

CHARLES UNIVERSITY
FACULTY OF PHYSICAL EDUCATION AND SPORTS

Post-surgical rehabilitation of the knee menisci

(Comparison of post-surgical rehabilitation in Albania and USA)

Master thesis

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Abstract

Title:

Post-surgical rehabilitation of the knee menisci

Aim:

The purpose of this thesis is to evaluate the post-surgical rehabilitation of the knee menisci in Albania comparing it with recommended guidelines from American Academy of Orthopaedic Surgeons in USA.

Method:

This thesis is a comparative analysis, comparing post-surgical rehabilitation of the knee menisci followed in Albania and in USA. The comparison between the post-surgical rehabilitation program followed in both states was done confronting recommended guidelines from American Academy of Orthopaedic Surgeons (AAOS) in USA, to data gathered from Military Hospital of Albania-Traumatology Department, private hospitals and private clinics in Tirana. Articles, clinical tests, systematic reviews, pilot studies and scientific books in Albanian, Czech and English were used as sources of information. To develop the search strategy, combination of the keywords: *menisci injury, surgery and rehabilitation* were used.

Results:

Outcomes in Albania were not satisfactory, showing not a complete rehabilitation program followed by the patients after menisci surgery. There was no use of physical therapy modalities as an integrated part of the rehabilitation process, lack of check-ups after the operation and consequently no long-term rehabilitation outcomes after a menisci surgery. We can conclude that in Albania there is no high quality post-surgical rehabilitation of the knee menisci present.

Key words:

menisci injury, surgery, rehabilitation

Shrnutí

Název práce:

Pooperační rehabilitace úrazů menisků kolenních kloubů

Cíl práce:

Práce hodnotí průběh rehabilitace po operaci menisků kolene v Albánii a porovnává ji s doporučenými postupy American Academy of Orthopaedic Surgeons ve Spojených státech amerických. Hlavním cílem je zjistit, jakým způsobem lze v Albánii zlepšit rehabilitaci po operaci menisků.

Metoda:

Diplomová práce je komparativní analýzou. Porovnává rehabilitaci pacientů po operaci menisků kolenního kloubu v Albánii a ve Spojených státech amerických. Pro srovnání jednotlivých rehabilitačních programů byly vybrány doporučené postupy Americké akademie ortopedů (American Academy of Orthopaedic Surgeons - AAOS) ve Spojených státech amerických a data z Albánské Vojenské Nemocnice (traumatologické oddělení), soukromé kliniky a soukromá nemocnice v Tiraně. Byly shromážděny články, klinické studie, systematické přehledy a pilotní studie v albánštině, češtině a angličtině. Při hledání byla použita následující klíčová slova: úrazy menisků, operace a rehabilitace.

Výsledky:

Výsledky ukázaly že, úroveň rehabilitační péče u pacientů po operaci menisků v Albánii je na nízké úrovni. Fyzioterapie nebyla součástí rehabilitačního procesu, neproběhlo dostatečné množství kontrol po operaci ortopedem a nebyl stanoven žádný dlouhodobý rehabilitační plán. Z dostupných zdrojů lze vyvodit, že v současnosti není kvalita péče o pacienty po operaci menisků příliš vysoká.

Klíčová slova:

Úraz menisků, operace, rehabilitace

Declaration

I hereby declare that this work is entirely my own individual work, based on the knowledge I gain from books, journals, reports, scientific studies and attending lectures and seminars during my studies in Prague and research on Albanian resources of data and health institutions, which are listed in list of literature.

Prague, September 2014

Fregen Dedja

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Dedication

Roza and Besnik I dedicate this work to you, my dear parents.

I could never stop thanking you, for every single sacrifice, you have made for my education, giving me courage to fulfill all my ambitions and dreams. You have selflessly put my education above all else, and taught me the importance of hard work and determination.

Thank you for being always by my side in every way possible. Some obstacles in my life have not been easy to overcome, but you have always been there for me giving me strength and optimism. I hope I have never disappointed. You make me the luckiest girl in the world. I love you.

Acknowledgment

This thesis would not have been possible unless the support of my family, partner and dear friends.

Firstly, I would like to thank Andrea for always being beside me, giving me strength and love. Andrea are so important to me.

I would like to show my deepest gratitude to all my professors in Charles University that formed me professionally giving me the tools to build my future as a physiotherapist. I wish to thank my supervisor Mgr. Jalovcová for constructive recommendation on this thesis.

Last but not least, I would like to thank my dear friends Lousin, Květa, Xhejni, Alba, Stela, David and Ledjona for helping and supporting me. I am very grateful to you! Thank you

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LIST OF ABBREVIATIONS:

USA	United States of America
FTVS	Fakulta Tělesné Výchovy a Sportu
ROM	Range of Motion
AAOS	American Academy of Orthopaedic Surgeons
ACL	Anterior Cruciate Ligament
PCL	Posterior Cruciate Ligament
MCL	Medial Collateral Ligament
LCL	Lateral Collateral Ligament
GAG	Glycosaminoglycan
MR	Magnetic Resonance
CT	Computer Tomography
OA	Osteoarthritis
CMI	Collagen Meniscus Implantation
MAT	Meniscal Allograft Implantation
EMG-BFB	Electromyography Biofeedback
CKC	Closed Kinetic Chain
KOOS	Knee Injury and Osteoarthritis Outcome Score
ES	Electrical Stimulation

1. INTRODUCTION

Knee pain may derive from the damage of one or more structures of the soft tissue that stabilize the knee joint (including ligaments, muscles, tendons and menisci). The increasing popularity of some recreational and adrenaline sports, increase the frequency of injuries of the knee structures, especially ligaments and menisci. Soft tissue injuries of the knee are some of the most common and clinically challenging cases (Heqimi, 2011).

For most patients, the etiology or the severity of the pathologic process of an injury (acute or chronic), can be determined from a personal medical history, focused physical examination and target workup including diagnostic imaging (e.g., plain radiography, magnetic resonance). Damages of the knee structures might be very restrictive for some patients due to the long-term recovery period including several months of rehabilitation, sometimes up to a year (Dungl, 2005).

According to the type, location and size of the meniscus tear, the recommended rehabilitation guidelines followed after menisci surgeries differ from each other. It is very important to establish clear diagnostic and therapeutic objectives for these injuries, in order to formulate the proper rehabilitation program. The therapist must evaluate the patient thoroughly to implement the appropriate protocol needed to be followed.

Some of the main goals of rehabilitation after menisci surgery are pain and inflammation control associated with surgery, maintenance of ROM (range of motion), general conditioning restore or maintenance of muscle function and optimization of neuromuscular coordination of the lower extremity. Regularly followed rehabilitation program after the surgery of menisci is very important for future prognosis. Prolonged knee immobilization after surgery can result in the rapid development of muscular atrophy and delays in functional recovery (Brindle, 2001).

Another crucial goal of the rehabilitation protocol followed after menisci surgery is the prevention of excessive weight-bearing forces that can lead to further damages of the operated knee. This limitation is designed to control high compressive and shear forces that could disrupt the healing meniscus repair or transplant (Shaqiri, 2005). Patients are warned that an early return to strenuous activities, including impact loading, jogging, deep knee flexion, or pivoting, carries a definite risk of a repeat meniscus tear. Full weight-bearing is

indicated gradually by the orthopaed surgeon during an approximately three month period (Heckman, 2006).

There are several reasons why I chose to write about post-surgical rehabilitation of menisci and why I decided to compare post-surgical rehabilitation of the knee menisci in Albania to USA. When I came to Albania before starting my master program I volunteered in the Military Hospital of Tirana in the Traumatology Department for several months. I noticed that the highest percent of the cases were fractures of the lower extremities and knee injuries, especially menisci tears and ligamentous ruptures. Unfortunately, I witnessed a very poor rehabilitation protocol followed, after the menisci surgery in Albania.

The situation presented was much unknown to me, especially taking into consideration that I was educated in one of the most well-known university in Europe. During all my studies in Czech Republic I used to have many practices in different hospitals. This helped me form a proper frame of a successful rehabilitation schedule, needed to be followed for different diagnoses. With my will to do something in order to change the situation in my country, I decided to focus on post-surgical rehabilitation of menisci and to compare it with a state that follows recommended guidelines for these cases.

Recommended guidelines from American Academy of Orthopaedic Surgeons were taken as a ground of comparison. Lots of differences were noted in Albania comparing to USA including: absence of physical therapy modalities used during rehabilitation program after menisci surgery, not fulfilled rehabilitation program from the patients' side and no evidence of rehabilitation outcomes.

Despite all this, I got motivated and decided to dedicate my thesis to this case. Albania is my homeland and after my studies I will work there and put all my efforts to achieve a rehabilitation standard, like the one that I was educated all these years. I would be very glad if the conclusions of this thesis will serve as a material for further studies, long-term observation as an inspiration for those physiotherapists who are willing work hard and reach a higher standard of physiotherapy in Albania.

2. OBJECTIVES AND RESEARCH

This thesis is a comparative analysis representing a selection of published and unpublished data on issues that contain information and evidence comparing and contrasting the post-surgical rehabilitation followed after menisci surgery in Albania and USA. Bases for comparison are recommended guidelines from American Academy of Orthopaedic Surgeons (AAOS) described for patients after partial meniscectomy and after menisci repair. Recommended guidelines of AAOS prescribe all goals, precautions, treatments and criteria for advancement in the therapy for each phase of rehabilitation protocol from the first till the fourteenth week. These points are analyzed and compared with the rehabilitation protocol followed in Albanian patients after partial meniscectomy or undergoing a menisci repair intervention.

Having AAOS recommended guidelines as a frame of reference; it is possible to outline the main deficiencies of rehabilitation approach Albanian patients have after meniscectomy or meniscal repair. Conclusions of this thesis can be used as a ground for further studies in the rehabilitation field and to build an informative material helping detect problems and encourage further improvements in Albanian health care system. This comparative analysis tends to precisely fulfill appointed statements and express credible views on the kind of comparison being proposed (Fink, 2010).

Investigative questions:

1. Which are the main differences between Albania and USA during post-surgical rehabilitation followed after partial meniscectomy?
2. Do patients in Albania follow a sufficient rehabilitation program after partial meniscectomy?

Aim of thesis

The purpose this thesis is to compare the rehabilitation program followed after partial meniscectomy and menisci repair between USA and Albania and to outline the main differences between them. The rehabilitation program followed in USA is based on recommended guidelines from American Academy of Orthopaedic Surgeons. Other studies

were also taken as a reference, in order to enforce some statements included in AAOS recommended guidelines followed after partial meniscectomy or menisci repair. The rehabilitation program followed in Albania is based on the information gained from the Physiotherapy Department of the State Military Hospital in Tirana, also from the rehabilitation program followed in one of the most highly quality rated private hospital in Albania and by my own experience working in the Military Hospital in Tirana and in a private clinic.

AAOS recommended guidelines are taken as main source for comparison between Albania and USA. All the differences and insufficiencies of rehabilitation followed after partial meniscectomy or menisci repair in Albania were pointed out.

This thesis could be used in the future as a motivating work for further researches and improvements in Albania health care and also as a material for physiotherapist in Albania. All data used were collected from autumn 2011 till autumn 2014.

Methodology

Research criteria for data collection and analysis:

Different sources of information that were analyzed in order to form a full specter for comparison between post-surgical rehabilitation of the knee menisci followed in Albania and in USA. Due to the limited amount of Albanian articles, in first instance articles in English and Czech languages were screened and read. This restricted range of literature in Albanian goes hand to hand with the fact that in Albania, a few amounts of researches were done treating directly the concept of rehabilitation.

The main ground of comparison was recommended guidelines followed after partial meniscectomy and meniscal repair from American Academy of Orthopaedic Surgeons (AAOS). These guidelines were found in from the official website database of AAOS. In order to enlarge the specter of analysis other materials in English language were gathered from databases such as PubMed, Medline, Scopus, Pedro, Cochrane library, Web of Science, and Science Direct. Articles in Albania were gathered from the National Library of Albania and from the Medical Library in the Medical University in Tirana. To gather materials for the research strategy, combination of the keywords: *menisci injury, surgery and rehabilitation* were used.

Additional source of information were e-books or e-publications gathered from the websites www.amazon.co.uk and www.bksh.al (the national library database of Albania), found using the listed keywords.

Beside all the scientific materials, fundamental tool to create a proper comparative ground between post-surgical rehabilitation of the knee menisci followed in Albania and recommended guidelines followed in USA were interviews and email correspondence with doctors and physiotherapists working in the State Military Hospital, private hospital “Spitali Amerikan” in Tirana and private clinics in Tirana.

The Military Hospital in Tirana is chosen as the main reference concerning the rehabilitation followed after partial meniscectomy or menisci repair in Albania. This due to the fact, that all specialized interventions to menisci all over Albania are referred there. The head of Traumatology Department in the Military Hospital in Albania Dr. Arben Runa and the main physiotherapist near Physiotherapy Department in the Military Hospital in Albania Dr. Manushaqe Saraçi were contacted and interviewed concerning the rehabilitation program the patients in Albania follow after partial meniscectomy and menisci repair. Further additional material concerning the rehabilitation program followed after partial meniscetomy in Albania, was provided from an interview with one of the most well-known orthopead surgeon, Dr. Artan Bano. Dr. Bano works in the most highly quality rated private hospital in Albania “Spitali Amerikan”. His recommendations gave the proper orientation of the rehabilitation schedules followed after partial menisectomy in a private hospital in Albania. The reason why the orthopead surgeons were contacted separately is due to the fact that in Albania there is yet not founded an Academy of Surgeons Orthopeads in order to structure altogether a recommended guideline after meniscectomy or menisci repair. My own experience working in the Military Hospital and in a private clinic in Tirana helped a lot in verifying the actual situation in Albania and also being in direct contact with the patients ensured direct judgment on the problematic Albanian patients face during the rehabilitation process after menisci intervention.

Materials from the First Physiotherapy Conference held in Tirana in January 2012, were also used in order to gather more material concerning rehabilitation program followed in Albania after a menisci surgery.

Inclusion criteria for article involvement in this thesis were: language used, year of publication, menisci surgery intervention and prescribed rehabilitation program after the

menisci surgery. All articles analyzed were written either in English language, Czech language or Albanian language. English and Czech articles were not older than year 2000. Due to lack of Albanian literature involving rehabilitation field, articles in Albanian taken as a reference were from year 1995. Target group of patients chosen to be involved in this thesis, were those having undergone a menisci surgery and prescribed to follow a rehabilitation program. On the other hand, the exclusion criteria during article selection for this thesis, were patients who followed conservative care after a menisci injury. All the articles that were compatible with the inclusion and exclusion criteria were included in the thesis. To prosper the search strategy, different combinations of the keywords *menisci injury*, *surgery of menisci* and *rehabilitation of menisci*, were used.

Due to lack of Albanian rehabilitation guidelines, AAOS recommended guidelines followed after partial meniscectomy and meniscal repair were taken as a basic frame of reference. Goals, precautions, treatment strategies and criteria for advancement of each of the three phases in which the rehabilitation guidelines were divided concerning AAOS, were analyzed and compared with Albanian rehabilitation program followed after partial meniscectomy. The results were interpreted based on the differences that were found while confronting each of the phases of the rehabilitation protocol followed after partial meniscectomy in Albania and USA.

3. OVERVIEW OF THE KNEE ARTICULATION

3.1. Anatomy of the knee articulation

The knee joint is the largest synovial and one of the most complex joint in human body with a complicated anatomical and functional character. It is considered as a hinge joint with additional rotation movements. Many components of the knee articulation, such as the bones, muscles, ligaments and joint surfaces must work in synchronicity for the lower extremity to function accurately. In order to better understand the biomechanical requirement of knee movement, we should define the anatomical structures (Vogds, 2009).

The knee articulation is formed of four bones: femur, patella, tibia and fibula. Femur is convex at its distal end, so it can easily articulate with the patella and tibial plateau. The articular parts of femur are its medial and lateral condyles (Sosna, 2001). These excuse slightly posteriorly and distally, with the lateral condyle being wider in its frontal part than in its back. The medial condyle has a more constant width. Attached to the tibia are two structures called menisci. The condyles of tibia are divided by the intercondylar eminence.



Figure 1: The knee joint anatomy (AAOS, 2010)

Between each condyle of the femur, there is a corresponding meniscus and a condyle of tibia, forming all together two joints. The third articulation found in the knee is between the femur and patella (femoropatellar articulation). We can conclude that the knee articulation consists of three articulations in one (Čihák, 2001).

The articular capsule of the knee joint is lax and wide, thin in front and at the side, and contains the patella, ligaments, bursa and menisci. The capsule consists of a synovial and a fibrous membrane separated by fatty deposits anteriorly and posteriorly (Platzer, 2004).

In collaboration with the menisci and bursa, ligaments play a crucial role in protecting the articular capsule. They also insure the knee joint stability by limiting movements. The ligaments are divided into intercapsular and extracapsular.

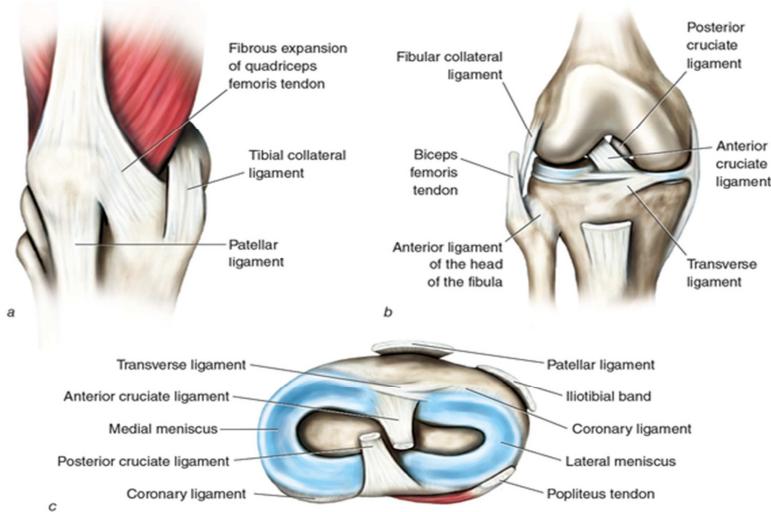


Figure 2: Knee Structure (Behnke, 2010)

Intracapsular ligaments join together femur and tibia. They play a very important role in the knee stabilization function. In the intracapsular ligaments are involved, the anterior cruciate ligament (ACL), the posterior cruciate ligament (PCL), the posterior and anterior meniscofemoral ligaments and the transverse or meniscomeniscal ligament (Čihák, 2001).

Extra capsular ligaments are found in the anterior, posterior and lateral compartment of the knee. They play a crucial role in the stabilization and range of motion of the knee.

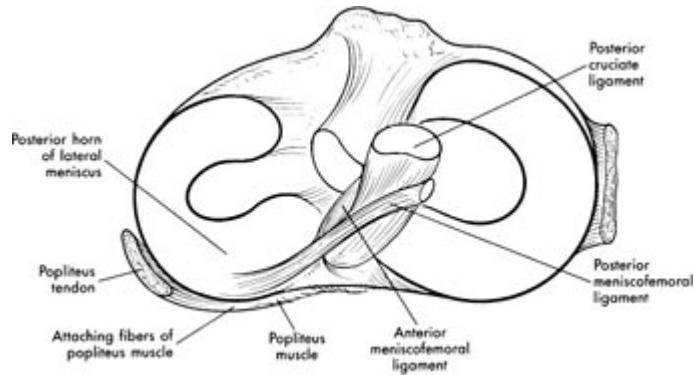


Figure 3: Superior view of tibial condyles after removal of femur (Crane, 2010)

3. 2. Structure of menisci

The menisci are two semilunar shaped cartilages positioned between the convex femurs superiorly and the relatively flat tibial plateau inferiorly. The menisci consist of two fibrocartilaginous disks, which fill the space between the tibial plateau and the femoral condyles. Without the help of the menisci, the convex femoral condyles cannot efficiently articulate with the flat surface of the tibia. This congruency is maximized during knee flexion. They are of an approximately 35mm in diameter and 110 mm in length. They cover one half of two thirds of the articular surface of their corresponding tibial plateau (Fazalare, 2009).

The menisci improve the congruency between the femoral condyles and the tibia by extending the superior tibial surface. Both menisci are wedge shaped in the coronal plane. The lateral meniscus is more circular in shape than the medial one. The superior parts of the menisci are concave, enabling effective articulation with their respective convex femoral condyles, whereas the interior surfaces are flat to adapt-conform to the tibial plateau.

Both menisci, even though having similar function, have differing anatomy. The medial one has an irregular radius, making it 3/5th of a complete ring around the tibial plateau. It has a c-shaped structure larger in radius than the lateral one. Its anterior horn is attached to the tibia near the insertion of the ACL, and the posterior horn is attached at the posterior intercondylar fossa between the PCL and the lateral meniscus posterior horn. Due to posterior insertion ligament of the medial meniscus to the posterior intercondylar fossa of the tibia the peripheral border is firmly attached to the medial capsule and this fact makes the medial meniscus less moveable than the lateral one (Goyal, 2013).

The lateral meniscus has a more circular shape, covering up to two thirds of the articular surface of the underlying tibial plateau. The lateral meniscus comparing to the medial one, encompasses more of the tibial plateau's total surface area than the medial meniscus because it has a constant radius. It is shaped into 4/5 of a complete ring or known also as O-shaped (Gupte, 2003).

The medial one, due to the fact that is attached to the medial collateral ligament, is limited in mobility. The lateral one is connected to the femur via the posterior meniscofemoral ligament (ligament of Wrisberg) and anterior meniscofemoral ligament (ligament of Humphrey), which can tension its posterior horn anteriorly and medially with increasing knee flexion (Gupte, 2003).

Some of main the functions of menisci are; shock absorption thanks to their viscoelastic consistence; facilitation of load transmission through the tibiofemoral joint by making possible congruency of the joint surfaces and increasing the articular contact. Menisci serve to cushion the knee joint, deepen the socket of the knee and increase joint congruity to better distribute weight-bearing forces, provide its stability, prevent joint hyperextension, facilitate joint gliding and protect the joint margins (Logan, 2009).

The medial meniscus transmits 50% of the entire load in the medial part, and the lateral meniscus 70% of the load in the lateral section. Other important function is protection of the ends of the bones from rubbing on each other and to deepen the tibial sockets into which the femur attaches (Fitzgerald, 2004).

The serve have an important function in proprioception due to nerve ending in menisci and also play a role as secondary restraints to anterior translation of tibia. Menisci help also the joint lubrication and cartilage nutrition by keeping the synovial fluid film over the joint surfaces compressing the synovial fluid into the cartilages of the knee articulation (Manske, 2006).

Compressive forces absorbed by menisci are approximately 50% to 60% of the knees loads. The meniscal load increases to more than 85% of the total knee joint compressive forces, when the knee is at 90grade flexion and when the force is applied at the posterior part of the joint. This fact may be related to posterior degenerative tears, as well as to the continuous activity imposed on the menisci during positional activities for example squatting. Acute tears occur often during activities, like running or other maneuvers, when the knee is near full extension (Houglum, 2005).

4. MECHANISM OF INJURY

Majewski in his study (Majewski, 2006), reported that injuries to the menisci are the second most often injury occurring to the knee, with an incidence of 12% - 14%. Its prevalence is 61 cases per 100.000 persons. Most frequent lesions of the menisci are done during sport practicing, mostly football and skiing. Studies confirm that all meniscal lesions occurring during different sports are in high percentage lesions of the medial meniscus 24%, lateral meniscus 8% and 20-30% are combined meniscal tears and ligament injuries. Majewski in his study observed that from all the cases having a combined meniscal tear (medial meniscus and ACL), almost 85% of these cases needed arthroscopic treatment.

In acute injuries of the soft structures of the knee (menisci, ligament) mostly these symptoms appear: pain, joint swelling, often with joint locking and reduced mobility. Medial menisci injuries are often associated with ACL insufficiency, as a result of abnormal tibial translation. The lateral meniscus is usually connected with an acute ACL tear. Isolated injury of the medial meniscus does not affect the knee instability, but if combined with a ligament rupture, ACL more often, the knee becomes unstable. The isolated tears of menisci tend to be degenerative ones, while combined tears are more likely to be acute (Shelbourne, 2009).

So if the knee is stable even though with a meniscal injury may not be needed to a meniscal repair. But this is not true for an unstable knee, because passing the time the knee will be more unstable and the risk of degenerative changes in the knee is high. Meniscal repair when it is combined tear even with an ligament repair, have better prognosis than an isolated meniscal repair (Huang, 2003).

Choosing the optimal therapy for an injury depends on the accuracy of diagnosis, type of injury, physician experience and the cooperation of the patient. If surgical treatment should be chosen, often it is the invasive arthroscopy. This due to a general effort to maintain as many parts as possible, of the injured structures of the knee articulation, especially menisci and cartilage (meniscal suture, reinsertion of cartilage). The goal of meniscal surgery is to restore a functional meniscus, to prevent the development of degenerative osteoarthritis in the involved knee. The goal of rehabilitation is to restore patient function based on individual needs (Brindle, 2001).

4. 1. Types of meniscal tears

The main mechanisms of injury in menisci are a combination of torsion (sharp twist by unstable load) and axial loading (high compressive force between tibial and femoral articular joints). Injuries of a healthy meniscus are usually produced by a compressive force coupled with transverse plane tibiofemoral rotation as the knee moves from flexion to extension during rapid cutting or pivoting (Cade, 2004).

Types of meniscal tear differ concerning the location of the tear and the mechanism of injury. Lateral meniscus has a larger articular surface, the load transmission in lateral meniscus is higher, is more mobile and collecting all this factors we came to the conclusion that, the probability to have a lesion or fracture is lower, than the medial meniscus (Masouros, 2008).

Frayed Edged

The meniscal lesion can be seen just as a small damage at the edge of the meniscus. A frayed inner meniscal border is a common consequence. Surgeons just reduce this worn-out part hoping that the damage is enclosed and so preventing enzyme release from the area which can increase further degeneration processes in the meniscus (Strover, 2008).



Figure7: Frayed Edged (Strover, 2008)

Radial tear

Radial tear is a sharp edged fissure from the medial to the lateral border of meniscus (across its radius). The main problem is the inner part of the split that may not heal properly due to the poor vascular supply in that area.



Figure 8: Radial Tear (Strover, 2008)

Parrot- break tear

De facto a parrot-break tear is a neglected oblique radial tear, which tries to heal spontaneously taking a shape of a parrot's break and having a risk of getting hatched in the joint and causing pain or instability.



Figure 9: Parrot- break tear (Strover, 2008)

Circumferential tear

This kind of tear expands all along the length of the meniscus parallel to the circumferential fibers.



Figure 10: Circumferential tear (Strover, 2008)

Bucket-handle tear

Bucket-handle tear is in itself, a form of a longitudinal tear. As the direction of the tear is from the inter part of meniscus to the periphery, the circumferential fibers are also disrupted. This kind of tear is less willing to heal as damaged circumferential fibers may not be able to repair.



Figure 11: Bucket- handle tear (Strover, 2008)

Horizontal cleavage tear

Horizontal cleavage tear is a horizontal division in the body of the meniscus. These tears are not so usual. Mostly they are asymptomatic but apparent on a MRI scan. Some of the causes of these tears can be: a minor injury, continuous stress in the knee articulation and degenerative processes that damage the area.

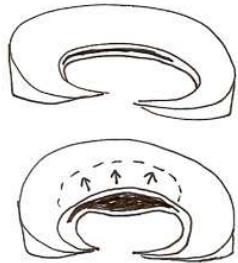


Figure 12: Horizontal cleavage tear (Strover, 2008)

Flap tear

This kind of tear is a horizontal one occurring at the surface of the meniscus. The flap tear is disposed to peel, rubbing with other structures of the knee and causing different symptoms. To trimme the flap away is easy and there is a good prognosis of healing because there is sufficient body of the meniscus to heal the lesion and provide shock absorption to the knee.



Figure 13: Flap tear (Strover, 2008)

4. 2. Non-operative treatment of menisci damages

There are several tears that can be healed conservatively without any need of an operation. Indications for these cases involve absence of symptoms such as swelling and pain, small separations in the meniscal capsular zone (between the medial meniscus and the medial collateral ligament) and degenerative knee disease. It is found that radial tears do not heal properly conservatively. Better results of conservative healing are found in vertical longitudinal tears and horizontal degenerative apertures (Logerstedt, 2010).

In the cases that the meniscus is treated with a conservative intervention the most important procedures followed are the application of ice, wrapping, compression, and nonsteroidal anti-inflammatory drugs. Best results are obtained if these methods are combined with physical therapy to improve the range of motion, stability and muscular strength (Çaushi, 2005).

It is very important the education of the patient during the process of the healing, he should gradually restart activities and should be very careful to avoid movements of the knee that can increase the risk of having a tear, such as pivoting movements, hyperflexion of the knee, especially during the first three days to first week, period that pain and swelling could still be present and the patient is not fully recovered.

Several conservative treatments were used to reduce the instability in the medial or lateral knee compartment, reduce pain and swelling, such as wedged insoles, ankle foot orthotics, knee braces, taping, kinesiotaping. Eun-Hi Choi (Eun-Hi, 2011) after examining the effects of knee brace in different activities, such as slow walking or fast walking ,came into conclusion that the knee brace during activities stabilized the knee and activated more efficiently the femoral muscles, especially m. quadriceps femoris.

Complications of the conservative care include progression of the lesion and joint degeneration, especially if there is a high loss of meniscal function (Logerstedt, 2010).

4. 3. Surgical treatment of menisci damages

The goal of meniscal surgery is to restore a functional meniscus, so to prevent the development of degenerative osteoarthritis in the involved knee (Brindle, 2001). Meniscus tears that occur in the periphery may be repaired using a variety of operative procedures with high success rates. Complex multiplanar tears that extend into the central one-third avascular zone can also be successfully repaired using a meticulous vertically divergent suture technique. The outcome of these repairs justifies preservation of meniscal tissue, especially in younger athletic individuals. Meniscal transplantation is a valid treatment option for patients who have undergone meniscectomy and have related tibiofemoral joint pain, or in whom articular cartilage deterioration in the meniscectomized compartment is present (Heckman, 2006).

It is necessary to monitor the patient's response after the surgery. The main complication is mostly arthrofibrosis, which can significantly worsen the outcome of therapy. After failure

of nonoperative treatment or in case that some injuries are primary recommended directly for a surgery, there are several current methods used to repair meniscal tears. These methods include the open technique, the arthroscopic outside-in, the inside-out, and the all-inside technique (Bernstein, 2010). Many studies led to the conclusion that surgery induces more often the development of post-operative degenerative conditions if not correctly connected to a specific rehabilitation protocol (Frizziero, 2012).

If after six to twelve weeks, the conservative treatment was unsuccessful, patient are indicated to undergo surgical treatment. Indications for operation are pain, swelling, instability to achieve full extension of knee, locked knee, and tears of meniscus especially in young patients. The aim of operation of the knee is to maximally maintain and stabilize the meniscus. These procedures include partial or total meniscectomy, vascular stimulation to increase the healing process, meniscal repair and replacement. Meniscectomy can be using open or close techniques.

Contraindications include tears located in the inner one-third region (width greater than 8 mm), tears with major tissue fragmentation or degeneration, and tears with edges that cannot be reduced and approximated. Longitudinal tears less than 10 mm in length or incomplete radial tears that do not extend into the outer one-third of the meniscus are not repaired (Heckman, 2006).

Contraindications for a meniscus transplant are advanced knee joint arthritis, defined as less than 2 mm of tibiofemoral joint space on 45° weight-bearing posteroanterior radiographs and MRI evidence of flattening of the femoral condyle, concavity of the tibial plateau, and osteophytes that prevent anatomic seating of the transplant (Gjika, 2010).

Knee joint instability is a contraindication unless the patient is willing to undergo ligament reconstruction either before or with the meniscus transplant. Other contraindications include knee arthrofibrosis, muscular atrophy, and prior joint infection.

4. 3. 1. Total and partial meniscectomy

In the year 1885 was reported the first surgical human meniscus repair and was a very long and difficult procedure. At the time, total meniscectomy became the preferred operation and the only way of repairing meniscal damages, because this kind of operation was considered very technically challenging and tear meniscus were also considered as functionless

structures. After long term observations about the results of the total meniscectomy, were noticed early beginning of osteoarthritis, prompting the discovery of other surgical options.

Other options were taken into consideration, replacing so the total meniscectomy, such as partial meniscectomy, repairs and transplantations. It is really important for the surgeon, that before selecting a particular surgical technique, to consider the patient's health, lifestyle, age, and willingness to undergo the surgery. Another very important process in the whole operation process is the education of the patients about the pros and cons of meniscal repair or resection and they should be informed of their extent period of rehabilitation and obligations. Patients should know that the surgical success is also based on which meniscus was injured and the type of tear they have. Gjika (Gjika, 2010) reported that degenerative meniscal tears show poor repair capacity due to the insufficient tissue integrity of both the lesion site and the sites that are next to the meniscal tissue.

For patients older than 30 years, partial meniscectomy is recommended as the surgical treatment of choice, even patients older than 50 years are ideal candidates for partial meniscectomy due to the high risk they have to develop OA. To indicate a patient to undergo a surgical repair are taken into consideration some factors, such as location of the tear type of injury, and also the vascular supply. Partial meniscectomy is mostly used in flap tears, radial tears, horizontal cleavage tears and tears located in the avascular area (white- white zone) (Brindle, 2001). In this kind of surgery the torn or instable fragment of meniscus is removed. Partial meniscectomy can be done arthroscopically. Studies show that results are very good in 90% of knees without articular degeneration and in 60% to 70% of knees with degenerative joint disease.

Complications of partial meniscectomy are repetitive tearing (which are not so common), mistakenly injuries of the joint surface from using the instruments and risk of necrosis in the avascular zones, due to decreased blood supply (Bejtullahu, 2007).

In those cases where the menisci are damaged beyond repair or has been partially removed with still persistent pain, locked knee, instability and swelling, a total meniscectomy is done. Total meniscectomy is last choice decision, due to high costs, increased risk of osteoarthritis and high risk of future total knee replacement.

Partial meniscectomy alter the biomechanics of the knee: after total meniscectomy the peak local contact pressure is pressure is 235% of normal, while in the partial meniscectomy increased by 65% (Fizziero, 2012).

There is a difference even between lateral and medial meniscectomy. The lateral meniscectomy proves a decrease of the contact area between articular structures by 40% to 50% and increase of the contact stress by 200%. While the medial meniscectomy decreases contact area by 50% to 70% and contact stress increases less than half of lateral one, which is 100% (Shaqiri, 2005).

4. 3. 2. Techniques used for meniscal repair

There are different techniques for meniscal repair. We can divide them into two categories of repairs: repair with an implant and suture repair.

Suture Repair

The suture repair involves two techniques: the inside-out technique, the outside- in technique and all inside. Suture techniques use a specialized implant. This surgical technique is very much developed due to its less “invasive” technique and better prognosis of OA (osteoarthritis) risk after the meniscectomy. Suture repair is indicated in acute states, longitudinal lesions, lesions of menisci associated with ligament injury or lesions in the vascular zone (red-red or red white zone) (Topi, 2007).

Outside-In Technique

This technique of arthroscopic meniscal repair was developed by Warren and Rodeo as a method to lower the risk of injury of the peroneal nerve during arthroscopic lateral meniscal repair (Rodeo, 2000).

The advantages of outside-in technique comparing to the inside-out techniques are that sutures can be established without the need for hard cannulas for the fixation of the suture, as used mostly in the inside-out techniques and the exact suture placement even in zones with limited access, this due to the small needles used, instead the hard cannulas in inside-out technique (Evans, 2013).

Inside-Out Technique

This technique becomes popular in early 1980s by Henning. This technique is used because it provides a very good visualization for placement of the sutures, and also due to the fact that it is used to repair meniscal tears in every zone, that they might be located. The disadvantage is the incision that should be done to place the needles and a risk of neurovascular injuries.

All- Inside Technique

This kind of technique uses non-suture implants and the choice the implant going to be used, depends on the surgeon's decision. The surgeon should be very careful while making this decision because some implants tend to lead to chondral injury once they are implanted (Manske, 2006).

Suture with an implant

Collagen meniscus implantation (CMI)

Purified type I collagen is taken from Achilles tendons to make CMI. In his study William (William, 2001) highlighted that CMI, which is a new biomechanically competent tissue imitating meniscus, can be used to replace irreparable parts of meniscus or lost meniscal tissue in patients with a chronic meniscal injury. This implant supports new tissue ingrowth and seems to have benefits for patients having a chronic meniscal injury.

Meniscal Allograft Implantation

Meniscal allograft implantation (MAT) is yet an experimental technique used recently to repair meniscus tears, and a rescue type of operation possible for the completely meniscus-deficient knee. The ideal candidate for an application meniscus allograft is an active, young person with pain over a meniscus- deficient zone (Manske, 2006).

Rodeo (Rodeo, 2000) showed that human meniscal allograft transplants are repopulated with cells that are derived from the synovial membrane.

5. CLINICAL EXAMINATION

The data obtained during the initial physical examination in combination with other diagnostic tests are largely decisive to decide if surgery after meniscal injury is needed. A complete examination should consist of a thorough injury history, regional palpation, and special tests. Heqimi (Heqimi, 2011), reported that statistical methods applied to medical historical data were 85% to 98% definite for predicting the presence of a meniscal tear, depending on whether predictive questions were used.

Some specific tests we use to distinguish menisci problems are: McMurray test, Payr's test, Prone knee extension, Bounce test, Appley's compression test, Childress' test, Thessaly test, Ege's test and Steinmann test.

It is very important to involve in clinical examinations diagnostic imaging, such as conventional radiography to evaluate the possibility of a fracture, osteochondral injury or even intraarticular loose body (Kola, 2012). Magnetic resonance imaging helps to visualize internal structures in details and better identification of meniscal tears.

5. 1. Physical examination

The most frequent symptoms present in the patients who have injured menisci are pain, swelling, locking of the knee and instability. The pain is manifested when the knee is flexed, for example when squatting. Other potential reasons of causing knee pain might include even intraarticular and extraarticular problems, such as arthritis and tendopathy (Manske, 2006).

The instability is also associated with ligamentous injury. The physical examination of a patient should include a whole inspection of the body, palpation, specific tests to distinguish the origin of the problem in the knee (whether it's because of meniscus or ligamentous injury). The McMurray test, Payr's test, Appley's compression test, Steinmann tests and Thessaly test are the most frequently used clinical tests for meniscal pathology (Canaj, 1999).

McMurray test

During the McMurray test the patient lies supine with fully flexed knee. In this position the examiner with one hand, holds the sole of the foot, and with the other palpates the tibiofibular joint. Depending on the meniscus that is going to be tested the examiner starts the maneuver in different positions. To test the lateral meniscus the maneuver starts with external rotation of the tibia, and is performed extending the knee, going to inner rotation of the tibia

and applying at the same time valgus stress. When testing the medial meniscus the tibia starts the maneuver in inner rotation of the tibia, applying varus stress in the knee while extending the knee and externally rotation the tibia (Cuccurullo, 2004).

The examiner always palpates the side of the joint that is being tested. The test can be repeated with increasing the flexion of the knee till 90 degrees. The test is positive if the patient feels pain or a “click” sound is felt by the examiner or the patient (Cuccurullo, 2004).



Figure 14: McMurray test (Cuccurullo, 2004) a) initial position b) final position (photo author)

Appley's compression test

We use the Appley's compression test to distinguish between meniscal or ligamentous pathology. The patient is in a prone position with the 90 degrees flexed knee. The examiner pressure downward on the heel compressing the menisci between tibia and femur, and from this position rotates the tibia, maintaining the initial pressure. This test is positive if the patient feels pain in the lateral or medial part of the knee (Cake, 2004).

To distinguish ligamentous pathology, the same test is applied, but instead compressing the examiner distracts the tibia from femur. If pain is located during this traction maneuver, than we can indicate ligamentous pain than meniscal injury (Cake, 2004).



Figure 15: Appley's compression test (Cake, 2004) (photo author)

Payr test

This test is also used to detect meniscal pathology. The patient is in a supine or sitting position. The heel crosses the dorsal part of the opposite tibia, the examiner lifts the heel towards the ceiling and the knee towards the table. Every pain in the medial part of the leg, determine medial meniscus pathology (Cake, 2004).

Steinmann test

The patient sits in the edge of the examination table with the 90 degree flexion in the knee joint. The examiner holding the foot from the heel and its ventral part rotates the tibia internally and externally. If the patient reports pain in the medial part of the knee, than the medial meniscus might have pathology. If the patient reports pain the lateral part of the knee, than we should take into consideration lateral meniscus pathology (Kolář, 2009).



Figure 16: Steinman test (Kolář, 2009) a) neutral position b) rotation of tibia externally c) rotation of tibia internally (photo author)

Thessaly's Test

Thessaly is a clinical screening tool for meniscal injuries that shows the dynamic reproduction of knee joint loading. Thessaly test is done in a knee flexion of 5° and 20°. The physiotherapist supports the patients from the front and the patient rotates the knee and the body, externally and internally, keeping the knee in 5°flexion. The same procedure is repeated with the knee flexed at 20°. The patients having a meniscal tear can experience a joint-tine discomfort and may have a sense of locking and pain (Heqimi, 2011).



Figure 17: Thessaly's Test (Heqimi, 2011) a) neutral position of the patient with a 20° flexion of the knee b) internal rotation of the knee and the body c) neutral position of the patient with a 20° flexion of the knee d) external rotation of the knee and the body (photo author)

Ege's Test

Ege's test is a weight bearing test, detecting a meniscus tear on the medial or lateral side of the knee. Depending on the meniscus we want to examine, the patient's feet are turned outwards for medial meniscus or inward for lateral meniscus (Heqimi, 2011).



Figure 18: Ege's Test (Heqimi, 2011) (photo author)

Duck Walk (Childress' Test)

Duck walking test or Childress' test is a weight-bearing test that consists in several repetitions of full weight bearing flexion on the knee in different positions. The patient tries to walk in these positions. If pain or snapping in posterior horn area, is present during duck walking, than we can take into consideration a meniscal pathology.

A patient can't perform duck walking, if having medial meniscus pathology (Kolář, 2009).



Figure 19: Duck Walk test (Kolář, 2009) (photo author)

Bounce Home Test

Bounce home test helps detect meniscal injuries while making a passive flexion of knee and hip. The therapist holds the heel of the patient and requests the patient to extend the knee freely and slowly. If the femur rotation on tibia, and if extension of the knee is blocked, than we can suspect for a meniscal injury (Heqimi, 2011).



Figure 20: Bounce Home Test (Heqimi, 2011) a) initial position b) final position (photo author)

Steinman's Tenderness Test

This test is done in order to diagnose meniscal tears at the knee joint. The patient lies supine with a flexed knee and hip to 90 degrees. The therapist palpates the lateral and medial line of the knee joint and moves anteriorly and posteriorly with flexion and extension of the knee. Tibia is rotated laterally and medially. If these movements are painful, than this sign indicates meniscal injury. The Steinman's Tenderness test is repeated in different degrees of knee flexion (Kolář, 2009).



Figure 21: Steinman's Tenderness test (Kolář, 2009) (photo author)

Joint Line Tenderness

The purpose of the test is to assess any meniscal injury. The patient is in a sitting position or laying with the knee at a 90° flexion. The therapist palpates both medial and lateral tibiofemoral joint line. If the patient feels pain in the line palpated, than the test is positive (Çaushi, 2005).

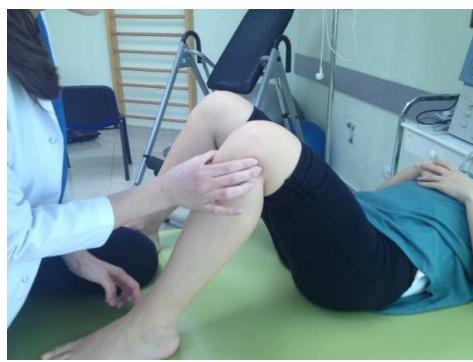


Figure 22: Joint Line Tenderness (Çaushi, 2005) (photo author)

Helfet test

The test is performed in a sitting position. The therapist should note the location and the axe of the tibial tuberosity. The patient is asked to extend the leg. The therapist should focus on the line of movement of the tibial tuberosity. No lateral movement of tibial tuberosity or blocked movement of the leg while extending indicates meniscal injury (Bejtullahu, 2007).



Figure 23: Helfet test (Bejtullahu, 2007) (photo author)

Merke test

This test is done in order to find menisci pathology. The patient stands on the leg that will be examined and rotates the body left and right. If the patient feels pain along the knee joint line, than the test can be considered positive (Bejtullahu, 2007).



Figure 24: Merke Test (Gjika, 2010) (photo author)

Bragard test

The tests helps to detect meniscal tears or articular surface irregularity, such as chondral lesion. The patient lies on the bed. If pain is present while external rotating and extending the knee, than the test is considered positive. External tibial rotation and knee extensions moves the meniscus more anteriorly, which can be a reason of pain reproduction along the joint line (Heqimi, 2011).



Figure 25: Bragard test (Heqimi, 2011) (photo author)

5. 2. Imaging examination

Radiographs

Radiographs can be done in a standing position with antero-posterior view, a lateral view and a Merchant view. When having 45 degrees of flexion in a standing postero-anterior view, it better demonstrates posterior part narrowing and is suitable when the examiner suspect early joint degeneration. Standing radiographs make possible the examination of alignment, which is very important due to atraumatic meniscal tears (Manske, 2006).

Magnetic Resonance Imaging (MRI)

Magnetic Resonance Imaging is largely used to visualize inner structure of menisci in details, because it provides very good imaging of soft tissues of the body. Menisci without pathologic changing have a low signal intensity shown in the MRI and areas of high signal intensity show tears or other meniscal pathology. For patients to whom the MRI is contraindicated (claustrophobic, patients who have heart pacemakers), computer tomography (CT) is indicated (Cela, 2001).

6. POST-SURGICAL REHABILITATION FOLLOWED FOR MENISCI INJURIES IN USA

The rehabilitation program for menisci injuries has gone through a considerable evolution over the past several years. Comparing to the past, current treatments and methods being used, make possible a more rapid return to daily activities of the patient with a more significant reduced damaging effects (Goyal, 2013).

Receiving the proper rehabilitation program after meniscal injuries is very important. During this process it is crucial a multidisciplinary interaction between the orthopaedic surgeon, physiotherapist, patient, patients' family and all the working staff, when the patient returns to his previous job and to his everyday activities. Factors like the type of meniscal tear, type of surgical intervention, patients functional needs, state of the knee articulation before the operation and motivation of the patient are crucial in deciding the rehabilitation protocol and proper timing of recovery needed after a surgery of injured menisci (Brindle, 2001).

6. 1. Post operation rehabilitation program for partial meniscectomy followed in USA

An arthroscopic partial meniscectomy is often a surgery of choice, in case that the meniscus is not reparable and the patients continue to experience knee locking, pain and high limitations in the knee range of motion. Major advantage of partial meniscectomy is considered the fact that the procedure itself preserves the peripheral rim of meniscus, insuring stable biomechanical function of the knee (Hwa-Jae, 2012). Concerning the American Academy of Orthopaedic Surgeons (AAOS, 2010), after the partial meniscectomy a rigorous rehabilitation program is necessary to be followed in order to restore the knee mobility, improve the symptoms, return to everyday living activities, insure a healthy unlimited life, return to sports and prevent additional damage. It is very important that every rehabilitation protocol to be supervised by the surgeon doctor and physiotherapist, which are responsible about choosing proper exercises that will help the patient achieving his rehabilitation goal. The intensity and the range of activities performed by the patients, should be primarily recommended by the orthopaedic surgeon.

Following recommended rehabilitation guidelines of American Academy of Orthopaedic Surgeons (AAOS, 2010), the rehabilitation program after menisci surgery is divided into

three phases depending on the post-surgery period, rehabilitation goals and persistent symptoms. First phase starts from the first day of the operation to the second week. This phase is the period when maximum protection of the knee structures is prescribed. Rehabilitation program starts with a two or three times per day exercise set, which lasts approximately 20 to 30 minutes each set of exercises. The main goals in this phase are control of post-surgical symptoms such as swelling and pain, maintenance of active and passive range of motion of the knee and regain of quadriceps strength.

Directly after the operation, the patient should be placed on crutches because of reflex inhibition of muscle activity (Heckmann, 2006). Depending on the ability of the patient to walk without assistance, within a few days after the operation as the pain and edema disappear, the weight bearing is tolerated gradually, being based on the tolerance of the patient (Brindle, 2001).

The muscles that should be activated during a well-structured rehabilitation program are quadriceps, hamstrings, hip abductors, hip adductors and gluteus muscles.

Exercises for quadriceps reinforcement are started immediately after the operation, but they are not easily performed by the patient because of reflex inhibition of the muscles.

A study done by Ericsson (Ericsson, 2006) concerning the muscle strength, functional performance, and self-reported outcomes four years after having an arthroscopic partial meniscectomy in middle aged patients was concluded that four years after the surgery of menisci, the quadriceps strength is reduced compared with the non-operated leg. Concerning Ericsson (Ericsson, 2006) this reduction of strength of quadriceps affects pain, knee function and quality of life of these patients. To assess this conclusion Knee Injury and Osteoarthritis Outcome Score (KOOS), isokinetic muscle strength testing, functional performance tests (one-leg rising test, square hop test) were used. This study demonstrated that after knee injury and surgery, quadriceps muscles are more affected than hamstrings.

This insufficiency in quadriceps strength leads to increased physical stress with more cartilage impact loading. The maintenance of the knee stability may be also affected by a decrease of proprioceptive deficit

In order to strengthen quadriceps muscles electrical stimulation (ES) is also used. There was evidence that ES accompanied with rehabilitation programmed exercises is effective in strength increase (Imoto, 2011). Quadriceps muscle strength is very crucial for recovering physical function and is shown to be connected with abnormalities of walking speed and stability. During the first phase, a very important part of the rehabilitation program is the strengthening of the knee extensor muscles. It is very essential for sportsmen to restore

the quadriceps normal strength in both limbs before returning to sports and to achieve this rehabilitation plays the main role.

A sportsman can return to sport when the muscle strength of quadriceps is at least 80% compared to the contralateral non-operated limb. But still there are some limitations for the period a sportsman can return to competitions. It can't be done unless the quadriceps muscle strength in the operated limb is at least 90% comparing to the non-operated limb. Usually the patients return to their works after 1 or 2 weeks after the operation, to sports after 3 to 6 weeks and competitions in a 5 to 8 weeks' time (Fizzero, 2012).

Based on recommended guidelines of American Academy of Orthopaedic Surgeons the rehabilitation protocol during the first phase, should contain stretching and strengthening exercises. It is very important after the warm-up or before the exercising to perform stretching exercises that should be repeated even in the end of the program. During the exercise the patient should not feel pain, if so the patient should stop exercising and contact the doctor (AAOS, 2010).

Some stretching exercises that are recommended from the American Academy of Orthopaedic Surgeons are: *heel cord stretch*, no need for equipment, 2-4sets of repetitions, six to seven days per week. The muscles that are activated during heel cord stretch are gastrocnemius and soleus. The patient should feel the stretch in the calf and into the heel. The stretch can be hold for 30 seconds to than relax for 30 seconds. While performing this exercise the patient should not arch the back.

Another stretch exercise recommended from the American Academy of Orthopaedic Surgeons could be *standing quadriceps stretch*. No equipment is needed while performing this exercise. In this exercise the main muscle working is quadriceps and the patients feel its stretch in the front of the thigh. It is important to have proper balance while doing standing quadriceps stretch so the patient can hold on the back of a chair or a wall for balance grasping the ankle and gently pulling the heel closer to the body. This position can be hold for thirty seconds to one minute and should always be repeated with both legs. The back should not be arched or twisted. This exercise can be repeated 2 to 3 times and 4 to 5 days per week.

Concerning American Academy of Orthopaedic Surgeons, *Supine Hamstring Stretch* is a very good exercise for stretching hamstrings. The patient can lie on the bed or on the floor with both legs bent and bring one knee to the chest having a straighten leg. Then the patient can pull slowly the leg to the head until he feels a stretch at the back of the thigh or behind the knee. No pain should be felt during the performance of this exercise, if so, the patient

should interrupt the exercise. This exercise can be performed 2 till 3 times, 4 to 5 days per week.

Main strengthening exercises recommended from the American Academy of Orthopaedic Surgeons are half squats, hamstring curls, calf raises, leg extensions, straight leg raises, straight leg raises (prone position), hip abduction, hip adduction and leg presses.

Half Squats are very good for strengthening of quadriceps, hamstrings and gluteus. Usually in the beginning no equipment is needed, but when the exercise becomes easier to perform from the patient, the doctor and physiotherapist can allow increasement of resistance by holding not heavy hand weights. The patient should have gained a good balance to perform this exercise. It is important for the physical therapist to give lots of instructions about how to keep the back and leg while performing half squats. This exercise can be repeated three to ten times, four to five times per week.

Hamstring curls activate hamstrings and as in half squats ankle weight are added when the exercise becomes easier for the patient to perform. Resistance is increased gradually. For balance the patient can hold a wall or the back of a chair. The knees should be kept close together and the heel is raised toward the ceiling as far as possible and without any pain. The exercise can be repeated three to ten times, four to five days per week.

Leg extensions and *Straight Leg Raises* are performed to strengthen mainly quadriceps. As the exercise becomes easier for the patient to perform, ankle weight can be added gradually. During the leg extension exercise the patients' sits up straight on a chair and slowly straighten and raise the affected leg as high as possible. This position is kept for about five seconds and then the patient relaxes. The leg should not swing or use force to lift higher. During straight leg raises, the patient can lie on the floor. The elbows should be kept under the shoulder to support the upper part of the body. It is very important not to tense up in the neck and shoulders while performing this exercise (AAOS, 2010). The patient keeps the affected leg straight and bends the other leg so that the foot reaches on the floor. Then tightening the quadriceps of the affected leg, slowly raises the leg 30-60cm off the floor. This position is held for five seconds and then relaxes. These exercises can be repeated for three to ten times, four to five days per week.

Hamstrings and gluteus can be strengthened using *straight leg raises in prone position*. The patient lies on the bed or on the floor keeping the pelvic bones on the floor and resting the head on the arms. After tightening the gluteus and hamstrings of the affected leg the patient raises the leg toward the ceiling as high as possible keeping this position for five seconds, and

then relaxing for two seconds. This exercise can be repeated three to ten times, four to five days per week.

Hip abduction: It is very important that during the exercise, the patient should not inner rotate the leg. The patient lies on the side having the injured leg on the top and the bottom leg is blended. The top leg is kept straight and slowly the patient raises it up to 45°, keeping the knee unlocked. This exercise can be repeated three to twenty times, four to five days per week.

Hip adduction strengthens the adductors muscles who are very important stabilizers of the pelvic articulation. The patients lies on the side of the affected leg, having both legs straight. The uninjured leg is crossed in front of the injured one. The patient raises the injured leg 30-40 cm from the floor, holding this position for five seconds. Then relaxes for two seconds and repeats this exercises three to twenty times, four to five days per week.

Leg presses is performed using an elastic band of an acceptable resistance, so not to cause any pain. If the patient performs the exercise easily without any pain the level of resistance of the elastic bands is increased. In this exercise the quadriceps and hamstrings muscles are activated. The center part of the band is positioned in the arch of the foot and the patients keep both ends. The patient lies on the floor or bed keeping the elbows bent and close to the body. After tightening the quadriceps muscle of the affected leg, he tries to bring the knee toward the chest and then flexing the foot slowly straighten the leg in front of him pushing against the band. This exercise should be performed slowly and without force or pain. Repetitions of this exercise and are three to ten sets, four to five days per week.

Achievement of full extension without feeling pain and flexion to 90° is one of the criteria for advancement. Other criteria for advancement into the next phase are also adequate quadriceps control strength and no perceptive post-surgical symptoms. During this period the patient should avoid active knee flexion, prolonged standing or walking and ambulation without brace. When all these parameters are settled, the second phase could begin targeting a moderate protection of the knee. The second phase period starts after the second week till the sixth week. Rehabilitation goals in this phase are restoring stabilized gait pattern, full range of motion and weight bearing, maximize quadriceps strength and increase ADL endurance. Treatment strategies recommended in this phase concerning the guidelines of American Academy of Orthopaedic Surgeons (AAOS, 2010) are progressive weight bearing, active resistance exercises, neuromuscular training involving proprioception and balance exercises, use of physical therapy modalities such as electro therapy and ultrasound. Once the clutches are off, the patient can start walking in treadmill or cycle without tension. Criteria for

advancement ahead with the rehabilitation program are ability to unilateral weight bear without pain, stability of the knee, achievement of 90° knee flexion.

Walking and running should be gradually involved in the exercise program after menisci surgery. Walking can be started in the second week after the surgery. The patient should not walk more than 10 minutes in the beginning. When the patient is well balanced and has gained strength, gradually the walking period is prolonged. Running is an activity that should be avoided until six to eight weeks because of the shock forces that are transmitted to the knee while running.

By the third to fifth week a jogging and running program can be started, always taking into the consideration the situation of the patient and how is he reacting to this mechanical force stresses (AAOS, 2010). If the patient reacts properly without any swelling or pain, we can progress to running and later functional activities. As soon as the patient is in a very good shape, has good physical condition and has an adequate coordination and strength, he can fully return to his functional activities, including sport participation.

Outcome from a systematic and intensive rehabilitation program followed after knee menisci surgery is to restore the knee mobility, strength and stability (Williams, 2001).

Anyway, there is a controversial study confronting the recommended guidelines of AAOS. In a randomized controlled trial done by Goodwin (Goodwin, 2003) he came to the conclusion that a supervised physical therapy used in the early period after arthroscopic partial meniscectomy was in no great benefit to the patients. To achieve this conclusion Goodwin randomly divided the patients into two groups. One group, received 6 weeks of supervised physical therapy and a home program of exercises. The second group received only the home program of exercises. Lots of specialized tests and questionnaires were done and factors, like the number of days a patient needed to return to work after the surgery, were taken into consideration to measure the outcome of this study. Goodwin (Goodwin, 2003) came into the conclusion that between groups were found no differences of any of the outcomes measured.

6. 2. Rehabilitation after meniscal repair in USA

Regarding to weight bearing allowance for patients after meniscal repairs, there exist conflicting opinion regarding rehabilitation programs aiming ROM improvement and proper timing needed to return to physical activities. In his study Logerstedt (Logerstedt, 2010), emphasized that the early progressive knee motion should be compatible with the knee meniscal surgery and delay to activities may be accepted depending on the type of meniscus lesion and patient ability to load gaining.

Open and closed kinetic chain exercises can be started on the first two or three days after the surgery. Step by step, other exercises are added, such as step-ups and step-downs, stationary bike, use of weights, balance exercising are also important to increase proprioception, and then activities that include dynamic balance training. Improving function, restoring knee stability, muscular strengthening, neuromuscular coordination and preventing further damages of the knee are the main goals of rehabilitation after surgery of the knee menisci.

In the following two-four weeks after the operation of menisci low intensity activity might be recommended, such as walking, riding a stationary bicycle, simple warm up exercises, or slow tempo walking in the treadmill. It is very important after the warm-up or before the exercising to perform stretching exercises that should be repeated till the end of the program (AAOS, 2010). During the exercise the patient should not feel pain, if so the patient should stop exercising and contact the doctor. During the second till fourth week the aim of rehabilitation is to achieve a full range of motion in the knee articulation.

After the fourth week and on strengthening exercises are given. The patient can return to sport activities. Symptoms like persistent swelling, redness around the knee and increasing pain should not be present.

Therapeutic exercises should consider strength and functional exercises to increase quadriceps and hamstrings strength and functional performance after meniscectomy. So in the early phase after the surgery, partial loading might be allowed for four weeks and the patient can return to sports after 5 or 6 months.

But as it was mentioned above, this is not the only one aspect the rehabilitation program is followed. Other authors consider early full load bearing without brace and immediate mobilization of the operated knee, as very important. Heckman (Heckmann, 2006), highlights that rehabilitation after meniscus repair includes knee motion and quadriceps strengthening

exercises initiated immediately from the first day postoperatively. Excessive weight bearing and compressive forces should be eliminated during gait because it might cause damages to the healing meniscus. In his study Heckmann (Heckmann, 2006) suggests that flexion up to 90 degrees should be allowed in the first two weeks after the operation, and this flexion should be increased up to 120 degrees in the third and fourth week, reaching its maximum from the first to second month after the operation. Immediate quadriceps strengthening isometric contraction exercises are recommended from the first day after the operation.

Always depending on the type of meniscal damage after the period of 3 to 5 weeks after the operation, a more completed strengthening rehabilitation program takes place. It might include *cup walking exercises*, which help the patient control their balance, heightened awareness of the operated limb and feeling the bodyweight over the operated knee. Other exercises aiming quadriceps muscle strengthening are wall sits, mini-squats, squat with little dumbbells, hamstring curls etc. Proprioceptive and balance exercises are important after the first month after the operation, even when the weight bearing is partial (AAOS, 2010).

The full load is considered to be possible after the first 6 or 7 weeks, period when even different fitness machines like *leg press* can start to be used from the patients always respecting a consider number of exercises. For patients who were physically very active before the menisci operation, it is very important the period that they could return to jogging or sports. Heckmann (Heckmann, 2006) suggests that running can begin after the 26th week and the return to full activity around 30 to 35 weeks after the operation, but this doesn't mean that it could not be delayed even up to 52week depending on the state the patient is.

Michaela Oravitan (Oravitan, 2013) did a randomized, controlled, parallel group study to evaluate the effectiveness of electromyographic biofeedback (EMG-BFB) as part of a meniscal repair rehabilitation program. Their study consisted in dividing 64 patients who were diagnosed with meniscal tears, aged between 20-50 years old. These patients had an arthroscopic meniscal repair. The aim of the study was to compare the convalescence of patients with meniscal tears treated by meniscal suture and their rehabilitation program included EMG-BFB, with a parallel group of patient whom followed the same rehabilitation program excluding EMG-BFB.

Table 1: Numbers of patients based on their meniscal tears location (Oravitan, 2013)

Injured meniscus	Localization of tear	Study group	Control group
Medial meniscus	Anterior horn	3	2
	Middle part	4	6
	Posterior horn	14	12
Total		21	20
Lateral meniscus	Anterior horn	1	-
	Middle part	1	2
	Posterior horn	10	9
Total		12	11

The early rehabilitation program followed by both groups after meniscal repair, was as shown in table 2.

Table 2: The early rehabilitation program followed by both groups after meniscal repair (Oravitan, 2013)

	Post-operative weeks			
	1-2	3-4	5-6	7-8
Range of motion				
0-90°	X	X		
0-120°			X	
0-123°				X
Weight-bearing				
¼ from body weight		X		
½ from body weight			X	
full weight-bearing				X
Scartissue mobilization	X	X	X	X
Physiotherapy				
Electrical muscle stimulation	X	X	X	X
Cryotherapy	X			
Stretching	X	X	X	X
Strengthening				

Quadriceps isometrics	X	X	X	
Hamstring isometrics	X	X	X	
Hip abduction and adduction	X	X	X	
Cycling		X	X	
Toe raises			X	X
Mini-squats			X	X
Lateral step-ups			X	X
CKC resistance exercise			X	X
Isokinetic exercises				X
Coordination				
Proprioception training	X	X	X	X
EMG-BFB (only the study group)	X	X	X	X

CKC- closed kinetic chain exercises. X shows when the mentioned activity was accomplished.

The study group had EMG-BFB on daily bases, from the first till the eighth week. Each patient was instructed to perform an isometric contraction of the selected muscles, as soon as they heard an acoustic sound. In the screen the patients were able to follow the electrical potential of the contracted muscle. They would be able to keep the highest possible value of the electrical potential of contracted muscle. Another second acoustic signal was given to the patient, in order to relax the muscle. This cycle was repeated several times. The muscle chosen to contract were those showing a significative role in the knee dynamic stability and decreased load of passive knee structures (Williams, 2001).

Michaela Oravitan (Oravitan, 2013) concluded their study that EMG-BFB increased the control the patients after meniscal repair had on their muscles during their everyday living

activities, including sport. Sport as a physical activity acquiring better neuromuscular coordination and control, showed, that EMG-BFB is a helping part of rehabilitation program after meniscal repair in achieving good neuromuscular coordination. EMG-BFB is seen as an effective part of rehabilitation program, because it helps muscle strengthening after meniscal operation and could increase knee muscles receptors feedback during exercises. It was observed a rise of the speed of muscle responded to acoustic stimulation given to start contraction and to relax. It is obvious that the speed of the response to the stimulus given (in our case, the acoustic stimulus) indicates the level of neuromuscular coordination recovery (Gordon, 2014).

The study found out that EMG-BFB is an instrumented process that helps patients with meniscal repair how to control their muscles (their contraction and relaxation) and increase the patients' perception of performing physical activities, such as sports, after a period of eight weeks of rehabilitation. The increase of both, the electrical potential in contraction of the knee stabilizers and, the speed of reaction to acoustic stimulus show an ability to develop muscular force faster and is a significant factor in performing physical activities that require neuromuscular control and coordination (Oravitan, 2013).

6. 3. Rehabilitation after CMI in USA

There are not so many studies done to determine the prognosis of patients after CMI or outcome of rehabilitation in these cases. Harston (Harston, 2012) underwent eleven studies with 520 subjects to analyze knee function, symptoms and period needed for the patients after CMI to return to activities. He came to the conclusion that there was a general improvement in patients after CMI, but there is poor information on the long-term prospective in this case, to better determine knee osteoarthritis prevention and if the patients return to activities earlier than those having meniscus repair or either total or partial meniscectomy.

6. 4. Rehabilitation after allograft meniscal transplantation in USA

Rehabilitation of meniscal injuries in the knee after allograft meniscal transplantation is a field, not yet so explored, due to lack of studies done in patients after this kind of operation. In the last 10-15 years this kind of intervention is developed as a surgical technique for those patients whose menisci have been severely damaged from traumas or previous unsuccessful meniscectomy intervention with early OA evolution and painful states. Heckmann (Heckmann, 2006), highlighted in his study that patients after meniscal transplantation need

for up to six weeks, long-leg brace and total weight bearing might be possible from the 5th or 6th week after the operation.

The range of motion increases by degrees little by little and after 6 weeks and the patient can restart sports after four months in order to strengthen the muscles and develop proprioception in the knee articulation. Before 6 months it is not recommended to perform squats, maximum flexion and return to racing sports. Based on the physical state of the patients the return to racing sports can be postponed even to 12 months.

7. POST-SURGICAL REHABILITATION OF THE KNEE MENISCI IN ALBANIA

7.1. Epidemiology of menisci injuries in Albania

As reported by Dr. Lluka Heqimi (Heqimi, 2006), injuries to the menisci are third most common injury to the knee in Albania, with an incidence of 10% to 12% and a prevalence of 41 cases per 100,000 persons. In his epidemiological study conducted on 2,000 patients in Albania from year 2000 till 2012 resulted that, the highest incidence of menisci is seen in young men around 25 years old playing sports involving pivoting, such as football, soccer and basketball. Sport in Albania is referred as an increased risk of meniscal injuries.

Among the injuries affecting the knee, Dr. Lluka Heqimi (Heqimi, 2006) shows that most injuries involved ACL (26%), medial meniscus (15%) and lateral meniscus (3%). He also observes that 80% of patients with meniscal and ACL injuries require arthroscopic treatment.

7.2. Influence of meniscectomy in Albanian patients

In Albania there has been a study from the orthopaedic-traumatologic department of the state Hospital “Mother Tereza” in Tirana (Çaushi, 2005). This study analyzed 400 cases of meniscectomy in the last 20 years and studied the connection between the influence that this intervention had had in the knee articulation. All the documentation of the patients chosen for this study were analyzed, such as anamnesis, clinical examinations, radiographies and MRI taken before and after the operation including all check-ins the patients had done through all these years.

From the study were expelled two groups of patients. Those that except menisci problems before the operation other problems such as arthritis, osteochondritis, foreign bodies, and ligaments tears and those that have had other serious illness (severe heart disease, thrombosis etc.). This study took into consideration only those cases that have had pure meniscectomy. The patients were invited to undertake another control in “Mother Tereza” Hospital in Tirana. Only 168 patients came and were clinically controlled and had an X-ray. All the check-ins was done by one doctor. The other 234 patients didn’t take part in the study,

due to different factors: present illness, wrong addresses given in the anamnesis, changed their apartments, immigrated, they had passed away and other personal reasons.

A questionnaire of 27 questions was given to these patients. This questionnaire had questions about preoperative phase, operational phase and the phase after the operation.

7.2.1. Pre operational phase

This phase includes all the information found in the anamnesis: type of damage, other traumas or operations, if hydroarthrosis or hemarthrosis were found before the intervention, how long did it take from the first symptom till the operation (latent period), age of the patient when operated, sex, profession, if the patient used at the time sport or attended other recreation activities.

Table 3: Basic information of the patients taking part in Dr. Çausi's study (Çausi, 2005)

	Genre	Profession before the operation	Sports attended before the operation	Age when the patient was operated	Hemarthrosis or hydroarthrosis found in the knee before the operation	Latent period	Type of trauma
1.	Female	Sitting	Often	Less than 20 years old	Never	One month	Tear of meniscus without ligamentous damage
2.	Male	Standing	Not so often	20-29 years old	Once	1-6 months	Tear of meniscus with ligamentous damage

3.		Without physical activity	At all	30-39 years old	Twice	6-12 months	
4.		Difficult physical activity		More than 40 years old	Up to 5 times	1-3 years	
5.		Student			More than 5 times	More than 3 years	

7.2.2. Operational phase

Table 4: Information of type of tear, damaged menitus and kind of intervention the patients had (Çaushi, 2005)

	Type of tear	Damaged meniscus	Kind of intervention
1.	Frayed Edged	Right medial	Total meniscectomy
2.	Bucket-handle tear	Right lateral	Parcial meniscectomy
3.	Parrot- break tear	Left medial	Suture repair
4.	Tear of the anterior part	Left lateral	
5.	Tear of the posterior part	Both medial menisci	
6.	Complex tear	Both lateral menisci	
7.		Both menisci of one knee articulation (both in the left or right knee)	

7.2.3. Post operation valuation

To achieve a post-operative valuation, the study was based on clinical and radiographic controls. In the clinical control the subjective and objective symptoms were valued separately.

For the subjective symptoms was asked concerning to the type of pain: chronic one, during the day or the night, after physical effort or no pain was detected. The patients were also asked if the knee function was very good, sufficient for everyday activities but not comfort during movements or bad function of the knee limiting everyday activities. The doctor during his examination asked the patient, if any blocking of the knee was present. The evaluation of post-operative subjective symptoms was done based in the Tapper and Hoover scale. The radiologic and objective results were not included in the validation based on this scale, so to find the correlation with the subjective results.

- 1- Excellent:** Patients do not have symptoms and any limitations or problems with the knee;
- 2- Good:** Patients have little pain resembling more to discomfort in the knee during physical activities but do not have any limitations in the range of motions;
- 3- Bad:** Patients have pain, especially during getting on and off the stairs. Pain often force patients to stop walking or moving the knee;
- 4- Very bad:** Patients can't move, severe pain making the patients stays immobile for several hours' even days.

7.3. Objective symptoms

To compare the clinical and radiographic findings, the study was also based on the objective evaluation of the patients divided into four groups.

Table 5: Group division of the patients concerning the points they gathered from the questionnaire given in the study done by Dr. Çaushi (Çaushi, 2005)

Group 1.	Excellent	More than 40 points
Group 2.	Good	More than 30 points
Group 3.	Bad	Less than 20 points
Group 4.	Very bad	Less than 10 points

The validation differs due to the various symptoms the patients have.

Table 6: Evaluation of examination done by the doctor (Çaushi, 2005)

Knee stability (measured based on Lachman test, McMurray test and instability test)	Verybad 0 points	Bad 5 points	Good 15 points	Very good 20 points
Muscle hypotrophy (measured 10cm above the patella in m.quadriceps)	More than 2cm 0 points	Less than 2 cm 10 points	No hypotrophy 20 points	
Knee flexion	Less than 90° 0 points	Less than 120° 5 points	Normal 10 points	
Crepitation of the knee articulation	Many 0 points	A few 3 points	No crepitation 5 points	
Effusions of the knee	Never 5 points	1-2 times 2 points	More than 3 times 0 points	

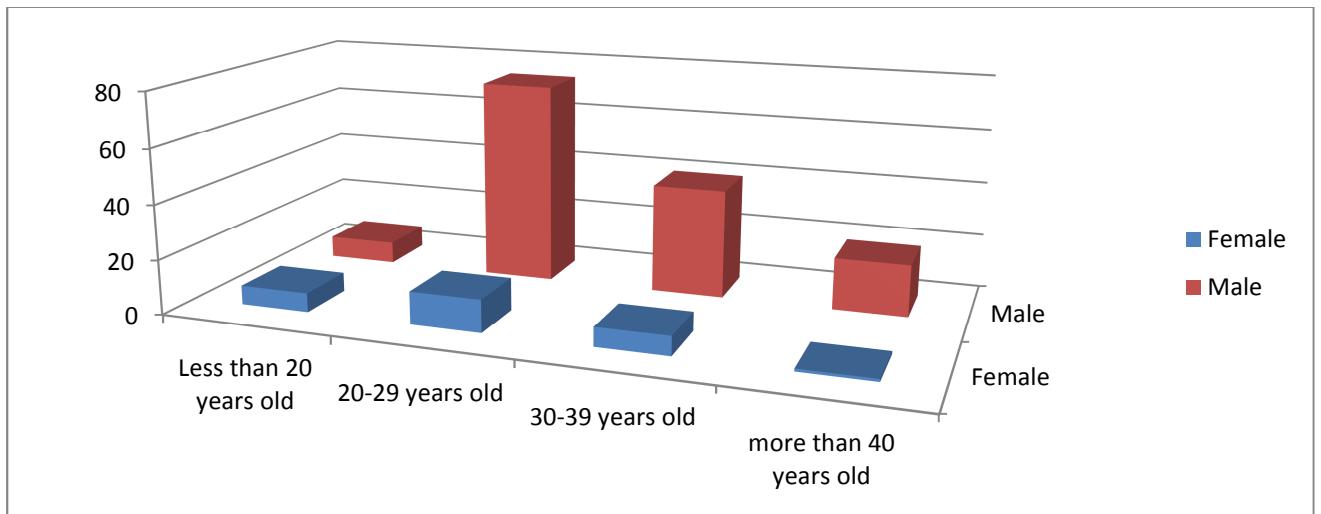
Total of points one patient could get is 100.

Except subjective symptoms and objective findings, the patients were also asked if they practiced any sport after the operation and if due to pain or other subjective symptoms of the knee, they were forced to change or leave their job. This information was added in the questionnaire. For each patient was written the time they had first post operatory symptoms (within 5 years, 5-10 years, 10-15 years, 15-20 years or more than 20 years) and when they came for checkup after the operation (7-10 years, 10-15 years, 15-20 years or more than 20 years). All the patients went through a radiologic control of the knee, so to insure if any sign of osteoartrosis was found, if there were a narrowing of the articular area of the operated knee or other structural changes, like subcondralscleroris mainly in tibial plato.

7.4. Results of the impact of meniscectomy in Albanian patients

The results gained were achieved concerning to all the objective symptoms, subjective symptoms and radiologic findings obtained from the patients. The results that were obtained based on gender showed that from 168 cases, 141 (83.9%) were male and 27 (16.1%) were females. Their report was 5.2:1. The average age the patients had and operation of menisci was 28.78 ± 9.59 years old.

Graph 1: Age and gender of operated patients taking part in the study (Çaushi, 2005)



As we can see from the graph, more cases of the menisectomy surgery done in the “Mother Tereza” hospital in Tirana were found in males aged between 20-29 years old. This due to the high physical activity they have in this period of life. Even the radiologic finding was much better in patients less than 40 years old. In patients more than 40 years old light tendency of osteoarthritis was detected. From the study done by Prof. Dr. Gjergj Çaushi (Çaushi, 2005) were found that the patients were followed at a period varying from 7 to 27 years after the operation, with an average of 15 years. These controls concerned of only clinical tests performed from the orthopedist. Severe pain or structure changes were reported from the patients or detected from the doctor, the patient had an X-ray done. From the statistics, most the patients just had the clinical tests performed. No rehabilitation procedures of physiotherapy were mentioned in this study, which is the only one done in Albania concerning operation of menisci and its effect after the menisectomy. From the 168 patients that were analyzed, 91 patients (54.1%) had a meniscectomy in the right knee, 73 patients (43.5%) in the left one and 4 patients (2.4%) have done meniscectomy in both knees. More patients had the medial meniscus operated (viz. Table).

Table 7: Medial meniscus resulting the most operated structure of the knee in Albania (Çaushi, 2005)

Number of patients	Medial meniscus	Lateral meniscus	M : L	Bilateral meniscectomy	
				Same knee articulation (<i>both right or both left</i>)	Different knee articulation (<i>in the right one and one in the left one</i>)
168 100%	122 72.6%	35 20.8%	3.5 : 1	7 4.2%	4 2.4%

The results after the medial menisectomy have been better than in the lateral one ($p<0.05$). And the prognoses of bilateral meniscectomy have been worse than medial or lateral ones.

In the study done by Prof. Dr. Çausi there was a significant connection between the postoperative symptoms and the latent period. If the patient had the latent phase less than one month, the prognoses were very good and no significant findings were detected in the X-ray. If the latent phase was 1-3 years in the radiography were seen arthritic changes and a tendency of narrowing the articulation surface. The worst group is the one having a latent phase of more than 3 years. They had the worst prognosis, narrowing of the articulation surface, arthritic changes, subchondral sclerosis and cysts. So the latent period till one year is the maximal limit to have a better prognosis after meniscectomy.

During the 20 years that the study took place total meniscectomy was the most frequent operation done in Albania 43 % of patients, partial meniscectomy was the second with a 31% of cases and the last was local meniscectomy with a 26 % of cases. Best prognoses were found in patients who had local meniscectomy. So it's obvious than the less part of meniscus we take from the knee the better prognosis.

Other factors that may have affected the prognosis after the surgery may be profession, sport and kind of tear. The study done in Albania by Prof. Doc. Çausi showed that only 6 of 168 the patients (3.5%) changed work due to meniscectomy, but from the study

there was shown that profession doesn't increase the percentage of meniscectomy done in Tirana.

Sport was another factor that was analyzed. It was found that 69 patients (41.1%) played sports before the surgery: 58 played football and 11 other sports. After the meniscectomy 19 of these patients (18.8%) couldn't play anymore any kind of sport and 50 patients (81.2%) restarted their sportive activity.

Table 8: The most frequent type of rupture in Albania were periphery and complex tears (Çaushi, 2005)

TYPE OF TEAR	NUMBER OF PATIENTS	PROCENTAGE
Frayed Edged	29 cases	17.3 %
Bucket-handle tear	57 cases	33.9 %
Parrot- break tear	12 cases	7.1 %
Tear of the anterior part	20 cases	11.9 %
Tear of the posterior part	20 cases	11.9 %
Complex tear	30 cases	17.9 %

Meniscectomy is becoming a routine operation in Albania. This make possible the decrease of total meniscectomy performed even if the tear of meniscus was little and partial or local meniscectomy was needed. Nowadays total meniscectomy is not the only way that the tears of menisci are repaired. Comparing to 20 years ago the number of total meniscectomy is decreased of 40 %. From the radiologic controls it was found that after the menisci surgery 60% of patients had arthritis, 28% had a high risk of it and only a little number didn't show any sign of arthritis. It should be emphasized that there is a close relation between the age the patient was operated, patients activity before and after the operation and type of operation the patient had.

The results of the study showed that the worse prognosis had patients, who were older than 40 years old, who had a high physical activity, chronically traumas, longer latent phase, complex tears, and total meniscectomy. It is important that after the meniscectomy to strengthen quadriceps muscle as it takes a crucial part in knee stabilization. Age and profession didn't affect the prognosis.

7.5. Rehabilitation after menisci operation in Albania

The main focus of rehabilitation following menisci operation are pain control, improvement of symptoms, restore function and prevent further damages. Post-surgical rehabilitation program is dependent on the surgical procedure and the protocol given from the orthopaedic surgeon (Bejtullahu, 2007). In order to find out the rehabilitation program followed in Albania after menisci surgery the state Military Hospital in Tirana was taken as main reference. Considering the fact that menisci surgery are done even in private hospitals in Tirana, their recommended guidelines were taken also as a reference, in order to analyze the situation in a larger specter.

Due to the fact that in the Military Hospital in Albania there is no official guideline followed for rehabilitation after menisci surgery, an interview with Dr. Manushaqe Saraçi (Saraçi, 2013), head of the only physiotherapy department in Albania, was taken as a source of information. Dr. Saraçi was asked about the rehabilitation program that patients follow after having a menisci surgery in Albania. Concerning the hospital politics, after menisci surgery a patient usually stays hospitalized 5 days to one week. The orthopaedic surgeon prescribes a week rehabilitation program while the patient is hospitalized and a total of six week rehabilitation program that the patient can follow privately after the hospitalization. Dr. Saraçi (Saraçi, 2013) confirmed that apart all obstacles confronted in the hospital, the most difficult part is to persuade the patients to follow the rehabilitation program rigorously. Some of the patients don't continue the rehabilitation program, as soon as they start to walk independently, even painfully.

Before starting the rehabilitation program, the orthopaedic surgeon and physical therapist need to explain to the patient the aim of the rehabilitation program and discuss together for the common rehabilitation goal. The exercises are supervised by a physical therapist at the direction of the orthopaedic surgeon. The physical therapist should help and

instruct the patient to perform the exercises correctly without causing further damages in the knee articulation, to improve ROM, to minimize the post-operative symptoms and to help the patient return to active daily routine (Canaj, 1999).

Dr. Saraçi (Saraçi, 2013) in her interview confirmed that in the physiotherapy department in Military Hospital in Tirana there is a rehabilitation program followed by patients. The goals of the first acute phase (week 1-2) are to regain quadriceps strength and to achieve a full passive extension of the knee. The patients are suggested not to full weight bear, to avoid knee flexion and to avoid walking without braces and crutches.

In the first postoperative day the patient is instructed to rest properly, use negative thermotherapy, use compressive elastic bandage and keep the knee elevated. The surgical dressing is removed three days after the operative day. Ice therapy begins directly after the surgery using ice packs every 3 hours. Patients were instructed to keep elevated the operated leg and not to place pillows under the knees in order not to flex or bent the knee. The pillows could be placed only under foot or ankle. In the acute phase after the operation, even if the patient manifests symptoms like swelling or pain, the exercise program is not stopped, but continues taking into consideration the actual state of the patient. The patients may increase the intensity of the exercise program but this should be done always gradually and consulting with the orthopaedic surgeon (Shaqiri, 2005). Exercises for muscles quadriceps reinforcement are started immediately after the operation,

Due to the culture bases it is very difficult for doctors and physical therapist to persuade Albanian patients not to bear more than 50% of patient's weight on the operative leg unless it is instructed by the surgeon doctor. As soon as they feel less pain or have the feeling that they can walk independently, they start not to use crutches and don't respect the instructions given to them. In lots of cases, they perform squats more than 90 degrees, sit or lie in the bed without elevated leg or walk for a prolonged time causing further problems and not allowing going further with the rehabilitation program.

Due to the fact that the patient stays only 5 days to one week in hospital, it is hard to observe from the beginning to the end a recommended rehabilitation program given in the hospital. If the patient doesn't have persistive post-surgical symptoms, the orthopead prescribes full active and passive ROM, active resistance exercises and unilateral weight bear. This starting from 2nd till sixth week. Mostly the patients after the hospitalization in Military hospital in Albania go home and don't follow any rehabilitation program or attend

private clinics that provide rehabilitation care. In this phase another problematic issue is the lack of neuromuscular training concept and lack of usage of physical therapy modalities.

Mostly, there are the patients who played sports, choose private physical therapist to follow them home or in their private rehabilitation clinics. So to the question about exact number of patients having a full rehabilitation program after menisci surgery, there is no statistical answer given.

From the interview taken from Dr. Arben Runa (Runa, 2013), head of surgery department in the Military Hospital in Tirana, Albania it is reported a low percentage of almost 5% of patients getting reoperated in the state hospital in Tirana. There are no exact number registered in the state hospital, because in most cases the patients having a second surgery in the menisci choose private hospitals in Tirana, than state ones. In the last year the state military hospital does only open meniscectomy, and all the arthroscopic intervention are made in private hospitals. This shows a great insufficiency in Health Insurance System in Albania, making patients pay privately even in state hospitals. That's why they prefer private hospitals where they have even more modern and secure facilities, rather than state ones. Another problem raised from the Dr. Runa was that patients don't visit the doctor or physical therapist for post-operative visits.

In order to verify the post-surgical rehabilitation of the knee menisci in private hospitals in Tirana, another interview was done with Dr. Artan Bano (Bano, 2013), orthopaedic surgeon at private hospital "American Hospital" in Tirana. Dr. Bano in his interview said that in their hospital after the partial meniscectomy there were also no contraindications or specific limitation concerning range of motion. It is the doctor, who decides the length of rehabilitation program, but usually the program should be continued for up to six weeks after the menisci surgery. The most important aim of the rehabilitation program during the first and second week are swelling and pain control, keeping the proper range of motion; especially extension (0-90°). Rehabilitation program is started first post-operative day. Exercises are of low intensity and without a lot of repetitions, unless otherwise is instructed from the doctor. The exercises are assisted twice by the physical therapist in the first three days. The patient is instructed to repeat the exercises twice alone. The patient is asked to perform as much as possible ankle pumps during the day to reduce any possibility of having blood clot in the calf. The patient should not feel unbearable pain, painful swelling or numbness of the leg, should not have fever, and color changes in the leg, continuous drainage

or bleeding from incision, difficulty in breathing, excessive vomiting. In all these cases the rehabilitation program is interrupted and the doctor is contacted. Gradual strengthening exercises, stretching exercises and exercises helping to gain proper balance and proprioception. It is very important to reeducate gait stereotype. The patient usually returns to work after 7-10 days after the partial meniscectomy.

During the second to fourth week after the surgery of menisci the pain and swelling should not be present and the patient starts to perform more strengthening exercises with higher intensity. Main problem in private hospitals, concerning the rehabilitation program after the surgery of menisci, consist on the early leave of the patients from these hospitals. The costs of one night stay in private hospitals are very high, so the patients prefer to stay a maximum of 3-4 days . Usually they consult the orthopaed surgeon and physiotherapist and take a list of exercises they need to perform. A prevalent phenomenon is that after leaving the hospital, mostly the patient don't come back to undergo controls, unless they have again pain or swellings. So, the outcomes of the rehabilitation program after menisci surgery are unknown in short and long term period.

Another situation is presented in private clinics, where the patients come by their own will. Mostly the patients come to follow post- surgery rehabilitation of the knee menisci, in private clinics in Albania are patients concerned about their diagnoses and the essential role of physiotherapy, sportsmen or young and physical active patients.

The guideline followed in a private clinic in Tirana, during the first till second week after the knee menisci surgery are the same as in private hospitals. The main difference is that in private clinics, the patients start the rehabilitation approximately after the first week of surgery. This indicates that a part of rehabilitation is done in hospitals, and the following rehabilitation is preceded in private clinics. During the second till fourth week after the knee menisci operation the main aim of physiotherapy is to restore the full range of motion of the knee, maximize quadriceps strength, unilateral gait and restore proper stabilization of the knee. After the fourth week, dynamic exercises, resistance exercises are performed , so as the patient could be able to sport. Long distance running is advised after the 8th week, tennis after 6th- 8th week and football after the 8th week.

The following exercises are performed during the second till fourth week after the partial meniscectomy.



Figure 25: Standing with one leg. Stabilization exercise (photo author)

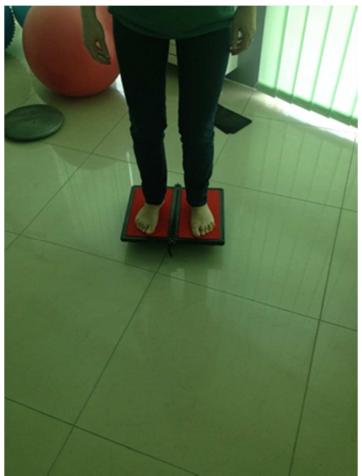


Figure 26: Balance exercise (photo author)



Figure 27: Balance exercise. a) both feet b) one foot (the operated one) (photo author)

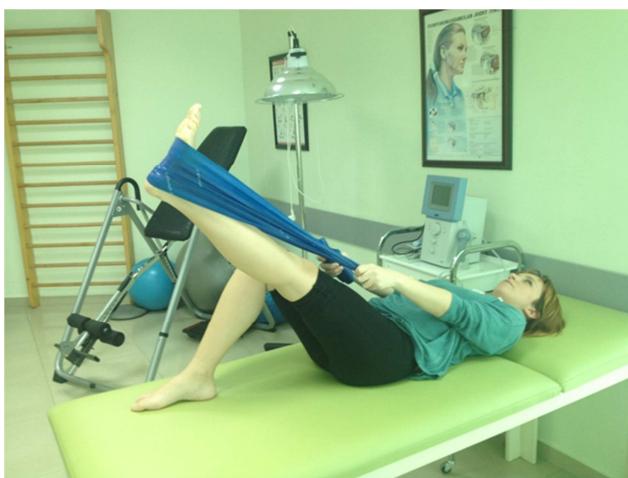


Figure 28: Full leg extension. Hamstring stretching (photo author)



Figure 29: Half Squats, strengthening of quadriceps, hamstrings and gluteus (photo author)



Figure 30: Step ups (photo author)



Figure 31: Lateral steps (photo author)



Figure 32: Stationary bike (photo author)

8. FINDINGS

8.1. Comparing AAOS standards of professionalism in Albaniaduring the first phase of post-surgical meniscus rehabilitation

According to the American Academy of Orthopaedic Surgeons (AAOS, 2010), any meniscus surgery must be followed by an intensive rehabilitation program, in order to restore knee mobility and, more importantly, ensure quality of everyday life and normal exercise of sports by the patient. These same goals after meniscus surgery are pursued also in Albania. It is very important that every program be supervised by a surgeon and a physiotherapist, whose job is to choose the proper exercises for the patient to achieve the rehabilitation goals (Shaqiri, 2005). Supervised immediate post-surgical rehabilitation is considered crucial and lasts up to six weeks in both countries. Rehabilitation goals are the same, with some differences in the process of achieving them in Albania and USA.

According to AAOS, the rehabilitation program starts immediately from the first day after surgery, with a two or three times per day exercise set, with each set lasting approximately 20 to 30 minutes. In the State Military Hospital in Tirana, the patient receives a 30 minute exercise program per day (Saraçi, 2013). By contrast, a different situation is present in private hospitals, where the post-surgical rehabilitation is performed twice a day (Bano, 2013). Each therapy session lasts about 45 minutes to an hour. In the period between the second and fourth week after the surgery, patients receive therapy 3 times per week and, after the fourth week, once a week.

Similarly, the main goals during the first phase of rehabilitation are control of post-surgical symptoms, ensuring full extension of the knee and reinforced quadriceps strength and maintaining active and passive range of knee motion (viz Table 9). According to AAOS, stretching and strengthening exercises are started immediately after the operation. The muscles that need to be activated through rehabilitation program include: quadriceps, hamstrings, hip adductors, hip abductors and gluteus muscles (esp. gluteus medius and maximus). Reinforcement exercises for quadriceps are started immediately after the operation.

Table 9: Comparison of post-surgical rehabilitation of the knee meniscus in Albania with AAOS recommended guidelines during the first phase (1-2 week)

	USA	ALBANIA	Differences
Goals:			
-Full passive extension -Control of post-surgical symptoms (swelling/pain) -Regain quadriceps control and strength	+	+	
Precautions:			
-Avoid active knee flexion -Avoid ambulation without brace -Avoid prolonged standing/walking	+	+	Personal approach of Albanian patients to the problem
Treatment strategies:			
-Stretching exercises - Strengthen quadriceps (use of ES/electrotherapy) -Progressive weight bearing	+	+	-No use of physical therapy in Albania - No equipment in Albanian hospitals
Criteria for advancement:			
-Perceptive post-surgical symptoms -Adequate quadriceps control strength	+	-	-Not complete rehabilitation program performed in Albania -Economical approach in Albania

Some of the above mentioned exercises are done in both State and private hospitals in Albania, with efficiency making the difference. Patients must endure painful situation after a

meniscus surgery therefore, the physiotherapist tends to tolerate the patient's defiance in doing exercises that are painful, tiresome and difficult. It is noticed that the main goal of the patient in the State Military Hospital is to sit and walk without any concern for neuromuscular coordination, quadriceps strengthening or proper restoration of knee stability. Lack of physiotherapist's insistence in performing the exercises in the proper way and timing, leads to further damage of the knee, although the patients is able to walk and leave the hospital. There is an opposite situation in private clinics in Tirana, where physiotherapist's aim is to gradually increase the intensity of exercises, always respecting the rehabilitation goal.

8.2. Comparing AAOS standards of professionalism in Albania during the second phase of post-surgical meniscus rehabilitation

According to the AAOS recommended guidelines for the first post-surgical phase, criteria for advancement are not fulfilled in Albania, resulting in a major problem for sustainable outcomes.

In Albania, the rehabilitation program after the meniscus surgery is not divided into proper phases, because the patients are hospitalized in the first week and later decide for themselves whether to continue with the rehabilitation program prescribed by the orthopaed surgeon and the physiotherapist. While in USA the second phase of rehabilitation guideline after meniscus surgery starts from the second week to the sixth.

When the patient is not showing persistent symptoms, other exercises are progressively added, such as step-ups and step-downs, stationary bike, weights and, balance exercise, which are fairly important to increase proprioception, coupled with activities that include dynamic balance training (viz. Table 10). Improving function, restoring knee stability, muscular strengthening, neuromuscular coordination and prevention of further damage to the knee are the main goals of post-surgical rehabilitation of the knee meniscus (AAOS, 2010).

Strangely enough, the concept of neuromuscular training is unfamiliar to Albanian hospitals. It was noticed that physiotherapists there do not train balance and proprioception. A major problem in the State Military Hospital is the total absence of means that help the patient perform proprioception and, balance exercises or stimulate the sensor-motoric system.

There are no balance pads, trampolines, gym balls or any other important means to train dynamic balance and knee stabilization.

According to AAOS guidelines, the physical therapy modalities are used after the first week and recommended to be continued through the end of rehabilitation program. While in Albania no modalities of physical therapy were used during the rehabilitation after meniscus surgery (Bano, 2013). All patients who need such rehabilitation after a menisci surgery have no other option but to follow the rehabilitation program in private clinics. In contrast, in USA they use all these means to maximize functional capabilities of the knee joint and job demands of the patients.

Table 10: Comparison of post-surgical rehabilitation of the knee meniscus in Albania with AAOS recommended guidelines during the second phase (2-6 week)

	USA	ALBANIA	Differences
Goals:			
-Restore stabilized gait -ROM (90° flexion) -Maximize quadriceps strength -Unilateral weight bear without pain -ADL endurance	+ + + + +	+ + + + +	
Precautions:			
-Avoid pain/ not coordinative movements -Avoid descending stairs unless having adequate coordination	+ +	- +-	-No control of the knee stability and coordination in Albania
Treatment strategies:			
-Progressive weight bearing	+	+	-No neuromuscular

<ul style="list-style-type: none"> -Active resistance exercises -Neuromuscular training (proprioception/balance) -Electrotherapy/ Ultrasound 	+	+	+	training in Albania -No use of physical therapy modalities in Albania
Criteria for advancement: <ul style="list-style-type: none"> -ROM (0-90° flexion) -Ability to unilateral weight bear without pain -Stability of the knee 	+	+	+	No control of the knee stability and coordination in Albania

8.3. Comparing AAOS standards of professionalism in Albania during the third phase of post-surgical meniscus rehabilitation

The third phase of the post-surgical rehabilitation of the knee meniscus according to AAOS guidelines spans between the 6th and 14th week. On the other hand, rehabilitation in this period in Albania is not documented at all. In USA, the goal in this period is to totally restore active and passive range of motion, maximize knee neuro-coordination and taking up sports (viz. Table 11). Mostly, patients are advised to continue neuro-muscular training, aquatherapy and gradually return to sports. After this period, the patient needs to visit the orthopedic surgeon again, in order to summarize the outcomes of the rehabilitation. Whereas in Albania, during this phase, hospitalized patients visit the orthopedic surgeon only in the event of post-surgical perceptive symptoms otherwise, no periodic controls are done.

Table 11: Comparison of post-surgical rehabilitation of the knee meniscus in Albania with AAOS recommended guidelines during the third phase (6-14 week)

	USA	ALBANIA	Differences
Goals:			
-Restore full ROM of the knee	+	+	-No control of the knee stability and coordination
-Ability to ascend/descend stairs	+	+	
-Maximize neurocoordination of the knee	+	-	
-Return to sports	+	+	
Precautions:			
-Avoid sport activities unless having an adequate quadriceps strength and neuromuscular coordination of the knee	+	+ _	
Treatment strategies:			
-Aqua-therapy (swimming)	+	-	-No modalities of physical therapies used in Albania
-Stationary bike	+	-	
-Flexion > 90°	+	+	
-Neuromuscular training	+	-	
Criteria for			

advancement:			
-Stability of the knee	+	-	-Lack of post-surgical rehabilitation outcomes in Albania
-No pain	+	-	-Lack of post-surgical controls in Albania -Albanian cultural approach

9. DISCUSSION

Post-surgical meniscus rehabilitation provided in Albania and USA differs also from the intensity and the level of rehabilitation. According to AAOS, the rehabilitation program starts with a set of exercises two or three times per day, lasting approximately 20 to 30 minutes each. In the first phase (0-2 week), stretching and strengthening exercises are suggested to the patient. In the State Military Hospital in Albania, the patient receives a 30 minute exercise program per day, from the first day of operation until the end of the week (Saraci, 2013). Quite different is the situation in private hospitals, where post-surgical rehabilitation for meniscus involves two sessions per day. The difference consists on the fact that patients are obliged to pay extra for this health service in private hospitals (Bano, 2013).

In private clinics in Tirana, the meniscus rehabilitation program starts after the patient's hospitalization. The physiotherapist does no longer collaborate with the orthopedic surgeon and decides himself about the frequency of the rehabilitation program. Usually, the patient visits the physiotherapist three times per week, with each session lasting roughly 45 minutes to an hour. In the second until the fourth week after the meniscus surgery, the patient has three sessions per week and, after the fourth week, one session per week (Bano, 2013).

Analyzing this situation, we drew the conclusion that is difficult to provide a full rehabilitation program in only one institution in Albania, even during the first acute phase after the meniscus surgery. This is due to the fact that patients are hospitalized only one week and he/she decides whether to continue with the rehabilitation program prescribed by the orthopaedic surgeon and the physiotherapist. If there was an official guideline for the Military Hospital in Tirana or in private hospitals and the State health insurance paid for the needed rehabilitation, maybe the patients would be clearer about the content, timing and schedule of their rehabilitation. Hand in hand with this, we could have long term outcomes of rehabilitation after meniscus surgery, and these outcomes could be analyzed and studies could be developed.

AAOS rehabilitation goals of the first phase between State Military Hospital in Tirana and private hospitals are very similar, i.e.: control post-surgical symptoms, reinforce quadriceps strength, achieve a full extension of the knee, and maintain active and passive range of motion of the knee. AAOS stretching and strengthening exercises are started

immediately after the operation to activate mainly quadriceps, hamstrings, hip adductors, hip abductors and gluteus muscles. In Albania, the focus is placed in quadriceps strengthening and no stretching exercises are done.

In Albania, the problem is not the goals set by the surgeon, but rather the efficiency of the rehabilitation performed. There is a tendency from the physiotherapist to tolerate the patient's defiance to doing exercises that are painful and not even prescribed in the rehabilitation schedule. I myself noticed that the main goal of the patient in the State Military Hospital is to sit and walk without any concern for neuromuscular coordination, quadriceps strengthening or proper restoration of knee stability. Lack of physiotherapist's persistence in performing the exercises in the proper way and timing, leads to further damage of the knee, although the patient is able to walk and leave the hospital. A very different situation presents itself in private clinics in Tirana, where physiotherapist's aim is to gradually increase the intensity of exercises, always respecting the aims of a proper rehabilitation program (Bano, 2013).

From my point of view, a serious impediment to long lasting outcomes of post-surgical rehabilitation for meniscus is that no criteria for advancement are fulfilled in Albania. According to AAOS recommended guidelines, additional exercises can be given during the first phase provided that all the criteria for advancement have been achieved. When the patient is not showing persistent symptoms, other exercises are progressively added, such as step-ups and step-downs, stationary bike, weights and balance exercise, which are fairly important to increase proprioception, coupled with activities that include dynamic balance training. Restoring knee stability, improving function, muscular strengthening, neuromuscular coordination and prevention of further damage to the knee are the main goals of post-surgical rehabilitation of the knee meniscus during the first phase (AAOS, 2010).

According to AAOS guidelines, the physical therapy modalities are used after the first week and recommended to be continued throughout the rehabilitation program. Nevertheless no modalities of physical therapy are used (Bano, 2013). Muscular strengthening, neuromuscular coordination and prevention of further damage to the knee are the main goals of post-surgical rehabilitation of the knee meniscus followed. Analogous to this, in Albania the concept of neuromuscular training is not known and practiced. It was noticed that physiotherapist in the Military Hospital in Albania didn't train balance and proprioception. In the state Military Hospital is the total absence of means that help the patient to perform

proprioceptive, balance exercises or to stimulate sensor-motoric system. During the first phase post-surgically there can't be given more exercises, if not all the criteria for advancement is achieved. Step by step when the patient is not showing perceptive symptoms, other exercises need to be added gradually.

Restoring knee stability, improving function, muscular strengthening, neuromuscular coordination and preventing further damages of the knee are the main goals of rehabilitation after surgery of the knee menisci in the second phase (AAOS, 2010). All patients who need proper rehabilitation program after a meniscus surgery, including proprioceptive, balance exercises, strengthening exercises, need to follow rehabilitation program in private clinics, where they can find all the facilities needed.

According to AAOS guidelines, the physical therapy modalities are used after the first week and recommended to be continued throughout the rehabilitation program. Interviews obtained by Dr. Saraçi (Saraçi, 2013) and Dr. Bano (Bano, 2013) found that no physical therapy was applied in patients. The lack of physical therapy equipment that help the patient stimulate sensor-motoric system and balance in Albanian hospitals is a very crucial problem that should be addressed seriously in the future. The State Military Hospital needs government grants to equip the Physiotherapy Department with theses indispensable equipment.

AAOS guidelines stipulates that the third phase of post-surgical rehabilitation extends between the sixth and the fourteenth week. All sources of information used in this thesis indicate that, this period is not documented at all in Albania, and no recommendation for rehabilitation programs is given. In the USA, the goal in this period is to completely restore active and passive range of motion without any limitations, maximize neuromuscular coordination of the knee and enable the patient to fully return to sports and everyday living activities. After this period, the patients in the USA visit again the orthopaedic surgeon in order to summarize the outcomes of the rehabilitation. In contrast, hospitalized patients in Albania visit the orthopaedic surgeon only if there are any perceptive symptoms after the meniscus surgery; otherwise no periodic checks are done.

Many studies lead to the conclusion that surgery induces more often the development of post-operative degenerative conditions, if not correctly connected to a specific rehabilitation protocol (Frizziero, 2012). In my opinion, a high percentage of patients experiencing meniscus damage in Albania suffer from degenerative and knee instability

complications, as a result of a non-effective rehabilitation programs. Reports of joint instability in knee osteoarthritis show a high prevalence and direct impact to physical function (Fitzgerald, 2004).

Sensations of knee instability include shifting, buckling or giving way of the knee. Patients with knee OA report knee instability during daily living activities that affect their physical functions. Knee instability is a very important factor that should be specifically accentuated during post-surgical rehabilitation protocols, because of the knee instability, limiting physical function. Knee osteoarthritis is a predominant state that contributes to functional limitation. Knee pain, decrease of the knee range of motion, loss of quadriceps strength are believed to have a reciprocal connection to OA contributing to physical functional limitation and progression of the menisci lesion. The physical function is also limited by swelling, pain, range of motion of the knee, tonus and coordination of the quadriceps muscle.

An interview with Dr. Arben Runa (Runa, 2013), head of the Surgery Department at the State Military Hospital in Tirana, pointed at a low number of patients getting re-operated in the state hospital in Tirana. There is no exact number of registered re-operations in the State hospital, because patient having a second meniscus surgery choose private hospitals in Tirana. In the last year, the State Military Hospital does only open meniscectomy, so all the arthroscopic interventions are made in private hospitals. Another problem raised by Dr. Runa was that patients do not visit the doctor or physiotherapist for post-operative consultations.

The only study existing in Albania is the one done by Dr. Çausi. Dr. Çausi (Çausi, 2005) analyzed 400 cases of meniscectomy interventions done in Albania during 1985-2005. From his study it was reported that from the total number 168 cases accepted to take part in the study, 141 (83.9%) were male and 27 (16.1%) females. The report was 5.2:1. The average age of patients having a meniscus operation in Albania was 28.78 ± 9.59 years old. Males aged between 20-29 years old were the largest group of patient. Medial meniscus was operated more than the lateral one, at a ratio 3.1:1. The largest number of knee operation involved the medial meniscus of the right knee. The study demonstrated that patients were followed in a period of six week after the operation. This fact is in contradiction with the information given from the actual head of orthopaedic department at the State Military Hospital, who claimed in the interview that one of the problems that the doctors have is that patients do not come for check-ups after the operation (Runa, 2013).

Analysis of all materials probed in this thesis found, that the most affected age in the USA was youngsters between 25-45 years old (Brindle, 2001). The most frequently damaged part was the medial meniscus, rather than the lateral one, at a ratio 2.5: 1 for medial meniscus damage (Fazalare, 2009).

The most frequent knee intervention in Albania is total meniscectomy accounting for 43% of all meniscus operations, followed by partial meniscectomy 31% and local meniscectomy at 26% of all cases. In USA, the most frequent intervention was partial meniscectomy rather than total meniscectomy, which lead worse prognosis concerning higher risk of osteoarthritis and knee instability with higher risk of chronic traumas (Williams, 2001). In Albanian patients, best prognoses were found in patients who had local meniscectomy. It is evident that the less part of meniscus is taken, the better the prognosis. Only 3.5% of all Albanian patients changed work after meniscectomy.

In Albania sports were another factor that weighted in the analysis. It was estimated that 69 patients (41.1%) played sports before meniscus operation. After meniscectomy 19 of these patients (18.8%) could not play any kind of sport because of pain, and 50 patients (81.2%) resumed their sport activity (Heqimi, 2011). In USA sports is also considered an important factor causing menisci damages (Frizziero, 2012).

In Albania the most frequent type of meniscus tear is bucket-handle tear with 33.9% of cases, followed by frayed edged tear 17.3% of cases, complex tear 17.9% of cases, tear of anterior and posterior part 11.9% each and the last parrot-break tear with 7.1% of cases. Nowadays total meniscectomy is not the only way of repairing torn meniscus. The number of total meniscectomy fell by 40 % comparing to two decades ago. Radiologic checks found that after meniscus surgery, 60% of patients had arthritis, 28% had a high risk of it, and only a few number did not show any sign of arthritis. It should be emphasized that there is a close relation between the age the patient, his/her activity before and after the operation, and the type of operation. The results of the study done by Çausi (Çausi, 2005) in Albaia, showed that the worse prognosis pertained to patients older than 40, who had a high physical activity, chronic traumas, longer latent phase, complex tears, and total meniscectomy. After the meniscectomy, it is important to strengthen quadriceps muscle as it takes a crucial part in knee stabilization.

There are no contrasting theoretical differences in the rehabilitation protocol and exercises followed in the AAOS and the State Military Hospitals, as regards post-surgical

meniscus rehabilitation. The main difference from my personal experience in Albania is that the rehabilitation protocol is not pursued rigorously by patients and physiotherapists, and even considered of no special importance by some doctors, physiotherapists and patients. This triangle sees the rehabilitation program as a financial thing. This due to the fact that, the Albanian patient pays each health service privately, albeit paying health care contributions. So, if a patient need to be operated, he/she will have to cover all costs personally, from the nursing staff to the surgeon and physiotherapist. Each injection he takes must be backed up by an under-the-counter fee to the nurse which seems to be a solid and established practice. The incomes of an Albanian employee are not high and considering that each physiotherapist charges around 20 Euros per therapeutic session, it is a heavy financial burden for a patient to follow long term rehabilitation program. For post-meniscus operation, a patient needs to be followed by a physiotherapist for at least 10 weeks.

By simple calculations, the patient pays 280 Euros, only in the first week, which exceeds their average salary. This will derive the intermission of rehabilitation because mostly the patients cannot afford it. That is why I think that it is in our culture that as soon as the Albanian patient feels less pain and can make one step alone, he has the tendency to push himself to the limits to leave the hospital and save him some of these “fees” he/she has to pay each day. The patient does not take proper rehabilitation care and it ends as soon as they leave the hospital, unless they decide to resume rehabilitation in a private clinic.

Hence, a crucial thing, multidisciplinary cooperation between the hospital staff and the patient is almost completely missing. Even if the physiotherapist asks the doctor about continuation of the rehabilitation program, the reply the physiotherapist will receive will be: do as you wish please. So, everybody does what they please. In my opinion, as a first step of improvement of actual situation in Albania, it is very important to future train the medical stuff in order to gain multidisciplinary way of organizing work and not to take anymore the patient as only a personal financial profit.

10.CONCLUSION

Comparison of AAOS guidelines followed by the Physiotherapy Department at the Military Hospital, the private “American Hospital” and private clinics in Tirana, found many differences concerning the level of rehabilitation and the health care provided to patients after the meniscus surgery.

The economical factor is one reason that patients cannot afford to follow a long lasting rehabilitation program after the operation of a knee meniscus. Improper functioning of the Health Insurance System in Albania obliges patients to pay each health service themselves, and it is a restrictive factor to providing efficient rehabilitation care. Albania needs to undertake thorough restoration of the health care system, so that patients will not need to pay for everything. This might be a reason why patients are not motivated to invest in their health, even as a form of prevention.

The cultural factor also has its own impact. Patients tend to interrupt full rehabilitation program as soon as they can walk independently, taking the risk of further damages.

Rehabilitation in Albania is at an early stage and lots of improvements need to be done, starting from a strict and serious work from doctors, physiotherapists and universities that must ensure graduation of qualified future physiotherapist. The education system should provide long term qualification and grant rehabilitation scholarships, so that sustainable rehabilitation outcomes after meniscus surgery (OA, knee instability) are generated.

In the near future, a union of physiotherapist should be established to organize and advance rehabilitation in Albania. Recommended guidelines should be followed by hospitals and private clinics. Further training for therapists should be taken place in Albania, in order to establish a multidisciplinary team. Awareness campaigns should be launched to inform people about the importance and healthy benefits of rehabilitation.

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