

REVIEW ARTICLE

REHABILITATION PROTOCOL AFTER HIP ARTHROSCOPY

POSTĘPOWANIE REHABILITACYJNE PO ARTROSKOPII STAWU BIODROWEGO

Łukasz Stołowski¹, Jacek Mazek², Bartosz Kiedrowski¹, Tomasz Piontek^{3,4}

¹Rehabilitation Department, Rehasport Clinic, Poland

²Collegium Medicum, University of Jan Kochanowski, Kielce, Poland

³Department and Clinic for Child Orthopaedy and Spinal Surgery, Poznań University of Medical Sciences, Poland

⁴Orthopaedic Department, Rehasport Clinic, Poland

ABSTRACT

Introduction

Pain in the hip joint area related to the femoro-acetabular impingement syndrome, local cartilage damage, or labrum tear is an increasingly common cause of orthopedic consultations. In the case of failure of conservative treatment, the treatment of choice is the arthroscopic treatment of the lesions and arthroplasty. As after any surgical procedure, an important aspect is subsequent rehabilitation, which may increase the positive effect of the treatment.

Aim

This article aims to present the original rehabilitation procedure after hip arthroscopy.

Material and methods

The presented rehabilitation program lasts about 5–9 months and consists of four stages. The first stage, lasting two weeks, mainly focuses on protecting the treated structures, reducing pain, and preventing adhesions and blood clots. Stage two, which lasts up to 4–6 weeks, is to restore the correct gait pattern and progress exercises from stage one. In the third stage, which lasts up to 12 weeks, rehabilitation focuses on regaining the full range of motion, muscle strength, and endurance similar to the non-operated leg. After a positive functional assessment, the patient progresses to the fourth stage, which prepares him to return to the entire sports activity. The decision to return to sport is based on the relevant results of the functional assessment and clinical examination.


Results

This work presents the original protocol of rehabilitation after arthroscopic procedures of the hip joint. Comparing the rehabilitation process, criteria for progression, and the time to return to sport, the protocol proposed by us is in line with the currently accepted rehabilitation trends in the world.

Conclusions

The rehabilitation protocol proposed by our team was based on the authors' experience and the available literature. The rehabilitation process has been divided into 4 phases with

Author responsible for correspondence:

Łukasz Stołowski
Rehabilitation Department
Rehasport Clinic
Górecka 30, 60-201 Poznań, Poland
Email: lukasz.stolowski@rehasport.pl
 <https://orcid.org/0000-0001-5705-3830>

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precise criteria for progression. Biomechanical Functional Assessment plays an important role in the control of the entire course of rehabilitation.

Keywords: hip arthroscopy, rehabilitation protocol, functional evaluation.

STRESZCZENIE

Wprowadzenie

Ból okolicy stawu biodrowego związany z syndromem konfliktu szyjkowo-panewkowego, lokalnymi uszkodzeniami chrząstki czy obróbka jest coraz częstszą przyczyną konsultacji ortopedycznych. W przypadku niepowodzenia leczenia zachowawczego postępowaniem z wyboru jest artroskopowe zaopatrzenie uszkodzeń oraz plastyka stawu. Jak po każdym zabiegu operacyjnym ważnym aspektem jest następcza rehabilitacja, która może zwiększać pozytywny efekt leczenia.

Cel

Przedstawienie autorskiego protokołu postępowania rehabilitacyjnego stosowanego po zabiegach artroskopowych stawu biodrowego.

Materiał i metody

Prezentowany program rehabilitacyjny trwa około 5–9 miesięcy i składa się z czterech etapów. Etap I trwający 2 tygodnie polega głównie na ochronie struktur poddanych zabiegowi, zmniejszeniu bólu oraz profilaktyce zrostów i zakrzepów. Etap II, trwający do 4–6 tygodnia zakłada przywrócenie prawidłowego wzorca chodu oraz progresję ćwiczeń z I etapu. W III etapie, który trwa do ok. 12 tygodnia, rehabilitacja skupia się na odzyskaniu pełnego zakresu ruchu oraz siły i wytrzymałości mięśniowej zbliżonej do nogi nieoperowanej. Po pozytywnym wyniku oceny funkcjonalnej pacjent przechodzi do etapu IV, który przygotowuje go do powrotu do pełni aktywności. Decyzja o powrocie do sportu oparta jest o odpowiednie wyniki biomechanicznej oceny funkcjonalnej oraz badanie kliniczne operatora.

Wyniki

Praca prezentuje autorski protokół postępowania rehabilitacyjnego po zabiegach artroskopowych w obrębie stawu biodrowego. Porównując przebieg rehabilitacji, przyjęte kryteria progresji oraz czas powrotu do sportu, proponowany przez nas protokół jest zgodny z obecnie stosowanymi w światowej literaturze.

Wnioski

Proponowany przez nasz zespół protokół postępowania fizjoterapeutycznego powstał na bazie doświadczeń autorów oraz dostępnego piśmiennictwa. Proces rehabilitacyjny został podzielony na 4 fazy wraz z precyzowanymi kryteriami progresji. W całym przebiegu rehabilitacji dużą rolę odgrywa kontrola postępów przez zastosowanie Biomechanicznej Oceny Funkcjonalnej.

Słowa kluczowe: artroskopia biodra, protokół rehabilitacyjny, ocena funkcjonalna.

Introduction

Femoro-acetabular impingement syndrome is a common cause of pain in the groin, especially in young and active people. Under

repeated loads, it can also damage the labrum or cartilage, increasing functional limitations. Initially, treatment should be conservative

and continue for approximately three months. In case of failure, the suggested treatment is arthroscopy (Griffin *et al.*, 2016). The most common procedures, in that case, are resection, repair, or reconstruction of labrum and cartilage and arthroplasty. The number of hip arthroscopies performed worldwide is rising (Bonazza *et al.*, 2018). Despite the development in surgical techniques, the literature is insufficient regarding postoperative rehabilitation, which also prompts expanding knowledge in this subject, especially in polish conditions (Ankem *et al.*, 2020).

Aim

This study aims to present the original rehabilitation protocol used with patients after arthroscopic procedures in the hip joint. An essential element is also the presentation of a functional assessment which can be used to evaluate the rehabilitation process.

Material and methods

The conservative treatment also serves as a preparation for surgery and may potentially accelerate recovery (Grant *et al.*, 2017). The postoperative protocol is divided into 4 phases (Table 1). The progression to the following stages depends on the biology of healing and functional criteria. The physiotherapist individualizes treatment methods based on the patient clinical assessment performed during each visit. Depending on the pain sensations, stiffness during hip movement, and the mastery of the prescribed exercises, rehabilitation may be slowed down or accelerated. The extent of the procedure, age, targeted physical activity, and psychophysical condition of the patient will also influence the physical therapy program. Throughout the rehabilitation process, communication between the patient, the physiotherapist, and the orthopedist is crucial.

Phase I – 0–2 weeks

The first phase of rehabilitation begins in the first days after the surgery. The main goal is to protect the treated structures and prevent

swelling, adhesions, and loss of muscle strength. In consultation with the operator, the therapist provides recommendations on everyday activities, such as limiting the time spent in a sitting position and maintaining the hygiene of healing wounds. In a hospital, the patient is taught to walk with elbow crutches and to do exercises to be performed at home. Walking on crutches without foot contact with the ground increases the activity of the hip flexors, which is undesirable at this stage. Therefore weight-bearing is to the tolerance limit (Malloy *et al.*, 2013). Surgery causes inhibition of the hip girdle muscles. Therefore isometric exercises play an essential role in this stage (Freeman *et al.*, 2016). Breathing exercises and ice packs are used to reduce swelling and pain (Domb *et al.*, 2016). To maintain mobility and relieve pain, range of motion exercises and a CPM machine is introduced immediately after the procedure (Cunningham *et al.*, 2017). It is also recommended to lie prone for two hours a day to reduce flexion contracture. The primary limitations arise from the healing of the anterior joint capsule and the repaired structures inside the joint. For this reason, for the first two weeks after the procedure, the extension range is limited to 0 degrees, abduction up to 30 degrees, external rotation in extension up to 20 degrees, and flexion especially combined with 90 degrees.

Phase II – 2–4/6 weeks

Approximately 14 days after the procedure, a consultation is carried out, during which the operator assesses the healing structures and sets further recommendations. Education plays a significant role at this stage. The patient is informed about the further course of rehabilitation, possible ailments, and home exercises' importance. Together with the patient, short- and long-term treatment goals are defined. One of the main tasks of this stage is to restore the correct gait pattern, regain the range of motion in the hip joint similar to the non-operated limb and introduce strength and proprioceptive exercises. The patient is

Table 1. Postoperative rehabilitation protocol.

Hip arthroscopy rehabilitation protocol
<p>Phase I (0–2 weeks) Goal: tissue protection, reduction of pain and swelling, prevention of adhesions, and loss of muscle strength.</p> <p>Restrictions*:</p> <ul style="list-style-type: none"> ▪ Range of motion: Extension 0° Abduction 30° External rotation 20° Flexion 90° ▪ Weightbearing: 2 crutches <p>*Can be changed based on the intraoperative view and the operator's recommendations</p>
<p>Phase II (2–4/6 week) Goals: Education, gait re-education, regaining range of motion, the introduction of strength, and proprioceptive exercises.</p> <p>Restrictions:</p> <p>Range of motion as tolerated.</p> <p>Weightbearing:</p> <ul style="list-style-type: none"> ▪ Osteoplasty – 2 crutches 1/3 weeks after surgery ▪ Repair and reconstruction of labrum – 2 crutches for 3/4 weeks after surgery ▪ Cartilage reconstruction – 2 crutches for 6 weeks after surgery ▪ Full weight-bearing depends from the correct gait pattern and absence of pain <p>Progression to next phase criteria: proper execution of the second phase exercises, correct gait pattern, pain less than 3/10 on a numerical scale.</p>
<p>Phase III (4/6–12 weeks) Goals: restoration of strength and endurance and a full range of motion of the hip joint</p> <p>Progression to next phase criteria:</p> <ul style="list-style-type: none"> ▪ Functional tests results > 80% non-operated side ▪ ≥ 2 points in FMS protocol tests <p>Functional tests:</p> <ul style="list-style-type: none"> ▪ Assessment of the postural strategy while standing on one leg in static and dynamic conditions using the DELOS system ▪ Evaluation of symmetrical weight-bearing when performing squats and toe jumps using the GAMMA dynamographic platform ▪ Assessment of the quality of basic movement patterns according to the FMS (Functional Movement Screen) assessment protocol ▪ "Step down test" ▪ "Star excursion balance test"
<p>Phase IV (> 12 weeks) Goals: Regaining full strength, endurance, and flexibility of muscles, preparation for returning to sport.</p> <p>Return to full activity criteria:</p> <ul style="list-style-type: none"> ▪ "BFA" results > 90% of non-operated side ▪ Absence of fear and pain during sport activity <p>"BEA":</p> <ul style="list-style-type: none"> ▪ Assessment of the postural strategy while standing on one leg in static and dynamic conditions using the DELOS system ▪ Evaluation of symmetrical weight-bearing using the GAMMA dynamographic platform during execution of: <ul style="list-style-type: none"> - Bilateral squats - Jumping on toes - Countermovement jumps - Running in place - Jumping on toes in full squat positions ▪ Assessment of the quality of basic movement patterns according to the FMS assessment protocol ▪ "Step down test" ▪ "Star excursion balance test" ▪ "One leg hop test" ▪ "Side hop test" ▪ "Figure of 8 hop test" ▪ "Lateral triple hop test"

allowed to withdraw the crutches when he presents a painless and correct gait pattern, which usually occurs about 3–6 weeks after the procedure (Avnieli *et al.*, 2020). In the case of cartilage reconstruction or extensive bone resections, the non-weight-bearing

time may be extended. Mobility exercises are implemented within the range that does not cause pain but only the feeling of stretching. Manual therapy procedures are performed to reduce pain, emphasizing the mobilization of soft tissues and joints in grades I–III (LeBeau

et al., 2014). Strengthening and balance exercises are performed in a range that does not burden the repaired joint structures. In the early stage of this phase, open chain exercises, especially for flexors, are avoided not to overload their tendons (Adib *et al.*, 2011). The main emphasis is on the activation of the gluteal muscles, adductors, and trunk muscles (Figure 1). It is highly recommended to exercise on a stationary bike so that one should maintain cardiovascular condition. The criteria for moving to the next stage are the correct performance of the second phase exercises, proper gait pattern, and pain less than 3/10 on the numerical scale (Ornetti *et al.*, 2011).

adduction and internal rotation of the thigh (Charlton *et al.*, 2016). Examples of exercises in this phase are squats, lunges, or deadlifts. Progression is introduced by increasing the range of motion, external load, or neuromuscular requirements. Much emphasis is placed on single-legged activities, which increase the strength of hip stabilizers and improve balance. As preparation for running, training in water conditions or using the Alter-G anti-gravity treadmill is introduced.

A functional assessment is performed 10–12 weeks after surgery to assess readiness to return to dynamic activities.

The tests set consists of:

- Assessment of the postural strategy while standing on one leg in static and dynamic



Figure 1. Basic strengthening exercise for adductors and gluteal muscles.

Phase III 4/6–12 weeks

The next phase aims to restore the proper strength and endurance of the trunk muscles, hip girdle, and lower limbs and full range of motion in the hip joint. During exercises, much attention is paid to setting the pelvis in a neutral position and control of excessive

conditions using the DELOS system (Piontek *et al.*, 2012).

- Evaluation of symmetrical weight-bearing when performing squats and toe jumps using the GAMMA dynamographic platform.
- Assessment of the quality of fundamental movement patterns according to the FMS

(Functional Movement Screen) assessment protocol (Schneiders *et al.*, 2011).

- Functional tests: “Step down test” (Loudon *et al.*, 2002) (Figure 2) and “Star excursion balance test” (Johansson *et al.*, 2016) (Figure 3).



Figure 2. Step down test.

Cisowski *et al.*, 2015; Bąkowski *et al.*, 2017). The tests execution methodology has been described in the literature provided except for testing with the GAMMA platform (Ac International East, Knurów, Poland) (Figure 4).



Figure 3. Star excursion balance test.

Phase IV – > 12 weeks

If the results of the tests are close to 80% of the non-operated side and the lack of results is less than 2 points during the FMS protocol, the patient is allowed to proceed to the final phase preparing to return to total activity. At this stage, progressive running training and plyometric exercises are introduced. The restoration of full muscle strength and flexibility is also continued. Rehabilitation training is specific to the target physical activity. It is imperative to program training intensity and volume by appropriate selection of loads, repetitions, or sets.

About 5–6 months after surgery, a “Bio-mechanical Functional Assessment” (BFA) is performed to determine the patient’s readiness to return to sport. It was created based on protocols already used in our clinic for other joints, such as the ankle joint or knee joint, and extended to tests specific for the hip joint (Piontek *et al.*, 2012; Kivlan *et al.*, 2013;



Figure 4. Evaluation of symmetrical weight-bearing during bilateral squat using the GAMMA platform.

This device consists of two dynamographic platforms and is used to assess and train neuromuscular coordination, load distribution, and balance. In our assessment patient stands on two dynamographic platforms and performs the prescribed motor tasks – bilateral squats, bilateral countermovement jumps, jumps on the toes, running in place, and jumping on the toes in a full squat. The result is a difference in the load distribution between sides. A load asymmetry more remarkable than 10% is considered incorrect.

In “BFA” for the hip joint, the following are performed:

- Assessment of the postural strategy while standing on one leg in static and dynamic conditions using the DELOS system (Piontek *et al.*, 2012).
- Evaluation of symmetrical weight-bearing using the GAMMA dynamographic platform.
- Assessment of the quality of fundamental movement patterns according to the FMS assessment protocol (Schneiders *et al.*, 2011).
- Assessment of lower body strength and balance with “Step down test” (Loudon *et al.*, 2002).
- Assessment of dynamic balance with “Star excursion balance test” (Johansson *et al.*, 2016).
- Assessment of power and motor control in the sagittal plane with “One leg hop test” (Docherty *et al.*, 2005).
- Assessment of endurance and motor control in the frontal plane with “Side hop test” (Docherty *et al.*, 2005).
- Assessment of power and motor control in the transverse plane with “Figure of 8 hop test” (Docherty *et al.*, 2005).
- Assessment of power and motor control specific for hip adduction and abduction motion with “Lateral triple hop test” (Kivlan *et al.*, 2013).

In the case of results close to 90% of the non-operated side, no fear or pain during testing and after a positive clinical evaluation by the operator, the patient is allowed to return to sport progressively. In case of

unsatisfactory results, the patient continues training aimed at the defined deficits. A reassessment is made after approximately 3–4 weeks. Before returning to full load, it is also essential to rebuild one's sport-specific fitness capabilities.

Results

This work presents the original protocol of rehabilitation after arthroscopic procedures of the hip joint. Comparing the rehabilitation process, criteria for progression, and the time to return to sport, the protocol proposed by us is in line with the currently accepted rehabilitation trends in the world.

Discussion and conclusions

The presented rehabilitation protocol after hip arthroscopy was based on the authors' own experiences, observations, and available literature.

The number of publications on this topic is low compared to, for example, procedures after the reconstruction of the anterior cruciate ligament and is mainly based on expert opinions (Grzybowski *et al.*, 2015).

The last systematic review from 2020 compared six articles describing rehabilitation programs that showed significant improvement in patient-reported outcome measures. Most of them represent the protocols, which are divided into phases with specific goals and progression criteria. All programs initially set limits on weight-bearing and the range of motion to protect healing tissues. The similarities are also in rehabilitation goals such as pain and swelling control, improvement of range of motion, normalization of gait, regaining strength and endurance, and other motor skills specific to the target sport.

Literature is also lacking on the topic of returning to sport after hip arthroscopy. O'Connor and colleagues, in their meta-analysis, state that only 2 out of 22 analyzed publications define functional criteria determining the possibility of returning to total sports activity (O'Connor *et al.*, 2018). Spencer-Gardner *et al.*, in their work as the criteria

for return to sports state difference less than 10% during jumping tests and asymptomatic execution of exercise from the last phase of rehabilitation (Spencer-Gardner *et al.*, 2013). The tests used are a single and triple hop and one vertical leg jump. Saveedra *et al.*, in their publication, also mention a correct performance of advanced exercises as a criterion and propose the use of the "Sports hip" tests (Saveedra *et al.*, 2016). This set of tests includes one-leg squats, diagonal and lateral bounds, and forward box lunges assessed and scored accordingly. In the meta-analysis mentioned before, the average time to return to sport was 7.4 months after surgery.

Considering the number of reports on this subject in the world literature, it seems crucial to propose a rehabilitation protocol and functional criteria before returning to sport for Polish conditions.

The program we propose does not differ significantly from those used globally and assumes the return to total activity after about 5–9 months after surgery. The division of the rehabilitation period into 4 phases allows for progression depending on the achieved functional criteria and clear goals for the patient and therapist. "BFA" before returning to sport was based on the available literature and our experience with ankle and knee injuries. Its main goal is to minimize the risk of recurrence of symptoms of the operated joint and injuries in other parts of the body.

The final decision to return to sport is determined by the positive result of the functional biomechanical assessment and not the time after surgery. One should remember that some biomechanical dysfunctions can persist for up to 2 years after hip arthroscopy. Therefore, after the postoperative rehabilitation period is over, it is essential to continue exercise and preventive measures (Chartlon *et al.*, 2016; Kemp *et al.*, 2018).

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