HIP ARTHROSCOPY PROTOCOL

Nevada Physical Therapy

Phase 1a

Weeks 0-2

Precautions (0-4 weeks):

- **90 deg Hip Flexion, 0 deg Hip Extension, 0-20 deg ER (surgeon dependent), 30 deg ABD restrictions**
- **Avoid straight leg raises (Spencer-Gardner et al. 2014)**
- **Avoid sitting longer than 30 mins at a time (Kuhns et al.)**
- **Avoid pivoting on involved Limb (Spencer-Gardner et al. 2014)**
- **Utilize ice and anti-inflammatory medications as prescribed/ needed.**
- **No active hip flexion >4+ weeks (Adib et al. 2018)**

Common Pitfalls:

- **Excessive Weight-Bearing**
- **Pushing through pain during mobility and stability progressions**
- **Rapid progression of exercise volume and intensity**
- **Under-utilization of ice and anti-inflammatories**

Mobility/Range of Motion:

- IR Log Rolls/Circumduction
- Reverse Butterfly at 45 deg hip flexion
- Modified Thomas Stretch

Therapeutic Exercise:

- Stationary Bike (90 deg hip flexion restriction)
- Isometrics (all planes except hip flexion)
- Standing (on UNINV) ABD with IR
- Standing TKEs
- Prone Hip Extension Ball Roll Outs

Phase 1b

Weeks 3-5

Mobility/Range of Motion (including above)

- Cat-Camel/Quadruped Rockbacks (90 deg Hip Flexion Restriction, i.e. forward version)
- Prone on Elbows

Progression Criteria:

- **Normalize PROM within precautions**
- **Normalize gait with appropriate aide**
- **<3/10 verbal pain scale**

Therapeutic Exercise (including above)

- TA OH Pullovers (surgical leg straight)
- Reverse Clamshells, no resistance
- Weight Shifts
- Tall Kneeling
- Progress Prone Hip Extension without ball assist
- 2L Bridge
- Prone HS Curls (monitor for hip flexor)
- Deep Hip Rotators (ER) >wk 4

Phase 2

Weeks 5-12

Precautions:

- **No sidelying hip abduction > 6wks**
- **No elliptical or stairmaster >10 wks**
- **Avoid rotation in CKC under load >10+wks.**
- **No resisted hip flexion >8 weeks (Adib et al. 2018)**

Common Pitfalls

- **Premature discontinuation of gait aides if criteria not met**
- **Pain with daily activity**
- **Rapid progression of exercise volume and intensity**

Progression Criteria:

- **ROM symmetry (except flexion/ER)**
- **Normalize gait**
- **Negative Trendelenburg**
- **>70% LSI dynamometry in all planes except hip flexion**
- **>70% on 1L Squat/Side Plank Test**
- **FABER 50% of UNINV or better**
- **Y-Balance <8cm deficit all planes**
- **HOS ADL of at least 89%**

HIP ARTHROSCOPY PROTOCOL

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Phase 2

Weeks 5-12

Mobility/Range of Motion:

- Modified Thomas Stretch
- Butterfly/Reverse Butterfly
- Seated Hamstring Stretch
- Stool Rotations
- FABER Stretch/FABER Slides
- Prone Quad Stretch
- Standing ABD Stretch >6 wks
- Standing ADD Stretch >6 wks
- 1/2 Kneel Hip Flexor Stretch >6 wks
- Saddle Stretch/V-Stretch

Therapeutic Exercise (including above)

- 2-Step Drill
- Hip Hikers
- Reverse Lunge
- Leg Press
- Knee Extensions
- Prone Hamstring Curls
- Heel Elevated Squats/TRX Squats
- Sidelying External Rotation
- Clams On Wall
- 2L Bridge/1L Bridge
- Bird Dogs
- Front Planks
- Reverse Sled
- Step Ups >6 wks
- Resisted Lateral Agility/Side Steps >6 wks
- RDLs >6 wks
- Side Planks >6 wks
- 1L RDLs >6 wks
- Sidelying Hip ABD, resisted >6 wks
- Barbell Bridge >6wks
- Hip Thrusters >6wks
- Rear-Foot Elevated Split Squats/ Bulgarian Split Squats >8 wks
- Plank Progressions
- Squat Progressions

Phase 3

Weeks 12-16

Common Pitfalls

- **Initiating Return to Run protocol prior to skill block 1**
- **Exceeding hip flexor tolerances as skill/run blocks progress**
- **Decreasing mobility emphasis too soon**
- **Progressing intensity too quickly**

Therapeutic Exercise (including above)

- Deadlifts
- Barbell Back Squats (earlier if well tolerated)
- Cossack Lunge
- Copenhagen Planks
- Reverse Nordics/Nordics
- Resisted Hip Flexion
- Side Plank Progressions
- Return to Run Skill Blocks
- Return to Running Protocol

Progression Criteria:

- **PROM >90% symmetry in all primary planes**
- **FABER >80% of UNINV**
- **>85% LSI on all HHD testing Y-Balance <6 cm in all planes**
- **>80% LSI with 1L Squat and Side Plank Testing**
- **>60% LSI with Copenhagen Testing**
- **Tolerate Phase 1 skill and plyo work with good tolerance (<2/10 pt VAS increase)**
- **Complete Return to Running Protocol**

Sample Skill Block 1 (Pre-Run Skills; see Appendix)

- Wall Marches> Wall Switches> DBL Wall Switches> A skips
- Pogos> 1L Lateral Tape Hops> FWD Pogo Mini-Hurdles
- Bulgarian Split Squat Tempo> Bulgarian Split Squat Hops
- Sled Push> Sled Sprints (moderate effort)

HIP ARTHROSCOPY PROTOCOL

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Phase 4

Weeks 16-RTS

Common Pitfalls

- **Failure to set appropriate expectations; ie. it is normal to still to have occasional hip symptoms at 4 months post-op; establishing appropriate expectations is encouraged to minimize emotional stress with athletes**
- **Continuing to progress workload in the presence of hip symptoms**
- **Persistent anterior hip symptoms, + FADIR**
- **Arbitrary skill progressions**
- **Failure to establish cardiovascular conditioning program**

Therapeutic Exercise

- As above with decreased volume and higher efforts with primary lifts (Squat, Deadlift, Olympic lifts)
- Progression into more explosive lifts, i.e. banded speed pulls, barbell snatch, clean and jerk, etc.
- Continued isolation work as needed based on RTS testing
- Maintain eccentric-focused movements throughout RTS phase and beyond, ie. Nordic HS Curls, Reverse Nordics, Copenhagens

Skill Development Model (sample)

- Sled Sprints/Lean Starts > Sprint to Decel > Sprint to Backpedal > Sprint to Backpedal to 180 deg turn
- 1L Drop Landings > Assisted 1L Vertical Jumps > 1L Reactive Box Jumps > 1L Vertical Jump
- Lateral Shuffle Cone Drill > 5-10-5 frontal plane > 5-0-5 > 5-10-5
- W sprints > Sprint to 45 deg Cut > DVJ to Sprint > Reactive Sprint Drill
- Unanticipated Skill Development

Return to Sport Criteria

- **>90% LSI with dynamometry testing for hip flexion, extension, abduction, adduction and external rotation**
- **ADD Torque to Bodyweight >2.3 Nm/kg; ABD Torque to Bodyweight > 2.0 Nm/kg; ADD:ABD >1.1**
- **>90% LSI with Copenhagen Plank and Side Plank Hip Abduction testing; maximum reps to failure**
- **Y-balance completed with less than 4cm deficit in any plane**
- **Successful completion of force plate testing with less than 10% asymmetry seen in all metrics (see force plate metrics)**
- **Completion of Phase 4 plyometric block training with less than 2/10 pain**
- **Vail Lateral Agility Test completed for 100 repetitions in 100 seconds with less than 10% error (maintain knee flexion, no valgus moment, center of mass alignment over ankle, etc)**
- **5-10-5 completed with less than .25 sec deficit side to side, sub 5-seconds for Division 1 athletes, qualitative assessment with video for side to side comparison**
- **HIP-RSI >80 pts, HOS-ADL >96 pts, HOS-SPORT >78%**
- **Establishment of appropriate workload for returning to full athletic activity, i.e. an athlete should be cleared for all activity but with progressively decreasing volume constraints until completing >70% of normal in-season demands**

HIP ARTHROSCOPY PROTOCOL

Nevada Physical Therapy

Introduction

Hip arthroscopy utilization to treat femoroacetabular impingement, labral tears, and other intra-articular hip pathologies has increased exponentially over the last two decades (1,2), however there appears to be a dearth of quality research to support rehabilitation guidelines and clinical decision making. Heerey et al. state regarding post-operative management that "exercise selection has often been based on theoretical constructs that have no underpinning of clinical evidence" (3). A recent review published in 2020 (4) investigated structured physical therapy for hip arthroscopy as it related to patient-reported outcome measures and was able to include only six articles; the most recent being published in 2018 (3). Much of the research published is either anecdotal or built off outdated and/or inaccurate research. For example, one of the most heavily cited authors in this area (5), in their 2016 publication, suggest hip adduction and internal rotation due to glute medius weakness causes increased strain on the repaired labrum although no citation for this statement is provided (6). Strain studies performed by Safran et al. (7) show no significant increase in strain on either the anterior or superior labrum in this position although it should be noted this was a cadaver study and compression forces were not applied (Figure 1). Similarly, minimal strain on the labrum was noted in closed chain tasks such as standing, ascending or descending stairs (8). Both papers suggest that in an anatomically normal hip, the labrum is not significantly involved in load distribution with daily activities.

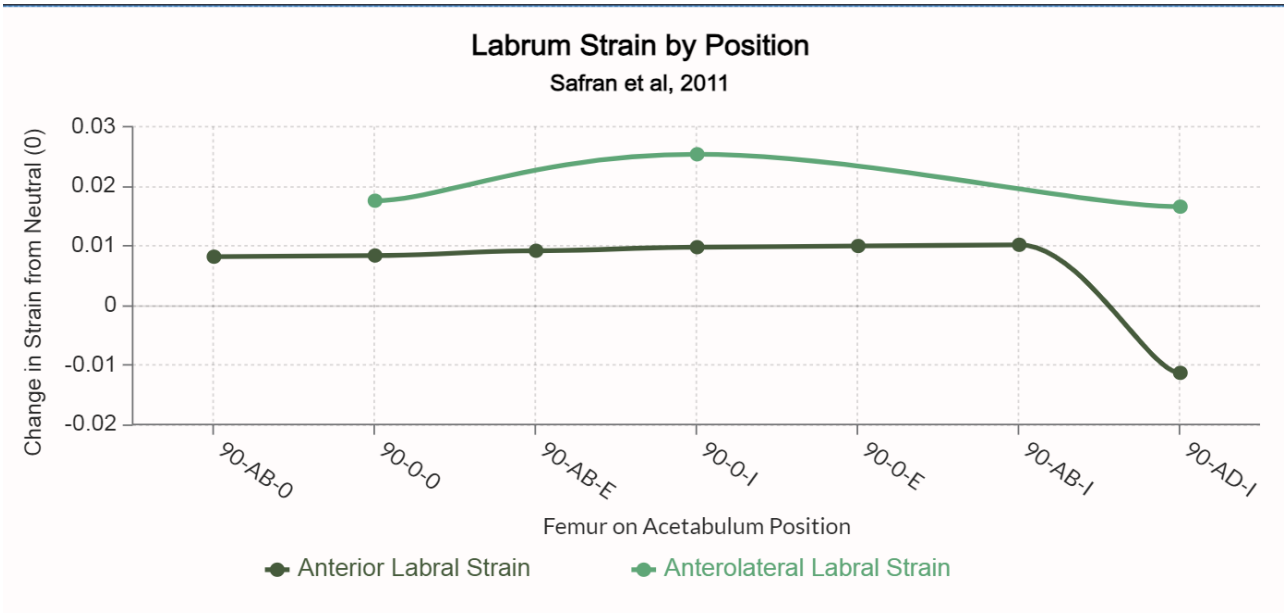

Fig 1. **(Horizontal axis: X-Y-Z (X=Flexion, Y=ABD, Neutral or ADD, Z= IR, Neutral or ER);** FADIR position (90-AD-I) included for demonstrative purposes although was not statistically significant from neutral

Domb et al. was published in 2016 with a total of 18 citations with only four of those references being published in the last 10 years (6). Pubmed searches for "hip arthroscopy protocol", "hip labral repair protocol", "hip arthroscopy rehabilitation" and similar yield few relevant results with the most recent protocol published in 2023 by Naessig et al. (3,9-9a). The Naessig et al. protocol was so conservative it immediately received a letter to the editor to this effect suggesting persistent disagreement among researchers and clinicians and a need for an updated approach. Several systematic reviews and meta-analyses have been conducted on the current state of rehabilitation after hip arthroscopy and demonstrate a continued need to improve our scientific foundation for clinical management (10,11). This protocol was written to update clinicians on the current state of the research and guide clinical decision making although it remains to be validated.

HIP ARTHROSCOPY PROTOCOL

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Biomechanics

Biomechanically, the labrum increases the articular surface of the hip by approximately 22% (12) and acts as a fluid seal creating a "suction effect" to reduce hip joint distraction (7). Crawford et al. showed a 43-60% reduction in force required to distract the hip 3mm when the labrum was ventilated or when an artificial 15mm tear was created (13). This fluid seal is thought to support hydration of the articular cartilage and decrease articular cartilage stress in the fluid phase (14) although this hydrostatic pressure system and its relationship to articular cartilage health continues to be investigated. A recent publication has shown removal of the labrum did not seem to significantly increase cartilage contact stress despite increased force applied to the cartilage in the solid phase (8). Increased displacement at the cartilage edge on the articular surface, a proposed mechanism for osteoarthritis, was identified with labral resection, however (15). More research is needed to draw long term conclusions on labral insufficiency as it relates to joint health, function, and quality of life in later years.

As previously mentioned, the labrum itself has a small load-bearing component in anatomically normal hips; bearing approximately 1-2% of the load with activities like walking and ascending or descending stairs (8) and 0-4% with squatting (15). This percentage increased to 4-11% with gait and stair navigation tasks when dysplasia was present (8). Safran et al. (7) studied strain forces in the labrum with different loading positions with the strain values that reached statistical significance illustrated in Fig.1. While load forces change based on hip positioning, the failure rate appears to be well above these peak strain thresholds, 10.4%(16) and 8% (17) respectively. It should be noted, that while failure rates were established in surgically excised samples in vivo, the average age of the participants was 60 years old (age range 35 to 78 years old) and human tissue free of pathology has not been investigated to this author's knowledge.

Risk Factors For Groin Injury

Femoroacetabular impingement, trauma, capsular laxity, hypermobility and dysplasia have been identified as risk factors for labral injury (7). None of the risk factors listed are considered modifiable; this protocol includes risk factors for hip and groin injury (i.e. adductor/psoas strain) to help guide Return to Sport testing. While we recognize the logical leap, this protocol relies on the current evidence of post-operative predictors for hip arthroscopy outcomes AND an emphasis on decreasing modifiable risk factors for hip and groin injury. Research regarding risk factors for labral tear and/or groin injury are conflicting and warrant continued research.

Niemuth et al. (18) found decreased hip abduction and hip flexion strength and increased adductor strength as significant risk factors for injury in runners compared to uninjured controls although Markovic et al. found adductor weakness and side to side asymmetry to be significant risk factors (19). Adduction strength of less than 80% of abduction strength in hockey players demonstrated a 17:1 increased relative risk of sustaining a groin injury (19). Langhout et al. report previous injury as the primary risk factor for future injury (20) although Markovic et al. did not (19); however this is noted by Markovic et al. to be potentially related to the small sample size of their study. While total hip rotation of less than 85 degrees has been identified as a risk factor (21), Short et al. (22) note that using this metric would effectively include the majority of all athletes in specific sport populations thus potentially limiting its value.

Trends in research seem to suggest decreased absolute and relative adduction strength, abduction:adduction strength of less than .8, level of sport participation, and lower level of sport-specific training as risk factors for groin injury (23) although care should be exercised with over-extrapolating this date to the general patient population.

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Preoperative Considerations

While the biopsychosocial (BPS) model is not new, it has seen a significant increase in popularity over the last several years. Although it is not the intent of this protocol to discuss the BPS model in depth, the psychological research around hip arthroscopies warrants specific attention. Stone et al., whose group has several publications in this area, investigated risk factors for those experiencing persistent post-surgical pain after hip arthroscopy (24). They found two primary risk factors for persistent post-surgical pain: surgical revision and positive history of anxiety or depression diagnoses. They defined persistent pain as a VAS >30 at 2 years follow up which was the arbitrary cutoff of the top 25% score for participants. Summary: 174 of the 688 patients fell into the persistent pain inclusion criteria with a 1.88 odds ratio, 95% CI 1.02-3.32 p value .042 = 84% more likely to have persistent pain.

In 2018, an investigation by Rosenblum et al. (25) had a smaller participant pool (as did the majority of the studies investigating this topic) with 51 patients participating and reported 45.1% of participants as having a positive medical history of psychiatric diagnosis of mental illness (compared to 23% in the control group consisting of similarly matched patients undergoing knee arthroscopy) with an odds ratio of 3.4. For those interested more in this topic, this paper does an excellent job of summarizing other studies in this area and further reading is recommended. *However*, there is research showing 42% of patients undergoing ACLR were classified as having mild to moderate depression based on the Quick Inventory of Depressive Symptomatology (QIDS) scale published in 2016 (26). Baron et al. investigated failure rates (failure being defined as revision hip arthroscopy or conversion to a total hip arthroplasty) in individuals undergoing primary hip arthroscopy and reported the presence of psychiatric comorbidities as an independent risk factor for revision of primary hip arthroscopy. Additionally, they reported 18% of those undergoing hip arthroscopy required additional surgery. (27)

After surgical intervention, patients with mild depression symptoms responded better to surgery than those with moderate to severe depression symptoms although improvement was seen in both groups (28). It is important to note that patients experiencing moderate to severe depression did still report improvement in quality of life and function, just less so compared to individuals with no or mild mental health symptoms (29). Post-operative outcomes are explored in more detail in the Return to Play section of this protocol.

Pre-operatively, hip extension weakness has been identified as an independent predictor for less favorable postoperative outcomes (29). Hip flexion weakness at 16 weeks and even 8 months post-op (31-32), persistent decrease in dynamic hip external

Postoperative Considerations

One of the most common questions a patient will ask when seeking care for an injury, especially post-surgical intervention, is "when can I get back to doing the things I love?" In regard to hip arthroscopy, this is an area where there are very few resources available for both clinicians and patients on what to expect after surgery. With the 18x increase in procedures performed between 1999 and 2009 (24) and the 250% increase in hip arthroscopy procedures performed between 2007 and 2011 (36) , it should follow that clinicians are able to accurately set expectations for patients for the next several months of rehabilitation. As described below, this does not match reality.

***"It is likely that some misconceptions and conflicting information from health professionals reflect the lack of clarity in rehabilitation protocols"*- Jones et al. 2020**

"...return to sport alone is a poor indicator of treatment success...return to sport may reflect the desire or need for these athletes to return to their profession as fast as possible."- Thorburg et al. 2018

HIP ARTHROSCOPY PROTOCOL

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Postoperative Considerations (continued)

A recent study by Jones et al. investigated the mismatch between patient expectations and reality after hip arthroscopy. While the sample size was relatively small, the findings appear to support clinical presentations; specifically that every patient in this group demonstrated a mismatch in expectations and return to activity at six months post-op (37). They routinely reported having an anticipated timeline of approximately 3-4 months to be back to prior level of function. One interviewee is quoted "*I feel like it's much slower than I thought -I really had projected about 3, 4 months then really believed that I would probably be back to normal by then -I don't know why I thought that.*" Many of these beliefs came from healthcare providers, which may also suggest that it is not only patients who do not have an accurate grasp on what to expect but also the medical personnel involved in this process. Setting expectations for the road ahead is, in our opinion, one of the most essential services we provide for patients; if you know what is coming then you are likely able to minimize the psychological effects (anxiety, frustration, depression, etc.) often seen when expectations do not match reality. Many patients in this study reported experiencing these emotions as they went through the rehab process, commonly referencing things like "*(it's) this last 3 months that my frustration has grown more, because it hasn't progressed for me in the way that I would have thought. That's been really hard.*" As previously described regarding psychological considerations for patients, it should come as no surprise that when an individual realizes unmet expectations, negative emotional experiences often follow. Curiosity of the origin of these expectations was the purpose of this investigation and subsequently, creating a resource for patients that have recently undergone or are considering hip arthroscopy to help calibrate expectations.

The Protocol

Phase 1 (weeks 0-5)

Patients are strongly encouraged to be seen within 72 hours of surgery to establish rehabilitation expectations and decrease the potential of inadvertently developing movement habits that may complicate rehabilitation or place excessive strain on the repair. If possible, a visit prior to surgery can help set the stage for a smooth transition from surgery to rehabilitation.

Phase 1 of this protocol should last between 1-6 weeks depending on criteria-based progress. There are several goals in this phase beginning with protecting the tissue and allowing healing to occur. Weight bearing precautions vary between non-weight bearing and weight bearing as tolerated (9-10,43) and most protocols progress to weight bearing as tolerated over the first 3-4 weeks (44-47,9). Guidelines may vary based on whether a labral repair or debridement was performed and the extent of bone resection needed to restore hip function, microfracture, hip dysplasia, etc. can all affect weight bearing progressions and consultation with the surgeon is recommended.

PRECAUTIONS

- **Avoid straight leg raises (Spencer-Gardner et al. 2014)**
- **Avoid sitting longer than 30 mins at a time (Kuhns et al.)**
- **Avoid pivoting on involved Limb (Spencer-Gardner et al. 2014)**
- **Utilize ice and anti-inflammatory medications as prescribed/needed.**
- **No active hip flexion >4+ weeks (Adib et al. 2018)**

COMMON PITFALLS

- **Excessive Weight Bearing**
- **Pushing through pain during mobility and stability progressions**
- **Rapid progression of exercise volume and intensity**
- **Under-utilization of ice and anti-inflammatories**

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The Protocol

Phase 1 (weeks 0-5) continued

In addition, there are usually movement precautions such as avoiding excessive hip extension, external rotation, and actively raising the surgical leg (45, 46) to minimize stress to the repaired tissue or hip aggravation. Other goals of phase 1 include appropriately managing pain (9,45,51,52), restoring hip mobility between 75-90% of the uninvolved hip or within PROM precautions (9, 47, 50), normalizing gait with gait aids such as crutches (45,50,52), and beginning strengthening exercises (9,44-47, 50-54).

By the end of phase 1, an individual should be able to move around their home independently, perform most of their normal daily activities such as clothing and self-hygiene, and tolerate lower level exercises as delineated in table 1. One common pitfall of particular interest is the tendency of developing hip flexor tendinopathy (9-10, 44-47). Adib et al. reported approximately 24% of subjects developed hip flexor tendinopathy after hip arthroscopy in their 2018 investigation (49). For this reason, straight leg raises, holding the foot off the floor in front of the body while using crutches, and getting in and out of bed without assistance of your uninvolved leg may become problematic early in the rehabilitation process.

WEEKS 0-2

- Heel Slides to 90 deg Hip flexion
- Banded Ankle Isotonics
- Quadruped Rockbacks/Cat-Camel
- OH Abs/Pullovers
- Quad/Ham/Glute Isometric Sets
- TKEs
- Standing Hip ABD w/ IR
- Stationary Bicycle, no resistance, <90 deg hip flexion
- Weight shift to tolerance, WBAT progressions*

WEEKS 3-5

- Prone Hip Extension Ball Rollouts
- Standing Hamstring Curls
- Glute Max Sidelying Holds
- Reverse Clams/ER Clams
- Tall Kneeling
- Calf Raises
- Two Step Drill (week 4-5)
- Heel Elevated Squats at Wall (week 4-5)
- Reverse Lunge (week 4-5)
- Inclined Front Planks (week 5)

<u>Weight bearing Considerations</u>: Protocols for hip arthroscopy rehabilitation nearly unanimously report partial weight bearing for the first several weeks following surgery (11); this protocol recommends weight bearing as tolerated in the absence of additional concomitant injury, e.g. microfracture, osteopenia, dysplasia or extensive femoral neck resection. In a recent study completed by Avnieli et al., no differences were found between individuals that could progress weight-bearing as tolerated compared to those who were delayed. Additionally, they report that labral repair failure was associated with persistent bony impingement rather than weight bearing status (43). Femoral neck fracture was associated with greater than 30% of the femoral neck being resected although the overall risk of femoral neck fracture was 0.1% (48). Allowing weight bearing to be progressed based on the individual's tolerances, history and surgeon guidelines may minimize secondary symptom development such as hip flexor tendinopathy or Achilles contracture (46, 49) and facilitate phase progression based on impairment rather than timeline alone (3). As always, consult with the referring physician for their weight bearing precautions and recommendations.

PROGRESSION CRITERIA

- Normalize PROM within precautions
- Normalize gait with appropriate aide
- <3/10 verbal pain scale

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The Protocol

Phase 2 (weeks 5-12)

During this phase, the first priority is to regain mobility in the involved hip closely followed by developing work capacity and strength required to begin participating in low levels of sport or activity specific movement. Normalizing end range passive mobility is emphasized as precautions are lifted. Persistent hip flexion PROM deficit was noted by Worner et al. at 8 months (+/- 2.6 months) despite this often being when most athletes are cleared to return to sport (32) and subsequently, PROM greater than 90% of the uninvolved side in all planes is emphasized for progression to phase 3. Building these physical characteristics (mobility, capacity, and strength) takes time and rushing through this phase may increase the risk of regression and poorer outcomes when it comes to returning to sport (46) and patience with the process is encouraged. To help illustrate this point, studies from one group exclusively treating *elite* professional athletes demonstrated that the mean time to return to sport activities was on average 3.4 months (56, 57) and full return to sport was 5.7-9.2 months for professional soccer players (58). In addition, it is commonly reported that most individuals have capacity deficits prior to having surgery; *capacity* being defined as mobility, strength, stamina, etc. and subsequently, developing these physical characteristics after surgery is strongly encouraged (55,59). These themes are emphasized in this phase but continue throughout the rehabilitation process.

PROGRESSION CRITERIA

- **ROM symmetry (except flexion/ER)**
- **Normalize gait**
- **Negative Trendelenburg**
- **>70% LSI dynamometry in all planes except hip flexion**
- **>70% on 1L Squat/Side Plank Test**
- **FABER 50% of UNINV or better**
- **Y-Balance <8cm deficit all planes**
- **HOS ADL of at least 89%**

PRECAUTIONS

- **No side lying hip abduction > 6wks**
- **No elliptical or Stairmaster >10 wks**
- **Avoid rotation in CKC under load >10+wks**

Sample Program at week 7-8

		Reps x Sets	Notes	Hip Series
Day 1	Hip Series	20 reps ea	See Daily Hip Series (can be 5x/wk)	2L Bridge
	Lateral Agility	3x10 yds	Banded, warm up	1L Bridge
	Resisted ER Clams	2-3 sets of 12-15	Light resistance, tempo reps	Bird-Dogs
	2 Step Drill	2x6-8 ea side	Lateral and Posterior, both sides	Prone Hip Extensions
	Reverse Lunge	2-3x 5-6	Scale depth based on symptoms	Standing Hip ABD
	Heel Elevated Squat	3-4x8-12	Should be moderate intensity, RPE 6/10 max	
	Front Planks	3x20-40 seconds	Build time as able, minimize lumbar extension	
	Reverse Sled	2-3rds x 60-90 seconds	No Resistance or light resistance	

	Day 2	Reps x Sets	Notes	Hip Series
Day 2	Hip Series	20 reps ea	Add light resistance around the knee, both legs	2L Bridge
	2 Step Drill	2x8 ea	Both legs, add band if easy	1L Bridge
	Lateral Agility	2-3 x 30-60 sec	Banded at knees, minimize valgus moment	Bird-Dogs
	2L RDLs	2-4x 6-10 reps	RPE 6/10 or less, scale depth for hip symptoms	Prone Hip Extensions
	1L RDL Progression	2-4 x 5-8 reps	Skill and tolerance emphasis	Standing Hip ABD
	Side Planks	3-4 rds x 20-40	Modify based on tolerances.	
	Hip Hikers	2x12-15 ea	Skill emphasis	

	Day 2	Reps x Sets	Notes	Hip Series
Day 3	Hip Series	20 reps ea	Add light resistance around the knee, both legs	2L Bridge
	Monster Walks	3x 60 sec	BAnd around knees, warm up	1L Bridge
	KB Step Up	3-4 rds x 8-10 reps	Adjust height as needed based on hip symptoms	Bird-Dogs
	BB Bridge	2-4x 6-10 reps	RPE 6/10 or less, scale, build skill and tolerance	Prone Hip Extensions
	Hip Thrusters	3-4 rds x 8-12 reps	Add band around knees to increase difficulty	Standing Hip ABD
	Sidelying Hip ABD	3 x 10-15	Add resistance if easily can complete 3x15	
	Pallof Press	2-3 rds x12-15 ea	Add resistance as able	

HIP ARTHROSCOPY PROTOCOL

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The Protocol

Phase 3 (weeks 12-16)

As previously mentioned, strength deficits are likely to have existed prior to surgery and often persist long after formal rehabilitation is completed (29-33) and for this reason, progressive strength training is emphasized during this phase in anticipation for reintegration into sport or recreational activities. Meeting phase 3 progression criteria should also include the implementation of a strengthening program that has been demonstrated to be reproducible and implemented independently by the patient. Patients are seen 1-2x per month during this phase and a strength program able to be completed outside of clinic visits should be prioritized. Once mobility progression criteria have been met (95% or greater of the uninvolved side) and limb symmetry deficits have reached a minimum threshold (90% of uninvolved side), rate of force development begins to be progressively emphasized over the course of this phase. This may include force absorption, eccentric control, acceleration, deceleration and change of direction proficiency.

PROGRESSION CRITERIA

- **PROM >90% symmetry in all primary planes**
- **FABER >80% of UNINV**
- **>85% LSI on all HHD testing Y-Balance <6 cm in all planes**
- **>80% LSI with 1L Squat and Side Plank Testing**
- **>60% LSI with Copenhagen Testing**
- **Tolerate Phase 1 skill and plyo work with good tolerance (<2/10 pt VAS increase)**
- **Complete Return to Running Protocol (see appendix)**

PRECAUTIONS/PITFALLS

- **Initiating Return to Run protocol prior to skill block 1**
- **Exceeding hip flexor tolerances as skill/ run blocks progress**
- **Decreasing mobility emphasis too soon**
- **Progressing intensity too quickly**

Sample Program at week 13-14

	Week 1		
	Day 1	**Sets and Reps**	**Weight**
Band Walk	Lateral Crab Walk, knees...	3x60 sec	
Skill	Wall March	3x6 ea (progress to switches next week)	
Primary	Barbell Deadlift	3x6 @ 2-3 RIR	
Secondary	1L RDL	3x6-10 @ 3 RIR	
Hypertrophy	Banded Hip ABD in Sidelying	2x15 @ 1 RIR	
Core	Side Plank Progression	3 rds x 20-40 sec, see video to scale	
	Day 2	**Sets and Reps**	**Weight**
Band Walk	Monster Walk FWD, Kne...	3x60 sec	
Skill	Pogos	4x20"	
Primary	BB Front Squat	4x8 @ 3-4 RIR	
Secondary	RFESS	3x6-10 @ RIR 3-4	
Hypertrophy	1L Elevated Bridge	3x10, 12 in box	
Core	Front Planks with Leg Lift	3-4 rds @ 40-60 sec (switch legs halfway through)	
	Day 3	**Sets and Reps**	**Weight**
Band Walk	Lateral Crab Walk, knees...	3x60 sec	
Skill	Bulgarian Split Squat Tempo	4x20"	
Primary	Glute Bridge (Barbell or Kettlebell)	10/8/6/4 ladder @ 2 RIR	
Secondary	Copenhagen Plank	2-3 rds x 4-6 reps	
Hypertrophy	1L Hip Thrusters	2x15 @ 0-1 RIR	
Core	Glute Med Side Plank	3-4x 15-30 sec, banded	

HIP ARTHROSCOPY PROTOCOL

Nevada Physical Therapy

The Protocol

Phase 4 (weeks 16-RTS)

This is potentially the longest phase in rehabilitation and time to return to play will vary based on the surgical procedure, progress with rehabilitation, and level of play being returned to, among a host of other contextual factors. Goals of this phase are to maintain a regular strength-based program and begin incorporating power, speed, and reintegration into sport with good tolerance. During this phase, sport-specific activities will be incorporated and once tolerance to mobility, strength, and work capacity development have been established, light practice may begin while maintaining a regular training program. Strength, power, and speed training will increase in the program to meet the demands of sport depending on the sport, position, time in season, and individual athlete traits. There is likely a strong desire to return to sport and activity and patients often have an expectation of returning to sport at 4 months although, as discussed above, this does not often match reality (60,40). Not only is average return to play around 7 months on average after hip arthroscopy but recent research also suggests only 57-74% return to their prior level (39-40). Physical therapy following hip arthroscopy is typically under dosed over the course of 24 weeks (61-62) *and* underloaded (55) due to most rehabilitation studies reporting rehabilitation protocols that follow mostly table-based, low-load, non-functional exercises for the majority of the program (54). For this reason, Phase 4 of this protocol incorporates high-load, functionally-based exercises to promote adequate preparation in the individual's return to sport rehabilitation. Phase 4 is completed with successful completion of the RTP battery as described below.

Hip arthroscopy, at first glance, has a very high success rate with return to sport often reported to be anywhere from 85-95% depending on the author (39, 41) however these rates may be overly optimistic. The infographic below shows commonly reported rates of improvement in function, return to sport, etc. from various publications but what may matter more is how we are *defining* Return to Play or Return to Sport. O'connor et al. completed a meta-analysis on the topic and found an average RTP of 7.4 months with 84% of the 1296 participants returning to play. However, a significant difference was noted between levels of competitiveness and rate of RTP: recreational athletes RTP was 66.7-84% with professionals being in the 82-93% range although subjective reporting of *quality* of play was not reported (38). With some authors reporting anywhere from 17% -74% of athletes making it back to the equivalent or better level of play (39-40) and other authors reporting 92% (41), it becomes clear that more research is needed.

Majority of improvement is seen in the first 3 months in ADLs, Pain, QoL, however only 62% reached acceptable Sport and Recreation Participation by 6 months. (Thorborg et al. 2018)

87-93% Return to Sport but only 55-83% to Prior Level of Competition (Parvaresh et al. 2020)

These wide variations in RTP rates may be due to, in part, that most of the studies were completed in populations where many of the surgeries were done by one surgeon in a high-volume setting which may bias the findings previously reported (41). Defining terms seems to be key in creating an accurate expectation on RTP after hip arthroscopy, specifically Return to Play vs Return to Participation vs Return to Play at Pre-injury level, etc. There is clearly a need for additional research on rehabilitation protocol efficacy, objective RTS criteria, and a more comprehensive assessment of the multifactorial aspects of an athlete's readiness to return to the field. Specifically things like external motivation to play (38), psychological readiness (63), etc. all may contribute to a successful RTP for a post-surgical athlete.

HIP ARTHROSCOPY PROTOCOL

Nevada Physical Therapy

The Protocol

Phase 4 (weeks 16-RTS)

While there are many similarities between rehabilitation of the post-surgical ACLr patient and post-op hip arthroscopy patient, one of the primary differences is a lack of RTP objective criteria for those who have undergone hip arthroscopy. While ACLr research has a wealth of RTP studies (yet very little agreement), there are far fewer hip arthroscopy publications. Recent systematic reviews investigating post-operative rehabilitation for hip arthroscopy often yielded less than 40 articles from which the reviews could be performed (39, 64-65) and of those protocols, high variability is noted between them (11).

With regard to RTP criteria, there is even less data to guide clinical decision making as demonstrated in a review completed in 2019 which reported 64% of the included studies used "*completed rehabilitation program*" as their RTP criteria (65). O'Connor et al. used a four-point scoring on RTP protocols (timeline, conditional criteria, specific measurements for conditional criteria, and rehab protocol) with a maximum score of 4 if the protocols included all sections. In their review, 13.6% scored a 0 and 63.6% scored a 2 or less (38). Reiman et al. reviewed 35 publications- they found none of the included studies reported criteria to assess readiness to return to play other *than time from surgery*. (39) Similarly, Chona et al. reported *"no studies included in this review measured return to play based on the achievement by athletes of sport-specific performance metrics equivalent to their preoperative level."* (65)

The return to sport testing criteria at each phase progression was derived from the collection of systematic reviews and RCTs as referenced below. Only tests that were reported in 2 or more studies from different authors, have been reliably reproduced in other studies, and were deemed practically reproducible in a clinical setting were included in the return to sport testing criteria. For example, hand-held dynamometer (HHD) testing for the hip has been reliably demonstrated (68-69) and was used in three studies though two of the three were from the same group (44,8,46). Correlations between isolated strength testing and functional testing such as the side plank test and single leg hop for distance have also been established as reliable and reproducible clinical assessments on hip joint function (69) . Kierkegaard et al (70) showed a positive correlation with hip extension strength and patient reported outcomes (as well as persistent decreased hip extension strength in patients after surgery), the modified Hip-RSI has been demonstrated as a valid measure for psychometric assessment on readiness to play (63), and the HOS being the current outcome measure with the most "clinometric evidence" (71). Although the RTS testing battery delineated in phase 4 is derived from various published protocols, comparative data is limited and more research is needed.

- **>90% LSI with dynamometry testing for hip flexion, extension, abduction, adduction and external rotation (9) with ADD:ABD ratio of >1.1 (19)**
- **ADD Torque to Bodyweight >2.3 Nm/kg; ABD Torque to Bodyweight > 2.0 Nm/kg; ADD:ABD >1.1**
- **>90% LSI with Copenhagen Plank and Side Plank Hip Abduction testing; maximum reps to failure**
- **Y-balance completed with less than 4cm deficit in any plane (75,76)**
- **>90% 1L Hop Testing (45); Successful completion of force plate testing with less than 10% asymmetry seen in all metrics (see force plate metrics in appendix)**
- **Completion of Phase 4 plyometric block training with less than 2/10 pain (see appendix)**
- **Vail Lateral Agility Test completed for 100 repetitions in 100 seconds with score of 14/15 or greater (9)**
- **5-10-5 completed with less than .25 sec deficit side to side, < 5-seconds for Division 1 athletes, qualitative assessment with video for side to side comparison**
- **HIP-RSI >80 pts (63), HOS-ADL > 96%, HOS-SPORT>78% (9, 71, 73)**
- **Establishment of appropriate workload for returning to full athletic activity, i.e. an athlete should be cleared for all activity but with progressively decreasing volume constraints until completing >70% of normal in-season demands**

References Cited

1.Khan M, Habib A, de Sa D, Larson CM, Kelly BT, Bhandari M, Ayeni OR, Bedi A. Arthroscopy Up to Date: Hip Femoroacetabular Impingement. Arthroscopy. 2016 Jan;32(1):177-89. doi: 10.1016/j.arthro.2015.10.010. PMID: 26743420.

2. Westermann RW, Day MA, Duchman KR, Glass NA, Lynch TS, Rosneck JT. Trends in Hip Arthroscopic Labral Repair: An American Board of Orthopaedic Surgery Database Study. Arthroscopy. 2019 May;35(5):1413-1419. doi: 10.1016/j.arthro.2018.11.016. Epub 2019 Apr 9. PMID: 30979629

3. Heerey J, Risberg MA, Magnus J, Moksnes H, Ødegaard T, Crossley K, Kemp JL. Impairment-Based Rehabilitation Following Hip Arthroscopy: Postoperative Protocol for the HIP ARThroscopy International Randomized Controlled Trial. J Orthop Sports Phys Ther. 2018 Apr;48(4):336-342. doi: 10.2519/jospt.2018.8002. PMID: 29607764.

4. Ankem HK, Yelton MJ, Lall AC, Bendersky AM, Rosinsky PJ, Maldonado DR, Shapira J, Meghpara MB, Domb BG. Structured physical therapy protocols following hip arthroscopy and their effect on patient-reported outcomes-a systematic review of the literature. J Hip Preserv Surg. 2020 Dec 18;7(3):357-377. doi: 10.1093/jhps/hnaa042. PMID: 33948193; PMCID: PMC8081410.

5. Tang N, Zhang W, Su Y, Han Z, Deng L, Li Y, Huang T, Li C. Femoroacetabular Impingement and Labral Tear: From the Most Highly Cited Articles to Research Interests. Orthop Surg. 2021 Aug;13(6):1922-1933. doi: 10.1111/os.13037. Epub 2021 Aug 22. PMID: 34423576; PMCID: PMC8523776.

6. Domb BG, Sgroi TA, VanDevender JC. Physical Therapy Protocol After Hip Arthroscopy: Clinical Guidelines Supported by 2-Year Outcomes. Sports Health. 2016 Jul;8(4):347-54. doi: 10.1177/1941738116647920. Epub 2016 May 12. PMID: 27173983; PMCID: PMC4922519.

7. Safran MR, Giordano G, Lindsey DP, Gold GE, Rosenberg J, Zaffagnini S, Giori NJ. Strains across the acetabular labrum during hip motion: a cadaveric model. Am J Sports Med. 2011 Jul;39 Suppl:92S-102S. doi: 10.1177/0363546511414017. PMID: 21709038.

8. Henak CR, Ellis BJ, Harris MD, Anderson AE, Peters CL, Weiss JA. Role of the acetabular labrum in load support across the hip joint. J Biomech. 2011 Aug 11;44(12):2201-6. doi: 10.1016/j.jbiomech.2011.06.011. Epub 2011 Jul 14. PMID: 21757198; PMCID: PMC3225073.

9. Wahoff M, Dischiavi S, Hodge J, Pharez JD. Rehabilitation after labral repair and femoroacetabular decompression: criteria-based progression through the return to sport phase. Int J Sports Phys Ther. 2014;9(6):813-826.

9a. Naessig S, Kucharik M, Meek W, Eberlin C, Martin S. Prehabilitation and Rehabilitation Program for Patients Undergoing Arthroscopic Acetabular Labral Repair: A Comprehensive 5-Phase Patient-Guided Program. Orthop J Sports Med. 2022 Feb 8;10(2):23259671211071073. doi: 10.1177/23259671211071073. PMID: 35155708; PMCID: PMC8829742.

10. Grzybowski JS, Malloy P, Stegemann C, Bush-Joseph C, Harris JD, Nho SJ. Rehabilitation Following Hip Arthroscopy - A Systematic Review. Front Surg. 2015;2:21. Published 2015 May 26. doi:10.3389/fsurg.2015.00021

11. Cvetanovich GL, Lizzio V, Meta F, Chan D, Zaltz I, Nho SJ, Makhni EC. Variability and Comprehensiveness of North American Online Available Physical Therapy Protocols Following Hip Arthroscopy for Femoroacetabular Impingement and Labral Repair. Arthroscopy. 2017 Nov;33(11):1998-2005. doi: 10.1016/j.arthro.2017.06.045. Epub 2017 Sep 29. PMID: 28969949.

12. Seldes RM, Tan V, Hunt J, Katz M, Winiarsky R, Fitzgerald RH Jr. Anatomy, histologic features, and vascularity of the adult acetabular labrum. Clin Orthop Relat Res. 2001 Jan;(382):232-40. doi: 10.1097/00003086-200101000-00031. PMID: 11153993.

13. Crawford MJ, Dy CJ, Alexander JW, Thompson M, Schroder SJ, Vega CE, Patel RV, Miller AR, McCarthy JC, Lowe WR, Noble PC. The 2007 Frank Stinchfield Award. The biomechanics of the hip labrum and the stability of the hip. Clin Orthop Relat Res. 2007 Dec;465:16-22. doi: 10.1097/BLO.0b013e31815b181f. PMID: 17906586.

14. Philippon MJ, Nepple JJ, Campbell KJ, Dornan GJ, Jansson KS, LaPrade RF, Wijdicks CA. 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 Apr;22(4):722-9. doi: 10.1007/s00167-014-2874-z. Epub 2014 Feb 12. PMID: 24519614.

15. Todd JN, Maak TG, Ateshian GA, Maas SA, Weiss JA. Hip chondrolabral mechanics during activities of daily living: Role of the labrum and interstitial fluid pressurization. J Biomech. 2018 Mar 1;69:113-120. doi: 10.1016/j.jbiomech.2018.01.001. Epub 2018 Jan 16. PMID: 29366559; PMCID: PMC5815394.

16. Ishiko T, Naito M, Moriyama S. Tensile properties of the human acetabular labrum-the first report. J Orthop Res. 2005 Nov;23(6):1448-53. doi: 10.1016/j.orthres.2004.08.025.1100230630. Epub 2005 Aug 15. PMID: 16099616.

17. Bsat S, Frei H, Beaulé PE. The acetabular labrum: a review of its function. Bone Joint J. 2016 Jun;98-B(6):730-5. doi: 10.1302/0301-620X.98B6.37099. Erratum in: Bone Joint J. 2017 May;99-B(5):702-704. PMID: 27235512.

References Cited

18. Niemuth PE, Johnson RJ, Myers MJ, Thieman TJ. Hip muscle weakness and overuse injuries in recreational runners. Clin J Sport Med. 2005 Jan;15(1):14-21. doi: 10.1097/00042752-200501000-00004. PMID: 15654186.

19. Markovic G, Šarabon N, Pausic J, Hadžić V. Adductor Muscles Strength and Strength Asymmetry as Risk Factors for Groin Injuries among Professional Soccer Players: A Prospective Study. Int J Environ Res Public Health. 2020 Jul 9;17(14):4946. doi: 10.3390/ijerph17144946. PMID: 32659937; PMCID: PMC7400295.

20. Langhout R, Tak I, van Beijsterveldt AM, Ricken M, Weir A, Barendrecht M, Kerkhoffs G, Stubbe J. Risk Factors for Groin Injury and Groin Symptoms in Elite-Level Soccer Players: A Cohort Study in the Dutch Professional Leagues. J Orthop Sports Phys Ther. 2018 Sep;48(9):704-712. doi: 10.2519/jospt.2018.7990. Epub 2018 May 23. PMID: 29792105.

21. Tak I, Engelaar L, Gouttebarge V, et al. Is lower hip range of motion a risk factor for groin pain in athletes? A systematic review with clinical applications. Br J Sports Med. 2017;51(22):1611-1621. doi:10.1136/bjsports-2016-096619

22. Short SM, MacDonald CW, Strack D. Hip and Groin Injury Prevention in Elite Athletes and Team Sport - Current Challenges and Opportunities. Int J Sports Phys Ther. 2021 Feb 1;16(1):270-281. doi: 10.26603/001c.18705. PMID: 33604155; PMCID: PMC7872466.

23. Whittaker JL, Small C, Maffey L, Emery CA. Risk factors for groin injury in sport: an updated systematic review. Br J Sports Med. 2015 Jun;49(12):803-9. doi: 10.1136/bjsports-2014-094287. Epub 2015 Apr 1. PMID: 25833903.

24. Stone AV, Malloy P, Beck EC, et al. Predictors of Persistent Postoperative Pain at Minimum 2 Years After Arthroscopic Treatment of Femoroacetabular Impingement. Am J Sports Med. 2019;47(3):552-559. doi:10.1177/0363546518817538

25. Rosenblum A, Landy DC, Perrone MA, Whyte N, Kang R. The Presence of a Psychiatric Condition is Associated With Undergoing Hip Arthroscopy for Femoroacetabular Impingement: A Matched Case-Controlled Study. J Arthroplasty. 2019 Mar;34(3):446-449. doi: 10.1016/j.arth.2018.10.038. Epub 2018 Nov 9. PMID: 30503308.

26. Garcia GH, Wu H-H, Park MJ, et al. Depression Symptomatology and Anterior Cruciate Ligament Injury: Incidence and Effect on Functional Outcome—A Prospective Cohort Study. The American Journal of Sports Medicine. 2016;44(3):572-579. doi:10.1177/0363546515612466

27. Baron JE, Westermann RW, Bedard NA, Willey MC, Lynch TS, Duchman KR. Is the Actual Failure Rate of Hip Arthroscopy Higher Than Most Published Series? An Analysis of a Private Insurance Database. Iowa Orthop J. 2020;40(1):135-142. PMID: 32742221; PMCID: PMC7368532.

28. Sochacki KR, Brown L, Cenkus K, Di Stasi S, Harris JD, Ellis TJ. Preoperative Depression Is Negatively Associated With Function and Predicts Poorer Outcomes After Hip Arthroscopy for Femoroacetabular Impingement. Arthroscopy. 2018 Aug;34(8):2368-2374. doi: 10.1016/j.arthro.2018.03.020. Epub 2018 May 19. PMID: 29789247.

29. Dick AG, Smith C, Bankes MJK, George M. The impact of mental health disorders on outcomes following hip arthroscopy for femoroacetabular impingement syndrome: a systematic review. J Hip Preserv Surg. 2020;7(2):195-204. Published 2020 Apr 2. doi:10.1093/jhps/hnaa016

30. Beck EC, Nwachukwu BU, Krivicich LM, Malloy P, Suppauksorn S, Jan K, Nho SJ. Preoperative Hip Extension Strength Is an Independent Predictor of Achieving Clinically Significant Outcomes After Hip Arthroscopy for Femoroacetabular Impingement Syndrome. Sports Health. 2020 Jul/Aug;12(4):361-372. doi: 10.1177/1941738120910134. Epub 2020 May 11. PMID: 32392094; PMCID: PMC7787575.

31. Wierks CH, Boersma JB, Pate MJ, Davis AT. Hip Strength Before and After Arthroscopic Femoroacetabular Impingement Surgery. Orthopedics. 2021 May-Jun;44(3):148-153. doi: 10.3928/01477447-20210416-05. Epub 2021 May 1. PMID: 34039218

32. Wörner T, Nilsson J, Thorborg K, Granlund V, Stålman A, Eek F. Hip Function 6 to 10 Months After Arthroscopic Surgery: A Cross-sectional Comparison of Subjective and Objective Hip Function, Including Performance-Based Measures, in Patients Versus Controls. Orthop J Sports Med. 2019 Jun 12;7(6):2325967119844821. doi: 10.1177/2325967119844821. PMID: 31218235; PMCID: PMC6563410.

References Cited

33. Hallberg S, Sansone M, Augustsson J. Full recovery of hip muscle strength is not achieved at return to sports in patients with femoroacetabular impingement surgery. Knee Surg Sports Traumatol Arthrosc. 2020 Apr;28(4):1276-1282. doi: 10.1007/s00167-018-5337-0. Epub 2018 Dec 12. PMID: 30542743; PMCID: PMC7148271.

34. Charlton PC, Bryant AL, Kemp JL, Clark RA, Crossley KM, Collins NJ. Single-Leg Squat Performance is Impaired 1 to 2 Years After Hip Arthroscopy. PM R. 2016 Apr;8(4):321-330. doi: 10.1016/j.pmrj.2015.07.004. Epub 2015 Jul 27. PMID: 26226209.

35. Marquez-Lara A, Mannava S, Howse EA, Stone AV, Stubbs AJ. Arthroscopic Management of Hip Chondral Defects: A Systematic Review of the Literature. Arthroscopy. 2016 Jul;32(7):1435-43. doi: 10.1016/j.arthro.2016.01.058. Epub 2016 Apr 23. PMID: 27117866.

36. Sing DC, Feeley BT, Tay B, Vail TP, Zhang AL. Age-Related Trends in Hip Arthroscopy: A Large Cross-Sectional Analysis. Arthroscopy. 2015 Dec;31(12):2307-13.e2. doi: 10.1016/j.arthro.2015.06.008. Epub 2015 Jul 17. PMID: 26194938.

37. Jones DM, Kemp JL, Crossley KM, Hart HF, Ackerman IN. Mismatch between expectations and physical activity outcomes at six months following hip-arthroscopy: A qualitative study. Phys Ther Sport. 2020 Sep;45:14-22. doi: 10.1016/j.ptsp.2020.05.006. Epub 2020 Jun 13. PMID: 32570091.

38. O'Connor M, Minkara AA, Westermann RW, Rosneck J, Lynch TS. Return to Play After Hip Arthroscopy: A Systematic Review and Meta-analysis. Am J Sports Med. 2018 Sep;46(11):2780-2788. doi: 10.1177/0363546518759731. Epub 2018 Mar 29. PMID: 29595996.

39. Reiman MP, Peters S, Sylvain J, Hagymasi S, Mather RC, Goode AP. Femoroacetabular impingement surgery allows 74% of athletes to return to the same competitive level of sports participation but their level of performance remains unreported: a systematic review with meta-analysis. Br J Sports Med. 2018 Aug;52(15):972-981. doi: 10.1136/bjsports-2017-098696. Epub 2018 Mar 26. PMID: 29581142.

40. Ishøi L, Thorborg K, Kraemer O, et al. Return to sport and performance after hip arthroscopy for femoroacetabular impingement in 18- to 30-year-old athletes: a cross-sectional cohort study of 189 athletes. Am J Sports Med 2018;46:2578–87.

41. Mohan R, Johnson NR, Hevesi M, Gibbs CM, Levy BA, Krych AJ. Return to Sport and Clinical Outcomes After Hip Arthroscopic Labral Repair in Young Amateur Athletes: Minimum 2-Year Follow-Up. Arthroscopy. 2017 Sep;33(9):1679-1684. doi: 10.1016/j.arthro.2017.03.011. Epub 2017 May 10. PMID: 28501221.

42. Clapp IM, Nwachukwu BU, Beck EC, Jan K, Gowd AK, Nho SJ. Comparing Outcomes of Competitive Athletes Versus Nonathletes Undergoing Hip Arthroscopy for Treatment of Femoroacetabular Impingement Syndrome. Am J Sports Med. 2020 Jan;48(1):159-166. doi: 10.1177/0363546519885359. Epub 2019 Nov 19. PMID: 31743036.

43. Avnieli IB, Vidra M, Factor S, et al. Postoperative Weightbearing Protocols After Arthroscopic Surgery for Femoroacetabular Impingement Does Not Affect Patient Outcome: A Comparative Study With Minimum 2-Year Follow-up [published correction appears in Arthroscopy. 2020 Mar;36(3):923]. Arthroscopy. 2020;36(1):159-164. doi:10.1016/j.arthro.2019.08.012

44. Garrison JC, Osler MT, Singleton SB. Rehabilitation after arthroscopy of an acetabular labral tear. N Am J Sports Phys Ther. 2007 Nov;2(4):241-50. PMID: 21509143; PMCID: PMC2953303.

45. Spencer-Gardner L, Eischen JJ, Levy BA, Sierra RJ, Engasser WM, Krych AJ. A comprehensive five-phase rehabilitation programme after hip arthroscopy for femoroacetabular impingement. Knee Surg Sports Traumatol Arthrosc. 2014 Apr;22(4):848-59. doi: 10.1007/s00167-013-2664-z. PMID: 24077689.

46. Kuhns BD, Weber AE, Batko B, Nho SJ, Stegemann C. A FOUR-PHASE PHYSICAL THERAPY REGIMEN FOR RETURNING ATHLETES TO SPORT FOLLOWING HIP ARTHROSCOPY FOR FEMOROACETABULAR IMPINGEMENT WITH ROUTINE CAPSULAR CLOSURE. Int J Sports Phys Ther. 2017 Aug;12(4):683-696. PMID: 28900574; PMCID: PMC5534158.

References Cited

47. Stalzer S, Wahoff M, Scanlan M. Rehabilitation following hip arthroscopy. Clin Sports Med. 2006 Apr;25(2):337-57, x. doi: 10.1016/j.csm.2005.12.008. PMID: 16638496.

48. Horner NS, Vikas K, MacDonald AE, Naendrup JH, Simunovic N, Ayeni OR. Femoral neck fractures as a complication of hip arthroscopy: a systematic review. J Hip Preserv Surg. 2017 Jan 9;4(1):9-17. doi: 10.1093/jhps/hnw048. PMID: 28630716; PMCID: PMC5467412

49. Adib F, Johnson AJ, Hennrikus WL, Nasreddine A, Kocher M, Yen YM. Iliopsoas tendonitis after hip arthroscopy: prevalence, risk factors and treatment algorithm. J Hip Preserv Surg. 2018 Dec 24;5(4):362-369. doi: 10.1093/jhps/hny049. PMID: 30647926; PMCID: PMC6328754.

50. Tijssen M, van Cingel R, de Visser E, Nijhuis-van der Sanden M. A clinical observational study on patient-reported outcomes, hip functional performance and return to sports activities in hip arthroscopy patients. Phys Ther Sport. 2016 Jul;20:45-55. doi: 10.1016/j.ptsp.2015.12.004. Epub 2015 Dec 30. PMID: 27325539.

51. Saavedra M, Moraga R, Diaz P, Camacho D, Mardones R. Comparative analysis of kinesiotherapy rehabilitation after hip arthroscopy, quantified by harris and vail hip scores: a retrospective study. Muscles Ligaments Tendons J. 2016;6(3):420-426. Published 2016 Dec 21. Doi:10.1

52. Shaw KA, Jacobs JM, Evanson JR, Pniewski J, Dickston ML, Mueller T, Bojescul JA. FUNCTIONAL OUTCOMES OF HIP ARTHROSCOPY IN AN ACTIVE DUTY MILITARY POPULATION UTILIZING A CRITERION-BASED EARLY WEIGHT BEARING PROGRESSION. Int J Sports Phys Ther. 2017 Oct;12(5):840-847. PMID: 29181261; PMCID: PMC5685403.

53. Bennell KL, Spiers L, Takla A, O'Donnell J, Kasza J, Hunter DJ, Hinman RS. Efficacy of adding a physiotherapy rehabilitation programme to arthroscopic management of femoroacetabular impingement syndrome: a randomised controlled trial (FAIR). BMJ Open. 2017 Jun 23;7(6):e014658. doi: 10.1136/bmjopen-2016-014658. PMID: 28645960; PMCID: PMC5623417.

54. Mansell NS, Rhon DI, Meyer J, Slevin JM, Marchant BG. Arthroscopic Surgery or Physical Therapy for Patients With Femoroacetabular Impingement Syndrome: A Randomized Controlled Trial With 2-Year Follow-up. Am J Sports Med. 2018 May;46(6):1306-1314. doi: 10.1177/0363546517751912. Epub 2018 Feb 14. PMID: 29443538.

55. Kemp JL, King MG, Barton C, et al. Is exercise therapy for femoroacetabular impingement in or out of FASHIoN? We need to talk about current best practice for the non-surgical management of FAI syndrome. Br J Sports Med. 2019;53(19):1204-1205. doi:10.1136/bjsports-2018-100173

56. Philippon M, Schenker M, Briggs K, Kuppersmith D. Femoroacetabular impingement in 45 professional athletes: associated pathologies and return to sport following arthroscopic decompression. Knee Surg Sports Traumatol Arthrosc. 2007;15(7):908-914. doi:10.1007/s00167-007-0332-x

57. Philippon MJ, Weiss DR, Kuppersmith DA, Briggs KK, Hay CJ. Arthroscopic labral repair and treatment of femoroacetabular impingement in professional hockey players. Am J Sports Med. 2010;38(1):99-104. doi:10.1177/0363546509346393

58. Locks R, Utsunomiya H, Briggs KK, McNamara S, Chahla J, Philippon MJ. Return to Play After Hip Arthroscopic Surgery for Femoroacetabular Impingement in Professional Soccer Players. Am J Sports Med. 2018 Feb;46(2):273-279. doi: 10.1177/0363546517738741. Epub 2017 Nov 14. PMID: 29135269.

59. Freke MD, Kemp J, Svege I, Risberg MA, Semciw A, Crossley KM. Physical impairments in symptomatic femoroacetabular impingement: a systematic review of the evidence [published correction appears in Br J Sports Med. 2019 Oct;53(20):e7]. Br J Sports Med. 2016;50(19):1180. doi:10.1136/bjsports-2016-096152

60. Thorborg K, Kraemer O, Madsen AD, et al. Patient reported outcomes within the first year after hip arthroscopy and rehabilitation for femoroacetabular impingement and/or labral injury: the difference between getting better and getting back to normal. Am J Sports Med 2018;46:2607–14.

References Cited

61. Ardern CL, Glasgow P, Schneiders A, et al. 2016 consensus statement on return to sport from the first world congress in sports physical therapy, bern. Br J Sports Med 2016;50:853–64

62. Griffin DR, Dickenson EJ, Wall PDH, et al. Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicentre randomised controlled trial. Lancet 2018;391:2225–35.

63. Wörner T, Thorborg K, Webster KE, Stålman A, Eek F. Psychological readiness is related to return to sport following hip arthroscopy and can be assessed by the Hip-Return to Sport after Injury scale (Hip-RSI). Knee Surg Sports Traumatol Arthrosc. 2021 May;29(5):1353-1361. doi: 10.1007/s00167-020-06157-4. Epub 2020 Jul 22. PMID: 32699920; PMCID: PMC8038984.

64. Chona DV, Bonano JC, Ayeni OR, Safran MR. Definitions of Return to Sport After Hip Arthroscopy: Are We Speaking the Same Language and Are We Measuring the Right Outcome? Orthop J Sports Med. 2020 Sep 21;8(9):2325967120952990. doi: 10.1177/2325967120952990. PMID: 33015214; PMCID: PMC7509720.

65. Memon, M., Kay, J., Hache, P. et al. Athletes experience a high rate of return to sport following hip arthroscopy. Knee Surg Sports Traumatol Arthrosc 27, 3066–3104 (2019). https://doi.org/10.1007/s00167-018-4929-z

66. Davey MS, Hurley ET, Davey MG, Fried JW, Hughes AJ, Youm T, McCarthy T. Criteria for Return to Play After Hip Arthroscopy in the Treatment of Femoroacetabular Impingement: A Systematic Review. Am J Sports Med. 2021 Sep 30:3635465211038959. doi: 10.1177/03635465211038959. Epub ahead of print. PMID: 34591697

67. Bolia IK, Briggs KK, Matheny L, Philippon MJ. Survey results from an international hip course: comparison between experts and non-experts on hip arthroscopy clinical practice and post-operative rehabilitation. Knee Surg Sports Traumatol Arthrosc. 2020 Apr;28(4):1270-1275. doi: 10.1007/s00167-018-5289-4. Epub 2018 Nov 22. PMID: 30467580.

68. Bohannon RW. Test-retest reliability of hand-held dynamometry during a single session of strength assessment. Phys Ther. 1986 Feb;66(2):206-9. doi: 10.1093/ptj/66.2.206. PMID: 3945674.

69. Thorborg K, Petersen J, Magnusson SP, Hölmich P. Clinical assessment of hip strength using a hand-held dynamometer is reliable. Scand J Med Sci Sports. 2010 Jun;20(3):493-501. doi: 10.1111/j.1600-0838.2009.00958.x. Epub 2009 Jun 23. PMID: 19558384.

70. Kierkegaard S, Mechlenburg I, Lund B, Rømer L, Søballe K, Dalgas U. Is hip muscle strength normalised in patients with femoroacetabular impingement syndrome one year after surgery?: Results from the HAFAI cohort. J Sci Med Sport. 2019 Apr;22 (4):413-419. doi: 10.1016/j.jsams.2018.10.004. Epub 2018 Oct 17. PMID: 30509564.

71. Lodhia P, Slobogean GP, Noonan VK, Gilbart MK. Patient-reported outcome instruments for femoroacetabular impingement and hip labral pathology: a systematic review of the clinimetric evidence. Arthroscopy. 2011 Feb;27(2):279-86. doi: 10.1016/ j.arthro.2010.08.002. Epub 2010 Oct 29. PMID: 21035994.

72. Kemp JL, Schache AG, Makdissi M, Sims KJ, Crossley KM. Greater understanding of normal hip physical function may guide clinicians in providing targeted rehabilitation programmes. J Sci Med Sport. 2013 Jul;16(4):292-6. doi: 10.1016/j.jsams.2012.11.887. Epub 2012 Dec 21. PMID: 23266242.

73. Martin RL, Philippon MJ. Evidence of validity for the hip outcome score in hip arthroscopy. Arthroscopy. 2007 Aug;23(8):822-6. doi: 10.1016/j.arthro.2007.02.004. Erratum in: Arthroscopy. 2007 Nov;23(11):1252. PMID: 17681202.

74. Crossley KM, Zhang WJ, Schache AG, Bryant A, Cowan SM. Performance on the single-leg squat task indicates hip abductor muscle function. Am J Sports Med. 2011 Apr;39(4):866-73. doi: 10.1177/0363546510395456. Epub 2011 Feb 18. PMID: 21335344.

75. Smith CA, Chimera NJ, Warren M. Association of y balance test reach asymmetry and injury in division I athletes. Med Sci Sports Exerc. 2015 Jan;47(1):136-41. doi: 10.1249/MSS.0000000000000380. PMID: 24870573.

76. Plisky PJ, Rauh MJ, Kaminski TW, Underwood FB. Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players. J Orthop Sports Phys Ther. 2006 Dec;36(12):911-9. doi: 10.2519/jospt.2006.2244. PMID: 17193868.

HIP ARTHROSCOPY PROTOCOL

Nevada Physical Therapy

Appendix

Phase 1 Exercises (wks 0-3)

Phase 1b Exercises (wk 3-4)

Phase 1-2 Mobility (wks 4-5)

REFERENCE	ABDUCTION	ADDUCTION	ABD:ADD	EXTERNAL ROTATION	EXTENSION	POPULATION
Mendonca et al. (2022)				0.46 Nm/kg		Male Soccer
				.27 Nm/kg		Male Basketball
				.29 Nm/kg		Female Volleyball
				.37 Nm/kg		Male Volleyball
Moseler et al. (2016)	2.6 +/- .4 Nm/kg	3.0 +/- .6 Nm/kg	1.15			Male Pro Soccer
Beddows et. al (2020)	2.6 +/- .4 Nm/kg	2.8 +/- .4 Nm/kg	1.07			Field Hockey
Bittencourt et al (2016)	1.12 +/- .31 Nm/kg					10-14 yo Youth
	1.41 +/- .27 Nm/kg					15-19 yo Youth
Jaenada-Carrilero et al. (2024)	2.86 +/- .56 Nm/kg	3.19 +/- .69 Nm/kg	1.12			Elite Female Soccer
	2.07 +/- .5 Nm/kg	2.40 +/- .67 Nm/kg	1.16			Sub-Elite Female Soccer
Kemp et al. (2013)	1.65 Nm/kg	1.46 Nm/kg	.88		1.49 Nm/kg	Healthy Adults 18-50 yo
Ocarino et al. (2020)					.71-.72 Nm/kg	15-17 yo Male Soccer
					.74-.75 Nm/kg	18-29 yo Male Soccer
Tsai et al. (2018)	0.7 Nm/kg	0.94 Nm/kg	1.34		1.87 Nm/kg	Youth Male Volleyball

Force Plate Metrics:

- 10% or less asymmetry with CMJ concentric impulse
- 10% or less asymmetry with CMJ Peak Landing Force
- Eccentric Velocity 1.2 m/s or faster
- CMJ Reactive Sport Index (RSI) >.3 m/s
- No obvious lateralization with hop testing
- 10% or less asymmetry with vertical jump height with Single Leg Jump Testing
- 10% or less asymmetry for RSI with Single Leg Jump Testing
- 10% or less asymmetry with peak landing force with Single Leg Jump Testing