arthroplasty (THA)** is one of the most successful surgical procedures known to man, but the influence of patient activities on implant survival remains controversial. With the increasing number of hip arthroplasties, especially in a younger population, the activity levels and expectations of patients have continuously increased. This is especially true in regard to a return to sports.
- › **New implants** combined with less traumatic surgical approaches and more aggressive rehabilitation protocols seem to offer sports medicine and our arthroplasty patients a more active and brighter future. Reliable data with regard to the topic "Return to sports after hip replacement" remain sparse. The post-THA orthopedic consultation must take many aspects into account, beginning with the individual's activity level and concluding with evaluation of the surgical outcome.
- › **Joint arthroplasty** should not prohibit the implementation of sporting activities, especially as inactivity can produce a number of different problems. Low-impact activities are generally encouraged for all THA patients. The effects of high-impact athletic participation, on the other hand, still remain unclear, so that all interested patients, especially the more active individuals, must be counseled individually. Recommendations are undergoing constant change and must be modified by the treating surgeon accordingly, frequently without the help of evidence-based medicine.
- › **This review** will offer some guidance with the help of a general review of the literature and current trends.

KEY WORDS:

Arthroplasty, Joint Replacement, Hip, Sport

Zusammenfassung

- › **Der Hüftgelenkersatz** gehört zu den erfolgreichsten chirurgischen Maßnahmen, aber der Einfluss des Aktivitätsniveaus des Patienten auf das Langzeitergebnis bleibt unklar. Mit der Zunahme dieser Eingriffe, insbesondere bei jüngeren Patienten, nehmen das Aktivitätsniveau von Endoprothesenträgern, aber auch deren Erwartungen, kontinuierlich zu. Diese gilt insbesondere bezüglich der Rückkehr zu sportlichen Aktivitäten.
- › **Neue Implantate und Gleitpaarungen** sowie atraumatischere Zugänge kombiniert mit aggressiveren Rehabilitationsprotokollen scheinen den Betroffenen und den betreuenden Sportmedizinern eine vielversprechende, aktivere Zukunft zu ermöglichen. Leider gibt es kaum belastbare Daten, die als Leitfaden für die „Rückkehr zum Sport nach Hüftgelenkersatz“ dienen könnten. Die postoperative Beratung muss eine individuelle Entscheidung unter Berücksichtigung vieler Aspekte – von dem patienteneigenen Trainings- und Erfahrungsniveau bis zur Bewertung des operativen Ergebnisses – beinhalten.
- › **Generell** sollte heutzutage eine Endoprothese keine Sportverbote zur Folge haben, v. a. da die Inaktivität ihre eigenen Probleme mit sich bringt. Aktivitäten mit geringer Stoßbelastung und Verletzungsgefahr werden für alle Hüftendoprothesenträger angeraten. Da die Auswirkungen von den sogenannten „high-impact“-Sportarten bei diesem Patientenkollektiv noch unklar sind, muss im Sinne einer Einzelfallentscheidung eine Nutzen-Risiko-Abwägung, v. a. für die Sport-begeisterten, jüngeren Patienten, erfolgen. Die Sportempfehlungen werden derzeit permanent angepasst, sodass der behandelnde Sportorthopäde seine Vorgaben häufig modifizieren muss, leider ohne dass man sich auf „evidence based medicine“-Publikationen berufen kann.
- › **Diese Übersichtsarbeit** wird Anhaltspunkte anhand allgemeiner Trends und Literatur bieten.

SCHLÜSSELWÖRTER:

Endoprothetik, Gelenkersatz, Hüfte, Sport

Introduction

Even in an expanding and aging society, the role of sports continues to increase every day. The advantages of athletic activity in the prevention of heart disease, in the aftermath of cancer treatment and for neurological disorders have been well established (5, 8, 22). The medical community has spent much time and effort encouraging people to remain physically active. Sports medicine has frequently supplied lifestyle behavior recommendations to improve the individual's health-related quality of life. The increasing number of

older athletes has consequently led to many patients with degenerative joint disease, wanting to return to sports following hip arthroplasty. In the past, many physicians have recommended rest, reduced level of activities and caution when it came to sports following such large surgical procedures. Some regard athletic activity and total hip replacement as being mutually exclusive. This inactivity frequently results in loss of muscle mass and increased body mass, while coordination and proprioceptive functions suffer. ➤

REVIEW

ACCEPTED: January 2017

PUBLISHED ONLINE: May 2017

DOI: 10.5960/dzsm.2017.268

Siebert CH. Hip Replacement and Return to Sports. Dtsch Z Sportmed. 2017; 68: 111-115.

1. PARACELSUS KLINIK HANNOVER-LANGENHAGEN, *Clinic for Orthopedics and Sports Traumatology, Hannover-Langenhagen, Germany*



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CORRESPONDING ADDRESS:

Prof. Dr. med. Christian H. Siebert
Paracelsus Klinik Hannover-Langenhagen
Clinic for Orthopedics and Sports Traumatology
Oertzeweg 24
30851 Hannover-Langenhagen, Germany
✉ : christian.siebert@paracelsus-kliniken.de

Table 1

Main rehabilitation characteristic from the RCTs reported by Di Monaco and Castiglioni (4).

AUTHOR	NUMBER	ADDED ACTIVITY	STARTING POINT	SCORE
Giaquinto et al. (6)	70	Hydrotherapy	2. postop. week	WOMAC score, Lequesne hip score
Heiberg et al. (10)	68	Walking skills training	4. postop. month	6-minute walk test, Harris Hip Score
Husby et al. (12)	24	Strength training hip abductors, leg press	2. postop. week	Max. strength
Liebs et al. (15)	203	Ergometer cycling	3. postop. week	WOMAC score

Thanks to the high success rates of total hip arthroplasty (THA) with regard to pain relief and functional improvement, patients with a painful arthritic hip have come to expect to participate in athletic activity postoperatively (9). In 2014, more than 219.000 primary hip replacement surgeries were performed in Germany, making it one of the most frequent in-hospital procedures nation-wide (21). Within what is therefore a common procedure, the number of young and active patients receiving joint replacements has been steadily growing, and these younger patients want to maintain their high activity levels. Some implant producers even use sports as a marketing tool for their products. All of this means that the issue of athletic participation is becoming more relevant across a larger population, and consultations regarding sports participation after THA will be more frequent (13).

The replacement of a hip joint usually follows a long time period marked by an increasing burden of the typical changes associated with progressive osteoarthritis, such as reduced range of motion, changes in gait pattern, loss of bone stock, as well as reduced muscle activity. According to Mantovani et al. these changes in lower extremity kinetics and kinematics persist even at the 300 day follow-up after hip replacement (16). For many patients a reduction in pain and improved mobility are the driving force behind their hip replacement surgery but today many also cite the desire to return to recreational sports as a main motivator.

Many orthopedic surgeons fear that impact, overuse, shear forces, and falls associated with sporting activity will lead to poor long term outcomes (11). Medical problems after THA include dislocation, periprotetic fracture, aseptic loosening, surface wear and premature revision are cited, while the actual risk associated with participating in sports remains unknown (17). Little consensus exists among orthopedic surgeons regarding sports that should be recommended or even allowed after THA. The role of surface wear and sports also remains unclear. Even with the help of in-vivo loading data of hip implants obtained by Bergmann and his group, it is still impossible to provide exact thresholds for forces, which are detrimental for the outcome of surgical interventions (19, 20).

Most recommendations on this topic are developed by the individual orthopedic surgeon taking advantage of information, gathered over many years during lectures, from textbooks and publications, as well as personal communication, while combining this with his or her personal experience. This paper will provide a basis for practical recommendations, although ultimately, each patient will have to be evaluated on an individual basis, especially in light of the patients' athletic experience before the joint replacement. Patients must be educated to carefully assess the risks and benefits of their participation in athletic activity (9).

Return to Sports Following Hip Arthroplasty

There is very little evidence-based data available to assist the physician in the consultation of their arthroplasty patients regarding sports. The literature that does exist only reports on primary joint replacement surgery, which leads most patients and their physicians to avoid athletic activity altogether following revision joint arthroplasty. A recommendation following revision arthroplasty therefore is impossible and must be decided on an individual basis. Some go so far as to define revision arthroplasty as a contraindication for sport (3).

In the orthopedic community, a heated debate is ongoing with regard to the ideal surgical approach for total hip arthroplasty (THA). When comparing the results of a direct lateral, anterolateral and posterior approach one year after surgery, Queen et al. were not able to find any significant effects for physical performance measures or biomechanical variables (18). Therefore, the return to sports following hip replacement should be dependent on joint function and not on the surgical approach or choice of implant.

In 2014, Jassim et al. provided a systematic review to evaluate the return to athletic activity post joint replacement. They found that while functional demands on the implants are increasing, no study reported an increase in complication rates associated with sports with respect to less active control groups. Neither polyethylene wear nor revision rates seem to increase in sporting populations, although prospective studies with long term follow up are still missing (13).

A survey of American orthopedic surgeons revealed that 91% let their arthroplasty patients return to sports after six months, albeit mostly at a lower level (13, 14). The preoperative athletic activity and expectation surrounding joint replacement in combination with patient's age, weight and sex were a frequent determinant of post-THA sporting endeavors (13). Generally, expectations regarding postoperative athletic activity seem to be on the rise. One must point out that patient-specific factors have more influence on postoperative activity than factors specific to type of surgery, implant or surgeon factors (23). A total of 62% of preoperative sporting participants returned to a sporting activity at 1 to 3 years after large joint arthroplasty (23).

Di Monaco and Castiglioni, in their search for newer randomized controlled trials regarding THA rehabilitation, also came up with only sparse evidence in a review of a total of nine papers, some showing advantages of different treatment options (Tab. 1). It should not come as a surprise that additional treatment in the intervention group, be it aqua therapy, cycling or strengthening, led to a trend towards a better outcome. The same can be said for early full weight bearing. Even for this very specific review, weakness and limitations of the trials are paramount, so that the authors are only able to provide "robust evidence" for ergometer cycling and resistance strength training in the early postoperative phase, and weight bearing exercises in the late phase (4). The implications of this study for evidence regarding the much more complex topic of return to sports following THA, are disheartening at best.

Golant et al. believe, the benefits of athletic activity following total joint arthroplasty to be undeniable (7). In addition to psychological aspects, better body control, which may prevent injury from simple falls, is cited. THA-patients benefit from better muscle strength, coordination and endurance thanks to sports. Simmel et al. report that those patients participating in sports following THA, are happier with their results and have better values in the Harris Hip Score (20).

Table 2

Classification of sports following total hip replacement and the changes over time (9).

	ALLOWED		ALLOWED WITH EXPERIENCE		NO CONSENSUS		NOT RECOMMENDED	
	1999	2005	1999	2005	1999	2005	1999	2005
Stationary Cycling	✓	✓	Bowling	✓	Square Dancing	✓	Baseball	✓
Ballroom Dancing	✓	✓	Canoeing	✓	Fencing	✓	Basketball	✓
Golf	✓	✓	Road Cycling	✓	Ice Skating	✓	Football	✓
Shuffleboard	✓	✓	Hiking	✓	Roller Skating	✓	Gymnastics	✓
Swimming	✓	✓	Horseback Riding	✓	Downhill Skiing	✓	Handball	✓
Doubles Tennis	✓		Cross-Country Skiing	✓	Stationary Skiing	✓	Hockey	✓
Normal Walking	✓	✓	Rowing		Speed Walking	✓	Jogging	✓
Bowling		✓	Ice Skating		Weight Lifting	✓	Rock Climbing	✓
Canoeing		✓	Roller Skating		Weight Machine	✓	Soccer	✓
Road Cycling		✓	Downhill Skiing		Baseball		Squash/Racquetball	✓
Square Dancing		✓	Stationary Skiing		Gymnastics		Singles Tennis	✓
Hiking		✓	Doubles Tennis		Handball		Volleyball	✓
Speed Walking		✓	Weight Lifting		Hockey			
			Weight Machine		Rock Climbing			
					Squash/Racquetball			
					Singles tennis			
					Volleyball			

Despite the clear benefits of exercise and sports activity on general health and function, however, there may be some trade-off between quality of life after THA and the wear rate after this surgery (17). In fact, the German National Paralympic Committee requires its handicapped athletes with THA wanting to participate in German championships to supply a questionnaire from the treating physician, declaring their patient fit for sporting activity. The athlete must also sign a waiver regarding the implant associated risks (2). Some of relevant criteria found there can be summed up in a check list similar to the one below.

Checklist for a Return to Sports Following THA (2)

- Primary hip replacement
- Correct implant position
- Six months have gone by since the procedure
- No pathological Trendelenburg sign or limp
- No signs of instability, infection or loosening
- No pain upon at rest or weight bearing
- Symmetrical muscle definition
- Suitable range of motion to complete the desired task

Considering the heterogeneity of surgical procedures and hip implants, as well as the absence of randomized studies, no conclusive evidence can be drawn from the literature regarding the ideal point in time for arthroplasty patients to return to play their sports.

Sporting Activity

There is sufficient literature available to suggest that safe participation in a number of sporting activities is possible following hip arthroplasty (7). Generally low-impact sports are preferred. Some argue that adequate loading of the implant and the surrounding bone stock, are beneficial for the longevity of well-fixed ingrown implants, while improving the function of the musculoskeletal system as a whole. These benefits outweigh possible negative effects such as increased joint surface wear (7).

Given the lack of evidence-based information, many of the guidelines available in the literature are some variation of the recommendation originally published by Healy in 2001 and updated 2008 following a survey of the Hip Society members (8, 9).

Table 2 is taken from the latter publication depicting the evolution of recommendations regarding specific sports during that time frame. The number of "allowed" activities continues to increase, while the "not recommended" ones are on a steady decline, documenting that many surgeons have started to relax their restrictions for several specific athletic activities (8, 9). The German Society for Sports Medicine and Prevention approves of swimming, cycling, hiking, dancing etc., while cautioning with regard to alpine skiing, ice skating, team sports and inline skating following THA (3). In reality, a patient will attempt to return to the sport that he or she is familiar with or has a desire to return to – advice should be adjusted accordingly. The decline of coordination, strength, and endurance seen in the aging athlete also needs to be communicated openly. Injury and fall prevention must be a mainstay of any such orthopedic consultation, while endurance activities should be encouraged.

Even the high impact sport of jogging seems to have a place in the rehabilitation following an arthroplasty, although only about 5% of the degenerative hip patients were still jogging prior to surgery. A majority of the hip patients do not jog due to anxiety and fear of falling, but two thirds of the original joggers return to this activity (mean distance 3.6km; mean duration: 29 minutes; mean frequency: 4 times a week) (1). Importantly, no increased surface wear was seen in the joggers at the 5 year follow-up. In the past, jogging has frequently not been recommended because of the repeated production of high peak hip contact forces (1). It may be time to reevaluate this activity, especially in light of patient's preferences, with the help of long-term prospective studies. Generally, the patient's previous athletic experience needs to be a central component of the counseling.

Practical Recommendations

Before suggesting a return to sports, the general health of the patients, especially in light of the limitations acquired prior to the joint replacement surgery, must be evaluated. Medical history, medication and clinical examination should all be part of the work up before an individualized training program utilizing joint sparing activities with proper equipment (adequate sport shoes etc.) in a safe environment can be implemented. Any sporting activity needs to begin with an extensive warm up followed >

by a very gradual increase of the intensity and duration of the training (17). Sometimes 10-15 minutes every second day is an acceptable way to reintroduce previously inactive patients with a new joint to sports. Maximal strength and maximal loading should be avoided. A general guideline permitting 2/3 of an individual's maximal parameters is easily communicated to THA bearers. The use of water (depth 1.35m) as a training medium can reduce joint loads up to 50% and can be recommended in the form of aqua jogging or swimming (preferably using a freestyle or flutter kick). Bicycles and other fitness devices can also prove helpful. The chosen activity needs to take the actual range of motion of the large joints into account. Activities should always be pain free. Naturally, a return to low or moderate rather than high-impact activities is preferable, although no clear consensus exists (13).

Conclusion

The patient and the sports medicine professional must always be aware of the conflict arising from the limited life expectancy of a hip implant, the dangers of inactivity and the quality of life following total joint replacement surgery. This is especially true because it is still not clear, how much athletic activity should be reasonably allowed or recommended (8, 9). Even with the help of in-vivo biomechanical data it seems unlikely that a census

will be reached in the near future (20). Joint arthroplasty should not prohibit the implementation of sport as a treatment form for various medical problems – there also seems to be no reason to reduce activity levels on behalf of a joint replacement. Inactivity can produce a number of different problems. Therefore, low impact activities are encouraged for all THA patients to improve general health and cardiovascular fitness (7). Since the effects of high-impact athletic participation still remain unclear, all patients, especially the younger individuals in the arthroplasty population, must be counseled accordingly. Recommendations are undergoing constant change and must be modified accordingly, especially because patients have become less tolerant of activity limitations (9, 20).

In conclusion, hip replacement surgery is one of the most successful surgical procedures, but the influence of patient activities on implant survival remains controversial. Newer implants and surfaces combined with less traumatic surgical approaches and more aggressive rehabilitation protocols, may lead sports medicine and our arthroplasty patients to a more active and brighter future. The best interest of the patient must remain in the forefront. ■

Conflict of Interest

The author has no conflict of interest.

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