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Rehabilitation and Social Integration Committee
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DEAR READERS,

Issues of Rehabilitation, Orthopaedics, Neurophysiology and Sport Promotion – IRONS (formerly Issues of Rehabilitation Promotion) publishes the original papers, reviews, research reports and case reports from the fields of rehabilitation, physiotherapy, orthopaedics and neurophysiology as well as topics dealing with diagnostic and treatment of the sport related traumas. IRONS edits the scientific papers based on methods used in many medicine branches. IRONS is printed quarterly in Polish and English languages, both in printed journal and electronic versions. IRONS is dedicated to both advanced and experienced as well as young scientists.

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The official Journal of Polish Shoulder and Elbow Society.

IRONS Editor in Chief
Prof. Juliusz Huber

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CONTENT

DEAR COLLEAGUES,

On behalf of organizers and editors we are happy to introduce to you new suplement of IRONS. It is devoted to topics of XI Poznan Course and II Meeting of Polish Shoulder and Elbow Society.

All the abstracts of the course and the meeting have been included into journal's supplement. Two other issues of IRONS contain full selected papers on the course lectures.

The preparation of papers as well as edition of IRONS is major effort from both authors and editorial team. Therefore, on behalf of organizers and Polish Shoulder and Elbow Society we want the express the gratitude for the precious time and effort to make the issues so valuable and on time. Special thanks should be given to the IRONS Editor in Chief Juliusz Huber and Scientific Secretary Agnieszka Wincek as well as the Secretary of the Society Joanna Wałecka.

We hope, that the special editions of IRONS will help to get the best and most of the Course and the Meeting participation being the source of valuable knowledge.

Dr hab. Przemysław Lubiatowski
President of Polish Shoulder and Elbow Society
Chairman of Organizing Committee.

Prof. dr hab. Leszek Romanowski
Head of Department of Traumatology, Orthopaedics, and Hand Surgery,
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SZANOWNI PAŃSTWO,

W imieniu swoim i Redakcji IRONS z wielką przyjemnością oddajemy w Państwa ręce suplement i towarzyszące wolumeny kwartalnika IRONS, w całości poświęcone tematom XI Poznańskiego Kursu Chirurgii Kończyny Górnej oraz II Zjazdu Polskiego Towarzystwa Barku i Łokcia.

Wszystkie streszczenia doniesień zgłoszonych na kurs i zjazd zostały zawarte w suplemencie. Dwa kolejne wydania regularnych wolumenów IRONS zawierają artykuły podsumowujące wybrane tematy. Przygotowanie artykułów oraz wydań czasopisma to olbrzymi wysiłek zarówno autorów jak zespołu Redakcji. Dlatego w imieniu organizatorów Polskiego Towarzystwa Barku i Łokcia dziękujemy za ten wysiłek i poświęcony cenny czas. Szczególne podziękowania należą się Redaktorowi Naczelnemu czasopisma IRONS Juliuszowi Huberowi, Sekretarzowi Naukowemu Agnieszce Wincek oraz Sekretarzowi Polskiego Towarzystwa Barku i Łokcia Joannie Wałeckiej.

Mamy nadzieję, że przygotowane wydania IRONS pomogą jeszcze pełniej wykorzystać wiedzę uzyskaną w trakcie spotkania.

Dr hab. Przemysław Lubiatowski
Przewodniczący Polskiego Towarzystwa Barku i Łokcia
Przewodniczący Komitetu Naukowego i Organizacyjnego

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**SESSION I**
**INSTABILITY – INVITED LECTURERS**

## Science behind shoulder instability

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**Keywords:** shoulder instability, clinical studies, biomechanics studies

### Introduction and aim

The lack of consensus regarding the treatment of first shoulder dislocation, controversies regarding indications for arthroscopic Bankart repair and increasing popularity among shoulder surgeons for bony procedures made us search the literature for what we know and what is still unknown in the treatment of anterior shoulder instability.

### Material and methods

The Pubmed, Cochrane and Medline databases were searched for English-language articles published between 2000 and 2017. Papers with highest level of evidence and the most cited ones have been taken into account.

### Results

Recent studies have improved our understanding of the pathoanatomy of shoulder instability and thus changed indications and contraindications for different treatment methods. Although best clinical results with the smallest number of recurrence have surgical treatment of first shoulder dislocation, conservative treatment with short time of sling immobilization seems to be the gold standard.

Arthroscopic Bankart repair is currently the most commonly applied surgery for the treatment of anterior shoulder instability. The most important factors influencing good clinical outcome is proper patient selection and in-depth evaluation of both glenoid and humeral bone loss. Other relevant factors affecting the success of the Bankart repair include technical issues.

In cases of significant bone loss the most effective surgical procedures are Latarjet and bone block surgery. Numerous biomechanical studies explain stabilizing mechanisms of these methods and describe important technical issues influencing the outcomes.

### Conclusions

Although more and more clinical and biomechanical studies are published, controversies regarding the treatment of shoulder instability remain and further investigations are needed.

**PTBL MEETING**
**INSTABILITY – SCIENTIFIC PRESENTATIONS**

## Reliability of measurements performed on two dimensional and three-dimensional computed tomography in humeral head assessment for instability

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**Keywords:** shoulder instability, bone defects, glenoid defect

### Introduction

The aim of the study was to compare two measurement methods of humeral head defects in patients with shoulder instability.

We performed the intra- and inter-observer reliability of humeral head parameters with the use of 2D and 3D computed tomography

### Material and methods

The study group was composed of one hundred humeral heads measured with the use of 2D and 3D computed tomography by two independent observers – experienced and inexperienced.

Both observers repeated measurements for 30 randomly selected humeral heads after one week.

### Results

To check the reliability of measurement, the intra-class correlation coefficient (ICC) was performed. For inter-observer reliability, ICC was significantly higher for 3D-CT than for 2D-CT.

All intra-observer ICC values for 3D was very good (0.966 to 0.997) for both experienced and inexperienced observer.

For 2D-CT, reliability values were significantly higher for experienced observer.

### Coclusions

3D-TK humeral head reconstruction is more reliable method for humeral head bone defects than 2D-TK. It gives similar results when used by experienced and inexperienced observer.

## Reliability of 2D-CT measurements of conflict between the anterior edge of glenoid and Hill-Sachs defect (on-track-off track interplay)

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**Keywords:** shoulder instability, bone defects, Hill-Sachs, glenoid defect

### Introduction

The aim of the study was to assess the reliability of the authors method of determining the occurrence of conflict between the anterior edge of glenoid and Hill-Sachs bone defect based on 2D CT.

Intra- and inter-observer reliability of glenoid-Hill-Sachs relation was performed.

### Material and methods

The measurements were performed on 2D CT scans of shoulder joints in patients with anterior shoulder instability by two independent observers (experienced and inexperienced).

The study group was composed of 70 CT scans in which Hill-Sachs defects were found.

### Results

To check the reliability of measurements, the intra-class correlation coefficient (ICC) was performed.

For inter-observer reliability ICC was on the border of moderate/good reliability (0.653). The similar results were found for intra-observer reliability for experienced observer (0.636). The reliability for inexperienced observer was poor (0.425).

### Coclusions

Differences between measurements performed by experienced and inexperienced observers indicate the imperfection of 2D-CT measurement method. Our previous studies indicate a significant advantage of 3D measurements of shoulder bone defects compared to 2D method. Further research is necessary and is underway.

## Arthroscopic Latarjet stabilisation procedure – clinical and radiological short term outcomes after first 101 cases.

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**Keywords:** Latarjet, shoulder instability, arthroscopy, coracoid bone block

### Introduction

The number of arthroscopic Latarjet stabilisation procedures for treating anterior shoulder instability is gradually increasing, however the number of published results remains limited.

### Aim

The goal of this study was to evaluate clinical and radiological outcomes in patients after the arthroscopic procedure.

### Material and methods

Between 2011 and 2016, an arthroscopic Latarjet stabilisation was performed in 104 patients.

Patients were invited for clinical examination and CT scan. Satisfaction, subjective shoulder value (SSV), Walch-Duplay and Rowe scores was evaluated. Screw placement, graft position and fusion were assessed on CT.

**Results**

101 shoulders (97.1%) were available for clinical evaluation. 96 shoulders (95%) had CT scan. Patient satisfaction was evaluated as 92%, SSV 88%, Walch-Duplay and Rowe scores respectively 77 and 80 points. The mean forward flexion and abduction was 176°, external rotation was 57° with 17° of loss of rotation. Recurrence was reported in 4%.

Also 46.5% reported "subjective apprehension" to return to overhead activity. CT showed 95.8% of graft fusion rate. Graft osteolysis around the superior screw was found in 67.1%. The grafts were flush to the glenoid rim in 42.1%, medial in 38.9% and lateral in 18.9%. The angle between the glenoid and screws was 14.1°.

**Conclusion**

The arthroscopic Latarjet stabilisation shows satisfactory results on clinical and radiographic evaluation in short term follow-up. However, there is still some improvement to perform, regarding the partial graft osteolysis, graft placement and some hardware problems. In clinical results "subjective apprehension" and loss of external rotation are two factors influencing the outcomes the most.

## Outcome of Latarjet procedure without capsule repair in a group of multidislocators: does duration of instability and number of dislocation changes outcome of surgery? (mid-term results)

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**Keywords:** Latarjet, ROM, Recurrent dislocation, shoulder instability

**Introduction**

A prospective research evaluating a homogeneous group of patients after mini open Latarjet procedure.

**Aim**

To investigate and evaluate outcome and ROM of Latarjet without capsule repair in a group of patients at medium fallow up of 4.5 years.

**Material and methods**

Study included 45 shoulders with anterior unidirectional instability that were operated with mini-open procedure of Latarjet. The subjective outcome measures scores were completed, returning to sport, and range of motion after the full recovery was checked. The data were collected prospectively analyzing medical documentation and on clinical examination before and after procedure.

**Results**

None of patients were lost at follow up. No recurrence was noted. Mean number of dislocation and subluxations before the surgery was 19. Full recovery and sport activity after reconstruction reported respectively 100% and 89% of patients. There was significant improvement in all outcome measures: Rowe score from 49 to 94.44, Oxford.

Instability Score from 32.64 to 46.16. The decrease of rotational movement was significant (7 degrees lower) when compared with control healthy shoulders p-value< 0.0001.

**Conclusion**

Open Latarjet procedure is very effective method of management of anterior shoulder instability in active patients that require full stability for sport and every day activity.

Number of dislocation episodes doesn't influence a good outcome of this procedure. Decreased rotation was significant compared to the heathy shoulder but didn`t influence outcome after procedure.

## Isokinetic shoulder evaluation after capsulolabral stabilization

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**Keywords:** isokinetic shoulder evaluation, capsulolabral stabilization

**Introduction**

The function of the shoulder depends on balance between its stability and mobility.

Many disorders can destabilize the system. The shoulder is susceptible to dislocation and instability. In majority of the cases the instability is addressed with arthroscopic labral repair, to stabilize the shoulder and then followed by rehabilitation program to restore proper motor function.

**Aim**

The aim of this study was isokinetic evaluation of the shoulder after capsulolabral stabilization and comparison to control group healthy volunteers.

**Materials and methods**

45 patients after arthroscopic capsulolabral shoulder stabilization were evaluated. The average follow – up was 4.4 years. Control group consisted of 38 healthy volunteers.

Biodex System 4 Pro® was used for bilateral, isokinetic protocol at four angular velocities in internal and external rotation.

**Results**

In the study group total muscle work in external rotation was significantly lower in operated side in comparison to non-operated side at higher angular velocities. The results of peak torque in internal rotation were lower at middle velocity in operated and non-operated side in comparison to the control group. Values of peak torque to body weight parameter were significantly lower in operated shoulder in comparison to the control group in external rotation at extreme and medial velocities. The internal/external muscle group balance result was lower in operated shoulder in comparison to reference values.

**Conclusions**

Despite the labral repair and postoperative rehabilitation some motor deficiencies remain in the operated shoulder. That may indicate a need for longer rehabilitation recovery and risk of recurrent injury in left as is.

## SESSION II
## ARTHROPLASTY – INVITED LECTURERS

### Evaluation and Management of Glenoid Bone Defects in Reverse Shoulder Arthroplasty

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**Keywords:** Glenoid bone defects; Reverse Shoulder Arthroplasty; Bone Grafting

Reverse shoulder arthroplasty (RSA) is a successful treatment for elderly patients with cuff tear arthropathy. Because of its success, the indications for RSA have expanded beyond cuff tear arthropathy to include more challenging cases with moderate to severe glenoid bone loss in primary and revision cases. Failure to appreciate and address glenoid bone loss during RSA can lead to improper baseplate positioning and early failure or complications such as dislocation or scapular notching. The authors present a review of the current literature as well as recommended strategies for characterization of glenoid bone loss and preferred surgical techniques for addressing bone loss during RSA.

### Long term results in shoulder arthroplasty

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**Keywords:** shoulder, arthroplasty, results

The fourth generation of anatomical shoulder prosthesis with variable inclination, torsion and eccentricity has improved the outcome and long term results.

Stemless designs with metaphyseal fixation offer better and shaft-independent positioning of the humeral component as well.

In anatomical arthroplasty more than one third of problems are caused by glenoid loosening but 80 percent of hemi-problems are caused by omitted glenoid replacement.

Hemi arthroplasty is only appropiate in isolated humeral defects as osteonecrosis of the humeral head and humeral head fractures without damages of the rotator cuff insertion in younger patients.

Comparing hemi and total shoulder arthroplasty a better pain relief, range of motion and patients' satisfaction has been evaluated for totals. The key age for TSA indication has been 50 years for a long time but has decreased recently. A radial mismatch with a six to ten mm greater radius of the glenoid liner compared with the humeral head has shown to obtain the best results concering radiolocent lines of the glenoid.

In reversed shoulder arthroplasty the most concerning problem is the scapular notching. The metaphyseal humeral liner hereby impinges in adduction at the inferior glenoid neck

and causes osteolysis and loosening of the metal back fixation. The osteolysis is increased by polyethylene-wear-bodies of the liner resulting in a so called debris-disease. Humeral metaphyseal metal liners with corresponding polyethylen glenospheres have tried to reduce this problem.

A further problem of reversed arthroplasty is weakness of the overtensioned deltoid muscle ten to fifteen years after RSA implantation. Whether this deltoid-overtensioning can be reduced by more lateralization with a steeper humeral inclination is not clear up to date.

## What is new in shoulder arthroplasty?

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**Keywords:** shoulder, arthroplasty, methods

There have come up lot of novelties in shoulder arthroplasty for the last years.
In general, stemless metaphyseal fixation for the humeral component has become popular in terms of bone preserving without entering the humeral shaft. Stemless fixation also allows a better positioning of the humeral implant especially in posttraumatic cases because the fixation is independent of the humeral shaft. Stemless designs offer the oppertunity to convert from anatomic to reversed arthroplasty without changing the humeral body as well as the glenoidal metal back part.

Regarding anatomical shoulder arthroplasty new materials are available. The pyro-carbon humeral head could be a good option in hemi arthroplasty while reducing the humeral protrusion into the glenoid. Elliptic humeral heads instead of round heads try to better restore the elliptic anatomical head. A new design has changed the glenoid liner in metal back glenoids from polyethylen to metal in association with a humeral head out of polyethylene. This material inversion has become popular in reversed systems as well. A polyethylene glenosphere paired with a humeral metaphyseal metal liner avoids polyethylene-wear caused by scapular notching of the humeral polyethylene liners. By a humeral metaphyseal metal liner creation of thinner liners are possible and allow bigger corresponding polyethylene glenospheres with increasing motion and stability.

Regarding humeral resection, the steeper anatomical 135 degrees inclination with more lateralization has proven to reduce scapular notching without decreasing stability and motion.

Looking at the glenoid site, restoration of the anatomical offset epecially with bony augmentation of the scapular neck creating a so called long neck scapula seem to result in better results as well.

## The Results of Reverse Shoulder Arthroplasty In Rheumatoid Arthritis Patients

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**Keywords:** shoulder, arthroplasty, rheumatoid arthritis

**Introduction**
The structural changes of the shoulder depend on severity of rheumatoid arthritis (RA), activity of disease, efficacy of disease-modifying antirheumatic drugs (DMARDs), duration of disease etc. Quite often the functional and quality of life limitations are happens because of pain, joint and bone destruction, rotator cuff tears. In most cases arthroscopic treatment or anatomical shoulder replacement are ineffective. Reverse shoulder arthroplasty (RSA) is alternative.

**Aim**
To investigate the results of Reverse Shoulder Arthroplasty In Rheumatoid Arthritis Patients

**Material and methods**
We identified 37 patients with RA who underwent reverse shoulder arthroplasty between 2008 and 2015. Patient-reported outcome was obtained using ASES Shoulder Score, the Disabilities of the Arm, Shoulder and Hand (DASH) Score, VAS score, HAQ and EQ-5D questionnaire, UCLA, Constant score, SST (Part 1). The mean follow up was 53 months (range 24 to 84 months).

**Results**
Pain, poor quality of life, massive rotator cuff tear, glenoid erosion, superior migration of the humeral head where the main indication for reverse shoulder arthroplasty.

Consistent improvements were noted. Ninety five percent of patients described excellent to satisfactory outcomes ($p < 0.01$). The cumulative 5-year revision rate was 2.7% (deltoid detachment with shoulder dislocation).

**Conclusion**
Reverse shoulder arthroplasty has good results in terms of reducing pain and improving function in patients with RA.

## Shoulder muscles biomechanical examination among professional Street Workout players

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**Keywords:** street workout, biomechanical parameters, shoulder muscles

**Introduction**
Street workout is part of calisthenics, a variety of artistic gymnastics, which descends from cities in which elements of sprawl were mainly used for exercises with one's body mass. In such type of training muscle, tendons and ligament of joints overstraining is desired.

**Aim**
The aim of the study was to assess shoulder muscles biomechanical parameters among professional street workout players and proprioception by joint position sense among professional street workout players.
**Material and methods**
11 street workout players (all men, average age: 29) were examined with Biodex System 4 Pro isokinetic protocol for shoulder flexion-extension, abduction-adduction and rotation. To evaluate the risk of injury players filled in the authors questionnaire composed of training specification questions
**Results**
There were no significant difference ($p > 0.05$) between shoulder muscles groups examined by peak torque, average peak torque, total work, agonist/antagonist ratio measured in flexion, extension, abduction, adduction and rotations due to limb dominance.

The average peak torque in external rotation was 29.4 Nm for dominant limb and 26.7 Nm for nondominant limb. The average peak torque in internal rotation was 40.4 Nm for dominant limb and 38.7 Nm for nondominant.
**Conclusion**
The street workout is a developmental training used in army, martial arts. The exercises are performed symmetrically what helps in eliminating the differences between upper limbs. Street Workout training is responsible for maintaining muscles equilibrium.

## Alternations in serratus anterior electromyographic activity in preadolescent swimmers with a history of shoulder pain

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**Keywords:** swimmer's shoulder, immature swimmers, surface electromyography

**Introduction**
The presence of shoulder pain among swimmers is a well – known fact among researchers interested in clinical and biomechanical issues of shoulder overload injuries. Musculoskeletal problems connected with the demands of swimming trainings are known as swimmer's shoulder and are characterized by such symptoms as: pain in anterior aspect of the shoulder, shoulder muscles dysfunctions, lack of neuromuscular control and posture disorders.
**Aim**
The objective of this study was to search for the epidemiology of shoulder pain in preadolescent swimmers and to investigate whether there is a difference between the electromyographic activity of two important muscles involved in proper shoulder functioning – upper trapezius and serratus anterior – in two groups: swimmers with a history of shoulder pain and these, who have never reported any problems with their shoulders.
**Material and methods**
Six competitors with reported shoulder pain in their training history were compared to sixteen members of the same team who haven't suffered the pain yet. After the functional examination of the shoulder region, the electromyographic signal for upper trapezius and

serratus anterior was registered during bilateral shoulder elevation in the scapular plane in accordance with SENIAM recommendations

**Results**

Increased activity of the serratus anterior muscle, especially of the non – dominant arm, was found in the symptomatic group (median for symptomatic group = 81.04 μV; median for asymptomatic group = 33.11 μV; p – value = 0.0245.

**Conclusion**

Previous episodes of shoulder pain may result in the long-lasting adaptations in muscles function to prevent swimmers from recurring shoulder dysfunctions.

## Inferior shoulder joint position sense in junior handball players

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**Keywords:** upper extremity, shoulder, handball, proprioception, junior players

**Introduction**

It is controversial whether throwing sports and sports training affects shoulder proprioception. The aim of the study was to evaluate and compare the joint position sense (JPS) of both shoulders of senior and junior male handball players, and non-athletic healthy male individuals.

**Aim**

The aim of the study was to determine the influence of playing position on isokinetic parameters of professional male handball players.

**Material and methods**

90 senior and 19 junior handball players from national handball teams, and 32 healthy male volunteers had participated in the study. The protocol had included the measurement of dominant and non-dominant shoulder proprioception by active reproduction of joint position and comparison of results between groups. Measurement included flexion, abduction, internal and external rotation. JPS had been measured with electronic goniometer.

**Results**

JPS of the junior throwing shoulder had proven to be significantly worse compared to the throwing shoulder of senior handball players and to the dominant shoulder of control group at highest ranges of flexion (4.7°±2.3 vs. 3.0°±1.6 vs. 3.6°±1.5) and abduction (8.9°±9.9 vs. 3.6°±2.6 vs. 4.5°±2.1). There was no difference in joint position matching between shoulders among junior handball players and control group in contrast to senior handball players.

**Conclusion**

Junior handball players showed significantly inferior JPS in the throwing shoulder at highest ranges of flexion and abduction when compared to senior athletes and control group. This might be related to a younger age and less experience in handball specific training.

The project was funded by the National Science Center based on decision number DEC-2011/01/B/NZ7/03596.

## Influence of playing position on isokinetic parameters of professional male handball players

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**Keywords:** upper extremity, shoulder, isokinetic evaluation, handball, position

**Introduction**
Court and phases of the game dictate the specific repertoire of technical and tactical elements a player should perform in a particular moment of a game. Due to that, the players can be discriminated among themselves with respect to a particular playing position.
**Aim**
The aim of the study was to determine the influence of playing position on isokinetic parameters of professional male handball players.
**Material and methods**
46 (26 back court players, 15 wing attack players, 5 pivot players) professional handball players of average age 24 (± 4.5 years), height 187.4 (±5.8) and weight 91.8 (±10.7). Data comparing differences in peak torque (PT), peak torque to body weight (PT/BW), total work (TW), average power (AP) and ratio of internally (IR) and externally (ER) rotating muscles in correlation to players position were analyzed for statistical significance using a paired t-test with a significance set at 0.05.
**Results**
Statistically significant results were obtained for PT IR (69.7±12.4), TW ER (851.3±330.1) & IR (1361.8±352.8), AP ER (78.5±29.9) & IR (112.6±42.2) for dominant arm, and PT ER (44.0±12.7) & IR (71.4±8.7), PT/BW IR (64.1±9.3), TW ER (673.9±288.2) & IR (1335.6±244.2), AP IR (123.4±27.2) for non-dominant arm. There were no differences between backs and wings.
**Conclusion**
Pivots are characterized with higher body mass and higher isokinetic parameters comparing to backs and wings.

The project was funded by the National Science Center based on decision number DEC-2011/01/B/NZ7/03596.

**SESSION III**
**TRAUMA**

## Proximal humeral fracture fixation techniques – critical analysis

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**Keywords:** humerus, fracture, surgery

Proximal humeral fracture is the third most common type of fracture behind distal radius and proximal femur. There is a huge increase in operations due to proximal humeral fracture, mainly open reduction and internal fixation and reverse total shoulder protheses. The problem is that fixation management has not yet been standardised.

The questions are: can we really achieve the aim of the treatment by fixing the proximal humeral fracture? Do we have support in the literature? Should we fix this fracture so often?

There are many publications relating to different types of PHT fixation in the PubMed, including „positive" studies, in which the authors in their conclusions encourage us to treat our patients surgically and „negative" studies, in which the authors discourage us from doing fixation. This present analysis is focused on the rate of complication.

If we precisely analyse articles for the number of complications, we see that they are at about 40% and even very experienced surgeons who do this kind of surgery on a daily basis are able to achieve a complication rate of about 20%, which is still a large number.

If we examine the literature for the comparison of outcomes following fixation and conservative treatment, we do not find significant differences between the operative and non-operative treatment, but we can find conclusions that that operative treatment is an independent risk factor for inpatient adverse events and mortality in older patients admitted to the hospital with isolated proximal humeral fracture.

When we analyse the data for rates of complication, we see that the results following proximal humeral fracture fixation are not as good as we would like so we should more often think not HOW we should fix the fracture but if we really should fix the fracture?

## I treat most of proximal humerus fractures over 60 y.o. with open reduction and internal fixation

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**Keywords:** humerus, fracture, surgery, open reduction, internal fixation

Proximal humeral fracture (PHF) is the third most common osteoporotic fracture after proximal femur and distal radius in patients above 65 years old. Treatment options remain variable depending on not very clearly defined indications yet. Surgery remains indicated in unstable displaced fractures, however its definition stays controversial.

Some recent publications put in doubt the need of surgical treatment showing no statistical benefits of surgery versus conservative treatment.

The goal of this study was to evaluate current literature regarding PHF treatment paying special attention for the studies concerning fractures' open reduction internal fixation (ORIF).

All described surgical methods of treatment are not free from the complications. That is the reason why all options, including non-operative treatment should be considered and discussed with the patients. If operative treatment is chosen one physician should chose the fixation system that fits his skills the best. Our goal should be to minimize the soft tissue injury and to fulfill the crucial factors for stable, anatomic fixation – calcar and tuberosities reposition and stabilization. At this moment ORIF seems to fulfill these criteria the best, however the tendency to perform this in a minimally invasive fashion is visible.

In our institution the arthroplasty remains an option for "massive" fractures, sometimes associated with dislocations and reverse arthroplasty seems to be more predictable system, particularly in elderly patients.

## Reverse Shoulder Arthroplasty for Fractures of the Proximal Humerus

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**Keywords:** shoulder arthroplasty, fractures, proximal humerus

Proximal humeral fractures (PHF) are currently managed with multiple methods from conservative therapy to total arthroplasty. The modern scientific approach is also related to the tools and implants available and the diversity of new concepts help the surgeon to offer a variety of solutions for shoulder anatomic reconstruction using sutures, wires, screws, plates, nails etc or replacement in the cases that show severe comminution or in cases where time is precious and we prioritize the return to mobility.

Different publications describe results with the reverse total shoulder arthroplasty in comminuted fractures of the proximal humerus in elderly. The first study with reverse arthroplasties for fractures was published by Cazeneuve from France. A retrospective cohort study from the New Zealand Joint registry records included 218 patients with Reverse Shoulder Arthroplasty and 427 with Hemiarthroplasty for acute proximal humerus fractures between 1999 and 2014. Post-operative outcomes were measured at 6 months and 5 years. The results show that patients with RSA are older (78.2 vs 71.6 years), with a higher proportion of females (90% vs 77%) No significant difference in revision rate per 100 component-years (0.58 RSA vs 1.16 hemi, P = 0.137), 1 year mortality (3.8% vs 3.4% P = 0.805) No difference in 6 month Oxford Shoulder Score (OSS) (29.6 vs. 28.4) or 5 year OSS (37.6 vs 32.7, P = 0.078) Conclusion – No significant difference in functional outcomes or revision rates between RSA and hemi for acute prox humerus fractures. They were disappointing at long term follow-up, mainly for limited ranges of motion but also for pain related to progressive loosening, notching and other phenomena that does not recommend this procedure on a regular basis for fracture cases. Gallinet made a comparative study between HA and RTSA. The function scores are better with a RTSA but the mobility is higher with HA. Baudi *et al.* published in 2014 in the Journal "Musculoskeletal Surgery" a comparative retrospective cohort study between Hemiarthroplasty versus reverse shoulder arthroplasty measuring functional and radiological outcomes in the treatment of acute proximal humerus fractures. They evaluated 67 Patients treated with HHR or RTSA. 53 cases were available for evaluation with an average follow-up of 27.5 months, 28 patients (mean age 71.4) treated with HHR and 25 patients (mean age 77.3) treated with RSA Constant, ASES, DASH score,

Abduction Strength, ER1, ER2, and X-Rays were evaluated. All the scores including the tuberosity healing were better with the RTSA, only the DASH score was better with HHR.

Our current attitude is to attempt anatomical reconstruction in any arthroplasty for fracture by using fracture prosthesis with a small metaphysis, careful dissection and fixation of the tuberosities to the diaphyseal bone. A deltopectoral approach is recommended as if needed, it may be extended. However, in patients over 65 years with strong comminution or fractures-dislocations we currently use Reverse Shoulder

Arthroplasty as one-shot procedure for reconstruction. We use either the delto-pectoral approach or the external approach if the fracture line is high over the deltoid insertion and if there is no extension to the diaphysis. If RTSA is used the supraspinatus insertion is divided and the muscular stump is cut in order to provide space for the reverse mechanism. We personally avoid the use of cement in Traumatology applications. The method of work and technique is demonstrated in the extended presentation.

## TRAUMA – SCIENTIFIC PRESENTATIONS

### Shoulder function after displaced proximal humeral fractures-comparison nonoperative and operative treatment using Targon Ph intramedullary nail.

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**Keywords:** displaced proximal humeral fractures

**Introduction**

The displaced proximal humerus fractures (dphf) are a difficult problem in treatment.

Still it is open question of choice between non-operative or operative treatment.

**Aim**

1. Evaluation of shoulder function after non-operative and operative treatment of dphf with use of Targon Ph intramedullary nailing.
2. Comparison of non-operative treatment and operative treatment of dphf.
3. Analysis of complications after non operative and operative treatment.

**Material and methods**

The material was: 134 shoulders at 67 of patients treated for dphf. 25 patients treated non-operatively and 42 patients treated operatively. Non-operative treatment was done by splint immobilization, and next rehabilitation since the second week. Targon Ph intramedullary nailing was used in operative treatment. Non-operative and operative treatment was done by the same five orthopedists. Average period of patients' observation was 19 months.

**Results**

Patients after non-operative treatment obtained 52/100 and after operative treatment 70/100. ACC to Constant-Murley score. Patients after non-operative treatment of dphf obtained 71% percentage of score on unaffected side, and after operative treatment – 80%. Complications in the group of patients treated non-operatively occurred in 16 % and 42.84% in the group of patients treated operatively.

**Conclusions**

1. Shoulder function in Constant-Murley score after non-operative treatment of dphf corresponded to unsatisfactory mark and satisfactory mark in operative treatment group.

2. The author found better results of operative treatment of dphf than non-operative treatment in Constant-Murley score.
3. Method of operative treatment of dphf has risk of occurrence with more complications.

## 3- and 4-part proximal humerus fractures – a comparative study of locking plate osteosynthesis and hemiarthroplasty

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**Keywords:** proximal humerus fractures, hemiarthroplasty, ORIF

**Introduction**
**Displaced 3- and 4-part proximal humerus fractures are still difficult clinical problems**
**Aim**
The aim of this study was to compare treatment results between open reduction and internal fixation (ORIF) and hemiarthroplasty (HA).
**Material and methods**
The study was a retrospective assessment. Sixty-three patients (30 HA, 33 ORIF) met the inclusion criteria; mean age: 64.5 years. The Constant-Murley scale, DASH score and VAS surveys for pain and satisfaction were used to evaluate the results.
**Results**
HA group: the constant score was 44 points, and the DASH score was 57 points; 53% of patients had osteolysis of the greater tubercle; none of the patients had revision surgery. ORIF group: the constant score was 59 points, and the DASH score was 38 points; 21% of patients had avascular necrosis; revision surgery was performed in 18% of cases. A significant correlation between good functional outcomes and young age of patients was found in the ORIF group. Patients who started physical therapy earlier achieved better results. DASH scores were better compared to ones from the objective Constant-Murley score. There was no difference in satisfaction between HA and ORIF groups.
**Conclusion**
ORIF should be considered for patients < 60 years old, but gives increased risk of urgent revision, due to screw protrusion. HA provides fewer complications, lower risk of revision and can be better for patients between 60 and 70 years old.

## Arthroscopy assisted acromioclavicular joint capsule and coraco-clavicular ligaments reconstruction with hamstring autograft for acromioclavicular joint dislocation

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**Keywords:** acromioclavicular instability, acromioclavicular dislocation, acj hamstring reconstruction

### Introduction

Surgical management for type III-V chronic acromioclavicular (AC) joint dislocation remains controversial and there is no gold standard for its treatment.

### Aim

Purpose of this study is to present results of the entire AC joint anatomy reconstruction using an autologus graft with reinforcement.

### Material and methods

Nine male patients with mean age 33.5 (23–45) operated between 2012 and 2016 were included in the study. Seven patients presented posttraumatic type V AC joint dislocation and 2 athletes with type III. In clinical examination all patients reported pain during AC joint palpation and cross-body test. Seven underwent capsular and coraco-clavicular reconstruction using semitendinosus tendon autograft and 2 using gracilis tendon autograft. In six cases high-strength tape were used as reinforcement material, suture anchor in two cases, and in one case non-absorbable braided thread. The mean follow-up was 28.9 (7–59) months. Control radiographs, clinical examination of AC joint stability via posterior translation test (PTT) and patient satisfaction score were evaluated.

### Results

In final clinical examination 8/9 patients presented AC joint stability in PTT, painless cross-body test and direct palpation of the joint. Five patients in final radiographs presented AC joint symmetry and three patients demonstrated superior translation of the distal clavicle less than 50% of the clavicular width. One patient who underwent reinforcement by braided thread had failure of treatment with reccurence of AC joint instability and required revision surgery with hook plate stabilization.

### Conclusion

Described technique provides sufficient limitation of posterior and superior translation in treatment of type III–V chronic acromioclavicular posttraumatic instability.

## Long Head of Biceps Augmentation in full thickness rotator cuff tear treatment

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**Keywords:** rotator cuff reconstruction, long head of biceps augmentation, large and massive RCT, LHB augmentation

### Introduction

Repair of large and massive rotator cuff tears with high grade of tendon retraction can be difficult due to the lack of tissue to cover the native footprint. Partial reconstruction is the

most common method to deal with this problem. Another option is an artificial rotator cuff patch which is costly and doesn't provide full growth with the tendon.

Augmentation of the rotator cuff repair with an intraarticular portion long head of biceps tendon (LHB) might be a biological option to fully restore rotator cuff coverage.

**Aim**

The aim of this study was to assess the results of rotator cuff tear treatment with long head of biceps augmentation.

**Material and methods**

10 patients aged 47–69 were operated by a single surgeon between 2009 and 2017. All patients presented with large and massive rotator cuff tears and preserved LHB. LHB tenodesis was performed with a suture anchor and the intraarticular portion of LHB was used to augment the repaired tendon using a side-to-side suture. In all cases the augmentation enabled to fully restore the cuff continuity. Mean follow-up period was 43.5(12–104) months. Preoperative and postoperative Simple Shoulder Test (SST) and Constant Score were assessed before surgery and at the last follow-up.

**Results**

Mean SST score increased from 4.8(±1.2) to 9(±1) at the last follow-up. Mean Constant score increased from 50.5(±7.2) to 74.5(±7.6).

**Conclusion**

Augmentation with the LHB is a good treatment option in cases with large and massive, irreparable rotator cuff tears. It provides better coverage of the footprint using autologous biological material.

## A systematic review of clinical and patient-reported outcomes of irreparable posterior rotator cuff tears treated with arthroscopically assisted latissimus dorsi transfer technique.

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**Keywords:** Irreparable rotator cuff tears, Arthroscopically assisted latissimus dorsi transfer, Systematic review

**Introduction**

Irreparable rotator cuff tears remains a complex problem for clinicians. Arthroscopically assisted latissimus dorsi tendon transfer (LDT-T) has recently been introduced to treat this type of injury with an advantage of minimally invasive surgical approach.

**Aim**

Systematic review of literature of treatment outcomes of irreparable rotator cuff tears treated with arthroscopically assisted latissimus dorsi transfer.

**Material and methods**

Electronic databases: Cochrane Library, PubMed, Embase and Ovid Medline were searched with use of PICO guidelines . All literature of prospective and retrospective case series studies with treatment of irreparable rotator cuff tears with arthroscopically assisted LDT-T available in English was included.

**Results**
We have found 10 relevant studies that meet inclusion criteria, with 357 patients treated with arthroscopically assisted LDT-T in total. The most commonly used clinical score for outcome assessment was Constant Score (287 patients), however UCLA Shoulder Score, SSV, DASH Score and VAS Pain scales were also used. In each study, a statistically significant improvement in the shoulder range of motion and pain relief was demonstrated. In 13 cases, postoperative complications were observed (3.6%).
**Conclusion**
Arthroscopically assisted LDT-T as a treatment of irreparable cuff tears is a minimally invasive technique that has proven effective in restoring shoulder function and provide pain relief with minimal complication rate. The unification of objective clinical scales to determine precisely the effects of surgical treatment is recommended.

## The autotenodesis phenomenon after the LHBT tenotomy and its relationship to the reduced Popeye deformity incident.

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**Keywords:** autotenodesis, LHBT, biceps, Popeye deformity

**Introduction**
Long head biceps (LHBT) tendinopathy is usually concomitant to other shoulder pathology, however its treatment still remains controversial. Open or mini-invasive operative treatment is a method of choice, but still debatable.
**Aim**
The aim of the study was to investigate the LHBT autotenodesis phenomenon after shoulder arthroscopic procedure and the association with the occurrence of the Popeye deformity.
**Material and methods**
This study included 40 patients who underwent the LHBT arthroscopically-assisted tenotomy (29 patients) and tenodesis (11 patients) procedures. Minimum 1-year follow was required for inclusion. The clinical outcomes were assessed using ASES scale, clinical tests dedicated for biceps tendinopathy and Popeye deformity occurrence. The sonographic examination of the bicipital groove was performed to determine the localization of the LHBT stump.
**Results**
The average age at follow-up was 58 years, outcomes measured by the ASES were higher in tenotomy group, pain during clinical tests was higher in the tenodesis group.

"Popeye" deformity was present in 11 subjects of tenotomy group, compared with 1 subject of tenodesis group, no patient complained on visual appearance of the arm contour. The sonographic examination revealed autotenodesis phenomenon in 18 subjects.
**Conclusion**
Numerous authors reported that a significant group of their patients had no cosmetic deformity in the anterior area of the arm. There is a great possibility that the autotenodesis phenomenon occurred in those cases. The intra-articular part of LHBT is painlessly trapped in the bicipital groove by the surrounding soft tissues and the biceps muscle length remains relatively unchanged in some patients.

## Results of extended suprascapular nerve decompresion in suprascapular and spinoglenoid notch through postero-superior approach in overhead athletes (volleyball and basketball players)

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**Keywords:** suprascapular neuropathy, spinoglenoid notch, nerve entrapment

**Introduction**
Suprascapular nerve entrapment is typically localized in a suprascapular notch. In specific group overhead athletes like volleyball and basketball players this pathology manifests as infraspinatus muscle atrophy due to distal entrapment in spinoglenoid notch. Strength decrease and limitation of external rotation is usually observed.

**Aim**
Authors present an arthroscopic technique of extended SSN decompression in the suprascapular and spinoglenoid notch through novel postero-superior approach and report the results in professional athletes' consecutive series.

**Material and methods**
Eleven professional athletes (9 volleyball players, 2 basketball players) including 10 males and 1 female with mean age 27.9 (±15.3) years treated surgically between 2008 and 2016 were enrolled in the study. Prior to surgery all patients complained of impaired (2.7 (±0.9) Lovett scale) and limited external rotation of the affected shoulder (mean range 41.36° [± 32.7]). All patients were treated with arthroscopic release of SSN and a specific physiotherapy protocol. Mean follow-up period was 16.6 months. The results were assessed with clinical examination of range and strength external rotation.

**Results**
Mean range of external rotation of 60.9° (±21.9), ($p < 0.05$) and mean strength of 4.54 (±0.69) Lovett scale ($p < 0.05$) were observed in 6 months follow up. No complications were reported during the study. All the athletes returned to previous sports.

**Conclusion**
The postero-superior portal for shoulder arthroscopy allows better visualisation and extended release of suprascapular nerve and its' branch to the infraspnatus muscle. It is an efficient technique which enables improvement of infraspinatus muscle function and significantly increases external rotation of the shoulder.

## Polish cultural adaptation and validation of patient self-assessment questionnaires for painful shoulder: ASES, SST, Constant Score and UCLA

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**Keywords:** polish cultural adaptation, shoulder questionnaire, ASES, SST, Constant Score, UCLA

**Introduction**
The American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), Simple Shoulder Test (SST), Constant Score and University of California – Los Angeles (UCLA) Shoulder Scale are forms widely used to evaluate the patients with shoulder disfunction.
**Aim**
The purpose of this study was to translate into polish, culturally adapt and validate ASES, SST, Constant Score and UCLA.
**Material and methods**
All questionnaires were translated into polish and adapted to polish culture according to Beaton recommendations.

The group of 63 patients with painful shoulder disorders completed the polish version of ASES, SST, Constant Score, UCLA and previously adapted to polish forms: Disability of the Arm, Shoulder, and Hand (DASH) and the Short Form-36 (SF-36). The subgroup of 37 persons filled in the four adapted scores the second time after 2–14 days. Internal consistency, test-retest reliability (ICC) and construct validity were calculated.
**Results**
No significant problems occurred during forward-backward translation and cultural adaptation of all questionnaires. The internal consistency by Cronbach-α was high: ASES 0.89; SST 0.85; Constant 0.86; UCLA 0.73. The reliability (ICC type-2.1) was excellent: ASES 0.94; SST 0.95; Constant 0.93; UCLA 0.93. The construct validity was evaluated by comparing scales with DASH and SF-36. The correlation was statistically significant for all questionnaires ($p > 0.05$) and was respectively: ASES (−0.75) and (−0.41), SST (−0.85) and (−0.25); Constant (−0.68) and (−0.28), UCLA (−0.67) and (−0.26).
**Conclusion**
The polish versions of ASES, SST, Constant Score and UCLA are valid and reliable questionnaires to use among polish language patients with painful shoulder.

## SESSION IV
## ELBOW

### What is new in elbow arthroplasty?

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**Keywords:** total elbow joint prostheses, implant loosening, total joint arthroplasty, total elbow arthroplasty

Total elbow joint replacement has the highest rate of complications among all kinds of TJPs. Indications for implantations have to be carefully considered in every patient. The patient has to be informed that *"The results are unpredictable in regard to pain relief and predictable in loosening and/or instability"*.

On the way of the development of the total elbow joint prosthesis, early simple hinge designs were modified, allowing some out-of-plane motion, varus, valgus, and rotational motion on the "sloppy" hinge. This is considered to reduce the stress transferred to the bone-cement interface, as the main cause of the implant loosening.

The analysis of an old ideas and designs of the total elbow prosthesis, together with a new philosophy on mechanics of the elbow, new materials, implant to bone interface are discussed. Currently, there are no revolutionary new designs of the total elbow implants reported in the literature.

So far, the tried-and-true solution is Nexel Total Elbow, which is built upon the original, market leading Coonrad/Moorey implant which holds a promise of improvement in total elbow implant survival rate.

Partial joint implants such as the radial head replacement, gives predictable and satisfactory results.

## ELBOW – SCIENTIFIC PRESENTATIONS

### Supracondylar humeral fracture in children: ulnar nerve stability evaluation in 4 children with iatrogenic ulnar nerve palsy

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**Keywords:** supracondylar humerus fracture

**Introduction**
Displaced supracondylar fractures are mostly treated with closed reduction and crossed pins percutaneous fixation. Neurovascular complications are reported in 5–19% displaced fractures.

**Aim**
To evaluate ulnar nerve function after iatrogenic palsy and to establish if ulnar nerve instability can be one of the risk factors when closed reduction and percutaneous pinning is performed.

**Material and methods**
This case report included children with supracondylar humeral fracture with ulnar nerve palsy hospitalized between 2012–2016 in Gdańsk. We analysed 4 of 5 patients with iatrogenic ulnar nerve palsy.
**Results**
QuickDash questionnaire resulted with 0–11.4 points, all patients showed 0 on VAS scale. The Fromment test was in all cases negative. Sensation resolution ranged from 2–5mm and was symmetrical in both limbs. Monofilament sensation test indicated results 2.83–4.31 symmetrical for both limbs and in one case asymmetrical with the result 3.61 for operated side and 2.83 for healthy one.

In USG ulnar nerve structure the loss was seen only in one patient. In two cases we observed enlarged diameter from 4mm to 7–9 mm inside of injury. In dynamic nerve examination in 3 of 4 patients ulnar nerve moved into epicondyle apex and flattened, in one case it was stabile in groove.
**Conclusion**
In all analysed cases good ulnar nerve function recovery was observed despite the palsy after operative treatment. In 3 of 4 cases in dynamic USG while bending the elbow some subluxation over epicondyle apex and flattering of the nerve was noticed.

## Job dependencies and its influence to forearm muscles biomechanical parameters among tennis elbow patients

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**Keywords:** tennis elbow, forearm muscles, biomechanical examination

**Introduction**
Tennis elbow is the most common upper limb entezopathy. Most affected working populations are physical workers, manual workers and sportsman who play amateur tennis or squash. Biomechanical testing is more and more emphasized due to patients muscle objective testing.
**Aim**
The aim of the study was the assessment of forearm muscles of tennis elbow patients by the biomechanical parameters isotonic testing and grip strength examination in comparison with the results of the healthy limb.
**Material and methods**
73 patients with unilateral tennis elbow [32W, 41M] were examined with isotonic protocol on Biodex System 4 Pro® dynamometer. Protocol consists of 3 trials with constant tension 0.5/1/0.5 Nm combined with repetitive wrist flexion and extension movements. According to interview and questionnaire results patients were classified to one of the groups connected with probable reason of the disease: physical workers, amateur sportsman, manual workers.
**Results**
Muscles were assessed with average peak torque, medium power, total work and functional range of motion. Wrist and fingers extensors biomechanical parameters were significantly lower than wrist and fingers flexors biomechanical parameters ($p < 0.01$). There were significant difference ($p < 0.001$) between examined biomechanical parameters in manual workers group due to physical workers and sportsman group. Grip strength in manual

workers group were significantly lower ($p < 0.0001$) than grip strength in other groups.

**Conclusion**

Work type or amateur sport significantly influences the process of decreasing the forearm muscles biomechanical parameters of tennis elbow patients.

## Terrible triad in a 17 year old boy. Functional outcomes using pilates machines for postsurgical physiotherapy. Case report

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**Keywords:** Pilates Machines, Elbow, kinesiotaping, surgery

**Introduction**

We present a 17-year old professional fencer with terrible triad of the elbow, sustained after fall from own height. Initially the fracture pattern consisted of small apical coronoid fragment, non-dislocated radial neck fracture and small wedge radial head fracture. During the dislocation reduction the radial head was dislodged and rotated at 90° behind the lateral humeral condyle. The patient was immobilized for 40 days in cast. Two months later open reduction and radial head fixation with 4 screws was performed.

**Aim**

Restoration of the functional capacity of the elbow.

**Material and methods**

Seventeen year old boy with late surgical reconstruction for terrible triad.

Physiotherapy started on the 7th postoperative day and consisted of AAROM in pain free arc with Pilates Machines and kinesiotaping.

Results were assessed by goniometry, VAS for pain, Mayo elbow performance score.

**Results**

We reached excellent ROM and lack of pain. Four months post-surgery the results were:

Flexion 140°, extension 15°, pronation/supination 70/75°, MEPS – 75 (good), VAS – 0, Independence in ADL.

**Conclusion**

Early and correct physiotherapy with active pain free exercises using different Pilates machines gives us a great opportunity to restore the functional range of motion.

The great variety of positions, different vectors and elastic resistance modes allows for exercises without inclusion of compensatory movements.

Four month after the physiotherapy the patient restored participation in professional competitions with great success.

No complications from stiffness were noted.

## Systematic review of spacer application in staged revision elbow arthroplasty.

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**Keywords:** elbow arthroplasty, spacer,staged revision

**Introduction**
Treatment of infected total elbow arthroplasty (TEA) is challenging.

Two-stage revision requires application of appropriate spacer to enhance tissue healing, maintain space for future implantation and provide temporary elbow function.

**Aim**
Systematic review of literature of application of the spacer in two stage revision after elbow arthroplasty.

**Material and methods**
Electronic databases: Cochrane Library, PubMed, Embase and Ovid Medline were searched with use of PICO guidelines to include and analyse the references of prospective and retrospective case series studies with treatment of infected total elbow arthroplasty with cement spacer or beads.

**Results**
We have found 6 relevant studies that met inclusion criteria, with 96 patients treated with cement spacer for infected total elbow arthroplasty. In each study, an operative technique is described and the exact spacer design. The most commonly used design was unlinked spacer. However in one of the studies spacer was hinged with Ilizarow rods and in the other one design as monoblock. There was various length of intramedullary components and various attempts to constrain the matcing surfaces. In all studies spacers were antibiotic- loaded.

**Conclusion**
Currently there is no standard technique to use and prepare elbow spacers. Different designs have been used so far. Current data do not support superiority of particular design.

## Open elbow arthrolysis: evaluation of recovery and final results

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**Keywords:** elbow contracture, elbow stiffness, arthrolysis, joint release, trauma

**Introduction**
Contracture of the elbow is a common result of elbow trauma. This significantly impairs activities of everyday life.

**Aim**

The purpose of this study was to compare the final outcome of patients with elbow contracture caused by joint trauma after arthroscopic and open elbow release performed by one surgeon.

**Material and methods**

The two groups of patients with traumatic elbow contracture, operated by one surgeon (2009–2016), were evaluated retrospectively. Group I (ASK) after arthroscopic elbow release (30 patients) and group II (OPEN) after open elbow arthrolysis (27 patients). The mean age: group I- 35.5 ± 14.1 (5–70) y.o. group II 34.5 ± 14 (9–58) y.o.; minimal follow up- 26 weeks.

**Results**

The average preoperative range of motion (ROM) of ASK was significantly better than in OPEN respectively: extension 35.1°vs.50.0° ($p = 0.003$); flexion 119.5°vs.105.7° ($p = 0.033$); arc of motion (ARC) 84.6°vs.55.7° ($p < 0.001$). There was no significant difference in the intraoperative ROM between the groups.

Both arthroscopic and open release provided similar results in severe and very severe contractures. However, in moderate and minimal contractures arthroscopic release was superior. In minimal ones the final gain of ARC comparing to intraoperative: ASK(22.9°) > OPEN(−11.7°) ($p = 0.003$); loss of ARC between intraoperative and final: ASK(8.7°) < OPEN(37.5°) ($p = 0.016$). Functional improvement (MEPS) was comparable in both groups.

**Conclusion**

In both types of surgery, effectiveness to restore intraoperative ROM was similar. So was the effectiveness of final of results throughout the study period in very severe and severe contractures. However, arthroscopic technique had better outcomes in moderate and minimal limitations of ROM.

## Modified SPOC technic for distal biceps tendon fixation

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**Keywords:** biceps, tendon, suture fixation

**Introduction**

Distal biceps tendon rupture (DBTR) occur in 1.24/100000 population per year (it is uncommon entity). DBTR consists 3% of all biceps ruptures. 30 to 60 year old men are most frequently injured (93%) during overuse or sadden heavy traction injury.

Conservative treatment leads to 30–50% of flexion and supination power lost on injury side.

**Aim**

Elbow function restoration after DBTR among demanding population group.

**Material and methods**

Seven cases of DBTR were evaluated retrospectively. Surgery was performed in 2015–2017 years. Modified one incision SPOC technic (Tanner, 2014) was used. Tendon rupture was treated by a one incision approach and its refixation to radial tuberosity.

Clinical outcome and supination strength tests were performed during follow-up examinations. Mean patient age was 42 (min 32, max 51), all were males. Mean follow-up time

8 month (from 2 to 13 month).

**Results**

It was observed statistically significant improvement in supination power asymmetry and elbow ROM in postoperative rehabilitation period. Supination power on healthy side (Ncm) was 512±216. Since 2 month after procedure difference was 45±24%. In 6 month mean difference was 24±12%.

**Conclusion**

No complications registered, no suture failures and no heterotopic ossifications were diagnosed. Introduced modified one incision SPOC technic for elbow function restoration after DBTR among demanding population group is effective method.

## Distal Biceps tendon fixation after complete rupture – clinical and functional evaluation

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**Keywords:** distal biceps, rupture of distal biceps, endobutton

**Introduction**

Complete rupture of the distal biceps is a rare condition, typically in middle aged males. It manifests as painful and weakened forearm supination and elbow flexion with typical deformation. Preferred method of treatment is operative reinsertion.

**Aim**

Summarizing epidemiological, clinical and functional outcomes of patients with distal biceps tendon reinsertion.

**Material and methods**

We collected data about patients operated between 2009–2017 in Rehasport Clinic and Department of Traumatology, Orthopaedics and Hand Surgery, Poznań University of Medical Science.

We analysed epidemiological factors, clinical examination before and after biceps reinsertion, type of treatment and postoperative evaluation (Mayo Elbow Score).

Examined group contained 61 men with average age 42.7. The most common mechanism of injury was lifting (in 40 cases): injury while daily living activities in 27 cases and sport in 21. Patients were treated operatively with: reinsertion by anchors in 30, endobutton alone in 15 and endobutton and interference screw in 14. 2 cases required palmaris longus graft and 1 patient Achilles tendon reconstruction.

Complications were reported in 12 cases (paraesthesias from radial nerve sensory branch, scar hyperesthesia and range of motion limitation).

Vast majority of patients had good and excellent results in terms of strength, ROM, function, satisfaction.

**Conclusion**

Distal biceps rupture is a problem of young and active patients. The best method of tendon function restoration is operative reinsertion. Different methods of fixation have similar outcomes. Surgery has relatively low risk of complications.

## Evaluation of upper limb function in professional musicians

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**Keywords:** upper extremity, musicians, functional evaluation, pain, shoulder proprioception

**Introduction**
Professional musicians in their work are exposed to many psychological and physical burdens daily. Adding these factors causes a number of problems within the musculoskeletal system. Physical loads include long-term actions in an unnatural position, long-term muscular isometric work and repeated the same movements.
**Aim**
The aim of the study is the evaluation and identification of the frequency of dysfunctions as well as clinical and biomechanical assessment of the musculoskeletal system within the upper limbs in professional musicians.
**Material and methods**
The evaluation comprised 38 professional musicians (21 women and 17 men), average age 38 +/−11 years. The study protocol included a specially designed questionnaire (including, among others, demographic and epidemiological data, pain assessment and the impact of pain on the instrument playing) and proprioception assessment with a propriometer (electronic goniometer).
**Results**
The average playing time on the instrument in the study group was 29.0 +/−15.6 hours per week. Twenty two people reported pain complaints with an average intensity of 2.4 +/−2.8 in the VAS scale. In 12 people the occurrence of complaints coincided with the change in the repertoire, technique or intensity of the playing in the last 12 months. The results of the proprioception study show a much better feeling of joint position for 90° flexion and 90° extension, both in the dominant and non-dominant limb.
**Conclusion**
Professional musicians are exposed to more frequent occurrences of overloading of the musculoskeletal system and more frequent occurrence of pain related. Better results in 90° flexion and 90° extension in the proprioception study may indicate adaptive changes in the neuromuscular control resulting from the position when playing the instrument.

**SESSION V**
**SHOULDER INSTABILITY**

## Peculiarities of posterior shoulder dislocation. Diagnosis and treatment

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**Keywords:** Posterior shoulder dislocation, treatment tactics

### Introduction

Posterior shoulder dislocation occurs in 2–5% of all dislocations of the humerus. At the initial examination correct diagnosis is not established in 60–79%. Almost always it is accompanied by a reverse Hill Sachs defect (McLaughlin lesion), size of which is progressing with time after dislocation. Real problem is that it is often impossible to collect anamnesis – patient may have an epileptic attack that he does not remember.

Approximately 15% of posterior humerus dislocations are bilateral.

### Aim

To identify the features of diagnosis and develop a differentiated approach to the treatment of posterior shoulder dislocation depending on size of the humerus head defect.

### Patients, methods and results

Results of surgical treatment of 40 patients (35 men and 5 women from 20 to 70 years old) posterior shoulder dislocation (20 – right, 16 – left, 4 – bilateral) were analyzed.

Time from injury was from 6 days to 53 months. Depending on timing from injury and its type, differentiated approach to reconstructive surgery was used. In postoperative period, immobilization was carried out in the position of the external rotation of 20° and abduction of 30° for a period of 4–6 weeks.

Patient treatment results were evaluated by Constant-Murley score. Results depended on the time from injury to surgery and on severity of combined injuries. The largest number of excellent and good results 23 (57.5%) was obtained during the treatment of fresh cases (up to 1 month from injury), when shoulder joint stabilizers were restored and early active rehabilitation (4 weeks after operation) was started. It was possible to reach up to 81 points at the end of rehab.

### Conclusions

Absence of external rotation should be used for clinical diagnosis as pathognomonic sign. Successful treatment of patients with posterior shoulder dislocation is possible with restoration of all damaged structures and differentiated approach to reconstructive surgery.

## Complex Shoulder Instability/Dislocation

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**Keywords:** Shoulder instability, associated lesions, bony defects, nerve lesions, cuff tears, revision surgery

Traumatic shoulder instability can be complicated by the presence of cartilage injury, glenoid and/or humeral bone defects, rotator cuff injuries and nerve lesions. A high index of suspicion is required in the diagnosis of complex shoulder instability.

Patients presenting with continued pain and dysfunction two to three weeks after the initial event should be investigated further. Older patients have a higher risk of associated injuries, but presentation in younger patients is frequent and may lead to devastating outcomes when missed.

Correct recognition and treatment of the concomitant injuries is imperative in order to adequately stabilize the glenohumeral joint and avoid long-term dysfunction and degenerative changes. Shoulder instability can also be complicated by prior failed stabilization procedures.

Failures are mostly caused by renewed traumatic events, misdiagnosis of the initial pathology or technical errors during the surgery. Type of previous surgical treatment and type of failure will influence the subsequent therapeutic strategy.

Surgical history needs to be considered along with patient characteristics, anatomical lesions and functional demands. Clear guidelines in the setting of revision stabilization surgery are not available and treatment should be selected after a thorough case-by-case analysis.

## Evaluation of bone defects in shoulder instability

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**Keywords:** Shoulder instability, glenoid defect, Hill-Sachs lesion, shoulder arthroscopy, computed tomography

### Introduction

Both glenoid and humeral defects have been attributed to play significant impact on both the results and the choice of treatment in shoulder instability.

**Aim**
The aim of the paper was to review the literature and share own-experience with clinical and radiological evaluation of bony defects of glenohumeral joint.
**Results**
The diagnostic approach in shoulder instability should include: establishing the correct diagnosis, identification of multiple risk factors for recurrence, evaluation of morphology of lesions to finally come the decision of proposed treatment method.

Increased suspicion of the bone defects can be raised by taking the history and physical examination (bony apprehension test). The most important part of evaluation is the imaging to identify and measure the bone loss. Various modalities have been used: radiography, magnetic resonance, computed tomography (CT) and arthroscopy. Three-dimensional CT is the most accurate and reliable in identifying and quantifying the glenohumeral defects. The measurements focus mostly on the size of anterior glenoid defect and Hill-Sachs lesion. However, the evaluation of interplay between the bipolar lesions (engagement/glenoid track) seems to be important for establishing the risk of recurrence and understanding the pathology in shoulder instability.
**Conclusions**
Clinical data may raise the suspicion of significant glenohumeral osseous deficiency.

However, it needs to be confirmed by appropriate imaging. CT scan currently seems to be the gold standard but other techniques can be used as well. The concept of glenoid track allows for evaluation of interplay between bipolar lesions may help in the surgical decision making.

## Management of bone defects in shoulder instability

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**Keywords:** Shoulder instability, latarjet technique

Recurrent anterior shoulder instability is commonly associated with defects of the anterior glenoid rim. Substantial osseous defects significantly diminish the glenohumeral stability and require a bony augmentation, either by a coracoid transfer or free bone grafting procedure. Both reconstructive techniques have been applied for a long time and evaluated biomechanically and clinically. Although neither treatment option has been recognized as clearly superior, both comprise certain advantages and disadvantages.

The Latarjet technique enables a biomechanically superior stabilization through the additional sling effect at time zero, but constitutes an extra-anatomical procedure with a broad spectrum and relatively high incidence of complications. Free bone grafting techniques enable an anatomical reconstruction of the glenoid concavity, offer the advantage of an unlimited graft size and show generally less severe and more easily manageable complications. The indications need to be carefully considered depending on the specific defect type, the glenoid track concept in cases of bipolar lesions as well as the individual patient characteristics. For both reconstructive procedures, open and arthroscopic approaches have been described with very good results, allowing a selection based on individual surgical skills and experience levels.

## SESSION VI
## STIFF SHOULDER

### Management of frozen shoulder: orthopaedic perspective

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**Keywords:** frozen shoulder, surgery

Frozen shoulder is a syndrome of unknown etiology which is characterized by pain and limited active and passive shoulder movement in all directions. It occurs in patients aged 40 to 60. It is present more often in diabetics and patients with thyroid and heart diseases.

In the early stage of the disease, clinical signs are scarce and correct diagnosis is very difficult. Such patients should be monitored in order to get the full clinical features and make a diagnosis of frozen shoulder. Diagnostic imaging methods have limited use but are necessary to eliminate other painful shoulder conditions. Ultrasound often shows discharge in the tendon envelope of the long head of the biceps, which is also present in shoulder osteoarthritis. Ultrasound examination can eliminate ruptures of rotator cuff tendons and calcific tendinitis of the shoulder. An X-ray image is regular in the early stage, while in later stages shoulder bones show signs of osteopenia due to the inactivity of the arm. An X-ray image is used to eliminate shoulder osteoarthritis, which is shown with typical caudal humeral head osteophyte. MR is used to show soft tissues and shoulder bone structures.

The frozen shoulder syndrome develops in 4 stages:

Stage 1. Usually lasts 3–4 months, patients complain of pain in the shoulder and upper arm. The pain limits shoulder movement. Patients usually regard the beginning of the disease as minor arm injury.

Stage 2. This stage is known as the “freezing stage” and it lasts 4–6 months. It is characterized by severe pain and reduction in all shoulder movements. The loss of movement is a consequence of the shortening and thickening of the joint capsule.

Stage 3. Stage 3 is actually the frozen shoulder. It lasts 3–6 months. Active and passive movements are limited in all directions. Typical clinical features include arm elevation to 90 degrees, external rotation to 10 degrees and internal rotation to the sacrum. The pain is less severe and occurs with sudden arm movements.

Stage 4. This is the recovery stage which lasts 6–9 months. Shoulder movements gradually return and the pain disappears.

The changes are reversible and in most cases recovery is expected within 2 years. Primary frozen shoulder is a clear clinical entity with a predictable prognosis in most patients. Clinical features show equally limited active and passive movements in all directions. During the early stage, due to pain, the patients hold their arm in internal rotation, in a protected position, and avoid elbow and hand use. In my clinical practice, the test I named “fixed shoulder blade test” has proven to be a very reliable clinical sign Fig.1A. The test is performed with the patient in a sitting position, with adducted arms and elbow flexion to 90 degrees with a neutral position of forearms. The physician performs external rotation of the arm, while both elbows have to be firmly rested against the thorax. Even with the smallest reduction in shoulder movement, a reduction in external rotation can be detected on the affected side.

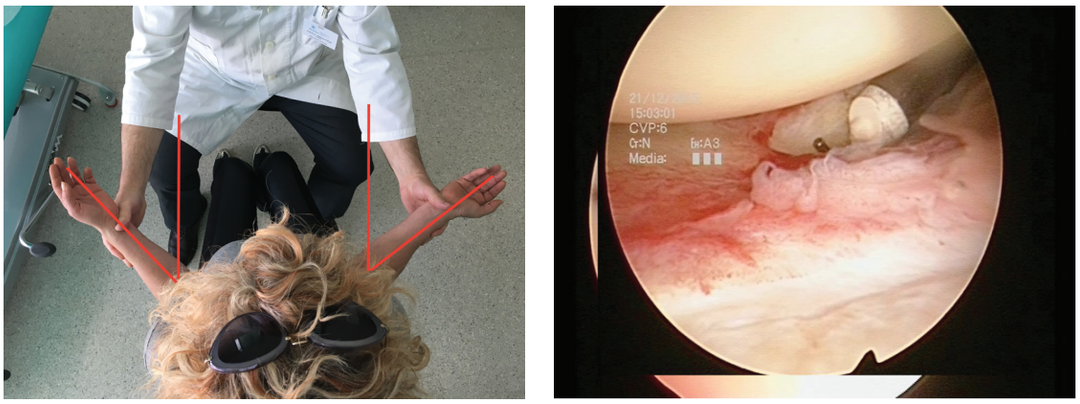


**Figure. 1.** A – Fixed shoulder blade test. The test is performed with the patient in a sitting position, with adducted arms and elbow flexion to 90 degrees with a neutral position of forearms. The physician performs external rotation of the arm, while both elbows have to be firmly rested against the thorax. Reduction in external rotation can be detected on the affected side. B- Arthroscopic release of the shoulder capsule (capsulotomia).

The goal of the treatment is to reduce pain and prevent further shoulder stiffness. It is important to familiarize the patient with the nature of the disease. During the early stage of the disease, it is almost impossible to reduce the pain. The purpose of physical therapy is to reduce patient's suffering with various procedures. In very painful and persistent cases, arthroscopic capsulotomy is performed, with a dissection of the joint capsule from the front, bottom and back side, as well as the opening of the rotator interval.

The surgery reduces pain and shortens the recovery. The surgery – arthroscopic capsulotomy with shoulder manipulation – is performed 3 months after the onset of symptoms at the earliest Fig.1B. Physical therapy plays a very important role in the return of shoulder movement and function during the recovery stage and after arthroscopic capsulotomy. After the surgery, the patient normally regains full passive mobility and it is necessary to immediately start individual physical therapy with analgesia (interscalene block), so that the patient can regain full active arm mobility and shoulder function as soon as possible.

## Physiotherapy Management of the Frozen Shoulder

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**Keywords:** frozen shoulder, physiotherapy

Robust scientific evidence in the published literature for the specific physiotherapy management of a frozen shoulder remains limited. The uses of adjunctive therapies such as laser, ultrasound, acupuncture, and electrotherapy have limited roles in the management of the pain element in this condition. We have established that physiotherapy management has some role to play in collaborative inter-disciplinary approach to this condition. Targeted treatment of the rotator cuff, normalising movement patterns, and patient education are believed to minimise the disease impact of this condition. Correct diagnostic assessment, collaborative team approach, and the management of patient expectations form the basis of best clinical practice at this time.

A hydro-dilatation injection coupled with intensive exercise based physiotherapy is the preferred management option in the UK. Arthroscopic capsular release with a post-operative

'roller towel' regime is the preferred management option for those who fail conservative management options.

### Posttraumatic stiff shoulder

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**Keywords:** stiff shoulder, contracture, trauma, osteoarthritis

**Introduction**
Post-traumatic contracture in the shoulder joint is a very common problem. In patients with posttraumatic contracture, pain and a significant limitation of the functional abilities of the joint are constantly present, in addition, a study by Sergiienko *et al.* (2017) showed that contracture in the shoulder joint leads to early development of osteoarthritis.
**Aim**
Summarize the treatment results of patients with posttraumatic stiff shoulder.
**Material and methods**
Between 2011 and 2017, 37 patients with posttraumatic stiff shoulder were treated operatively.

Of these, there were 28 men and 9 women. The causes of contracture were the following: incorrectly consolidated fracture of the major tuberculosis (40% of patients), incorrectly consolidated proximal metaepysis fractures (40% of patients), capsular contractures (20% of patients).
**Results**
Patients with a preliminary ineffective course of conservative treatment underwent surgical treatment in the volume – anatomical reconstruction of fractures and selective ligamentocapsulotomy.

In the postoperative period, using a multi-level rehabilitation system, a significant increase in the functional state of the shoulder joint was obtained.
**Conclusion**
Surgical treatment of patients with posttraumatic stiff shoulder depends on the pathogenesis of the contracture and allows improving the functional state of the shoulder.

## SESSION VII
## ROTATOR CUFF

### Scientific evidence in rotator cuff pathology and treatment

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**Keywords:** rotator cuff, pathology, treatment

**Introduction/Aim**
Presentation and update of scientific proofs concerning rotator cuff pathology and treatment issues.

**Methods**
PubMed library search for recent level I and II publications.
**Results/Conclusions**
1. Platelet Rich Plasma (PRP)
2. Results of use of PRP in treatment of rotator cuff tear (RCT) are contrary. Many of them claim no improvement after augmentation with PRP. However there are reports that PRP improved the results
3. Arthroscopic versus Mini Open repair
4. Most reports claim no difference in long-term results between those two methods. Arthroscopic repair seems to allow earlier recovery and faster improvements. The retear rate is similar
5. Acromioplasty
6. The results of acromioplasty and conservative treatment in shoulder impingement are similar; even in long term observation
7. Acromioplasty during rotator cuff repair doesn't improve results in 2 years observation
8. Biceps tenotomy versus tenodesis with RC repair
9. Both techniques provide improvement of clinical status of the patients. The supination is might be better after tenodesis and the chance of Popeye deformity is lower, however the tenotomy is faster and provide earlier pain relieve
10. Degenerative RCT

    Comparing conservative and surgical treatment the later provided better pain relief and less disability but there were no significant differences in function. Patients without retear after repair have the best results.

    After 60 and 70 years of age rotator repair prevents against upper migration of humeral head and provides better function in intermediate tears when compared to pure acromioplasty/tenotomy. However there are reports that the difference between surgical and nonsurgical treatment are similar.

## What is new in rotator cuff management? (SCR, biology, approach)

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**Keywords:** SCR, patch, biology, LHBT

**Introduction**
Tears of the rotator cuff are frequent. An estimated 250 000 to 500 000 repairs are performed annually in the United States. Massive rotator cuff tears (MRCTs) are a challenge, particularly in a younger population.
**Aim**
The aim of this study was to evaluate new treatment options in rotator cuff management.
**Material and methods**
The PubMed database was searched using the key words: "SCR, patch, LHBT, biology approach in RCR" published between 1986 and 2017.
**Results**
SCR theoretically improves force coupling as well as superior stability, increasing the functional outcome score. The treatment methods using biologic agents are promising, however, the relevant studies are still lacking. It is difficult to clearly assess the suitability of the patches in the reconstruction of massive rotator cuff tears.

**Conclusions**

A superior capsular reconstruction adds good stabilization to the glenohumeral joint.

What is more, the arthroscopic SCR remains technically demanding. Using long head biceps tendon (LHBT) as a patch, or an element of SCR, is an option for a rotator cuff treatment. This method is effective in maintaining force coupling of the rotator cuff.

However, it has high healing failure rates. Modulation of the selected matrix metalloproteases (MMPs) activity, after a rotator cuff repair, may offer a novel biological pathway to augment tendon-to-bone healing. Administration of PRP alone is insufficient to compensate the progressed tissue damage. Using marrow stem cells (MSCs) in a surgical rotator cuff repair shows great promise. Currently, there is no consensus on the optimal technique of gene therapy. Promising the functional results after using different types of patches is questioned due to a high percentage of complications.

## SESSION VIII
## ELBOW PAIN

### Lateral elbow tendinopathy – general and orthopaedic perspectives

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**Keywords:** elbow, tendinopathy

Lateral elbow tendinopathy remains a domain of conservative treatment. The pathology is self-limiting in most cases. There is neither superiority for any non-operative methods nor for any of the surgical techniques described in literature. Surgery is reliable and well established for open and arthroscopic procedures but reserved for the few pertinacious cases that will not improve with conservative treatment. This short review discusses the mechanism of disease, symptoms and signs, investigations, current management protocols and potential new treatments.

### Lateral epicondylitis – physiotherapeutic perspective

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**Keywords:** upper extremity, elbow, lateral epicondylitis, treatment, physiotherapy

**Introduction**

Tennis elbow, or lateral epicondylitis, is a frequently reported condition characterized by pain over the lateral epicondyle of the humerus and aggravation of the pain on resisted dorsiflexion of the wrist. The incidence in general practice is approximately between four and seven per 1000 patients per year, with an annual incidence of 1–3% in the general population, mostly among those between 30 and 64 years of age, peaking between 45 and 54. It typically affects the dominant upper extremity and is associated with repetitive and forceful activity.

**Elbow epicondylitis**

Lateral epicondylitis is believed to be a degenerative process, which stems from repetitive microtrauma. Typically, samples from the affected tissue demonstrate angiofibroblastic hyperplasia at the extensor origin of the forearm. Activities requiring repeated contraction of the wrist extensors are implicated, with the extensor carpi radialis brevis (ECRB) tendon most commonly involved.

**Treatment**

The majority of patients diagnosed with lateral epicondylitis can be effectively managed without surgery, as it is usually a self-limited process from which up to 90% of patients will recover by 1 year without surgical intervention. Non-surgical approaches to treatment are numerous. Examples include an expectant waiting policy, corticosteroid injections, orthotic devices, surgery, and physiotherapeutic modalities, such as exercises, ultrasound, laser, massage, electrotherapy, and manipulations.

## Is there any evidence of PRP in elbow pain treatment?

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**Keywords:** elbow epicondyle tendinosis, treatment, biomechanics

**Introduction**

Elbow epicondyle tendinosis is a common problem in outpatient clinic. Patients complain because about painful elbow and weakness caused by inflammation of the tendinous origin of extensor carpi radialis brevis (ERCB) muscle. The condition primarily affects athletes and manual workers (strong gripping, repetitive wrist movements). There are various methods of conservative treatment described in the database: rest, physical therapy, bracing, nonsteroidal anti-inflammatory medication, physical therapy, corticosteroid injection, autologous blood injection, platelet rich plasma injection, botulinum toxin injection. Return to daily activities takes long time.

**Aim**

The aim of the study will be to evaluate the clinical, biomechanical and morphological results after PRP injection based on pubmed.

**Conclusion**

In recent years platelet rich plasma (PRP) has gained its popularity in tennis elbow treatment. Platelet rich plasma is a concentrate of autologous human blood platelets in a small amount of plasma in published literature there are 88 articles about PRP treatment in lateral elbow pain. PRP injection may bring potential benefits to lateral tendinopathy: various growth factor expression, cell proliferation and angiogenesis. It may contribute to the tendon healing and regenerating process to cure the condition.

## Arthroscopic treatment of tennis elbow

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**Keywords:** tennis elbow, lateral epicondylitis, arthroscopy

Lateral epicondylitis is one of the most common overuse injuries and has been reported to reduce limb function and affect daily activities.

Usually conservative treatment is effective, but if it fails surgery is effective and safe option.

Clinical examination is essential to establish the diagnosis with typical clinical test: tenderness at lateral epicondyle, resisted wrist extension (ECRB) and resisted finger extension (EDC).

Arthroscopic procedure is an alternative to the classical method of open debridement of lateral epicondyle. Thourgh technique will be presented.

The first step is to corectly position the patient and the operated limb. Patient is lying supine with the arm on the narrow support. This position allows full access to medial, lateral and posterior aspect of the elbow. Anatomical landmarks are identified and outlined with the marker pen.

Join space is injected with 10–20 ml of saline to extend the capsule. The skin is incised to perform mid-lateral portal and we set the elbow in 90 deg flexion and full pronation. Then the scope is introduced.

After evaluation of the joint, scope is moved to the medial portal with inside-out technique. Then we can examine the joint from medial portal. Part of lateral capsule is removed with the shaver to expose ECRB and EDC origin. Then the origin of both tendons is detached from the epicondyle using soft tissue shaver. Care is taken not to damage radial collateral ligament (RCL) and radial nerve.

Finally, skin is closed and soft compressing dressing is performed.

The arthroscopic procedure is effective method of treatment of tennis elbow but it requires arthroscopic practice and knowledge of elbow anatomy.

## Plica syndrome of the elbow

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The plica humeroradialis is an anatomical structure as a synovial fold of the radiohumeral aspect of the elbow joint. The plica shows a high amount of morphologic changes caused by aging or degeneration. The anterior and posterior part of the plica in adults are nearly similar to those of embryos, whereas in adults the anterior part consists of a shorter and narrower villous pattern and the posterior fold tended to be wider compared with this of

embryos. The lateral part of the synovial fold, never seen in embryos, is characterized by a hard fibrous type plicate pattern in the adult. This is probably resulted from alterations in the movement of the radial head caused by aging.

The lateral fibrous part of the fold is a meniscus like tissue with abundant nerve endings in its periphery causing pain directly associated with pathology in this structure.

The plica falls into the radiohumeral articulation in extension and snaps back as it retracts over the radial head and neck during flexion of the elbow. Supination caused the plica to retract, whereas pronation tightened the plica around the radial head and into the radiohumeral articulation.

The typical pain associated with a synovial plica in the radiocapitellar joint is typically localized in the lateral aspect of the elbow with symptoms during flexion-extension of the pronated forearm.

The synovial fold belongs to the lateral epicondyle enthesis as a composite of the common extensor tendon, undersurface capsule and bone. Lateral epicondylitis with pathology in the area of the common extensor origin may therefore involve one or more of these elements.

A painful plica may mimic lateral epicondylitis would be relieved by excision of the inflamed plica.

## Osteochondritis dissecans of the elbow

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**Keywords:** elbow, osteochondritis

Osteochondritis dissecans of the elbow is predominatly located in the capitellum humeri and causes disability and pain in the throwing adolescent athlete. It refers to an acquired lesion of the subchondral bone with varying degrees of resorption, fragmentation, and sclerosis and potentially involves the overlying cartilage. It is typically observed in repetitive overhead or weightbearing sports. Although the etiology of the underlying pathological process is likely to be multifactorial secondary to repetitive stress, biomechanical mismatch or vascular supply, the true cause still remains unknown. The key diagnostic tool is magnetic resonance imaging, because it discovers early stages of the disease. Hence, early treatment of stable lesions can result in healing with later resumption of sporting activities. Unstable lesions or those failing non-operative therapy can be treated with various surgical interventions including arthroscopy with debridement and loose body removal. In situ fixation of unstable lesions or transplantation of osteochondral allografts harvested from the knee or rib provide new but promising techniques in the treatment of advanced cases.

## Ulnar nerve neuropathy

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**Keywords:** ulnar nerve, neuropathy

Ulnar nerve neuropathy is the second most frequent nerve compression syndrome in the upper limb. The compression usually occurs in the cubital or Guyon's tunnel or in the both places at the same time.

Typically patient with complain on decreased sensation include numbness of fourth and fifth finger which increase during the flexion of the elbow. Motor dysfunction usually manifests in the form of weakness, motion clumsiness and dropping of objects.

The diagnosis is usually made on the basis of a clinical evaluation. The positive Tinel test and positive stress provocation tests, allow to make the correct diagnosis. In unclear situations, it nerve conduction studies are useful.

Conservative treatment is usually the first line of treatment but is it fails and symptoms progress surgical treatment is required.

Surgical treatment usually involves local nerve decompression of the nerve at the site of its entrapment. In specific conditions (ulnar nerve instability, arthritic changes, bone impingement, revision surgery) the ulnar nerve transposition may be required.

## Endoscopic ulnar nerve release – operative technique presentation (re-live surgery)

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**Keywords:** ulnar nerve, endoscopy

The nerve compressive neuropathy on the level of ulnar tunel may be treated by the endoscopic release which is an altenative method to open decompression. The autors goal is to show the details of the operative technique in re-live surgery presentation. The pictures seen from both external and endoscopic camera allow to follow the operation step by step and to find the key-point of the procedure.

## Posterior interosseus nerve (PIN) neuropathy – supinator syndrome

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**Keywords:** posterior interosseus nerve, neuropathy, supinator syndrome

Posterior interosseus nerve (PIN) is a purely motor branch of radial nerve and its neuropathy is the most common compression neuropathy for the radial nerve. It occurs especially in

manual workers and bodybuilders. The most common structure causing pressure on the PIN is the Frosche arcade, which is the proximal edge of the supinator muscle.

PIN neuropathy is mainly manifested by burning pain in the lateral region of the elbow and forearm with distal or proximal radiation. Much rarer weakening of the finger straightening force is observed. Often symptoms are caused by repeated rotations of the forearm, especially when the elbow is straight. In some patients PIN neuropathy coexists with the tennis elbow.

Clinical examination presents palpation pain occurs in the distal region of the radial head with intensification of symptoms during passive pronation of the forearm with pressure on the PIN or during resistant forearm supination and also fingers extension. In order to supplement the diagnosis, it is very useful to perform electrophysiological examination and ultrasound.

In the first stage, conservative treatment is prefered: oral medications (mainly NSAIDs), limb relieving and physiotherapy. Steroidal injection is also helpful.

In case of no improvement after about 3–6 months of conservative treatment or advanced stage of the disease, surgical treatment consisting of decompression of the PIN with intersection of supinator fibers is recommended.

## SESSION IX
## ELBOW TRAUMA – SOFT TISSUE

### Evaluation and Management of Chronic Posterolateral Rotatory Instability (PLRI)

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**Keywords:** PLRI, instability, elbow, ligament, LUCL

The lateral ulnar collateral ligament (LUCL) is the main static stabilizer to prevent posterolateral rotatory instability (PLRI). Symptomatic PLRI can range from subtle instability to recurrent dislocations in which the ulna and radius rotate around the humerus in a posterolateral direction. The LUCL shares a common insertion with the radial collateral ligament (RCL) on the lateral condyle of the humerus and inserts distally on the proximal part of the supinator crest of the ulna. The most common mechanism of injury is a fall on the outstretched hand. If initial treatment fails, chronic instability may develop. Direct repair may no longer be possible and augmentation of the reconstruction can be necessary in chronic cases. The diagnosis is mainly clinical with several specific tests. Imaging may be helpful. In patients with grade I instability arthroscopic imbrication of the LCL complex has been shown to yield excellent results. A tendon graft is often used in more severe grades of instability.

## Management of chronic medial elbow instability. Literature review

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Traumatic injury to the medial collateral ligament (MCL) of the elbow typically results from either an acute or chronic process. Valgus instability more typically is a manifestation of chronic overuse of the elbow. Athletes who participate in throwing activities compose the majority of patients who suffer from this condition – there are much more reports regarding the pitchers from American and Asian literature. The incidence of chronic medial elbow instability significantly increased last years, so did the number of primary and revision reconstructions performed for these athletes. The goal of this study is to evaluate elbow stability biomechanics, changings leading to chronic medial elbow instability and the methods of diagnosis and treatment of this relatively rare injury in Europe. This study is based on the literature review and concerns soft tissue pathologies, as no bony pathologies leading to chronic elbow instability are to be analyzed.

## Complex elbow dislocation

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**Keywords:** fracture-dislocation, instability, radial head replacement, dynamic joint distractor

Complex elbow dislocation is the condition resulting from both the injury and the resultant loss of function due to damage to the articular surface and the ligamentous structures that stabilize the elbow [1]. The reliable treatment of this injury is usually very complicated and outcome is not always satisfactory [2, 3, 4, 5, 6]. Every fracture or injury around the elbow joint can cause instability of the humero-ulnar or humero-radial joint. The importance of the different structures is as follows:

- Fracture of more than 50% of the coronoid can cause instability.
- Injury to the Lateral Ulnar Collateral Ligament (LUCL) – Postero-Lateral Rotatory Instability (PLRI).
- Injury to the Medial Collateral ligament (MCL) – Valgus instability (anterior bundle is a first valgus stabilizer of the elbow joint).
- Fracture of the radial head – second valgus stabilizer of the elbow joint. Its role is more important when we have MCL injury and coronoid fracture.
- Fracture of 50% of olecranon – small degree of instability.

*First degree stabilizators*: Coronoid, Olecranon, Trochlea of the humeri, Ligaments especially LUCL and anterior bundle of MCL, Humero-ulnar joint
*Second degree stabilizators*: Radial Head, Capitellum, Annular ligament and quadrate ligament, Anterior capsule, Humero-radial joint, Muscles: Flexors, Pronator teres, Extensors, Supinator
The different types of complex elbow dislocation and its treatment [1–6, 7–12]:

1. Postero-lateral rotatory instability (PLRI) – Injury to the lateral ulnar collateral ligament (LUCL).
   Reparing of LUCL
2. Postero-medial rotatory instability (PMRI) – Coronoid fracture (posteromedial part), injury to the LUCL, possible injury to the anterior bundle of MCL.
   Fixation in II and III types of coronoid fracture, reparing of LUCL, possible reparing of the anterior bundle of MCL.
3. Anterior dislocation of the elbow joint with olecranon fracture. Proximal radio-ulnar joint (PRUJ) intact, possible coronoid fracture and/or radial head fracture, very rare injury to the LUCL and/or MCL (anterior bundle intact).
   Fixation of olecranon fracture sometimes together with coronoid fracture. Radial head fixation or radial head replacement if necessary, very rare is need to LUCL repair.
4. Posterior dislocation of the elbow joint with olecranon fracture and posterior dislocation of the radial head – PRUJ injury (Monteggia variant), sometimes with radial head fracture.
   Fixation of olecranon fracture, radial head reduction with Kirschner wire fixation, usually with no need for Annular Ligament (AL) reparing. In case of radial head fracure its fixation or repalcement. LUCL repair if necessary.
5. Hotchkiss terrible triad – elbow dislocation, comminuted radial head freacture, coronoid fracture.
   Open reduction of elbow dislocation, radial head fixation or replacement, possible coronoid fixation, possible reparing of LUCL and/or MCL (anterior bundle).
6. Varus instability – injury to the Lateral Collateral Ligament Complex (LCLC) or LUCL only.
   Reparing of LCLC or LUCL.
7. Valgus instability – injury to the MCL (anterior bundle).
   Reparing of the anterior bundle of MCL.
8. Dislocation of the radial head – injury to the AL, very often as a Monteggia variant: extension, flexion or lateral.
   Open reduction of the radial head. In case of Monteggia lesion as a first step fixation of the ulna and later on close or open reduction of the radial head with Kirschner wire fixation. Reparing of AL usually is not necessary.

In all cases mentioned above after fracture fixation and ligaments repair if the elbow is still unstable application of Morrey's Dynamic Joint Distractor II is recommended. In case of lack of this distractor, temporary fixation of articular surfaces by use of 1 or 2 Kirschner wires is recommended.

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## Chronic Elbow Dislocation

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**Keywords:** chronic elbow dislocation, radial head transfer, ligament reconstruction

Chronic Elbow Dislocation is a rare and severely disabling condition that usually occurs after a not-recognised or undertreated fracture dislocation of the elbow. The suggested treatment depends on several factors including delay of diagnosis and treatment, joint surface integrity, quality of the primary and secondary stabilizers of the elbow.

The aim of this presentation is to review our experience with chronic elbow dislocation in order to provide a flow chart for the suggested treatment.

## Prevention & Treatment of Elbow Stiffness

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**Keywords:** elbow, stiffness, treatment

The purpose of the elbow is to position the hand in space. Therefore, loss of elbow range of motion (ROM) causes significant impairment of function of the upper extremity. The 'functional arc of motion' for elbow flexion is defined as a 100° arc from 30° to 130°, that is adequate to perform most activities of daily living. The 'functional arc' for pronation/supination is a 100° arc from 50° to 50° in each direction. Loss of elbow motion is most commonly post-traumatic, but can also be due to arthritis, neurogenic causes, infection or developmental abnormalities. The restriction itself can be due to boney abnormalities such as malunion or heterotopic ossification (HO), but soft tissue scarring is almost always present regardless of any bone abnormalities. If the loss of motion occurs prior to skeletal maturity, articular dysplasia and shortening of the soft tissues (including neurovascular structures) can be present.

Prevention of elbow stiffness requires an understanding of *The 4 Stages of Stiffness*:

1. Bleeding & Edema
2. Deposition and accumulation of extra-cellular matrix molecules
3. Formation of granulation tissue
4. Periarticular (± intraarticular) Fibrosis

In order to prevent fibrosis ultimately, one must prevent the formation of granulation tissue. In order to do that, one must prevent the deposition and accumulation of extra-cellular matrix molecules. In order to do that, one must prevent (or at least reverse) bleeding and edema in the joint and the surrounding soft tissues.

One can readily appreciate the critical role of the first few days following surgery. This is best accomplished, when possible, by holding the elbow in extension with a soft bulky dressing and an anterior plaster slab. Elevation of the elbow above the level of the shoulder and heart also helps, but should not be continuous in case a compartment syndrome occurs.

Once a contracture is already present, a careful history should be taken for the cause of motion loss, looking specifically for evidence of acute or repetitive trauma (as in athletes and those overusing the elbow for work or weight-bearing) or a potential neurogenic cause. Examples of neurogenic causes include subclinical ulnar neuritis following ORIF of an olecranon fracture. In my experience, the presence of CRPS (complex regional pain syndrome) or RSD (reflex sympathetic dystrophy) or even just severe pain in the days and weeks following trauma are reliable indicators that the contracture is neurogenic in nature, and a strong indication for identifying and surgically relieving the cause for ongoing nerve irritation. A CT scan will often reveal subtle areas of HO near the offended nerve, most commonly the ulnar nerve.

Preoperative assessment of virtually all elbow contractures includes a CT scan, in which the most useful views are the 3D surface rendering and 2D reconstructions in the sagittal plane. Typical osteophyte patterns can be recognized for preoperative planning.

Surgical treatment can be done open or arthroscopically. For experts, most elbow contractures can be safely treated arthroscopic osteocapsular arthroplasty (OCA) unless there is need for extensive hardware removal or other substantial concomitant open procedure, removal of HO that cannot be safely separated from a nerve, or HO in the ligaments. Arthroscopic OCA is performed in 4 steps:

1. Get In & Establish A View
2. Create A Space In Which To Work
3. Bone Removal
4. Capsulectomy

Typically I start in the posterior compartment then work in the medial and lateral gutters before going to the anterior compartment. In each compartment, the same sequence of steps 1→4 above are followed. Retractors and fluid management are important technical components. The risk of nerve injury is minimized by following the same safety-driven technique and knowing the 3-dimensional anatomy of the nerves.

Open arthrolysis is a reliable technique for more complicated cases and for surgeons not experienced with arthroscopic techniques. The elbow is approached through a lateral "column" approach and the collateral ligaments and tendon origins are preserved. A small medial incision permits ulnar nerve decompression and posteromedial capsular release.

## Acute distal triceps tendon repair

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**Keywords:** Triceps tendon; tendon rupture; repair; elbow

Direct repair to the olecranon is the treatment of choice for acute distal triceps ruptures. Risk factors include chronic overuse, steroid (ab)use, previous surgery and systemic diseases. Unfortunately, triceps tendon ruptures are often missed acutely, resulting in a delayed diagnosis. Direct repair may no longer be possible in these patients and a tendon augmentation may be necessary. Diagnosis starts with a thorough clinical exam, followed by radiographic examinations. The patient may complain of some weakness and pain with swelling over the elbow and distal triceps tendon. During the clinical exam, a gapping of the central portion of the tendon insertion may be felt, both in a relaxed state and during contraction. Plain anteroposterior (AP) and lateral radiographs are the first line of imaging and may show a retracted flake of bone. This is pathognomonic for a triceps tendon avulsion from the olecranon. Ultrasound and MRI are more sensitive exams to confirm the diagnosis. The indication for surgery depends on the functional impairment and the specific demands of the patient. We have a low threshold for early surgical fixation of an acute rupture of the distal triceps tendon as it is easier to directly fix the tendon back to bone in acute rather than chronic repairs. Our preferred technique is a primary hybrid fixation with drill holes and one central bone anchor. Depending on the stress on the repair, the triceps tendon is often protected with a brace to allow for progressive flexion. After three months, unrestricted use of the elbow is permitted. The outcome after triceps tendon repair is predictable and usually leads to excellent functional results. The complication rate is low and retears are rarely observed.

## Rehabilitation in elbow instability

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**Keywords:** elbow instability, physiotherapy, non-operative treatment

According to statistics the elbow is the second most commonly dislocated joint during sports activity or trauma. After nearly 15–35% elbow dislocations have led to the further instability. Common instability symptoms may occur after single trauma or may be conducted because of microtrauma accumulation during excessive throwing or tackle. The proper rehabilitation protocol should be selected according to the timing of the instability (acute or chronic), direction of displacement, articulation involved, the degree of the displacement and the additional disturbances such as fractures.

The non-operative treatment should be adapted according to the patient age, elbow dysfunction and work, social and sports dependencies. In acute elbow dislocation and further instability cases rehabilitation protocol is divided into three main phases.

Phase I (0–3 weeks) is considered with posterior elbow splint and assisted ROM exercises. The exercises should be provided with shoulder horizontal position and wrist in neutral position. The maximum extension during exercises should not exceed 30 degrees. During Phase II (3–6 weeks) wrist strengthening exercises should be applied with elbow ROM increasing exercises. Phase III (6–12 weeks) is composed of upper limb muscles endurance and proprioception exercises.

If the surgery was conducted the post-operative protocol should be applied. At the beginning patient is immobilized in stabilizer in 90 degrees of elbow flexion and pronation for 24 hours. Next 2 weeks the elbow orthosis is applied in ROM 60 degrees to full flexion. Patient is encouraged to exercise every day with assisted and active exercises, contralateral and stability exercises. In 3–4 weeks patient is improving orthosis ROM from 30 degrees to full flexion. After 6 weeks of rehabilitation the endurance, strengthening and proprioception training should be proceed. Recommendations for patients should consider information about avoiding excess strain at the reconstructed side as during lifting weights with shoulder abduction. The return to full sports should be planned after 5–6 months.

## SESSION X
## ELBOW TRAUMA – BONE

### Arthroplasty in distal humerus fractures

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**Keywords:** elbow, endoprosthesis, distal humerus

**Introduction**

The aim of the study was to evaluate the results of treatment of distal humeral fractures with the semi-constrained Coonrad-Morrey prosthesis.

**Materials and methods**

We performed a retrospective studyof 40 individuals who underwent elbow joint replacement using the Coonrad-Morrey implant between 2006 and 2012. Mean follow-up duration was 4.5 years (range: 3 to 7 years). The study group comprised 36 (90%) patients with post-traumatic dysfunction of the elbow, including 20 (55.5%) women and 16 (44.5%) men aged 49 to 77 years (mean age 64.5 years), and four patients post primary arthroplasty: 3 (75%) women and 1 (25%) man, ranging in age from 63 to 75 years. The type of fracture was assessed according to the AO ASIF classification. The Mayo Elbow Performance Score (MEPS) and the Disabilities of the Arm, Shoulder and Hand Score (QuickDash) score were used to evaluate treatment results.

**Results**

The range of MEPS scores in the study group (n = 40) was 20–100 (mean 86.2 points). On a 5-point scale, there were 23 excellent results, 13 good results, 1 good and 3 insufficient ones. The mean Quick Dash score for the entire study group was 38.25, with a range of 5.7–83.2. The final MEPS scores was most significantly ($p < 0.001$) influenced bypain reduction in the elbow joint and improvedability to carry out activities of daily living ($p = 0.001$).

**Conclusions**
The use of total elbow arthroplasty with the semi-constrained total Coonrad-Morrey prosthesis in the treatment of therapeutic failures and as primary intervention in distal humeral fracturesproduces good results that aremainly connected with reduction in pain and improvement in mobility.

## 100 Things I have Learned About Total Elbow Arthroplasty

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**Keywords:** elbow, arthroplasty

The field of total elbow arthroplasty (TEA) is not as developed as that of total knee or hip arthroplasty. As such, there is much for us to learn. The purpose of this presentation is share "100 things I've learned about TEA" during the 29 years in which I have been practising, researching and designing TEA implants. They are divided into the following categories:

1. Preoperative Considerations
   - Preoperative considerations include body size, BMI, smoking history, willingness and ability to cooperate with postoperative plans, and scars and soft tissue deficiencies.
2. Surgical Approaches
   - Superficial approach – skin incision, flaps,
   - Deep approach –
     - Management of the triceps – triceps on vs off, recognizing and preventing weakness, reconstruction of chronic triceps deficiency
     - Ligament detachment & repair
3. Management of the ulnar nerve
   - Primary TEA – handling, decompression vs. transposition
   - Revision TEA – preop US, exposure
   - Neurolysis & Revision Transposition
4. Bone Preparation
     - Preventing & managing intra-op fractures
5. Deformity correction and soft tissue balancing
   - Contractures, varus/valgus deformity
6. Cement techniques
   - Canal preparation, cement restrictors, planning for revision
7. Design consideration
   - Current limitations of TEA – bushing wear, inadequate load-bearing
   - Linked vs unlinked? Limitations of each→why not linkable?
   - Load-bearing capacity of the polyethylene
   - Role of the radial head
8. Modes of failure
   - Design-specific
   - Factors affecting wear, loosening, instability, component fracture
9. Revision TEA
   - Infection – component removal, cement removal, staging, spacers, endoscopy
   - Peri-prosthetic fractures

- Bone loss – endosteal, cortical, structural
- Component fractures

10. Post-op management – preventing wound complications

## Radial head fracture

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**Keywords:** radius, fractures

The most frequent fracture within the elbow joint is fracture of the radial head. This fracture usually occurs as a result of falling on outstretched hand. In more than one third of the cases there is injury of the ligament and associated fractures. Radial head is important for elbow biomechanics, for valgus and longitudinal joint stability.

The characteristic radial fracture can be described with Mason Classification, which is based on the X-ray (AP, lateral and oblique view). During physical examination it is important to evaluate mechanical blocks to the elbow motion, stability of the elbow joint, DRUJ stability and tenderness of interosseous membrane. Radial head fracture can be treated with both nonsurgical and surgical techniques for example early mobilizing fragment excision, open reduction and fixation, radial head resection or radial head replacement.

## Olecranon and coronoid fractures

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**Keywords:** olecranon, coronoid, fractures

Fractures of the olecranon and coronoid are common fractures of the proximal elbow and can be caused by direct or indirect trauma. Olecranon fractures are described by different classifications and there are various treatment options. Coronoid fractures are pathognomonic of an episode of elbow instability. Isolated fractures of coronoid process are rare and usually are associated with other injuries of the elbow.

The aim is to overview the olecranon and the coronoid fractures. Fractures of the proximal elbow present a challenge to the orthopaedic surgeon. There have been described many classifications to more reliably predict associated injuries and guide treatment decisions. Olecranon fractures are classified by many classifications systems.

Most commonly used systems are Mayo, Colton, Schatzker and AO. Most olecranon fractures are displaced and surgery is required. Coronoid fractures are associated with 10–15% of all elbow dislocations. O'Driscoll *et al.* developed Regan and Morrey classification of coronoid fractures. The correct treatment must be chosen and key to successful outcome is recognition of concomitant elbow injuries. The guiding principle in treating fractures of olecranon and coronoid is to restore articular surface and elbow stability in order to implement early active motion program.

## Terrible Triad Of The Elbow

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**Keywords:** elbow, terrible triad

The terrible triad of the elbow consists of a posterior dislocation of the elbow, characterized by fractures of the radial head and the coronoid process. It was called "terrible" due to the high chance of poor outcomes observed in past with both conservative and surgical treatment. A high percentage of complications has been reported in the literature, including residual instability, stiffness, heterotopic ossification (HO) and arthritis.

The aim of presentation is to review the most key features of this complex disease and to propose a flow chart that could help the reader to choose the better treatment to achieve satisfactory results in most of the patients.

## Rehabilitation after elbow trauma

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**Keywords:** Elbow injury, Elbow fracture, Endoprothesis, Rehabilitation, physiotherapy

The rehabilitation of elbow fractures especially these with dislocations can be challenging for physiotherapist. The function after the elbow trauma can often be limited due to the joint geometry disorder and soft tissue contracture. Knowledge of elbow stabilization and biomechanics, surgical techniques or endoprothesis construction are very important in early rehabilitation programme and in avoiding complications.

The main goals of rehabilitation programme following elbow trauma include: preventing joint contracture, restoring motion and muscle performance and also restoring or maintaining joint stability. Controlling of edema and scar remodelling therapy are also important and helps to prevent the elbow contracture. Some of elbow fractures can cause other complications such as nerve injury. Then sensory reeducation programme is additionaly recommended.

Sometimes the elbow trauma can be quite complicated and surgery can be not sufficient to restore both the normal anatomy and biomechanics of the elbow. Then the physiotherapist has to be aware of some functional limitations of this joint and match the rehabilitation goals to acquired surgery result. These patients who underwent an postraumatic elbow arthroplasty has some functional limitations such as unholding a heavy object and this should be considered in rehabilitation programme.

Good cooperation between physiotherapist and orthopaedic surgeons gives the best results of the rehabilitation of elbow trauma.

## Arthroplasty of the radio-capitellar joint – comparison between different types of prostheses

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**Keywords:** modular radial head prosthesis, bipolar radial head prosthesis, anatomic radial head prosthesis

The main indication for radial head replacement is comminuted radial head fracture – Hotchkiss type III. The additional indications are: elbow dislocation, fractures around elbow joint, ligaments injury, Essex-Lopresti lesion and complex injury and instability of the elbow joint. Radial head replacement is not contraindicated in young people. It can work as a temporary spacer. The contraindications for radial head replacement are: synovitis of the elbow joint and damage to the cartilage of the humerus capitellum.

*We can classify radial head prostheses bearing in mind their different parameters*:

- Type of fixation of the stem: Cemented, Uncemented (press-fit)
- Type of the material of the head: Acryl, Silastic, Metal, Pyrocarbon, Poliethylen (UHMWP), Poliethylen covered by metal, Peek Optima covered by metal
- Type of the head: Solid (1 part), Modular (2 parts)
- Type of the stem: Straight, Curved, Reconstructive
- Type of the connection between head and the stem:
  Monoblock: Straight, Tilted
  Modular: 2 pieces (head + stem), 3 pieces (head + connection + stem), Bipolar (floating)
- Anatomic – anatomic shape of the prosthesis head

Different combinations of prostheses are possible, for example our new design KPS implant can be described as follows: cemented, straight stem with peek optima head covered by metal (modular head), bipolar implant.

In case of damage to the humerus capitellum the prosthesis of the capitellum can be combined with simultaneous prosthesis of the radial head. So far they are few publications regarding this problem. They are mentioned below [1–6].

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## PHYSIOTHERAPY DAY 16TH MARCH FRIDAY

### SESSION I
### Elbow pain

**Physical therapy tretment in elbow neuropathies cases** **Marek Kiljański, Jakub Oberbek**
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**Keywords** : neuropathies, physical therapy

Elbow most common neuropathies are: median nerve neuropathy (pronator teres syndrome), anterior interosseus nerve syndrome (Kilocha-Nevina syndrome), posterior interosseus nerve syndrome, radial nerve neuropathy and ulnar nerve neuropathy. Increase of tissue pressure and traumatic repercussions such as fractures are the main cause of peripheral neuropathies. The main symptoms are: muscles atrophy, pain during everyday living activities, oedema, sensitivity, range of motion restriction and muscles strength decrease. All symptoms leads to severe upper limb functional limitations and decrease of patients quality of life. The aim of the study was to present nonoperative treatment methods considering physiotherapy according to actual recommendations.

### SESSION IV
### Elbow trauma

**Elbow fractures: classification and imaging**
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**Keywords:** elbow, fractures

Within the elbow joint, we can diagnose various fractures and soft- tissue injuries.

Capitellum fracture occurs in 1% of all elbow fractures as a mechanism of low energy fall on outstretched hand. Recommended is X-ray and CT-scan to demonstrate fracture and classify it to Brayn and Morrey Classification (with Mc Kee modification).

Coronoid fracture may be isolated or occur with episode of elbow dislocation. Processus fracture is qualified to Regan and Morrey Classification or O'Driscoll based on X-ray or CT-scan. CT-scan may be more value due to overlapping structures.

Olecranon fracture can be diagnosed after high energy injures in younger population in low energy falls for older people. Standard AP and lateral views are used to define fracture. CT- scan may be more used to plan operation in comminuted fracture.

There are four popular classifications used in every day practise: MAYO, Colton, Schatzker and AO.

Radial head fractures are the most common elbow fractures. Usually patients fall on outstretched hand. To decide whether to treat it conservatively or surgically Mason classification can be used.

## Elbow fractures operative treatment – indications and methods

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**Keywords:** Elbow fractures, joint reconstruction, posttraumatic stiffness

Fractures of the elbow are still a problem in orthopaedics. Most of treatment protocols focused on precise and stable joint reconstruction. The goal is restoration of function as quickly as possible to allow rehabilitation involving the full range of motion. If left untreated, they commonly result in functional compromise and poor outcomes.

Surgical treatment to restore stable elbow range of motion has evolved in the past few decades based on increased understanding of elbow biomechanics and the anatomy of these injuries. This presentation highlights current concepts in the treatment of these complicated and frequently unstable injuries. Special emphasis is put on posttraumatic elbow stiffness.

## Elbow fractures non-operative treatment – indications, methods and rehabilitation

**Leszek Romanowski, Marek Kiljański, Jakub Oberbek**
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**Keywords:** elbow fracture, non-operative treatment

The fracture is defined as breaking the bone in direct or indirect injury. Fractures are classified as closed or open. The symptoms of fracture are: visible deformity, crepitations, pathological mobility, pain and swelling. The treatment plan includes: reposition, stabilization, immobilization and rehabilitation. The goal of orthopaedic treatment is to restore the function of the limb or minimize of consequences of injury. In conservative treatment redression with splints or cast, different types of medical supply and physiotherapy can be used. The aim of this study is to present nonoperative treatment methods in elbow fracture cases.

## Rehabilitation process after surgically treated elbow fractures

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**Keywords:** upper extremity, elbow, fractures, treatment, physiotherapy

### Introduction

Fractures of the elbow joint can be caused by a fall on upper limb or due to a sport trauma. Because the elbow has a substantial role in maintaining full function of the hand during all motor patterns in activities of daily living and sporting activities, there is a need of a proper individualized rehabilitation process.

**Rehabilitation process**

The most common fractures concerning the elbow are fracture of distal humerus, olecranon fracture, radial head fracture and coronoid fracture. Rehabilitation after surgical treatment of the aforementioned conditions will vary depending on the severity of the trauma and type of surgical procedure being used. Recent systematic reviews lack clear consensus about best therapeutic interventions, but the whole process can be divided into different phases varying in loading and complexity of motor patterns. The main goals during the first phase are reducing pain and oedema in the surgically treated joint and gradually increasing range of motion. Because stiffnes is a common sequellae after surgery involving the elbow joint, early mobilization is crucial to restore safe passive and active ROM. In the next phases, which are based on the healing stages of tissues, neuromuscular control, strength and endurance exercises gradually increase in difficulty. During the last phase of rehabilitation biggest stress is put on motor patterns that lead to safe return to work and return to sport.

## Posttraumatic stiff elbow – etiology, pathogenesis, operative treatment

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**Keywords:** elbow contracture, elbow injury, intrinsic, extrinsic

**Introduction**

Elbow contracture is a common sequel of injury.

**Etiology**

Elbow contracture might be a result of heterotopic ossifications (HO), osteoarthritis, scaring and fibrotic changes within joint capsule and ligaments or malunion of the fractures.

**Pathogenesis**

Elbow is prone to develop the contracture because its motion depends on very precise congruency. Anterior localization of brachialis muscle over the capsule favor HO formation within it substance. Prolonged immobilization after trauma also fosters the contracture.

**Classification**

Morrey developed system of classification that depends on localization of the pathology. Intra-articular contracture is result of adhesions, mal-alignment and defects of the joint surface. Extra-articular contracture is caused by changes within the joint capsule and ligaments, HO and extra-articular deformities. In some cases the contracture is classified as a mixed.

**Prevention**

Stabile fracture fixation with proper reduction of intra-articular fractures that enable early rehabilitation. Prophylaxis against HO formation includes NSAIDs or less often radiotherapy.

**Conservative treatment**

Physiotherapy concerning proper exercise protocols, in some cases static or dynamic splinting.

**Surgical treatment**

In case of extra-articular contracture the proposed treatment is either arthroscopic or open arthrolysis. The choice depends of the extent of contracture, type of deformity and experience of the surgeon.

In advanced intra-articular changes the solution might be arthroplasty with prosthesis. Less often in younger patients one might think of interposition arthroplasty.

**Prognosis**

Advanced arthritic changes and young age of patient are bad prognostic factors.

Treatment of HO after burns and head trauma usually gives good results.

## Posttraumatic stiff elbow – physiotherapy, prevention

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**Keywords:** elbow injury, elbow rehabilitation, contraction, stiff elbow

The aim of the treatment of elbow injury is functional, painless range of motion and stable joint. Prevention of stiffness is crucial. Posttraumatic joint contracture may be caused by soft tissue or bone pathology, or both simultaneously. The former includes intra-articular fractures, cartilage injury or osteoarthritis. They cause joint incongruity and deformity and result in contracture. Soft tissue pathologies are: fibrotic changes and scarring of joint capsule and ligaments, the changes occur in collagen structure.

The rehabilitation of the elbow should start as soon as it is possible because changes in structure of the joint capsule are fast. Animal research has proven that molecular and cellular changes occur two weeks after injury. Although the treatment should start as soon as possible one should always respect joint stability, which can be impaired after the trauma.

The rehabilitation protocols include active and active-assisted exercises within maximal painless (possible) range of motion (ROM). Flexion and extension should begin in horizontal plane because it decreases pain and increases safety of movements. Forearm pronation and supination should be performed with elbow flexed to 90° and arm in adduction to avoid shoulder compensation.

Exercises can be supplemented with static or dynamic splint with gradual stretching of the joint to improve the effect of treatment. The aim of splinting is to obtain plastic deformity of soft tissues. It causes remodeling and lengthening of capsule. Again, one should pay attention to joint stability. If joint is unstable, then application of dynamic splint is risky. When ligaments are injured articular elbow brace should be used. This brace should allow setting the desired custom ROM. It provides stability during rehabilitation.

The choice of treatment and its final result depends on cooperation between the physiotherapist and orthopedist.

## Post traumatic stiff elbow – physical therapy after elbow arthrolysis

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**Keywords:** stiff elbow, elbow arthrolysis

Elbow stiffness is one of the most common complications after elbow trauma. The high risk indicating factors for ROM restrictions are: prolonged immobilization, pain, soft tissue contracture, patient's lack of commitment in rehabilitation procedures. If all techniques

of non-operative treatment were used and elbow range of motion is still malfunctioned usually the elbow arthrolysis needs to be considered.

After the surgery the exercises should start immediately with passive and assisted ROM improvement. Crucial for the physical therapist is to learn about the ROM gained by the surgeon during and after the surgery. It should be considered as maximal, possible elbow movement. If the patient is in pain the proper pharmacological treatment should be applied before the exercises. Most important issue during exercises is to control and to teach the patient how to avoid the shoulder elevation and maintain right body posture.

After passive and assisted exercises additional device for afternoon and a homework exercise should be considered. The control passive motion device should have opportunity to set the ROM and give the patients ability to maintain the increased motion, bones gliding and edema evacuation. In stiff elbow arthrolysis cases cold therapy before and after exercises may be applied to accelerate the regeneration process and to create analgesic effect.

After sutures removal soft tissue therapy for contracted muscles should be proceed with scar tissue therapy. 3 weeks after surgery active exercises with stretching may start, strengthening exercises with weights should be started between 6–8 months after surgery.

## Scientific evidence in treatment of the elbow joint

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**Keywords:** upper extremity, elbow, pain, treatment, physiotherapy

### Introduction

Treatment of elbow injuries requires an understanding of the mechanism of injury and the anatomy and biomechanics of the human elbow and upper extremity kinetic chain, as well as a structured and detailed clinical examination to identify the structure or structures involved. A detailed review is needed for clinicians to optimally design treatment programs for rehabilitation and prevention.

Most common chronic musculoskeletal pain condition affecting the elbow is lateral epicondylalgia (LE), causing significant pain, disability and lost productivity.

Despite decades of research investigating treatments and the underlying mechanisms of LE, it remains a challenging condition for physiotherapy clinicians and researchers alike.

Non-surgical approaches to treatment are numerous. Over 40 treatment options are described in the literature. Examples include an expectant waiting policy, corticosteroid injections, orthotic devices, surgery, and physiotherapeutic modalities, such as exercises, ultrasound, laser, massage, electrotherapy, and manipulations. As yet, no optimal strategy has been identified. Research is limited on the identification of treatment modalities that can reduce pain and restore function to the elbow. Further research is needed in high-level study to delineate optimal treatment methods.

**POSTER SESSION**
**MEETING AT THE POSTER AREA WITH AUTHORS**

## Reconstruction of chronic pectoralis major rupture with Achilles tendon allograft

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**Keywords:** pectoralis major, Achilles tendon, pectoralis major rupture

**Introduction**
Pectoralis major ruptures are uncommon injuries typically affecting highly athletic individuals, often related to heavy lifting during eccentric contracture. In chronic situation, direct repair may not be effective due to muscle retraction and tendon atrophy. Achilles tendon allograft seems to be the optimal solution.

**Aim**
The aim of this study was to present the technique of reconstruction and early results.

**Materials and methods**
7 patients were treated with Achilles tendon allograft in our institution over the period of 2015–2017. Clinical and functional evaluation was performed. In all cases sternal parts (posterior tendon) were ruptured on average 14 months prior to surgery (5–36).

All injuries occurred during body building exercises. In 3 cases, previous direct repair was attempted and failed.

**Results**
In all cases continuity of the tendon and muscle was preserved. In all but 1 case nearly normal symmetry was achieved. In 1 patient, slight deformity occurred 4 months following surgery despite initial normal appearance and preserved continuity on US scan. Since that case technique of tendon-to-muscle fixation was slightly modified. All patients (including the partial recurrence) had normal functional outcome with full range of motion. All have returned to normal sport participation (including heavy lifting). There were no complications in presented series of patients.

**Conclusions**
Late reconstruction using Achilles tendon allograft is safe, feasible and effective technique yielding good clinical outcomes. However, it is based on small series on patients. Biomechanical testing might be necessary in order to obtain reliable tissue fixation.

## Polish version of Western Ontario Shoulder Instability Index (WOSI), Oxford Shoulder Instability Score (OSIS) and Walch-Duplay Score for assessment of patients with shoulder instability: translation, cultural adaptation and validation

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**Keywords:** shoulder instability, validation, translation and cultural adaptation, WOSI, Oxford Shoulder Instability Score, Walch-Duplay Score

### Introduction

The Western Ontario Shoulder Instability Index (WOSI), Oxford Shoulder Instability Score (OSIS) and Walch-Duplay Score (WD) are well known and easy to use questionnaires. They are disease specific and very sensitive tools for assessment patients with shoulder instability.

### Aim

The aim of this study was to translate into polish, culturally adapt to polish culture and validate WOSI, OSIS and WD.

### Material and methods

The WOSI, OSIS and WD underwent translation and cross-cultural adaptation to Polish in accordance with established guidelines. A total of 40 patients with unilateral anterior shoulder instability were included. The participants completed polish versions of WOSI, OSIS and a part of patient self assessment in WD (the rest of WD was filled in by a physician) and already adapted and validated scores: Disability of the Arm, Shoulder, and Hand (DASH) and the Short Form-36 (SF-36). 25 patients completed the three adapted forms second time after 2–14 days. Internal consistency, test-retest reliability and construct validity were calculated.

### Results

Internal consistency with a Cronbach-α was excellent for WOSI (0.96) and OSIS (0.83), and poor for WD (0.57). The test-retest reliability (intraclass correlation coefficient – ICC type 2.1) was excellent for WOSI (0.89) and OSIS (0.91) and moderate for WD (0.73).

The construct validity measured by correlation of WOSI, OSIS and WD with DASH and Section of Physical Functioning – SF-36 was significant statistically ($p > 0.05$) for all scores.

### Conclusion

The polish versions of WOSI, OSIS and WD are validated and reliable tools to apply for assessment of polish patients with shoulder instability.

# Brachial artery pseudoaneurysm in the form of "malignant tumor" as a complication of proximal humerus exostosis – case report

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**Keywords:** pseudoaneurysm, osteochondroma, malignant tumor, brachial artery, chondrosarcoma

## Introduction

Osteochondromas are mostly asymptomatic. More often they applies to lower extremity than the upper one.

We report a case of brachial artery pseudoaneurysm as a complication of humerus exostoses.

## Aim

The aim of this case is to present much less common complication of proximal humerus exostoses and stress the fact, that it was initially described and treated as malignant tumor.

## Material and methods

19-years old patient was admitted with acute pain of the left arm, which appeared a week earlier during arm swing. 8 years earlier he had been diagnosed with osteochondromas of left humerus.

Examination revealed palpable, non-painful tumor of the axilla area and posterior part of left arm, which coincided with localization of exostoses on radiography.

MRI demonstrated three osteochondromas, from the free end of one of them, it was spreading a big nodosum structure. Chondrosarcoma was suspected.

Samples were taken for histopathological examination, but lesion didn't look typical to chondrosarcoma.

After the surgery increased pulsations was observed around the operative area. USG revealed pseudoaneurysm of left brachial artery. Histopathologically there were no cancer cells, but deposits of heamosiderin.

Damaged part of brachial artery was grafted by saphenous vein, and osteochondroma was excised.

## Results

Patient recovered full function of the upper extremity. USG showed properly flow through the brachial artery and venous graft.

## Conclusion

In case of tumor in the area of osteochondroma, caused by trauma, the pseudoaneurysm should be suspected and must be planned proper diagnostic and therapeutic treatment. Unrecognized, it could cause a severe, life-threatening bleeding during the operation.

## Treatment Of The Rotator-Bicipital Complex With Ultrasound-Guided Platelet-Rich Plasma

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**Keywords:** Platelet-rich plasma, Rotator-Biciplital Complex

### Introduction

The problem of instability of biceps tendon and damages rotator cuff is wrongly paid little attention. Patients with this disorder are often treated unreasonably long and unsuccessfully with the diagnosis of periarthritis of the shoulder joint, and the knowledge of practitioners of this disease is extremely scarce.

### Aim

The aim of this study was to evaluate the results of treatment of patients with partial damages of the rotator-bicipital Complex.

### Material and methods

To perform the tasks of the study prospective and retrospective analyses of diagnostic methods and treatment of 14 patients were carried out in the period 2015–2017. The study had an open character.

The range of motion was assessed by the patients, provocative tests were carried out. Radiography was performed in 50% of MRI – 85.7%, US – 35.7%.

14 patients with symptomatic partial rotator cuff tears were treated with ultrasound guided platelet rich plasma injection.

### Results

The results of treatment were assessed using Rowe shoulder score. Among 14 patients with damage to the rotatory-bicipital complex treated with the developed approaches, 12 (85.7%) patients showed favorable results and distributed as follows: satisfactory – 1, well – 2, excellent – 9. Unsatisfactory results – 2 (14.2%) subsequently underwent surgical treatment.

### Conclusion

This study succeeded in demonstrating that those patients receiving with ultrasound guided platelet rich plasma injection have superior functional outcomes.

## The ultrastructure of the LHBT in tendinopathy process and its possible clinical implications

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**Keywords:** LHBT, biceps, tendinopathy electron microscope

Tendinopathy of the long head of the biceps tendon (LHBT) is a common source of pain in the anterior shoulder area. The ultrastructural alterations related to its tendinopathy have not been yet well described since most basic science studies focused on the Achilles tendon pathology.

**Aim**

The purpose was to study the ultrastructure of the LHBT in the process of the advanced tendinopathy by electron microscope.

**Material and methods**

This study included 4 subjects isolated from 39 patients group treated due to pre-operatively diagnosed LHBT tendinopathy. All patients underwent a shoulder arthroscopy assisted biceps tenodesis or tenotomy and microscopic analysis of the intra-articular part of the LHBT was carried out. The ultrastructure of a series of the LHBT fragments was examined using the transmission electron microscope (TEM); the examination was focused on the morphology of tenocytes and collagen.

**Results**

The ultrastructure of the LHBT samples was deeply altered. Tenocytes were randomly spreaded, enlarged, with deformed shaped. The collagen architecture was completely disrupted and disorganized with essential replacement by non-collagen matrix. Moreover the presence of apoptotic-like features in tenocytes was observed.

**Conclusion**

The LHBT samples have been deeply transformed in relation to their macrostructure, microstructure, and ultrastructure. Alterations to the collagen component impairs the process of the energy absorption and facilitates the development of tendinopathy. Deformation of the tenocytes interferes the mechanotransduction, proper remodeling process and full recovery of the tendinous tissue. Findings regarding apoptosis should be further explored and may be the possible key to resolve the tendinopathy issue.

## Pilates machines. New physiotherapy conception after orthopedic and traumatic cases

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**Keywords:** Pilates Machines, Fracture, Orthopedic, Physiotherapy, Concept

### Introduction

The basic idea for the selection and application of Pilates machines in restoring this type of problems is therapeutic concept of Joseph Pilates. This is a method for applying an elastic resistance by means of springs. Developed by Joseph Pilates, an American physiotherapist in 1926 for the recovery of patients placed in a hospital bed. Based on the idea of control muscles, opponent is indiscriminate movements that are a major cause of trauma. Since then this authentic methodology continues to work with great success. This success is due to the unique design of the machines do not permit the inclusion of compensatory movements and substitutes mechanisms. The use of special springs allows for the application of different elastic resistance depending on the individual features of the patient without pain.

### Aim

To present our innovative atraumatic method contributes to more effective early recovery.

### Material and methods

For a period of 12 months are followed 8 pts, ( 25–65). 1 pts.-Monteggia fracture,1pts-TSA, 3 pts.-transcondylar fracture, 1pts.-open fracture of the ulna, 2 pts.-radial head fracture. All patients are treated surgically in Emergency Hospital "Pirogov" Sofia. Early Physiotherapy program started on 7th postoperative day. The program includes special methods on Pilates Machines (Cadillac, Reformer, Core Align, Wunda Chair).

### Results

All patients were evaluated with different score according to their functional disability. ROM, MEPS, DASH – at 1st, 3rd , 6th months.

### Conclusion

We observed that physiotherapy conception with Pilates Machines gives the opportunities to improved muscles strength, soft tissue elasticity and ROM. All patients returned to work and sports activities, lack of pain.

INSTRUCTIONS FOR AUTHORS

**Submitting text**

Papers should be sent to Editorial Office at:

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This guide examines case studies, a form of qualitative descriptive research that is used to look at individuals, a small group of participants, or a group as a whole. Researchers collect data about participants using participant and direct observations, interviews, protocols, tests, examinations of records, and collections of writing samples. Starting with a definition of the case study, the guide moves to a brief history of this research method. Using several well documented case studies, the guide then looks

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## Acknowledgements

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**Elhassan, B., Bishop, A., Shin A., Spinner, R.** (2010) *'Shoulder tendon transfer options for adult patients with brachial plexus injury.'* J Hand Surg Am., 35 (7), pp. 1211–1219.

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Books:

**Rang, H.P., Dale, M.M., Ritter, J.M., Moore,** *P.K. Pharmacology.* 5th Ed. Edinburgh: Churchill Livingstone; 2003.

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*Przykłady:*

Artykuł z czasopisma:

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Książki

**Rang, H.P., Dale, M.M., Ritter, J.M., Moore,** *P.K. Pharmacology.* 5th Ed. Edinburgh: Churchill Livingstone; 2003.

**Phillips, S.J., Whisnant,** *J.P. Hypertension and stroke.* In: Laragh JH, Brenner BM, Editors. Hypertension: pathophysiology, diagnosis, and management. 2nd Ed. New York: Raven Press; 1995. pp. 465–478.

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