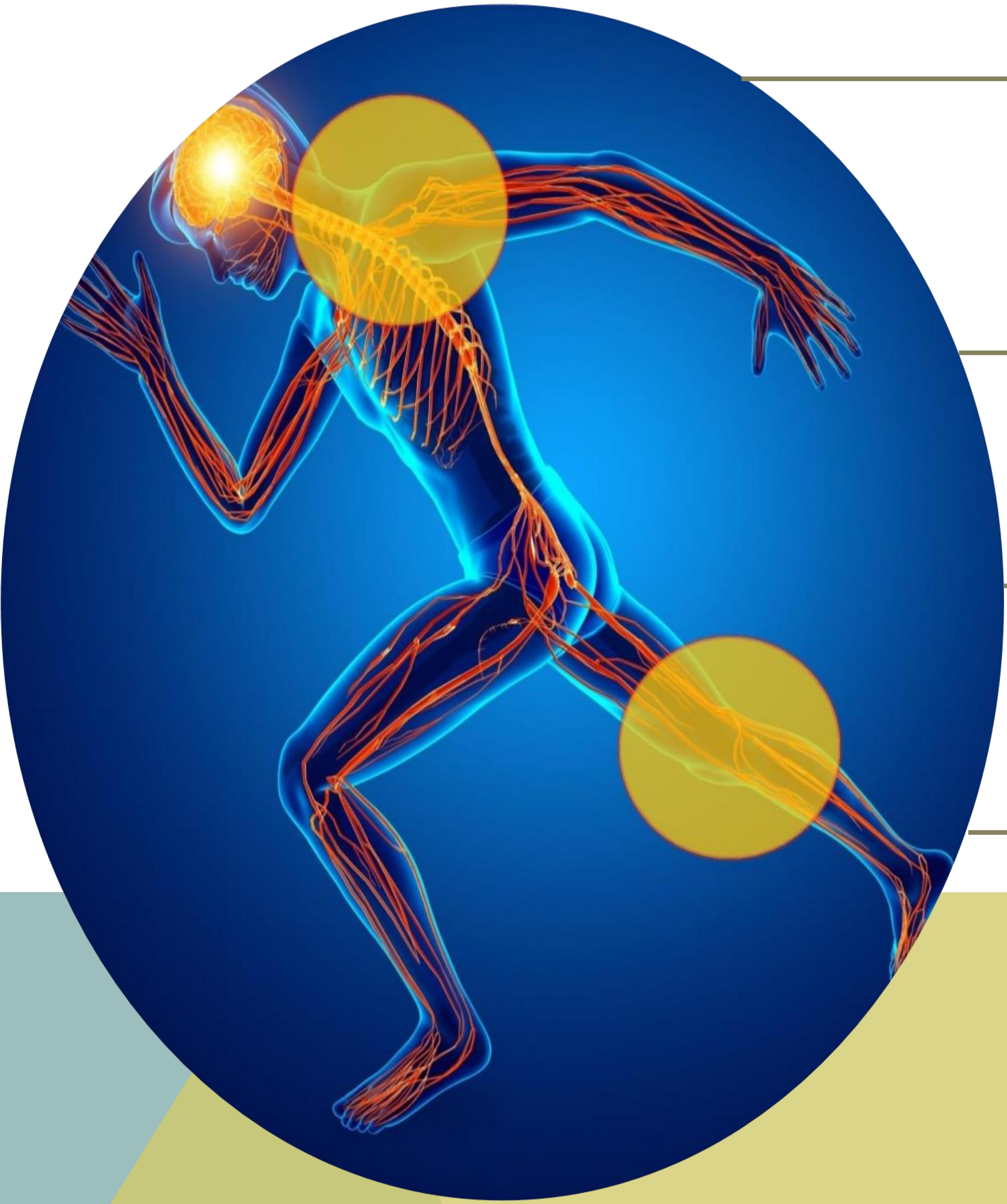
Current concepts in orthopaedic and rehabilitation treatment: Shoulder and knee sport related injuries

Valdoltra, Slovenija

July 19 - 20, 2019



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Friday, 19. July

SHOULDER DAY

7.50 – 8.20: **Registration**

8.20 – 8.30: **Welcome speech**

8.30 – 8.45: **Shoulder anatomy and biomechanics** (*Marko Nabergoj-SLO*)

8.45 – 9.00: **Shoulder Kinematic analysis: objective way to evaluate and compare treatment outcome** (*Davide Ballardin-ITA*)

Rotator cuff

9.00 – 9.15: **Rotator cuff tears from orthopaedic point of view** (*Francesc Soler-ESP*)

9.15 – 9.30: **Rotator cuff tears from PRM doctor point of view** (*Katarina Cunder-SLO*)

9.30 – 9.45: **Rotator cuff related dysfunction – physiotherapist's point of view** (*Milena Mirkovic-GBR*)

9.45 – 10.00: **Rehabilitation following RC repair – optimizing outcomes in sport active patients** (*Milena Mirkovic-GBR*)

10.00 – 10.30: **Battle orthopaedic and PRM + physiotherapist: reasons for failed rotator cuff tears healing**

10.30 – 10.40: **Discussion**

10.40 – 11.00: **Coffee break**

11.00 – 11.15: **Use of orthosis in sports-related injuries** (*Sara Tence-SLO*)

11.15 – 11.30: **Psychology of sport injuries** (*Iztok Žilevc, Matej Tušak-SLO*)

11.40 – 12.40: **WORKSHOP SHOULDER: How to use-IASTM technique. Using dynamic tape to facilitate shoulder function in sport** (*Kostantinos Fousekis*), **Using dynamic tape to assist shoulder function in sport** (*Milena Mirkovic*), **Shoulder** (*Matej Bombač*)

12.50 – 13.50: **Lunch**

Shoulder instability

13.50 – 14.05: **Shoulder instability from orthopaedic point of view** (*Gianluca Canton-ITA*)

14.05 – 14.20: **Shoulder instability from PRM point of view** (*Lonzarič Dragan-SLO*)

14.20 – 14.35: **Atraumatic shoulder instability – physiotherapist perspective** (*Yasmaine Karel – GBR*)

14.35 – 15.05: **Practical evaluation and discussion of patient; atraumatic instability** (*Anja Barič-SLO, Milena Mirkovic-GBR*)

15.05 – 15.20: **Manual therapy for patients after surgery – frozen shoulder** (*Alesa Klosterwaard-SLO*)

15.20 – 15.35: **Exercise therapy – different perspectives and their outcomes** (*Sean Gibbons-CAN*)

15.35 – 15.50: **Electric muscle stimulation to treat non-controllable positional functional posterior shoulder instability** (*Victor Danzinger-DEU*)

15.50 – 16.20: **Battle: Orthopaedic and PRM + physiotherapist treatment of posterior shoulder instability**

16.20 – 16.30: **Discussion**

16.30 – 16.50: **Cofee break**

16.50 – 17.05: **Musculoskeletal ultrasound of the shoulder joint** (*Klemen Grabljevec-SLO*)

17.05 – 17.20: **Imaging of the shoulder** (plain film, CT, MRI) (*Mojca Tomazic-SLO*)

17.30 – 18.30: **WORKSHOP SHOULDER: How to use IASTM technique** (*Kostantinos Fousekis*)**, Using dynamic tape to assist shoulder function in sport** (*Milena Mirkovic*), **Shoulder** (*Matej Bombač*)

19.00: **Dinner**

Saturday, 20. July

KNEE DAY

Knee pathology

8.45 – 9.00: **Knee anatomy and biomechanics** (*Samo Novak-SLO, Nino Mirnik-SLO*)

9.00 – 9.15: **Meniscal pathology from orthopaedic point of view** (*Jakob Merkac-SLO*)

9.15 – 9.30: **Patellofemoral pain syndrome** (*Klemen Grabljevec -SLO*)

9.30 – 9.45: **Influence of meniscal and ligamentary lesion on walking** (*Vincenzo Puglia–ITA*)

9.45 – 10.00: **Nutrition and healing in sport** (*Nada Rotovnik Kozjek-SLO*)

10.00 – 10.30: **Battle: Orthopaedic and PRM: Meniscal tears surgery or not?**

10.30 – 10.40: **Discussion**

10.50 – 11.50: **WORKSHOP KNEE: Walking reeducation with Gait Trainer walker view Technobody system** (*Alessandro de Paulis-ITA*), **Subclassifications and problems solving strategies in knee problems** (*Sean Gibbons-CAN*), **Eccentric and concentric knee flexors strength tests** (*G. Martelli-ITA*)

11.55 – 12.55: **Lunch**

ACL tears

12.55 – 13.10: **ACL from orthopaedic point of view** (*Aleksander Dolgan-SLO*)

13.10 – 13.25: **ACL from PRM doctor point of view** (*Katarina Cunder-SLO*)

13.25 – 13.40: **FTH acute phase of rehabilitation** (*Lucija Krzisnik Tursic-SLO*)

13.40 – 13.55: **ACL rehabilitation** (*Sean Gibbons–CAN*)

13.55 – 14.10: **Too fast rehabilitation can lead to failure?** (*Ravnikar Gregor-SLO*)

14.10 – 14.40: **Battle: Orthopaedic and PRM: ACL tears surgery or not?**

14.40 – 15.00: **Discussion**

15.00 – 15.20: **Coffe break**

15.30 – 16.30: WORKSHOP KNEE: **Walking reeducation with Gait Trainer walker view Technobody system** (*Alessandro de Paulis-ITA*), **Subclassifications and problems solving strategies in knee problems** (*Sean Gibbons-CAN*), **Eccentric and concentric knee flexors strength tests** (*G. Martelli-ITA*)

16.40 – 16.50: **Closing ceremony**

Contents

Anatomy and biomechanics of the shoulder

Marko Nabergoj[1]

[1]Orthopaedic Hospital Valdoltra, Ankaran, Slovenia

The human shoulder is the most mobile joint in the body. This mobility provides the upper extremity with tremendous range of motion such as adduction, abduction, flexion, extension, internal rotation, external rotation, and 360° circumduction in the sagittal plane. Furthermore, the shoulder allows for scapular protraction, retraction, elevation, and depression.

The term shoulder is often used interchangeably with glenohumeral joint, but the shoulder complex actually consists of four joints and many ligaments and muscles working synergistically. The other joints of the shoulder complex include the sternoclavicular, acromioclavicular, and scapulothoracic joints. The purpose of these joints of the shoulder complex is to move and stabilize the glenoid optimally during upper extremity movement, similar to the coordinated effort required to balance a spinning basketball on your finger or a book on your head.

Limited bony contact between the humeral head and glenoid fossa allows extended range of motion at a cost of relative instability. There must be a balance between mobility and stability to maintain proper function, and it is this balance that embodies the biomechanics of the shoulder complex.

Stability is created through both static (passive) and dynamic (active) mechanisms. Static stabilizers include concavity of the glenoid fossa, glenoid fossa retroversion and superior angulation, glenoid labrum, which enhances glenoid fossa depth by about 50%, the joint capsule and glenohumeral ligaments, and a vacuum effect from negative intra-articular pressure. It is estimated that the labral structures represent 10 to 20% of stabilization forces. Rotator cuff and deltoid muscle mass also help compress the joint at rest. All of these static restraints are important at rest, except for the glenohumeral ligaments, which seem to be important at extremes of motion. During upper extremity movement the effects of static stabilizers are minimized and dynamic or active stabilizers become the dominant forces responsible for glenohumeral stability. Dynamic stabilization is merely the coordinated contraction of the rotator cuff muscles that create forces that compress the articular surfaces of the humeral head into the concave surface of the glenoid fossa. This phenomenon is known as concavity compression and must occur during glenohumeral motion or unwanted humeral head translation and instability may occur, which can create forces that overload native structures causing pathologic conditions. This combined effect of rotator cuff muscular forces results in net force effect (or summation vector) known as a net joint reaction force. The joint reaction forces must remain balanced during motion via proprioceptive feedback. If unbalanced stability is compromised. The notion of a force couple can be thought of in its simplest terms as a tug of war contest between two teams. The sum force (or vector) of the winning team causes the rope to move in their direction. Imagine if there were three teams; the rope would travel in a different direction based on the strongest two teams. Now try to imagine the complexity of the upper extremity movement with over 20 different-sized muscles contracting at slightly different times in all three planes to create a desired motion.

Shoulder Kinematic analysis: objective way to evaluate and compare treatment outcome

Davide Ballardin[1], Marco Muraccini[2], Matteo Mantovani[1]

[1]NCS Lab, Bologna, Italy
[2]University of Bologna, Bologna, Italy

Today, clinical practice requires to provide objective data to support both rehabilitative and surgical treatments. The shoulder is a complex articulation; due to this fact is not simple to understand the complete mechanisms that explain its movements.
A widely used clinical parameter for the functional assessment of the shoulder kinematics is the scapulohumeral rhythm (SHR). It represents the coordinated movement between the scapula and the humerus, when the latter is elevated in the sagittal or frontal plane. For each elevation plane, the SHR is described by three scapulothoracic rotations (protraction-retraction PR-RE, medio-lateral rotation ME-LA and posterior-anterior tilting P-A) as a function of humeral anteflexion (AF) or humeral abduction (AB), depending on the movement considered. Despite its importance, the quantitative evaluation of SHR is limited to a few medical centers, where motion analysis laboratories with expensive optoelectronic systems are available. Inertial and magnetic measurement systems (IMMs) represent a new generation of commercially available, low-cost, portable, fully wearable motion analysis systems that enable real-time applicability.
In these field of application, SHoW Motion® technology has been developed, with the aim to objectivate kinematic data. SHoW Motion® is a biomechanics platform for kinematic and electromyographic analysis that provide and store dynamic information through validated biomechanical protocol for upper and lower limb. With this platform is possible to compare over time the kinematic data of the same subject, following the patient in his rehabilitation process. SHoW Motion® is used for collecting clinical data and monitoring in an objective way the evolution and the efficacy of a treatment. More specifically, the tool correlates the treatment with the outcome.
Using SHoW Motion® technology, different clinical studies are ongoing, in collaboration with many research centers and hospitals. Focusing on shoulder studies, the analyzed pathologies are: rotator cuff tears, latissimus dorsi tendon transfer, scapula instability and shoulder prothesis.

Rotator cuff tears from orthopaedic point of view

Francesc Soler[1]

[1]Manresa, Barcelona, Spain

The ultimate goal of the rotator cuff tears surgical treatment is to restore the anatomic tendon insertion on his footprint. To achieve this goal, we have a wide spectrum of a surgical instruments, implants and sutures, mainly through arthroscopic tecnique, which allow us to make a nice tendons repairs. But we all know the high rate of rotator cuff repairs failure (between 25% and 90% of the surgeries).

It has been described many items which could be responsible of this high failure rate: the patient age, the size of the tendon tear, the time between the tear and the treatment, the tendon retraction, the muscle fatty infiltration, smoking, NAID’s treatment, surgical tecnique, ... But there are two topics which are very important to explain the failures: the tendon biology and the post-op. rehabilitation protocol.

These two factors are strongly correlated: we have to know and understand the tendon biology in order to apply a rehab protocol which should help the tendon healing.

We’ll discuss about which is the latest knowledge about the biology of rotator cuff healing after surgical repair, and how we should use this knowledge to improve the prognostic of those repairs. We will also try to make a consensus about the main points a rehab protocol of post-operative rotator cuff repair should have.

Rotator cuff tears from PRM doctor point of view

Katarina Cunder[1]

[1] University Rehabilitation Institute, Ljubljana, Slovenia

Rotator cuff injuries occur both in overhead and contact sports. They can happen in acute traumatic episode with direct blow to the shoulder or fall on an outstretched arm, or from repetitive microtrauma in chronic overuse. Aetiology should play a part in the management decision making process, as well as the size and location of the tear, type of sport, patient's age, functional and performance impairment and concomitant pathology.

Rotator cuff tears can be classified as acute or chronic, symptomatic or asymptomatic and, regarding size, partial (A: articular, B: bursal) and full thickness, C (complete) and massive.

In an overhead athlete, rotator cuff injuries occur mainly from repetitive eccentric tensile overload in deceleration of the arm or from pathologic internal impingement in late cocking phase. They are usually partial-thickness and locate on the articular side of posterosuperior supraspinatus and infraspinatus tendons. Most partial and small full-thickness rotator cuff tears in overhead sports should initially be treated conservatively. Rehabilitation protocols focus on mobility, flexibility, strengthening, proprioception and advanced sport-specific exercises. All kinetic chain must be taken into consideration and any issues influencing shoulder biomechanics should be addressed and resolved. The first of them is posterior capsule and muscle tightness that leads to glenohumeral internal rotation deficit (GIRD) and external rotation gain (ERG) with pathologic internal (articular) impingement of rotator cuff. Second are scapular malposition and dyskinesis that lead to chronic subacromial impingement. The third is eccentric weakness of external rotators that allows greater anterior translation of humeral head during throwing motion.

Surgical treatment of rotator cuff injuries is needed when an athlete fails to respond to conservative management of smaller chronic tears and is the first line of choice for larger full-thickness, complete and massive tears. After surgical intervention there are usually very good results regarding pain, strength and quality of life. The return to the same level of competition after surgery is rather high (55 – 89%), but the same level of performance is usually lower (25% - 55%).

To this point, infiltration therapies, such as prolotherapy and platelet-rich-plasma therapy have not shown any evidence of additional benefit in sports related injuries to rotator cuff. The use of non-steroidal anti-inflammatory drugs (NSAID) is contraindicated in the first (inflammatory) phase of the healing process. Due to the risk of tendon weakening, we discourage any use of corticosteroid shoulder injections in young athletes with rotator cuff injury.

There is active and promising research in the field of induced pluripotent stem cells and intrinsic stem cell niche, but translation to the clinical practice has still been limited.

Rotator cuff injuries as well as their management can have significant impact on athlete's careers. Individual approach in the management of rotator cuff tears is therefore needed.

Rotator cuff related dysfunction – physiotherapist's point of view

Milena Mirkovic

Physiotherapy in form of exercise therapy is the accepted first line treatment for individuals with shoulder pain without trauma, and in older patients with minimal passive restriction but painful and/or restricted active movement. Physiotherapists are well placed to provide comprehensive assessment and care for this group of patients.

Multiple clinical tests have been proposed to selectively assess rotator cuff and other structures within the shoulder. However, their generally low specificity values and inadequate likelihood ratios reduce the ability to accurately inform the clinical decision-making process and patient management. The ability to achieve an accurate structural diagnosis is further challenged by a poor correlation between radiological imaging and symptoms.

Instead of structural diagnosis, a movement-based assessment with pain modification procedures appears to better inform therapist's practice and direction of treatment if it demonstrates significant improvement in patient's symptoms and signs. If the presenting shoulder complaint is of non-traumatic nature and there are no obvious red flags, as therapists we would like to know:

- The current level of shoulder function (i.e. active, passive and resisted shoulder movements)
- Can we modify the symptoms and/or improve the function by modifying movement/s and/or assisting the scapula?

Although the mechanism of symptom modification manoeuvres is not fully understood, from a practical point of view in trying to improve a patient's shoulder function, if by modifying a movement improves patient's symptoms or the quality of movement of the shoulder, then that manoeuvre can help direct and/or complement our exercise selection to optimise exercise therapy program.

Rehabilitation outcomes of rotator cuff-related shoulder problems depend on multiple factors, both intrinsic and extrinsic. Educating patients about a requirement for a minimum of 12 weeks of exercise therapy and up to a year to improve pain and function scores, helps set realistic expectations of the rehabilitation program.

Rehabilitation following rotator cuff repair – optimizing outcomes in active sporting patients

Milena Mirkovic

About three quarters of recreational athletes return to upper limb sports after arthroscopic rotator cuff repair, most often at the same level and with equivalent intensity compared to before surgery (Antoni et al., 2016). The mean time to return to sports has been reported to be 6 ± 4.9 months. Generally, such patients are motivated to return to their desired sport and their compliance rate is high when it comes to following rehabilitation programs.

Most therapists have a good understanding of post-operative protocols and the milestones required to rehabilitate a post-operative shoulder to be able to return to typical everyday activities. However, many therapists may lack understanding of the demands required by the shoulder to withstand loads associated with high level activities such as serving in a tennis match. Similarly, orthopaedic surgeons often provide patients with tissue healing timelines instead of functionally-based return to play expectations, resulting in inadequate rehabilitation for the desired sport and at times suboptimal outcome measures.

To optimise outcomes in sports-active patients one must understand the demands of the patient's sport on their shoulder specifically. When preparing a post-operative rehabilitation plan, it is important to understand what the athlete should be working towards. Essential questions to ask are:

- What do the high-intensity/high complexity movements look like? At what speed are the movements performed and are there easier variations/positions to play?
- How often per week and how many times per session are they performed?
- Is the athlete preparing for a tournament, and if so, what would a typical competition week look like?
- At what speed do they need to be performed?
- Are there published upper limb normative values for this sporting population
- What are the risk factors for shoulder injury in such sports?
- Does the patient have any pre-injury screening scores or strength/speed values to work towards?

Post-operative rehabilitation program focusing on staged return to sport-specific functional goals rather than timelines or only basic function is likely to produce optimal outcomes in active sporting patients.

Use of orthosis in sport-related injuries

Sara Tence[1]

[1]Orthopaedic Hospital Valdoltra, Jadranska cesta 31, 6280 Ankaran

Orthosis is externally applied device used for management of the musculoskeletal injuries. It is used for the immobilization of joints, for restriction of movement and for rehabilitation after ligament injuries, fractures etc.

The most frequently injured joints in sport are knee and shoulder. In base of the mechanism of action knee braces can be divided into four categories:

- the unloader knee brace (the purpose is to unload the affected compartment by altering alignment, e.g. in osteoarthritis for minimizing pain, improving function)
- the prophylactic knee brace (it is most commonly used by athletes who play contact sports such as football. It protects the MCL against valgus knee stresses, while also protecting the knee joints from being injured again)
- the patellofemoral knee brace (it is designed to resist lateral displacement of the patella and to maintain patellar alignment, effective in reducing anterior knee pain)
- the functional knee brace (with the purpose to achieve stability in ligament injuries, to keep a limited joint mobility, to protect the graft and to improve confidence by enhancing sensorimotor feedback; may be used also in a transitional period in sport activities).

The major part of knee injuries involves the anterior cruciate ligaments and less frequently other ligament injuries such as: PLC, PCL, MCL, MPFL. The risk of knee injuries is higher in contact sports, like handball and basketball, but also in individual sports like skiing. This type of injuries is treated conservative or operative.

The Orthopaedic Hospital Valdoltra performs surgeries after mentioned types of injuries. Each type of surgery requires specific physiotherapy protocol, where functional post-operative knee braces are used in the earlier phase of rehabilitation. After six weeks patients gradually remove the brace. In further rehabilitation braces are not recommended because of the potential muscle atrophy.

Brace that we apply in this phase of rehabilitation is the Donjoy Telescoping IROM Post-Operative Knee brace. The brace has telescopic bars that allows the brace to fit a variety of patient. It has a precise range of motion control in 10 degrees increments. For the immobilization of the knee the Gibaud Knee Immobilizer is applied which provides comfortable full extension knee immobilization.

The glenohumeral joint allows a large range of motion which make the joint structure to be susceptible to dislocation. Common sports-related shoulder injuries may occur in contact sports, like in rugby and also in non-contact sports, such as tennis, golf, swimming, weightlifting. Typical injuries are: rotator cuff tear, shoulder dislocation, glenoid labral injuries, clavicle fracture, acromioclavicular joint injury, biceps tendinopathy. Shoulder Immobilizer braces are used in the acute phase after injury or in the early post-operative phase. The aim of the brace is to support the arm and prevent certain motion in a comfortable way.

All the previous mentioned injuries are treated also in the Orthopaedic Hospital Valdoltra. After the medical intervention patients follow a physiotherapy rehabilitation protocol. In the early phase we use the Immobilizer brace approximately for six weeks to protect and support the shoulder in the appropriate post-operative position.

Orthosis are a useful support solution in the early rehabilitation phase to achieve an adequate outcome.

Psychology in sport injuries

Matej Tušak and Iztok Žilavec

Sport is determined by extreme motivation, intense practices and competitions together with high level of stress. Exceptional level of effort and striving for perfection demand work close to physiological limits. All of mentioned increases the possibility of sport injury, which is in professional sport quite common. Considering experiences, sport injuries are one of the crucial factors of athlete's success in sport. Early researches show (Duda, Smart, Tape, 1989; Larson, Starkey in Zaichowski, 1996; Green, 1992;) that psychological factors have a strong impact on the process of rehabilitation. To enable a sucessful rehabilitation, we have to considerate not only specifical rehabilitation of the injured part and general physiological rehabilitation, but also psychological rehabilitation of an athlete. The majority of the literature regarding sports injuries is concentrated on psychological characteristics following that represent risk factors for sustaining athletic injury. In the last 25 years the researches have move on to identifying psychological characteristics of athletes after sustaining an injury and psychological responses following an injury on coping strategies and social support of an injured athlete and rehabilitation adherence. Researchers have developed several models to illustrate the dynamical relationship between psychological response to injury and adherence to sport rehabilitation. One of the most current and widely accepted model of athletes psychological response to sports injury and adherence to rehabilitation is the Integrated Model of Response to Sport Injury (Wiese-Bjornstal, Smith, Shaffer, & Morrey, 1998). The model illustrates pre-injury and post-injury factors that influence psychological response to the injury. The predominant path is that cognitive appraisals (personal and situational factors) affect emotions, and that effect behaviour.

Among personal factors the most important are self-esteem, trait anxiety, pain tolerance, age, first time injured, gender, pessimistic explanatory style, personal hardiness, athletic identity, coping stress strategies etc. But among situational factor we should consider timing of the injury, injury severity, duration of injury, social support for rehabilitation, medical prognosis, recovery progress etc.

Future researches should combine the findings of previous researches and extend the validity and reliability of their results. In the future, we have to identify:

- personality, motivational and situation aspects of successful rehabilitation of an injured athlete
- possible predictors of successful rehabilitation of an injured athlete
- the variables that are connected with poor rehabilitation adherence
- the variables that are connected with good emotional adjustment to the injury
- hazardous personality characteristics regarding sports injury and therefore achieve better rehabilitation compliance and less emotional disturbances during rehabilitation.
- the importance of psychological attendance and the importance of psychological rehabilitation
- and form a complex model of successful psychological rehabilitation of an injured athlete.

The role of sport psychologist is to identify those factors and enable an athlete a successful rehabilitation. Every rehabilitation is individual, goal orientated and controlled. Sport psychologists' work bases on following steps:

- identification and recognition of emotional, cognitive and psychological response on the sport injury
- offering and help with organizing social and expert support
- maintaining motivation for rehabilitation (also motivate in critical moments)
- reducing pain and anxiety
- Use specific psychological interventions (biofeedback, goal setting, imagery, progressive relaxation, autogenic training, psychotherapy and systematic desensitization) to help athletes according to their psychological responses.

Shoulder instability from orthopedic point of view

Gianluca Canton[1], Bramir Hoxhaj[1], Nicholas Rasio[1], Luigi Murena[1]

[1]Orthopedics and Traumatology Unit, Department of Medical Sciences, Trieste University Hospital, Trieste, Italy

Shoulder instability affects 1% of the population, reaching 3% in the young and athletic population.

Shoulder instability can be classified according to: direction of instability, type of trauma, joint laxity, underlying neuromuscular or collagen disorder, structures involved or if the instability is volitional. A complete comprehensive classification system capable of defining etiology and treatment strategies has been difficult to create.

According to Gerber classification shoulder instability encompasses both dislocation and subluxation events and is classified as static or dynamic. Furthermore, dynamic instabilities are divided into unidirectional or multidirectional instability with or without general hyperlaxity.

Static instabilities are characterized by degenerative changes and absence of classical symptoms of shoulder instability. Subluxation of the humeral head and glenoid erosion represent the typical presentation. Non prosthetic surgical treatment and rehabilitation are often unsuccessful.

Unidirectional instability without hyperlaxity is usually caused by a single traumatic event. Acute traumatic anterior shoulder dislocations are the most common and are typically associated with Bankart lesions, bony Hill-Sachs lesions, SLAP lesions and glenoid rim fractures. Surgical treatment is performed through arthroscopic Bankart repair or bony procedures for patients with more than 25% glenoid bone loss.

Unidirectional posterior shoulder instability is rare and multifactorial. Single severe traumas such as direct blows to the shoulder or recurring microtrauma with repetitive shearing forces and loads to the posterior shoulder in the flexed, adducted, and internally rotated position, are responsible for posterior shoulder instability. Posterior instabilities without hyperlaxity can cause posterior Bankart lesions. Surgical treatment is performed through arthroscopic posterior capsulolabral repair or modified McLaughlin procedure. Unidirectional instabilities are treated with physiotherapy alone when no structural lesions are present or for first time dislocators. Surgical indication is given for recurring dislocating events or patients with high functional needs.

Unidirectional instability with hyperlaxity is characterized by a clear sulcus sign and hyperlaxity of the contralateral shoulder. Typically, in anterior unidirectional instability with hyperlaxity an opening of the rotator interval is expected associated with Bankart lesions, Hill-Sachs lesions may be present. Posterior instability with hyperlaxity usually has minimal labral lesions and is often atraumatic.

In anterior instability with hyperlaxity physiotherapy treatment alone is not enough and arthroscopic capsular retention to stabilize the shoulder is necessary. Posterior instability with hyperlaxity instead usually benefits from conservative treatment alone.

Multidirectional instability without hyperlaxity is a rare condition, lesions of anterior and posterior shoulder instability are found. Surgery is complex requiring both anterior and posterior repair through arthroscopic labral reconstruction.

Multidirectional instability with hyperlaxity is a rare condition characterized by incapacity of the patient to control the location of the humeral head relatively to the glenoid cavity. Patients are often young females who were subjected to repeated microtrauma, they usually present widespread signs of hyperlaxity. Structural lesions are minimal. A conservative approach through physiotherapy in these patients can wield good results in most cases.

Shoulder instability from physiatrist's point of view

Dragan Lonzarić[1]

[1]Institute for physical and rehabilitation medicine, University Medical Centre, Maribor, Slovenia

The glenohumeral (GH) joint is the most mobile joint of the human body and inherently unstable. Dynamic and muscular stability is therefore crucial and relies on rotator cuff muscles and scapulothoracic muscles that position the scapula, which is the base of the shoulder complex. Dislocations result from traumatic events and can be associated with atraumatic events (inherited hypermobile joints) and with repetitive micro-trauma due to overhead activity in athletes. Anterior dislocations represent 95% of acute traumatic dislocations of the GH joint. Acromioclavicular (AC) joint separations account for 9% of all injuries to the shoulder girdle. Stability of the AC joint is provided mainly by coracoclavicular ligaments. Full functionality of the shoulder depends on stability and full range-of-motion (ROM) of all true joints of the shoulder girdle and two functional joints (subacromial and thoracoscapular space). It is important to diagnose numerous possible complications of a dislocated shoulder (ligament damages, greater tuberosity abruption, Hill-Sachs lesion, Bankart lesion, shoulder labrum anterior to posterior (SLAP) lesions, rotator cuff tears, nerve or blood vessel damages). Structural and functional instabilities interact with each other. Scapular dyskinesis is a very important pathology to address in shoulder rehabilitation. Half of the power in throwing and tennis serves is generated from the lower half of the human body, therefore addressing dynamic stability and function of whole-body kinetic chain is also needed.

A physiatrist is involved in conservative and postoperative rehabilitation of patients with shoulder instability and leads the shoulder rehabilitation team. Rehabilitation should consider patient age, premorbid state and level of activity, and patient-oriented outcome goals. Communication between rehabilitation members is of utmost importance. Rehabilitation protocols are helpful, but they are not intended to diminish clinicians' ability to provide quality patient care by discouraging critical thinking and clinical decision making. A framework to approach post-surgery rehabilitation is based on the following principles: a thorough understanding of the surgical procedure; an understanding of the anatomical structures that must be protected, how they are stressed and the rate at which they heal; appropriate selection and skilled application of rehabilitation techniques, including management of the initial immobilization period, and gradual progression in motion and strengthening; optimization of the kinetic chain and in sports rehabilitation the consideration for return to play. Multi-phased progressive rehabilitation programs, starting from the first (protective) phase, continuing with ROM oriented second phase (gentle mobilization techniques in the scapular plane for pain relief and early ROM exercises, arthrokinematic mobilizations, strengthening scapular muscles, neuromuscular and proprioception training), and ending in advanced phases, which are focused on demanding strengthening exercises (eccentrics, plyometrics and isokinetics) and sport specific training, should be individualized and adapted to each patient. The appropriate care for the correct trunk posture and work on the full open and closed kinetic chain is needed. Rehabilitation team members must be familiar also with patient-related outcomes scales, for example the Western Ontario Shoulder Instability Scale.

Practical evaluation and discussion of patient; atraumatic instability

Anja Barič, Milena Mirkovic

The concepts of shoulder laxity and instability have changed in the last decades, and so has physical examination. While traumatic shoulder instability is more common and its structural defects are more straightforward to treat, a small group of patients suffer from recurrent shoulder instability in the absence of trauma, and this scenario is more difficult to manage. Successful treatment is highly dependent upon the correct clinical diagnosis, identification of anatomical structural defects and abnormal movement patterns so that rehabilitation programs can be designed accordingly.

A detailed interview and clinical examination of the patient are required in order to identify a shoulder instability problem. The mechanism of injury (traumatic versus atraumatic), severity (subluxation vs dislocation), direction of instability (anterior vs posterior vs inferior vs multidirectional), presence of ligamentous laxity and general hyperlaxity in other joints, and presence of volitional instability have all been described as considerations for classifying glenohumeral instability and for guiding treatment.

To determine which type of exercises are most likely to help the patient with instability requires adding manual correction techniques and/or symptom modification manouvres during assessment. In particular:

1. The patient performs the objective test/s (i.e. movement test, strength test) and the therapist notes scapular symptom onset, any scapula or humeral head malposition and/or strength deficit depending on the test chosen.
2. The therapist manually assists the scapula, then humeral head, then a combination of both, aiming to correct the malposition while repeating the objective test. Any improvement in pain levels, range of motion, strength, patient apprehension or humeral head position are noted
3. In addition, the effect of adding kinetic chain movement/s while repeating the same objective test/s should also be noted

The correction position/symptom modification manouvre that most improves the patient's symptoms is the one that is retrained and adopted throughout the atraumatic instability rehabilitation program.

Finally, a closer look at the rotator cuff in isolation helps determine whether it is able to produce the direction-specific control required around glenohumeral joint. Recruitment of the anterior and posterior healthy RC muscles should occur when the muscle is in its lengthened

position (outer range) as well as its shortened position (inner range), therefore a combination of manual muscle tests and ability to recruit actively through available range are useful tests to help guide treatment.

Manual therapy for patients after surgery – frozen shoulder

Aleša Kloosterwaard

Frozen shoulder, also known as adhesive capsulitis is a condition in which the shoulder is initially painful and later becoming progressively stiff with significant loss of active and passive glenohumeral joint range of motion with spontaneous complete or near complete recovery over varied period of time (Kelley et al.). The condition is frequently defined as loss of more than 25% of normal shoulder range of motion in at least two planes, particularly abduction and external rotation, but has minimum pain on resisted testing. According to Vastamäki et al. 94% cases resolve within 4-36 months, with 15 months on average. Frozen shoulder has a prevalence of 2% - 5.3% in a general population with a peak at 55 years of age and a higher prevalence amongst women, patients with endocrine conditions and a previous episode of frozen shoulder on a contralateral side. The pathoanatomical features of frozen shoulder are angiogenesis into the capsular tissue, producing collagen fibre proliferation, granulation, creating pathological crosslinks, diminished joint volume and contracture of the capsular ligament as complex. The shoulder can either be stiff due to a stiff tissue or due to a stiff joint in case of an osteoarthritis, fractures or rare locked posterior glenohumeral joint dislocations.

Although the ethology remains unclear, adhesive capsulitis can be classified as primary if the onset is idiopathic or secondary which results from a known cause, such as stiffens following a shoulder injury, surgery or prolonged period of immobilization.

Postoperative frozen shoulder presents after an initially successful postoperative rehabilitation process, but then is followed by a worsening of pain in the shoulder with gradual loss of both active and passive range of motion (Evans et al).

Diagnosing a frozen shoulder in the clinical examination starts with external rotation in 0° position, followed by the assessment of glenohumeral abduction and flexion. Positive finding is concerned if 50% of loss compared to the other side.

In a study of Hollmann et al. (2018) all suspected frozen shoulder patients display some degree of active muscle guarding, that is why is considerable to perform a coracoid pain test to distinguish a true or a pseudo frozen shoulder. Furthermore, the scapulohumeral rhythm has changed, where scapulae start to rotate already at about 30° passive abduction due to a capsular tightness, when normal is about 80°-90°. The arthrokinematics are changed as well, leading to a disturbed ratio rolling/shearing movement.

Prior to manual therapy treatment it's important first to release the soft tissues, such as Pectoralis minor muscle, joint capsule massage and scapula mobilisation. The sensory input from capsuloligamentous mechanosensory type 1 and 2, activates A beta fibres leading to pain control. Oscillation techniques can be used to diminish pain. When there are adhesions which are limiting the movement, traction, translational and shearing movement, 1D, 2D and 3D distraction in MLPP leading to MCPP should be done.

According to Carette S et al. an intraarticular injection of corticosteroid combined with physical therapy appears that the recovery rate regarding to the ROM, appears to be faster than injection therapy alone. Guler-Uysal et al. showed in a comparative study the Cyriax approach to be more successful than conventional physical therapy.

Imaging of the shoulder (plain film, CT, MRI)

Mojca Tomažič[1], Nina Ferenaz[1], Aleksandar Nikolić[1]

[1]Orthopedic hospital Valdoltra, Ankaran, Slovenia

There are many different imaging tools for evaluation of the shoulder pathology. After obtaining a detailed history and performing a careful physical examination the clinician should decide on the proper imaging method and provide necessary, adequate and meaningful information to the radiologist.

Plain films are still the first-line imaging method. At least two perpendicular planes should be obtained to assess bony anatomy of the shoulder. Together with clinical findings and age of the patient plain films are a guide for choosing further imaging methods.

Computed tomography (CT) is a method that provides detailed information about the bone structures. In general it should be used in acute problems like trauma. CT can be performed on patients in almost every clinical condition. Multiplanar and volume reconstructions ease the evaluation of fracture fragments, subluxations, dislocations and loose bodies.

The best method to show the entire anatomy of the shoulder soft tissues and bone marrow is magnetic resonance imaging (MRI). MRI is performed in multiple plains and with excellent tissue contrast enables the assessment of the joint cartilage, labrum, muscles, tendons, ligaments, bursae and bone marrow.

The gold standard to assess glenoid labral tears and shoulder instability is MR arthrography. Intra-articular injection of the contrast media increase the diagnostic accuracy of MRI. When MR arthrography is contraindicated, CT arthrography should be performed. It is less sensitive in the evaluation of labral tears and shoulder instability than MR arthrography, but it is the method of choice in case of osseous Bankart lesions.

In case of bone tumors and inflammatory arthropathy MRI should be performed with sequences after intravenous administration of the contrast media.

Imaging interpretation of the postoperative shoulder is a challenging and difficult task for both the radiologist and the clinician. Although MRI and MR arthrography are widely used, implementing a multimodality imaging approach (ultrasound, CT, CT arthrography) can provide additional imaging information that may be decisive and vital to diagnosis.

In many cases close cooperation between the clinicians and the imaging experts is essential in deciding on the imaging approach to the shoulder problems in a timely and cost-effective manner.

Anatomy of the Knee

Samo Novak[1]

[1]Valdoltra Orthopaedic Hospital, Ankaran, Slovenia

The knee is the largest and most complex joint of the human body. It can be conceptualized into two joints: tibiofemoral (functionally medial and lateral) and patellofemoral joint. Tibiofemoral joint transmits body weight from the femur to the tibia while providing hinge-like, sagittal plane joint rotation along with a small degree of tibial axial rotation. The medial femoral condyle and medial tibial plateau are more elongated, or ovoid, than in the lateral compartment. The medial femoral condyle (MFC) is larger and more circular while the lateral femoral condyle (LFC) is smaller. The articular surface of the medial tibial plateau is concave, whereas the lateral plateau has an anteroposterior convexity. The patellofemoral joint is a diarthrodial plane joint that consists of the posterior surface of the patella and the trochlear surface of the distal anterior femur.

Collateral Ligaments

Collateral ligaments control coronal plane stability. Lateral (fibular) collateral ligament originate proximal and posterior to the lateral epicondyle and inserts on the lateral fibular head. It is more flexible than medial, therefore it is less susceptible to injury. The medial (tibial) collateral ligament is divided into two structures. The superficial MCL is the major medial stabilizer, originating at the medial epicondyle and traveling deep to the pes muscles to insert broadly on the tibial side. The deep MCL is considered as thickening of the capsule.

Cruciate Ligaments

Cruciate ligaments provide stability in the sagittal plane. Anterior cruciate ligaments (ACL) originate from the posteromedial corner of medial aspect of lateral femoral and inserts to the to the intercondyloid eminence anteriorly and lateral to anterior spine. ACL prevents anterior subluxation of the tibia, particularly near terminal extension – it is taut around 15° of flexion. It also prevents excessive tibial medial and lateral rotation, as well as varus and valgus stresses.

Posterior cruciate ligament (PCL) originates from the anterolateral aspect of the medial femoral condyle within the notch and inserts along the posterior aspect of the tibial plateau. The PCL is an important restraint of posterior tibial translation relative to the femur. It acts as a secondary restraint to resist varus, valgus, and external rotation moments about the knee.

Menisci

The menisci contribute to various biomechanical functions, such as load bearing, constituting a contact area, guiding rotation, and stabilizing translation. The medial menisc is »C shaped«, whereas lateral meniscus is »O shaped«. The latter is more triangular-shaped in cross section than the wedge-shaped medial meniscus. Both menisci are critical components of a healthy knee joint. Two distinct regions of the meniscus can be distinguished: the outer, vascular/neural region (red-red zone), and the inner, completely avascular/aneural region (white-white zone). These two areas are separated by the red-white region.

Knee Biomechanics

Nino Mirnik

Orthopaedic Hospital Valdoltra, Ankaran, Slovenia

The knee has biomechanical roles in allowing gait by flexing and rotating and provides stability during the activities of daily life. It shortens and extends the lower limb as required and transmits forces across it. It also functions to transmit, absorb and redistribute forces caused during the daily activities. The knee is comprised of 2 joints, a tibiofemoral joint and a patellofemoral joint. It is a modified hinge joint with gliding function too. It has got six degrees of freedom. Three rotations and three translations. In sagittal axis it has flexion-extension movement, in frontal axis, it has a varus-valgus rotation in transverse axis it has internal-external rotation. Flexion-extension normal range of motion goes from 3 degrees of hyperextension to 155 degrees of flexion, with thigh-calf contact usually being the limiting factor to full flexion whereas normal use requires ROM from 0 to 110 degrees varus-valgus range of motion is 6 to 8 degrees in extension. Internal-external rotation range of motion is 25 to 30 degrees in flexion, anterior-posterior translation is 5 to 10 mm. Compression of patella is 2–5 mm and there is a normal medio-lateral translation of about 1-2 mm.

Patellofemoral articulation transmits tensile forces generated by the quadriceps to the patellar tendon and increases the lever arm of the extensor mechanism. Patellectomy decreases extension force by 30%. Patellofemoral joint reaction force is up to 7x body weight with squatting and 2-3x body weight when descending stairs. It is a "sliding" articulation as patella moves 7cm caudally during full flexion with the maximum contact between femur and patella at 45 degrees of flexion. Passive restraints to lateral subluxation are medial patellofemoral ligament which is the primary passive restraint to lateral translation in 20 degrees of flexion providing 60% of total restraining force, medial patellomeniscal ligament, which provides 13% of total restraining force and medial retinaculum which provides 10% of total restraining force. Dynamic restraint to lateral subluxation is the quadriceps muscle.

Tibiofemoral articulation transmits body weight from femur to tibia. There is an instant centre of rotation, appoint at which the joint surfaces are in direct contact. With posterior rollback as the knee flexes, the instant centre of rotation on the femur moves posteriorly which allows for increased knee flexion by avoiding impingement. The "screw home" mechanism is the external tibial rotation for 5 degrees in the last 15 degrees of extension which is caused by longer medial tibial plateau articular surface than lateral tibial plateau. It "locks" the knee thus decreasing the work performed by the quadriceps while standing. Knee stability is very important. Varus stress is opposed by lateral collateral ligament. Valgus stress is opposed by superficial portion of medial collateral ligament. Anterior translation is opposed by anterior cruciate ligament. Posterior translation is opposed by posterior cruciate ligament. External rotation is opposed by posterolateral corner. Menisci function as load bearers, stability providers, joint lubricators, preventors of capsule or synovial impingement and shock absorbers.

Patellofemoral pain syndrome

Klemen Grabljevec[1], Irma Zidar [1]

University Rehabilitation Institute, Ljubljana, Slovenia

Pain in retropatellar and peripatellar regions is clinically referred to as patellofemoral pain syndrome (PFPS) and it is aggravated by at least one activity that loads the patellofemoral joint during weight bearing on a flexed knee (e.g., squatting, stair climbing, running). Additional nonessential criteria include grinding sensation in the patellofemoral joint during knee flexion movements, tenderness on patellar facet palpation, small effusion and pain on sitting, rising on sitting or straightening the knee following sitting.

PFPS is a very common complaint in the general population, particularly in young adult and adolescent athletes. It is reported that almost 25%–30% of all injuries seen in a sports medicine clinic and up to 40% of clinical visits for knee problems, are attributed to PFPS. Current literature suggests PFPS is a refractory condition which may persist for many years (in some cases even up to 20 years) and is a likely contributor to long-term patellofemoral osteoarthritis, especially in cases of adolescent anterior knee pain.

Patients typically describe pain behind, underneath or around the patella and if asked to point to the site of pain, they place their hands over the anterior aspect of the knee or circle the patella with their fingers (the circle sign). Physical examination is the foundation of PFPS diagnosis, but there is no definitive clinical test to diagnose PFPS. Anterior knee pain elicited during a squatting maneuver is the best available test with 80% patients having evident PFPS. Several other tests proposed for PFPS have limited evidence supporting their use (tenderness on palpation of the patellar edges, patellar grinding and inhibition tests). Full range of knee motion and lack of effusion are common findings in PFPS patients. Diagnostic imaging is not required for many patients but plain radiography may be indicated in some specific cases (history of trauma, joint effusion, patients older than 50 years, no improvement after several weeks of conservative treatment).

Risk factors for developing PFPS are generally considered extrinsic (injury, type and volume of sports activity) and intrinsic, which can be anatomical (change in anatomical axes, muscle dysfunctions or tightness, hypermobile patella, rigid lateral structures) or biomechanical (decreased knee flexion angle and vertical ground reaction force, decreased quadriceps and hamstring muscles strength, increased hip external rotation strength, hip internal rotation angle and navicular drop). Current studies suggest Q-angle is not connected with PFPS pathology.

Expert panel of 5th International Patellofemoral Research Retreat, held in July 2017, released the following recommendations regarding treatment of PFPS:

1) Exercise therapy is recommended to reduce pain and improve function.
2) Combining hip and knee exercises is recommended should be used in preference to knee exercises alone.
3) Combined interventions are recommended to reduce pain and incorporate exercise therapy as well as one of the following: foot orthoses, patellar taping or manual therapy.
4) Foot orthoses are recommended to reduce pain in the short term.
5) Patellofemoral, knee and lumbar mobilisations are not recommended in isolation.
6) Electrophysical agents are not recommended.

Nutrition and healing in sport

Nada Rotovnik Kozjek

Clinical Nutrition Unit, Institute of Oncology Ljubljana, Slovenia

Injuries represent a negative aspect of physical exercise. All sportsmen can suffer from injuries, from those who exercise for health up to the elite athletes. Injuries can be acute, mainly from trauma but also, in a broader sense, from metabolic disturbances.

All injuries from physical exercise usually require relative rest with decreased physical activity. Sometimes limb immobilisation is necessary. Immobilization leads to a decrease in muscle protein synthesis, which results in negative muscle protein balance. The decrease of energy expenditure due to immobilisation is not highly pronounced since the processes of increased synthesis of inflammatory mediators and wound healing limit the reduction of energy expenditure. Consequences are seen as a decrease of function accompanied by loss of muscle mass and strength. Therefore, nutrient and energy deficiencies should be avoided. Proper nutritional strategy can maintain or improve nutritional status and boost recovery. It seems that this aspect of recovery is often overlooked and undervalued. In addition, there exists little scientific evidence for professional nutritional recommendations for injured athletes. At this point, the evidence from clinical nutrition in wound healing, surgery and even bed rest studies can be used to achieve optimal recovery.

Basic principles in nutritional support for injured sportsman include proper energy and nutrients intake to combat inflammation, to provide nutrients for wound healing and to minimize protein loss due to inactivity. When physical therapy with resistance exercise is included as a therapeutic measure, sports nutrition principles for power and strength sports may be included. This strategy helps to increase protein synthesis and restore sensitivity to anabolic signals. Proper energy and nutrients intakes in this phase of rehabilitation also support muscle growth.

For cases that are more complicated or require long-term rehabilitation, an individual nutritional assessment must be undertaken. The use of nutritional supplements during rehabilitation has theoretical rationale but there is not much scientific evidence. As sportsman must be careful regarding doping, the use of supplements must be individually adapted. Promising supplements are essential amino acids, leucine, β-hydroxy-β-methylbutyrate (HMB), creatine monohydrate and omega 3-fatty acids.

On the other hand, evidence-based sports nutrition is a good tool to prevent chronic sports injuries. The nutritional risk is the highest in athletes who train hard and regularly. Inappropriate nutrition increases the potential risks of injuries in high-intensity training and in extensive training modalities. Physicians must recognize these risks and monitor the health of athletes, including their nutritional habits. The nutrition is still unrecognized and underestimated preventive health and training tool, which can help to reduce the risks of injuries associated with high-level sports participation. Ultimately, in athletes with good nutritional status, the healing of acute injuries may have better outcome.

ACL from orthopaedic point of view

Aleksander Dolgan

ACL is one of the main ligaments of the knee and it provides anteroposterior as well as rotational stability. ACL deficient knees are prone to secondary injuries (mainly of the meniscus) and early onset of osteoarthritic changes. Treatment is focused on improving stability and restoring proper kinematics of knee and gait.

ACL and its role

Anterior cruciate ligament is one of the four main ligaments of the knee and it provides 85% of restraining force to anterior tibial translation. Besides that it provides also rotational stability of the knee by resisting the internal rotation of the tibia. It also contains mechanoreceptors that detect changes in direction of movement, position of the knee, changes in acceleration, speed and tension and in this way contributes to neuromuscular function. ACL rupture is a common injury that usually affects young, physically active patients and can lead to chronic instability.

Goals of treatment

The main goal of treatment is to improve the stability of the knee in order to prevent further injuries and early osteoarthritis. Studies show that the risk for secondary menisceal lesion increases by 20% - 80% after 5 – 10 years in unstable knees and since partial medial meniscectomy dramatically increases chances for osteoarthritis development, the role of stability cannot be overemphasized. Even without secondary injuries chronic instability can lead to osteoarthritis by altering kinematics of the knee, load bearing of cartilage and also gait kinematics.

Operative treatment

First ACL repair was reported in 1900 and since then the open procedure with simple suture has evolved into modern arthroscopic techniques with different choice of grafts and fixation methods. Despite numerous studies regarding ACL ruptures there are still no clear treatment strategies for isolated ACL injuries. The main indications for reconstruction are marked feeling of instability and subjective loading requirements. Even with operative treatment many authors report relatively high number of cases with chronic anteroposterior instability and increased risk of post traumatic osteoarthritis comparing to normal population.

Conservative treatment

In 80s and early 90s the prevalent view was that untreated ACL injuries lead to early onset of osteoarthritis and the solution would be ACL reconstruction. This view did not go unchallenged for too long. Studies emerged showing comparable results with neuromuscular training and even suggesting that the surgery itself can increase the risk of osteoarthritis when compared to conservative treatment. Modern rehabilitation programs focusing on strength, dynamic stability, balance and safe movement planning are giving very good results.

Conclusion

Despite so many years of investigation we still don't have clear treatment strategies for isolated ACL deficiency. ACL reconstruction is one of the treatment modalities but also modern conservative treatment rehabilitation protocols are yielding good results. With better study designs and longer follow-ups we got quite substantial amount of evidence that operative treatment can offer some advantages in improving stability and functional scores as well as lowering the risk of secondary injuries and post traumatic arthritis.

ACL from PRM doctor point of view

Katarina Cunder[1]

[1]University Rehabilitation Institute, Ljubljana, Slovenia

ACL injury is relatively common in a healthy, active population. Majority of ACL tears occur in noncontact situations that demand quick decelerations, landing or direction changes. Minority are due to contact injury with excessive knee valgus stress.

There are three main rehabilitation focuses when we talk about ACL injury: prevention of ACL injury, conservative treatment of ACL tear and postoperative rehabilitation.

When trying to prevent an ACL injury, we must recognize and avoid as many intrinsic and extrinsic predisposing factors as we can. Mainly we try to prevent dynamic valgus of the knee, improve landing and jumping technique, maintain muscle equilibrium between knee flexor and extensor group, improve muscle activation and lessen muscle fatigability. In attempt to prevent dynamic knee valgus we focus on the whole kinetic chain from the upper extremity, trunk and hips to the knees, ankles and feet. To evaluate muscle balance deficits we use isokinetic testing with concentric and eccentric modes, activation and fatigability evaluation and dynamic control ratios calculation. Useful information is gained with static and dynamic balance testing and functional testing, including simple and complex jumping tests.

Not all ACL injuries need to be or can be reconstructed. There are specific criteria that help surgeons and PRM specialists to decide which treatment is preferable. As we can see from the contemporary literature, there is no absolute consensus on the topic, though most common indications for operative treatment are: instability, especially after 3 months of structured rehabilitation, meniscal or other structural damage to the knee that needs surgery, high level activity demands and persistent pain. Weak evidence show that there are no differences in knee function and quality of life between conservative or operative treatment outcomes in 2 and 5 years, there is more osteoarthrosis in operative group and more knee instability cases in conservative group, as much as half of them needing operative treatment in the following years.

In conservative approach we use a four-phase protocol: acute, subacute, partial return to activity and full return to activity. The protocol is individually adjusted and there are goals to be reached to allow rehabilitation to progress to the next phase.

Rehabilitation protocols are helpful also in postoperative knee rehabilitation. Protocols are divided into phases and individually adjusted, taking into consideration the type of ACL graft, other structural damage of the knee (especially if also surgically treated), age, activity level and other comorbidities. In the course of conservative treatment and postoperative rehabilitation of ACL injury, we usually perform isokinetic and balance testing. Functional tests are performed before return to full activity.

Rehabilitation after ACL reconstruction – acute phase

Lucija Kržišnik Turšič

Orthopaedic Hospital Valdoltra, Ankaran, Slovenia

Anterior cruciate ligament (ACL) rupture is a common injury, mainly affecting young, physically active individuals. In approximately 10% of cases occurs in isolation in majority of cases, it is combined with other injuries, typically meniscal tears or collateral ligament and subchondral bone.
Treatment after ACL injury can be nonoperative or operative. Operative intervention have become usual for athletic individuals, initial non-operative treatment, based on physiotherapy, is used more commonly in the general population. Aim of the treatment is re-establish anteroposterior stability, restore function and in long-term avoid secondary osteoarthritis of the knee.
Preoperative and postoperative rehabilitation are important for successful outcome of treatment. Rehabilitation regimens commonly use a three-stage progressive programme: acute, recovery and functional phase. However there is little consensus over the most effective rehabilitation protocol. The purpose of this article is to present an acute phase of rehabilitation in Orthopaedic hospital Valdoltra.
With preoperative rehabilitation after injury, we want to achieve certain pre-operative goals:

- minimal pain and swelling,
- full range of motion,
- optimization of muscle strength and normal gait pattern.

This is beneficial to recovery and important for minimizing risk of developing a stiff knee after surgery.
From 2008 to 2018 in our hospital 1831 ACL reconstruction were made, in the previous 2018 year 187.
After surgery our patients stay in hospital approximately 4-5 days, where supervised rehabilitation is performed.
Goals in postoperative acute phase of rehabilitation are:

- control of pain, swelling and inflammation,
- increase range of motion to 90 degrees,
- restore full knee extension,
- re-establish quadriceps control,
- gait training and patient education.

We use different modalities to achieve these goals. Patients use Aircast knee cryocuff for cryotherapy. As soon as possible after surgery, patients start with ankle pumping for prevention of deep vein thrombosis and isometric contraction for quadriceps activation. In the next days we focus on AAROM (active assisted range of motion), AROM (active range of motion) exercises, straight leg raises in all four plane. We use electrostimulation (compex) for activation and better voluntary contraction of quadriceps muscle. With early full knee extension and good quadriceps control, we prevent compensatory gait pathologies. Patients begin gait training with crutches and weight bearing as tolerated and in a few days without crutches.
Conditions for discharge from hospital are:

- minimal swelling of the knee,
- flexion about 90 degrees,
- minimal pain,
- normal walking pattern.

Beside good rehabilitation, protocol, is for successful rehabilitation outcome important that patients follow instructions given by medical doctor and physiotherapist.

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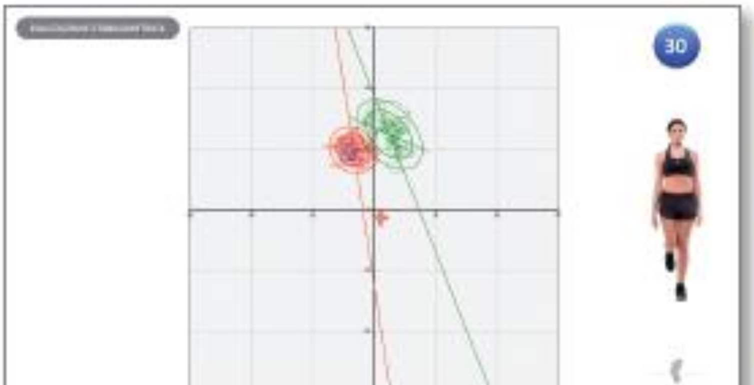

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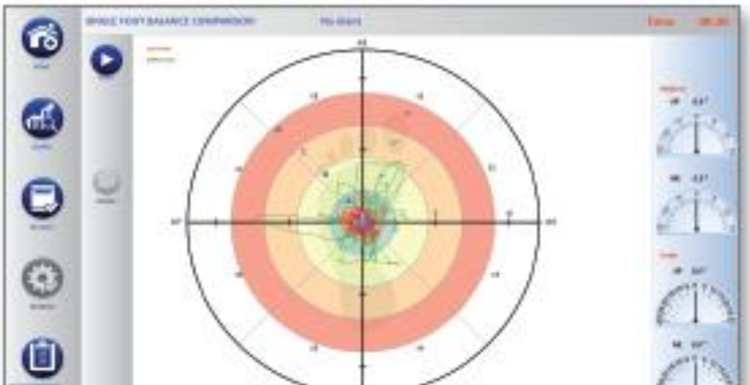

Esempio di dinamica monopodalica.

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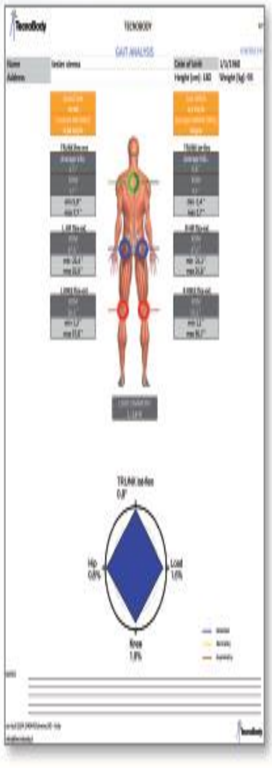

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