

# Return to Elite Level of Play and Performance in Professional Golfers After Arthroscopic Hip Surgery

Justin T. Newman,\* MD, Adriana J. Saroki,\* BS, Karen K. Briggs,\* MPH, and Marc J. Philippon,\*<sup>†</sup> MD

*Investigation performed at Steadman Philippon Research Institute, Vail, Colorado, USA*

**Background:** Hip conditions, such as femoroacetabular impingement and labral injury, can cause pain and limit the ability to play sports at a professional level.

**Purpose:** To evaluate performance metrics of professional golfers prior to arthroscopic hip surgery and after surgery.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** This study included professional golfers who underwent arthroscopic hip surgery. Primary outcome variables were greens in regulation and driving distance. Metrics were recorded for 2 years prior to arthroscopic hip surgery and 1, 2, and 5 years after arthroscopy.

**Results:** A consecutive cohort of 20 male professional golfers (27 hips) from 2000 to 2011 underwent arthroscopic hip surgery by a single surgeon. All players were on the PGA Tour with a mean age of 38 years (range, 26-54 years). Eleven hips had labral repair and 16 had labral debridements. Four hips required microfracture of a chondral lesion. All players returned to play at a mean of 4.7 months (range, 1 month to 2 years). The mean number of years played after surgery was 5.72. There was no significant difference between preoperative and postoperative greens in regulation ( $P = .227$ ). The mean distance per golf drive was significantly longer at 1 and 2 years postoperative compared with prior to surgery ( $P < .01$ ), and driving distance at 5 years was also longer than preoperative ( $P = .008$ ).

**Conclusion:** Arthroscopic management of chondrolabral dysfunction due to femoroacetabular impingement in the professional golfer allowed the golfer to return to the same skill level prior to surgery. Mean driving distance was found to increase after arthroscopy, demonstrating not only a return but also an improvement in driving performance from prior level of play.

**Keywords:** hip; femoroacetabular impingement; golf; labral tear; return to play

Arthroscopic hip surgery has revolutionized the treatment of hip injuries, and with these treatments, injuries that could have ended careers of professional athletes in the past can now be treated. Among these athletes are professional golfers. As a noncontact and low-impact sport, the

injury profile of golfers is different from many other sports. The injury pattern is influenced by repetition, muscle coordination, and a well-described range of motion required for the golf swing.<sup>7,16</sup> Dynamic hip motion is accentuated in professional golfers, whose careers hinge on both finesse and power and for whom small kinematic aberrations correlate with decreased performance. The extensors and abductors of the hip are of critical importance when initiating the forward motion of the golf swing and are responsible for creating the energy that is ultimately transferred through the upper extremities to the ball at impact.<sup>2</sup> Novice and professional golfers have differences in hip rotation, with increased rotation in professionals contributing to increased speed and power throughout the swing.<sup>9</sup> With repeated rotations, the labrum may become bruised or detached. The damaged labrum can no longer maintain the seal with the femoral head, resulting in increased femoral head translation. With the loss of the seal and increased translation, the labrum and cartilage are at risk of increased damage.<sup>14</sup>

<sup>†</sup>Address correspondence to Marc J. Philippon, MD, The Steadman Clinic, 181 West Meadow Drive Suite 400, Vail, CO 81657, USA (email: drphilippon@sprivail.org).

\*Steadman Philippon Research Institute, Vail, Colorado, USA.

One or more of the authors has declared the following potential conflict of interest or source of funding: M.J.P. receives royalties from Smith & Nephew, Linvatec, Bledsoe, DonJoy, and Arthrosurface; is a paid consultant for Smith & Nephew and MIS; owns stock/stock options in Smith & Nephew, Arthrosurface, HIPCO, and MIS; and receives research or institutional support from Smith & Nephew, Siemens, Ossur, and Arthrex. K.K.B. receives research or institutional support from Smith & Nephew, Siemens, Ossur, and Arthrex.

The Orthopaedic Journal of Sports Medicine, 4(4), 2325967116643532

DOI: 10.1177/2325967116643532

© The Author(s) 2016

This open-access article is published and distributed under the Creative Commons Attribution - NonCommercial - No Derivatives License (<http://creativecommons.org/licenses/by-nc-nd/3.0/>), which permits the noncommercial use, distribution, and reproduction of the article in any medium, provided the original author and source are credited. You may not alter, transform, or build upon this article without the permission of the Author(s). For reprints and permission queries, please visit SAGE's Web site at <http://www.sagepub.com/journalsPermissions.nav>.

Arthroscopic hip surgery has been shown to be effective in returning professional athletes back to play at a high level.<sup>3,15</sup> One study demonstrated that 6 professional golfers were able to return to play after arthroscopic hip surgery<sup>15</sup>; however, performance after arthroscopic hip surgery in this population has not been well documented. Performance metrics, such as driving distance, represent the player's skill level at a particular time. Performance data on professional golfers are widely available and uniform. These individual measures afford analysis of the level of performance that is unique to the professional golfer. Long-term performance of a large number of professional golfers with respect to age has been published, which affords a comparison of golfers who have undergone arthroscopic hip surgery to be compared with the expected age-related decline in function and performance.<sup>1</sup>

The purpose of this study was to evaluate performance measures of professional golfers prior to arthroscopic hip surgery and postoperatively. The hypothesis was that professional golfers with symptomatic intra-articular pathology would be able to return to play at a high level of performance, similar to their performance prior to arthroscopic hip surgery.

## METHODS

After approval from the Vail Valley Medical Center Institutional Review Board, official player statistics were obtained from their professional organization (PGA Tour, Champions Tour, European Tour, WEB.com Tour). The Professional Golf Association (PGA) and Official World Golf Ranking databases ([www.pgatour.com](http://www.pgatour.com)<sup>13</sup> and [www.owgr.com](http://www.owgr.com)<sup>12</sup>) were utilized for specific golf performance data. Inclusion criteria included professional golfers who underwent arthroscopic hip surgery with a minimum 2-year follow-up. Primary outcome variables were greens in regulation (percentage of time a player hits the putting surface in the expected number of strokes according to par) and driving distance (mean yards per measured golf drive). Metrics were recorded for 2 years prior to arthroscopic hip surgery, which was designated as uninjured. After arthroscopic hip surgery, metrics were recorded at 1, 2, and 5 years to see whether golfers returned to uninjured metrics and whether they were maintained.

Statistical analysis was performed using the SPSS (version 11; IBM) software package. All reported *P* values are 2-tailed, with an alpha level of .05 indicating statistical significance. Comparison of continuous variables by binary categorical variables was performed using the independent-samples *t* test and for multiple (>2) categorical variables using 1-way analysis of variance with Bonferroni correction.

## RESULTS

A consecutive cohort of 20 male professional golfers from 2000 to 2011 underwent arthroscopic hip surgery by a single surgeon. A total of 27 hips were included. All players

TABLE 1  
Player Metrics Before and After Arthroscopic Hip Surgery

	2 y Before	1 y After	2 y After	5 y After
Greens in regulation, %	64.9	65.1	64.9	66.1
Driving distance, yards	279	286	288	287

were on the PGA Tour. The mean age at time of surgery was 38 years (range, 26-54 years). Seventeen hips were treated for femoroacetabular impingement (FAI),<sup>10</sup> including 10 hips with cam and pincer deformity (combined femoral osteoplasty and rim trimming) and 7 with isolated pincer impingement. Hips not treated for FAI underwent arthroscopic hip surgery prior to 2003. Labral pathology was treated in all hips, with 11 repaired and 16 debrided. Microfracture was performed in 4 hips and 18 hips underwent chondroplasty. Capsular redundancy was visualized during the time of arthroscopy in 22 hips. Partial tears of the ligamentum teres were debrided in 13 hips.

All players analyzed in this study returned to play at a mean 4.7 months (range, 1 month to 2 years). Mean years played after surgery was 5.72. Postoperatively, these players' careers averaged 70.88 PGA events. Performance measures before and after surgery are shown in Table 1. There was no significant difference between 2 years prior to surgery and 1 year after surgery or 2 years after surgery for greens in regulation (*P* = .227). Driving distance at 1 year was significantly longer compared with 2 years preoperative (*P* = .001), as was driving distance at 2 years (*P* = .001) and driving distance at 5 years (*P* = .008). Two players (10%) including 3 hips (11%) progressed to total hip arthroplasty at 1, 2, and 5 years after undergoing arthroscopic hip surgery. Age at arthroplasty was 55, 54, and 52 years, respectively. Performance data for these players were not included in the analysis.

## DISCUSSION

This study demonstrated that a professional golfer's performance after undergoing arthroscopic hip surgery for symptomatic FAI and labral injury was similar to his performance prior to surgery. A return to an elite level was demonstrated based on 2 metrics of golf performance.

When compared with the long-term data on the performance of professional golfers, those who underwent arthroscopic hip surgery were on par with their colleagues as a group. In a study by Baker et al,<sup>1</sup> 96 professional golfers were studied to determine the golfer's maintenance of skilled performance with age. The mean decrease in greens in regulation 2 years after surgery in the current study was similar to the decrease per year found by Baker et al.<sup>1</sup> Greens in regulation showed no changes between the ages of 33 and 38 years and then a general rate of decline of 0.36% ( $\pm 0.04\%$ ) per year was observed.<sup>1</sup> The increase in driving distance in the current study also mirrors the increase demonstrated in other professional golfers over this time in their careers. In the previously mentioned study, a golfer's mean driving distance decreases

throughout the third decade of life to approximately 260 yards.<sup>1</sup> At age 45 years, it increased to 265 yards and returned to 260 yards by age 50 years.<sup>1</sup> Most players (16 of 20) in the current study were younger than 45 years, so the increase seen after arthroscopy may not have been due to general increases as seen in the study by Baker et al.<sup>1</sup>

Torry et al<sup>17</sup> described the biomechanics of the hip joint during the golf swing. The downswing forces the hip into external rotation during axial loading. The combination of forces result in translation of the femoral head due to anterior forces placed on the hip. Over time this may lead to focal anterior capsular laxity and stretching of the iliofemoral ligament. Joint instability may result, leading to increased translation of the femur away from the acetabulum.

Labral tears, particularly in the anterosuperior weight-bearing region of the acetabulum, are commonly seen in hips with FAI and joint laxity.<sup>17</sup> With a labral tear and the acquired capsular laxity or redundancy, the negative uploading pressure of this hip after hitting the ball will lead to excessive anterior hip forces and subsequently intra-articular pathology and pain during the through phase of the golf swing.<sup>5,6,11,14</sup>

Arthroscopic hip surgery in athletes with symptomatic FAI and labral pathology has been shown to return players to sport and to return at a rate that is faster than that found with traditional open hip surgery.<sup>4,15</sup> The ability to return to play has been influenced by the increased recognition of FAI and labral tears and by an advance in the technique and technology available to hip arthroscopists. Through these advances, athletes can be successfully treated with much less invasive procedures and to return more quickly to sport.<sup>4,15</sup> Byrd and Jones<sup>4</sup> showed that athletes undergoing arthroscopic hip surgery had excellent postoperative outcomes according to the modified Harris Hip Score. Players did not convert to total hip arthroplasty for more than 6 years after arthroscopy.<sup>4</sup> In an analysis of 45 professional athletes with FAI, Philippon et al<sup>15</sup> found that 42 athletes (93%) returned to professional sport after undergoing arthroscopic hip surgery, with 6 of 6 golfers returning to play.

Postoperative rehabilitation may have contributed to the success of these players. The players in this study followed the same rehabilitation protocol. The program is based on 4 phases: maximum protection and mobility, controlled stability of movement, reclamation of strength, and return to sport. Initially the focus is on early range of motion and protective weightbearing. Patients do flat-foot weightbearing, passive circumduction, stationary biking, and continuous passive motion. There are strict precautions on rotation based on the procedure performed. Progression to the next phase is dependent on when the patient experiences minimal pain and achieves range of motion equivalent to 75% of the opposite extremity. In the next phase, the goal is to normalize gain, restore full motion, and improve balance and proprioception. Once normal gait is demonstrated, the patient moves to the next phase, which aims to restore full preoperative muscular strength, endurance, and cardiovascular fitness. The last phase is sport-specific

training to restore the patient's power, explosiveness, and agility needed to return to play.

It is important to note outcomes are typically more dependent on the degree of osteoarthritis than on the underlying osseous abnormalities, and in some cases, total hip replacement may be more practical than arthroscopy.<sup>8</sup> It has been reported that 1 senior PGA golfer was able to return to play after surgery despite having diffuse osteoarthritis.<sup>15</sup> The authors of the study hypothesized that that senior golfer was able to return because of the low-impact nature of the sport, which highlights the importance of the individual sport when making a decision on treatment.<sup>15</sup> Not only the type of sport but also the professional athlete's career goals are important to consider when evaluating treatment options.

While this study specifically analyzed athlete performance after surgery, there are limitations. One of the limitations of this study is the low number of patients included. Although golf is a popular sport, the relative number of professional golfers is low, which could contribute to the low numbers in this study. Also, this study was limited to only 2 performance measures (driving distance and greens in regulation). These measures were consistently reported in the available PGA data and that driving distance would be the most indicative of how changes in hip health affected the player's athletic performance. Ranking or wins on tour were not used due to the player's participation in different tours. Another limitation of this study was that hip arthroscopy has advanced over the years of the study. Between 2004 and 2005, the operating surgeon transitioned from only treating the labrum, capsular redundancy, and cartilage of the hip joint to also addressing osseous impingement associated with FAI. The lack of objective and patient-reported outcomes is also a limitation. However, for these patients, the most important factor was returning to play golf, so this was the focus of this study.

## CONCLUSION

Arthroscopic management of chondrolabral dysfunction due to FAI in the symptomatic professional golfer allowed the golfer to return to the same skill level prior to surgery. Mean drive distance was found to increase after arthroscopy, demonstrating not only a return but also an improvement in driving performance from prior level of play.

## ACKNOWLEDGMENT

The authors thank Drs Peter Goljan and Teddy Fagrelus for their assistance with data collection.

## REFERENCES

1. Baker J, Deakin J, Horton S, Pearce GW. Maintenance of skilled performance with age: a descriptive examination of professional golfers. *J Aging Phys Act.* 2007;15:300-314.
2. Bechler JR, Jobe FW, Pink M, Perry J, Ruwe PA. Electromyographic analysis of the hip and knee during the golf swing. *Clin J Sport Med.* 1995;5:162-166.

3. Byrd JW, Jones KS. Hip arthroscopy in athletes: 10-year follow-up. *Am J Sports Med.* 2009;37:2140-2143.
4. Byrd JW, Jones KS. Arthroscopic management of femoroacetabular impingement in athletes. *Am J Sports Med.* 2011;39(suppl):7S-13S.
5. Ferguson SJ, Bryant JT, Ganz R, Ito K. The acetabular labrum seal: a poroelastic finite element model. *Clin Biomech (Bristol, Avon).* 2000;15:463-468.
6. Ferguson SJ, Bryant JT, Ganz R, Ito K. An in vitro investigation of the acetabular labral seal in hip joint mechanics. *J Biomech.* 2003;36:171-178.
7. Fradkin AJ, Cameron PA, Gabbe BJ. Golf injuries—common and potentially avoidable. *J Sci Med Sport.* 2005;8:163-170.
8. Gomberawalla MM, Kelly BT, Bedi A. Interventions for hip pain in the maturing athlete: the role of hip arthroscopy? *Sports Health.* 2014;6:70-77.
9. Hume PA, Keogh J, Reid D. The role of biomechanics in maximising distance and accuracy of golf shots. *Sports Med.* 2005;35:429-449.
10. Leunig M, Beaulé PE, Ganz R. The concept of femoroacetabular impingement: current status and future perspectives. *Clin Orthop Relat Res.* 2009;467:616-622.
11. Nepple JJ, Philippon MJ, Campbell KJ, et al. The hip fluid seal—part II: the effect of an acetabular labral tear, repair, resection, and reconstruction on hip stability to distraction. *Knee Surg Sports Traumatol Arthrosc.* 2014;22:730-736.
12. Official World Golf Ranking website. [www.owgr.com](http://www.owgr.com). Accessed March 3-10, 2015.
13. PGA Tour website. [www.pgatour.com](http://www.pgatour.com). Accessed March 3-10, 2015.
14. Philippon MJ, Nepple JJ, Campbell KJ, et al. The hip fluid seal—part I: the effect of an acetabular labral tear, repair, resection, and reconstruction on hip fluid pressurization. *Knee Surg Sports Traumatol Arthrosc.* 2014;22:722-729.
15. Philippon M, Schenker M, Briggs KK, Kuppersmith D. Femoroacetabular impingement in 45 professional athletes: associated pathologies and return to sport following arthroscopic decompression. *Knee Surg Sports Traumatol Arthrosc.* 2007;15:908-914.
16. Theriault G, Lachance P. Golf injuries. An overview. *Sports Med.* 1998;26:43-57.
17. Torry MR, Schenker ML, Martin HD, Hogoboom D, Philippon MJ. Neuromuscular hip biomechanics and pathology in the athlete. *Clin Sports Med.* 2006;25:179-197.