



Perceived skills for sports performance after primary hip arthroplasty: a cross-sectional study

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Abstract

Purpose Recommendations arising from existing literature regarding restrictions and benefits of sporting activities after joint replacement surgery vary widely. As hip arthroplasty patients are becoming increasingly active, their expectations about post-operative function are constantly evolving. The aim of this study is to identify the perception of patients regarding their performance in sports activities after hip arthroplasty.

Methods This cross-sectional study included all patients undergoing primary hip arthroplasty, for any diagnosis, between January 2009 and January 2016. By applying a telephone survey, practice of sports before surgery, resumption after surgery, level of performance, and causes of non-resumption of sports activities were assessed.

Results Data of 531 patients were obtained. Of these, 13% were engaged in sports before surgery. The most frequently practiced sports were golf (27.5%) and tennis (22%). Of the 72 patients that practiced sports, only 44.4% (30 patients) returned to this activity after surgery. Nonetheless, 71% of these patients reported to have an equal or better athletic performance than before surgery. The main causes reported by patients not to return to sports were the fear of injury and recommendation of the surgeon.

Conclusions A significant number of patients return to sports after hip arthroplasty and most of them perceive a good athletic performance after surgery. These findings should enrich the pre-operative assessment of patient's expectations, particularly for those who wish to resume physical activity.

Keywords Arthroplasty, replacement, hip · Long-term care · Sports · Sports medicine

Introduction

Standardization, advances in surgical technique, and implant designs have increased the survival rate of primary total hip arthroplasty (THA) as to convert this surgery in an appropriate option for active persons. In consequence, patients' expectations regarding the procedure have also changed [1, 2], and the ability to return to sporting activities after the procedure has become a matter of interest for a growing number of patients

[3]. Therefore, patients candidate to hip arthroplasty should be addressed considering their expectations with the procedure [4] and willingness to return to sports regardless of their recreational or professional interest [5, 6].

In spite of the abovementioned data, the evidence regarding the recommendations on returning to sports after surgery and the benefits or disadvantages of practicing sports after this procedure is contradictory [7–9]. Moreover, the performance of patients, regarding the skills to practice a sport after surgery, has not been studied previously.

Due to the limitations of the available evidence, the aim of this study is to measure the skills for sports performance of a group of patients who resumed this activity after primary hip arthroplasty, based on their own perception.

Materials and methods

In this cross-sectional study, all consecutive patients who underwent primary THA for primary or secondary hip

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osteoarthritis and hip fracture, between January 2009 and January 2016, were identified in order to assess whether they practiced sports before and after surgery. All patients were operated through a posterolateral approach and underwent a standardized education and rehabilitation program, which was not focused on the resumption of sports activities. All patients who respond to all the items included in the questionnaire applied were included. In patients who underwent bilateral hip replacement during the study period, only the latter event was included in the analysis.

A telephonic survey was designed to evaluate if patients were involved in sports before surgery, the type of sport practiced and the frequency of practice, to assess whether they return to these activities after surgery, their perceived level of performance, if they changed to another sport and the reasons reported by patients against returning to sport activities after the procedure. Demographic variables such as age, body mass index, and American Society of Anesthesiologists (ASA) classification were obtained from medical records.

Physical activity, exercise, and sport are terms commonly interchangeable, however, a distinction among them must be made: physical activity is defined as any body movement produced by activation of skeletal muscles, generating an increase in oxygen consumption; this type of activity is usually of low intensity and is held during work, leisure, and recreational tasks. Exercise is defined as a planned and structured program of physical activity to improve fitness, through repetitive body movements of high intensity. Sport practice is defined as a type of physical activity that is regulated, competitive, and institutionalized, which can improve the physical condition of the person who practices it [10–12]. For the purpose of this study, only patients who practiced sports are included in the analysis.

Statistical analysis

A descriptive analysis was performed. Qualitative variables were presented as frequencies and proportions. Quantitative variables were presented as means and standard deviations (SD) as they follow normal distribution. In order to determine which demographic variables were associated with the return to sports after surgery or perceived skills for sports, a multivariate linear model of analysis of variance (MANOVA) was designed. Gender, age (divided into four categories: 18 to 30 years; 31 to 50 years; 51 to 70 years, and older than 70 years), pre-operative diagnosis (resumed in three categories: primary hip osteoarthritis, secondary hip osteoarthritis, and hip fractures), body mass index, and health status in the ASA classification were defined as fixed factors. Statistical significance was defined as a *p* value of < 0.05. All data were processed using the IBM® SPSS® Statistics version 21 (IBM Corporation, Armonk, NY, USA) software. Figures were

created using GraphPad Prism 7.0 (GraphPad Software, La Jolla, CA, USA).

Results

From the total of 1032 patients who underwent primary hip arthroplasty between January 2009 and January 2016, data from 535 patients were obtained. Of these, 372 (69.8%) patients were females. Causes for THA were primary hip osteoarthritis 75.1%, secondary hip osteoarthritis (hip dysplasia, post-traumatic arthritis, avascular necrosis, failed osteosynthesis, rheumatoid arthritis, or septic arthritis) 17.0%, and hip fracture 7.9%. The mean age at the time of surgery was 67 (range 13–91) years, the mean body mass index (BMI) was 25.5 ± 3.9 kg/m², and 52.7% of patients were classified as ASA II (Table 1). During the study period, 23 patients died. Patient selection and description of the losses to follow-up are shown in Fig. 1.

Seventy-two patients (13.5%) practiced sports before surgery. Golf was the most frequently practiced sport (26.4%) (Table 2). Of all patients who practiced sport, 72.5% practiced it for five or more hours per week and 27.5% practiced it occasionally (less than 4 hours per week).

After surgery, 30 of the 72 patients who practiced sports returned to this activity (44.4%). However, eight patients who did not practice any sport prior surgery started this activity after the procedure. The mean time to return was 2.60 ± 1.2 (range 1–4) months. Golf (47.3%) continued to be the most commonly practiced sport. Conversely, the percentage of patients that played tennis decreased from 22.2% pre-operatively to 10.5% after surgery, and the percentage of patients practicing hiking increased to 18.4% (Table 2).

Table 1 Demographic characteristics of the patients included in the study

Variable	<i>n</i> (<i>N</i> = 535)	%
Gender		
Female (%)	374	69.9
Male (%)	161	30.1
Pre-operative diagnosis		
Primary osteoarthritis	402	75.1
Secondary	91	17.0
Hip fracture	42	7.9
ASA classification		
ASA I (%)	21	3.93
ASA II (%)	282	52.72
ASA III (%)	232	43.4
	Mean	Standard deviation
Age (years)	67	11.9
BMI (kg/m ²)	25.5	3.9

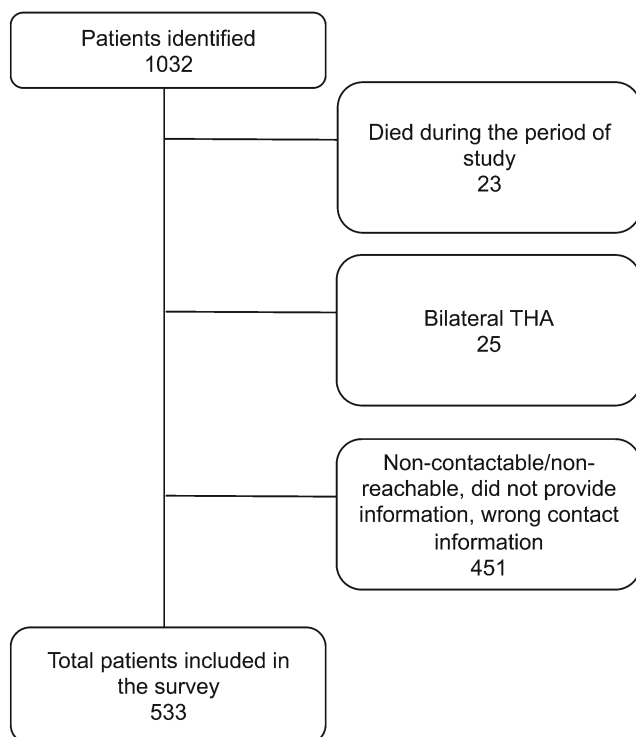


Fig. 1 Flowchart of patient inclusion in the study

Of the 38 patients who practiced sports after surgery, 71% (27/38) reported that their level of performance was equal or better than before surgery (Fig. 2). The change in the number of hours per week dedicated to sport practice is described in Fig. 3.

According to the multivariate analysis, there were no statistically significant differences between gender ($p = 0.981$), mean age at the time of surgery ($p = 0.593$), pre-operative

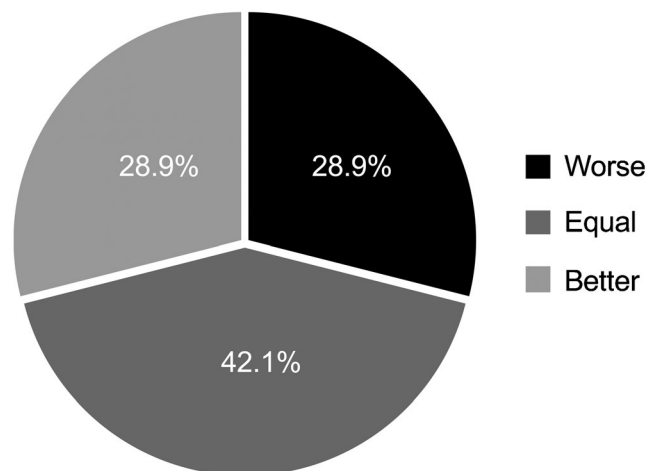


Fig. 2 Performance level achieved in sports or physical activity after surgery

diagnosis ($p = 0.160$), and ASA classification ($p = 0.478$) among patients who returned to sports and those who did not. However, there were statistically significant differences in BMI between those who returned to sports and those who did not ($p = 0.014$): of the total number of patients that did not return to sports after the surgery 50.3% were overweight or obese.

Similarly, gender, age, pre-operative diagnosis, and ASA classification were not different between patients who perceived equal or better performance skills for sport practice and those who perceived a decrease in their performance. Whereas differences in BMI were noticed among groups ($p = 0.014$), as only 51.8% of patients who performed equal or better were overweight or obese, while 72.2% of patients who perform worse had BMI above 25 kg/m².

The main reason reported by patients to not return or start sporting activities after hip arthroplasty was fear of causing damage to the prosthetic joint (20.5%). Other causes of no return are resumed in Fig. 4. Most patients who did not practice sport before or after surgery reported that they were not interested in being involved in these activities.

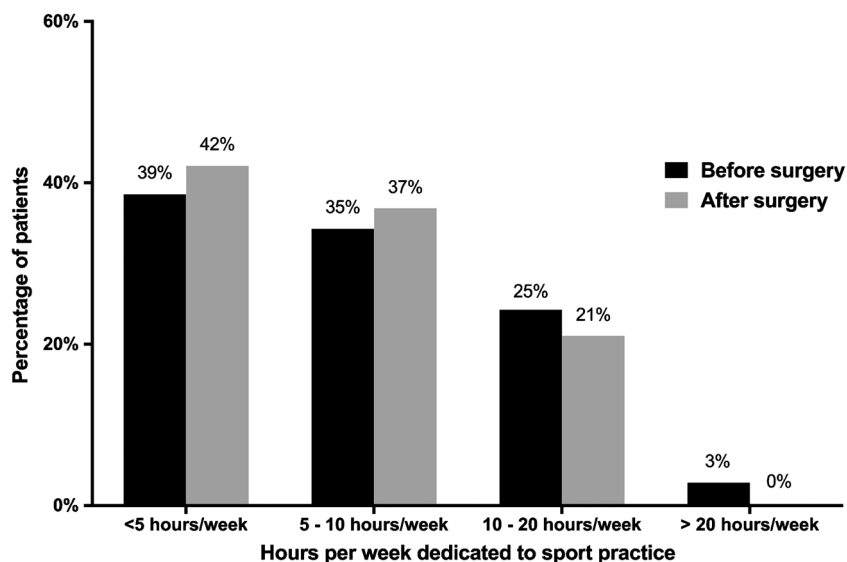
Table 2 Frequency of sports practiced by patients before and after surgery

Type of sport	Before		After	
	<i>n</i> (<i>N</i> = 72)	%	<i>n</i> (<i>N</i> = 38)	%
Martial arts	1	1.4	0	0
Horse riding	2	2.8	0	0
Polo	1	1.4	1	2.6
Squash	1	1.4	0	0
Weightlifting	1	1.4	1	2.6
Road cycling	2	2.8	0	0
Hiking	3	4.2	7	18.4
Basketball	4	5.6	0	0
Swimming	5	6.9	6	15.8
Jogging	5	6.9	0	0
Football (soccer)	11	15.3	1	2.6
Tennis	16	22.2	4	10.5
Golf	19	26.4	18	47.4

Discussion

Osteoarthritis of the hip negatively impacts the quality of life of patients and limits their ability to perform sports either recreational or competitively [13, 14]. Even though hip arthroplasty surgery improves the quality of life and functionality of these patients [15], there are several reports in the literature that contraindicate the return to some sports due to a possible association with an increased risk of prosthetic dislocations, periprosthetic fractures, and accelerated wear of the implants [5, 9, 16, 17]. However, as young active patients are being operated nowadays, their expectations include return to sport activity.

Fig. 3 Frequency of sports and exercise practice before and after surgery



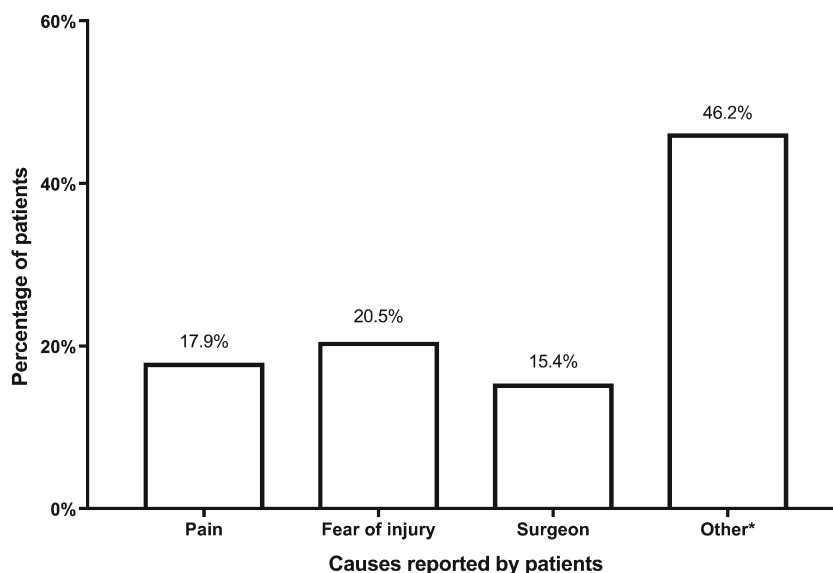
We found that 13% of the population of study practiced sports either recreationally or competitively, highlighting the relevance of this aspect in the well-being of patients candidates to hip arthroplasty [5, 18, 19]. However, this proportion is significantly lower than the one reported by Chatterji et al. [6] who found that in a cohort of patients with a mean age of 67 years, about 50% of patients practiced some kind of sport before surgery.

Regarding the return to sports after surgery, it has been described in the literature that less than half of the patients who were involved in sporting activities before hip arthroplasty, return to this activity after the procedure [3, 6, 19]. Consistently, in the present study, it was found that only 44.4% of patients resumed their sport activity, probably because their perception about the negative impact of sports on survival of the prosthesis [3, 19, 20]. Furthermore, a decrease

in the level of activity was showed after the procedure, evidenced by the hours dedicated, and the shift in the type of sport practiced. Similar results were obtained by Schmidutz and colleagues in patients undergoing hip arthroplasty with a short stem, where the level of activity was reduced after surgery [21].

Although patient factors such as body mass index are more associated with the return to physical activity than extrinsic factors such as the type of surgery or the type of implants [22], recommendations from surgeons still have an important role in the rate of return. In a survey carried out by Mont et al., the surgeon approved the resumption of tennis after total hip arthroplasty in 14% of patients [23]. In addition, we have identified that 15.4% of the patients included in this study referred that one of the reasons for not resuming the sport was advice from the surgeon. The development of new

Fig. 4 Causes of no return to sports activities reported by patients. *The variable “cause of no return” was defined as an open question. The most common answers were plotted independently and the less common answers were grouped and graphed under the name of “other”



surgical techniques and prosthesis designs, such as highly cross-linked polyethylene and dual mobility acetabular cups, might generate more confidence for both patients and surgeons in order to encourage the return to sports activities [3, 20].

One of the most important findings of this study is the fact that a high proportion of patients perceives a good athletic performance after surgery compared with that before the procedure, without any special rehabilitation program. Furthermore, patients with BMI > 25 kg/m² tend to perceive a decrease in athletic performance after surgery. To the best of our knowledge, this information had not been reported before and we believe it is of cornerstone relevance since it will assist surgeons discussing patient's expectations on resumption of sports activities.

Generation of recommendations on return to sport practice after hip arthroplasty is beyond the scope of this study; however, it is important to highlight that is not contraindicated [24], on the contrary, one of the new challenges that orthopedic surgeons face is to encourage the practice of sports [25]. Recent evidence recommended that surgeons should allow a gradual resumption of low-impact sports [24] and should motivate patients to be engaged in such activities in order to improve the overall health status and to prevent complications of systemic diseases [5, 26]. Furthermore, it has been demonstrated that low-impact sports are not associated with increased rates of aseptic loosening [7, 27, 28].

Kuster et al. [5] and Klein et al. [20] published a series of evidence-based recommendations on the return to sports after hip arthroplasty. Both authors conclude that patients should be encouraged to stay active after surgery and that these recommendations must be individualized, considering the type of activity, the intensity, and level of performance [5]. According to the Hip Society, activities such as golf, swimming, cycling, and ballroom dancing are highly recommended for hip replacement patients, while contact sports, gymnastics, squash, and jogging are not recommended [29]. Hara et al. demonstrated in a kinematic analysis that the golf swing did not produce excessive hip rotations or cup-head translation and prosthetic joint stability was preserved [30].

Regarding the lapse of return to sports, Cowie et al. reported a mean time of 18.8 weeks [31], while other authors suggest that this time can be up to 24 weeks [6, 32].

Although we were not able to retrieve information from 451 patients, one of the main strengths of this study was the ability to obtain information from a significant number of patients, which for purposes of proportion estimations is convenient and minimizes the effect of the population that was unavailable. This is especially relevant given the descriptive nature of this research and the lack of studies addressing this subject. On the other hand, the main limitation of this study is its retrospective nature, which represents an increased risk of recall bias and does not allow associations or causal analysis.

In addition, the mean age of the study population is 67 years, therefore, data on younger patients is not available; this special group of patients might demand a more intense sport performance, therefore, its safety and satisfaction must be the objective of further research. Furthermore, the assessment of the socioeconomic status and its influence on return to sports was not included in this study.

In conclusion, most of the individuals perceive equal or better athletic performance after hip arthroplasty. This finding must encourage surgeons to give confidence to their active patients who require such a procedure. In addition, a significant number of patients who are candidates for primary hip arthroplasty practice sports, however, only a small proportion of them return to sports after the surgery, mainly because of misinformation. Therefore, there is a need to develop education programs for surgeons and patients, as well as tailored rehabilitation strategies, to encourage patients to return to safe sporting activities.

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