Issue-1: ORTHOPEDICS

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Orthopedicians treat an array of disease conditions including fractures, dislocations, low back pain, and bone disorders that are often debilitating for the patients and have an adverse impact on their day to day functionality. Thus, comprehensive management that diminishes patient suffering and improves their quality of life is a necessity. Clinical management oftentimes involves multimodal interventions with pharmacotherapy as one of the cornerstone. It is usually directed towards achieving pain relief, alleviating underlying inflammation, and symptom control with minimal adverse effects. This scientific input will cover various aspects of different orthopedic conditions commonly encountered by the clinicians in their practice. It will keep the readers abreast about the latest information and developments. It is a precise coverage rich in scientific value and filled with images and tables. We sincerely hope this education initiative will provide useful insight to improve overall patient health.

In the treatment of intra-articular Salter-Harris (SH) fractures, the aim is to minimize the level of injury in the physeal plate and complete the fracture recovery in a usual way close to perfection. A need always exists for an anatomical reduction with surgical treatment to reduce the poor prognosis of these fractures and prevent possible deformities. Even if an open reduction for SH type 4 fracture is performed almost immediately, no biomechanical evidence is available other than a few studies on how fracture fixation is affected and how it affects the growth of cartilage under load.

SHOULD WE REALLY COMPRESS THE FRACTURE LINE IN THE TREATMENT OF SALTER–HARRIS TYPE 4 DISTAL FEMORAL FRACTURES? A BIOMECHANICAL STUDY

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Salter and Harris (SH) described two main types of physeal plates: pressure epiphysis and traction epiphysis. Pressure epiphyses are found at the end of long bones and provide longitudinal growth. It is intra-articular and weight bearing. In contrast, the traction epiphyses are located in the root or attachment region of the muscles and provide appositional growth. They are extra-articular and do not bear weight [1, 2]. The layers of the pressure physis plate have four regions. The first one is closest to the epiphysis, which contains resting cells and inactive chondroblasts; it is called the "resting zone." The metaphysial side of this region is the second region with more active chondrocytes producing extracellular matrix proteins; it is called the "proliferative zone." The third region, the "hypertrophic zone," is the layer where extracellular matrix proteins are less produced; it includes larger and organized chondrocytes. The hypertrophic layer is divided into sublayers called "maturation, degeneration and provisional calcification regions." The provisional calcification region has a transition area including calcified and non-calcified extracellular matrix proteins, which makes this area the weakest region. Histologically, SH mentioned that the physeal separation and fracture propagation typically occur in this area [2, 3]. The fourth region is called the "calcification zone" where the cartilage is calcified and the bone is remodeled [3]. In 1963, SH described five types of growth cartilage injury. SH classification helps to

estimate both the prognosis and the growth potential. SH reported that the separation of the physeal plate in type 1 and 2 injuries occurs between the provisional calcification region, which is the weakest region of the four regions it contains, and the calcification region. The good prognosis in these two types is usually thought to be associated with the case that this fracture zone does not include the proliferative region where the original growth cells are located, and therefore, the blood vessels feeding this layer are not injured. On the contrary, the bad prognosis was seen in type 3 and 4 fractures because they penetrate the proliferative layer. Moreover, the crushing of the growth cartilage in type 5 fracture has the worst prognosis because of death of the growth cells and termination of growth [1, 2]. Distal femoral physeal fractures occur for just over 5% of all physeal injuries [4] with complications that require a secondary surgery 40–60% of the time [5]. In SH type 4 fracture, the fracture line goes through the epiphysis and the physis with a section of metaphysis (Fig. 1).

In the treatment of intra-articular SH fractures, the aim is to minimize the level of injury in the physeal plate and complete the fracture recovery in a usual way close to perfection. A need always exists for an anatomical reduction with surgical treatment to reduce the poor prognosis of these fractures and prevent possible deformities [6–8]. Even if an open reduction for SH type 4 fracture is performed almost immediately, no biomechanical evidence is available other than a few studies on how fracture fixation is affected and how it affects the growth of cartilage under load [9]. The fixation generally can be achieved with screws or smooth Kirschner wires which passes through the metaphysis and rarely with plates such as pediatric physeal slide-traction plate (PPSP) when fracture is comminuted [10, 11]. It has been generally mentioned that the physis line should not be passed during implantation and partial fluted screws and optional ferrules should be used for the compression of the fracture [1, 7, 12, 13]. Damage to the physeal plate must be avoided during implantation. Otherwise, asymmetric growth can occur. The literature shows that the compression between fractures increases stability and consequently positively affects the rate of blood buildup and increases the rate of bone union. On the contrary, it has been noted that too much compression may lead to loosening of the screw and, thus, different complications may occur [14]. The present study searched for an answer to the question of how the compression impacted the physis line in a fracture site during the fixation made for an SH type 4 fracture. The results showed that the screw head began to compress the fracture line as soon as it rested on the bone cortex, and the rotation and impulse momentum led to a contusion in the physeal plate. If the distal femur physeal plate was transversely shaped in a straight line, it could only be shear stress, but it was observed that the wavy structure of the physeal plate created a compression stress in the physis. Theoretically, when a fracture line is compressed with a screw, an SH type 4 fracture is converted into an SH type 5 fracture with a worse prognosis and SH type 1 fracture with shear effect. If it is thought that the worst prognosis of the epiphysis fracture is the pressure on the physeal plate, the excessive stress may support bone formation and deformity and lead to some irreversible negative consequences such as avascular necrosis after the deterioration of blood circulation [1]. Although this situation may depend on many factors, it is directly related to the fixation pattern and technique [5]. Although classical textbooks noted that the compression should be applied in such fractures, this study was performed using the finite element method. Other experimental studies considering minimal changes have shown that this intervention creates an additional iatrogenic injury in the physeal line [7].

> *“Theoretically, when a fracture line is compressed with a screw, a Salter-Harris type 4 fracture is converted into a Salter-Harris type 5 fracture with a worse prognosis and Salter-Harris type 1 fracture with shear effect.*

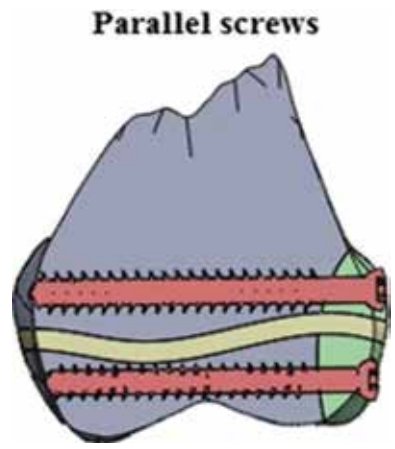

Fig. 1: Parallel screws configuration for SH type 4 fracture.

Also union of fractures is related to many factors such as being open or closed, age or mechanism of injury, and the other main factor is the interfragmentary compression. A consensus exists in many studies, which indicates the positive effect of compression between the fracture components. Besides the treatment of adults, interfragmentary compression is also recommended in pediatric fractures, especially physeal fractures. Epiphyseal fracture of the distal femur has a high risk, especially in terms of growth interruption and other complications [15–18]. The factors leading to this condition include type of the fracture, degree of dislocation, undulating structure of the physis and quality of fracture reduction with the fixation shape [19–21]. When the histology was viewed, physeal bar formation (bone bridge in physis) was found to be mainly responsible for angulation at the fracture line and growth complications [6, 19–21]. Generally, screws are used for treating SH type 4 distal femoral epiphyseal fractures. Also, the compression of the fracture line with partially threaded screws is recommended during fixation [7]. The compression of fracture line may reflect additional injury to the physis because of the undulating structure of the physis in distal femur. The treatment objectives were specified even for this type of fracture to achieve anatomical reduction and avoid additional injury to the physis; which is the safe technique and is not yet

Table 1: The bone screwing process parameters.

Screw dia Ø (mm)	Pitch (mm)	RPM (rev/min)	Feed rate (mm/min)
M4	1.75	100–200	125

defined [6, 9, 12, 19]. This study investigated the indirect effect on the physeal plate during the interfragmentary compression of SH type 4 distal femoral fractures. The aim of the study was to define the biomechanical effects on the epiphyseal plate while compressing the fracture line with partially threaded screws after reduction and decide whether a probability of iatrogenic injury to the physeal plate existed.

Computer-aided Finite Element Analysis and Modeling

A 3D of biologic models is very popular in nowadays. Data such as magnetic resonance imaging (MRI) and multislice computed tomography (CT) can be processed by using 3D modeling. The computer-aided numerical analysis to the distal femoral fracture line and physeal plate after reduction during fixation was performed using ANSYS Workbench software based on finite element method (FEM). FEM is very important in the development of new surgical techniques. It is also used as a reliable technique for validation of experimental or analytical results. In addition, several scientists similarly examined the optimal configuration, implant materials, fatigue behavior of implant materials, metal turning, bone drilling and bone screwing process using the computer-aided FEA tool [22–28].

Surgery Procedure

The bone screwing processes were performed on the sawbones samples. A CNC machine with 2.5 kW power was used for the bone screwing processes. M4 × 1.75 × 22 screw was used for parallel configuration of SH type 4 fractures. Generally, in orthopedic surgery, a drilling process (2.5-mm drill bit) was applied to screwing zone before the bone screwing processes. A Kistler 9257B dynamometer was used to measure the screwing moment and thrust force.

The bone screwing process parameters are given in Table 1.

3D Modeling

A 3D scanner was used to obtain the point cloud of child human femoral model. Geomagic Studio 10 software was modeled as 3D using point cloud data. The diameter of partially threaded screw used

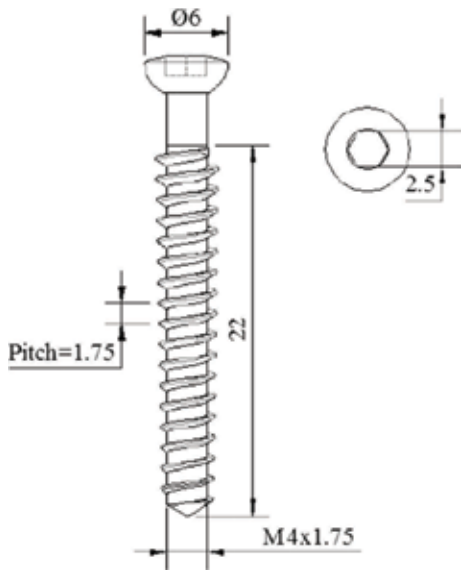

Fig. 2: Ø4 × 1.75 × 22 screw.

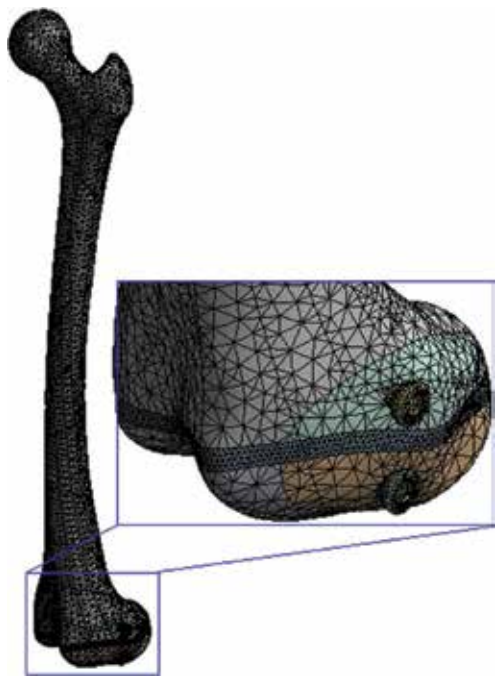

Fig. 3: Mesh structure of screw configuration.

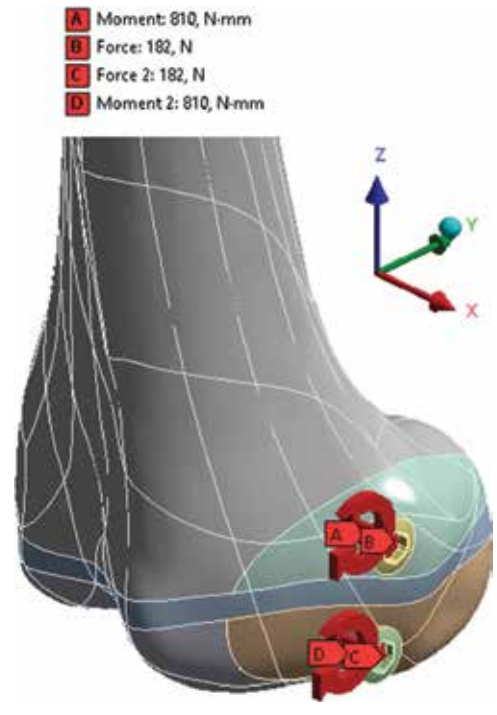

Fig. 4: The loading types for parallel screw configurations.

in configuration was M4 × 1.75 × 22 screw (Fig. 2). The bone screws were provided via orthopaedic-implants.com. Tapping process was not applied before the screwing process.

Loading and Boundary Conditions

The mesh process was performed using tetrahedrons finite element for FEA modeling after importing single configuration of 3D models into ANSYS Workbench software (Fig. 3). FEA model has 264,697 nodes and 166,285 elements. While the mesh density for femur and femur fragments was aided as 1 mm, that for the physeal plate and screw was inputted as 0.5 mm. A moment of 810 Nmm around the Z axis in CW of the screw was applied to the screw head, and a force of 182 N was applied to the screw head. Both screws applied the boundary conditions (Fig. 4). It was fixed from the distal femoral condyles. Transient structural analysis type was selected for the parallel screws configuration for SH type 4 fracture. The force of 182 N was applied at the end of the screwing process to apply the actual surgical process. The contact types between bone and bone interaction, and screw and bone interaction were defined as a frictional contact. Friction coefficients were taken as 0.46 for bone and bone interactions and 0.42 for screw and bone interaction, respectively [29]. The frictionless contact type was selected among the physeal plates. Besides, the bonded contact type was selected, i.e., between bone and physeal plates [30]. Finally, convergent analysis was performed. This is very important for correct analyses.

Material Model

Table 2 shows the mechanical properties of bone and physeal plates. The stainless steel was used for screws used in FEA. ANSYS Workbench Material Library used the mechanical properties of screw [31]. The material model of the mechanical behaviors of bone, physeal plate and screw was selected as linear isotropic material model in this analysis. The physeal plate was assumed as soft tissue.

Results and Discussion

In the literature, behavioral loads under ductile materials such as cartilage have been calculated according to the von Mises damage

criterion. A three-dimensional finite element analysis was carried out to investigate the effect of varying the high tibial osteotomy correction angle on the stress distribution in both compartments of the human knee joint by Trad *et al.* [35]. The maximum von Mises stresses in articular cartilages were obtained to see overall stress distribution. Atmaca *et al.* [36] analyzed the loading on the tibial articular cartilage following medial meniscectomy performed in various locations and extents, as well as in the healthy knee, via finite element analyses on the solid models. von Mises was selected as damage criteria for cartilage. Wang *et al.* [37] compared the stress distributions on knee joint cartilage between kneeling and standing positions. The finite element models for both postures were presented, and the mechanical status of the cartilage was investigated. The models were established from magnetic resonance (MR) images of the same subject and assigned with identical material properties. In many papers in the literature, von Mises damage criteria were used because meniscus and soft tissues

> *According to the Salter-Harris classification, while type I and II fractures can be treated by closed methods, type III and IV fractures mostly need open reduction and internal fixation.*

exhibit ductile material properties.

After entering the loading and boundary conditions, FE analyses were solved. The maximum stresses are given in Table 3 for different damage criteria. These stresses were presented as image in Fig. 5 (von Mises), Fig. 6 (Tresca) and Fig. 7 (minimum principal). The maximum von Mises stress in physeal plate was calculated as 1.30 MPa. The maximum von Mises stress in screw and fragments was calculated as 12,931 MPa and 190.31 MPa, respectively. The maximum Tresca stress in physeal plate was calculated as 0.749 MPa. The maximum Tresca stress in screw and fragments was calculated as 6862.80 MPa and 105.01 MPa, respectively. The maximum/minimum principal stress in physeal plate was calculated as 0.36 MPa. The maximum/minimum principal stress

Table 2: Mechanical properties of screw, bone and physeal plate used in FEA [32–34].

Parameters	Bone	Physeal plate	Stainless steel
Density (kg m^{-3})	2100	1000	7750
Young's modulus (MPa)	17,000	5	193,000
Yield strength (MPa)	135		207
Ultimate strength (MPa)	148		586
Poisson's ratio	0.35	0.46	0.31

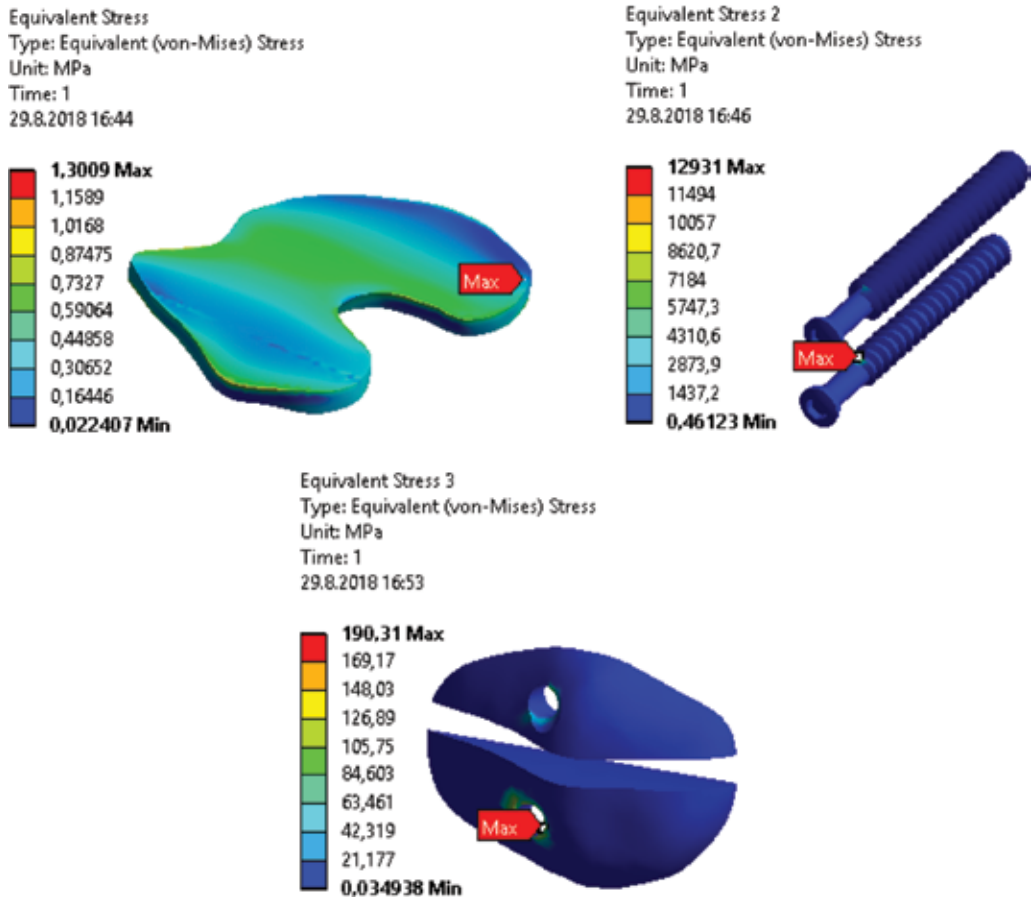

Fig. 5: von Mises stresses.

in screw and fragments was calculated as 492.28 MPa and 29.44 MPa, respectively. As seen in Table 3, stresses in physeal plate are smaller than stresses in screw and fragments. This indicates that a great majority of the stresses on the physeal plate are absorbed by screws. Even if these stress values in physeal plate are very small, physeal plate is affected by stresses. Williams *et al.* [38] researched physis properties for 5-month bovine. They found ultimate stress value to be 1.36 MPa. We found the maximum von Mises stress in physeal plate to be 1.30 MPa. Even at these values, the epiphyseal plate is likely to be damaged. Also you can see minimum principal stresses in Fig. 7. The minimum principal stresses show compressive stress better. The compressive stresses occur on the wavy surface of the epiphyseal plate. This confirms our analysis, and minimum principal stresses show the compression stresses better than von Mises.

According to the SH classification, while type I and II fractures can be treated

Table 3: The stress values in different damage criteria.

No.	Damage criteria	Stress distributions		
		Physeal plate (MPa)	Screw (MPa)	Fragments
1	von Mises	1.30	12,931	190.31
2	Tresca	0.749	6862.80	105.01
3	Minimum principal stress	0.36	492.28	29.44

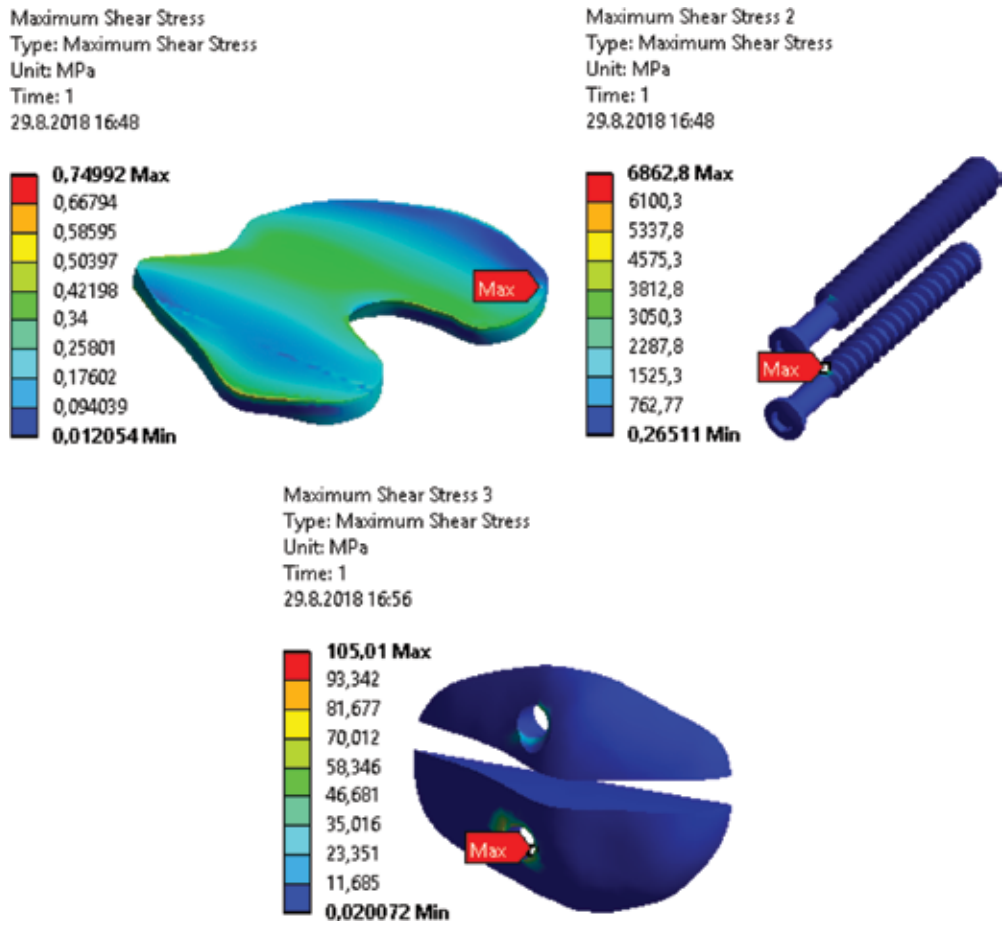

Fig. 6: Tresca stresses.

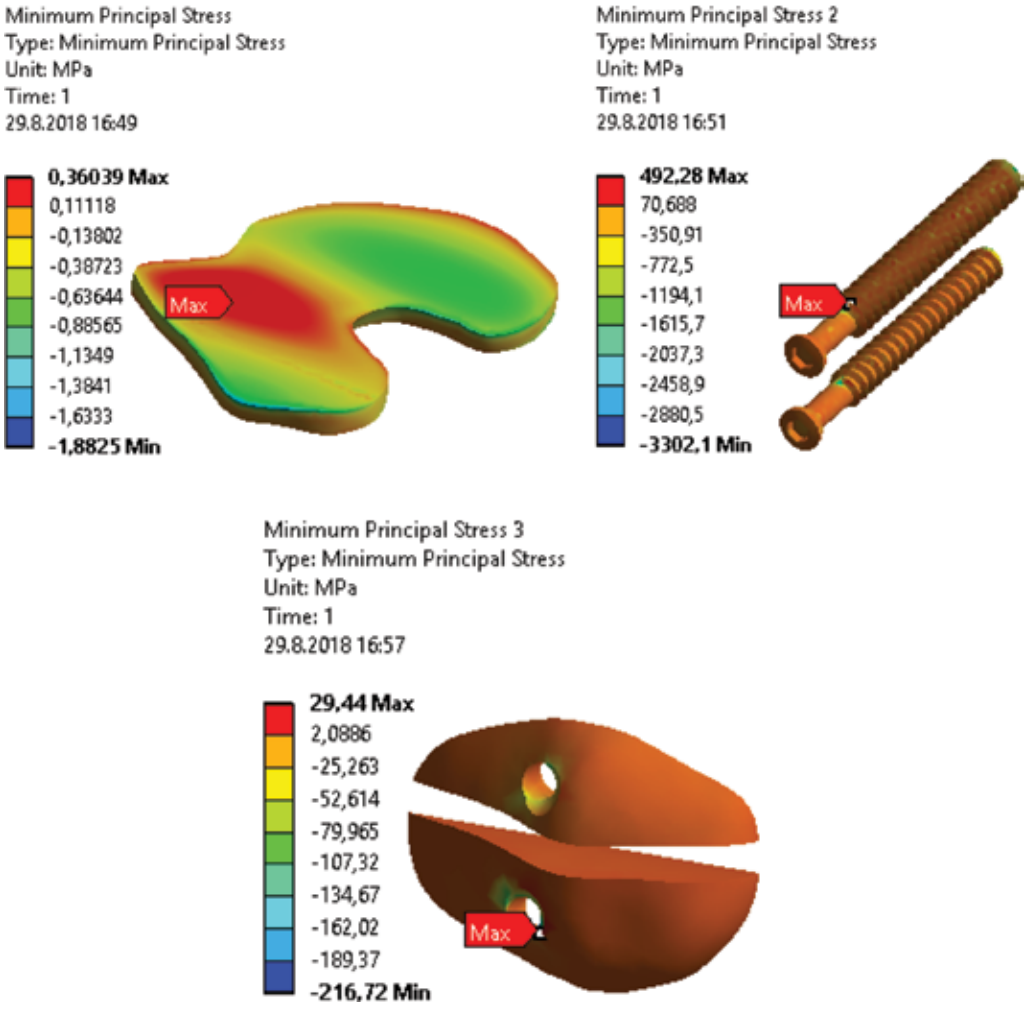

Fig. 7: Minimum principal stresses.

by closed methods, type III and IV fractures mostly need open reduction and internal fixation. Generally, anatomic reduction of physeal plate with fracture and stable fixation maintain normal physeal growth and good articular surface. Particularly at the distal femoral region, even type II fractures can cause physeal growth arrest and angular deformity, so that reduction maneuvers must be applied gently and avoid further physeal damage. At this region, type III–IV fractures have higher incidence of physeal arrest and must be treated with open reduction and internal fixation because closed reduction can cause physeal bar due to loss of reduction [39–42]. At the surgery for type IV fractures, two parallel Kirschner wires or screws must be chosen for fixation instead of Kirschner wires or screws passing physis in order to avoid causing physeal bar. In order to protect physis from any kind of extra injury while maintaining stabile fixation at the surgery, taking care for forced compression of the fracture can be important and valuable. In our experimental model, we tried to investigate

At the surgery for type IV fracture, two parallel Kirschner wires or screws must be chosen for fixation instead of Kirschner wires or screws passing physis in order to avoid causing physeal bar.

this issue.

Since SH classification and displacement of the fracture are absolute predictors of the final outcome, Arkader *et al.* reported in their study that the treatment method can affect the final outcome [9]. Pennock *et al.* used the lag screw technique for type III and IV distal femur fractures with a high long-term success rate [43].

Regarding materials, the bone is accepted as a linear isotropic and homogeneous as cortical bone. But in fact it is anisotropic and heterogeneous; some of this area is cortical, and other is cancellous bone. We believe that this situation is a limitation of our study, and also application of this situation to this area

> *Although compression in the fracture line is a desirable condition in classical fractures that do not affect the growth cartilage, here it is not recommended in the surgical treatment of fractures involving growth cartilage of the distal femur.*

is very difficult in FEA technically. In this region because of its growth, the amount of cortical and cancellous bones always changes. Although this region is a mixture of cortical, cancellous bone and physis, we researched the indirect effect on the wavy structure of physis by compressing the screw. We think that the compression in fracture line can be measured by overlooking the anisotropic structure. For this reason, we accept it as homogeneous except the physis. The growth plate is not a trabecular or cortical bone. It is an area of cells where mainly soft tissue (collagen, etc.) processes to the bone just near the physis. The other limitation of our study we believe is that how much force kills the cells in proliferative layer. We do not have knowledge about this issue. We mentioned that cells die when compression occurs axially in SH type 5 fracture. What the amount of force is? Or anything, unknown, we did not find any explanation on this aspect. But in our study we believe that can say "do not compress the fracture line" because this force changes to axial load on physis may be causing cell die like SH type 5 injury, "only place the screws to protect the reduction position of fracture."

There are two ways of fixation methods on fracture line without compressing it. The first one is described here by using partially thread screw without rotating its head when it touches the bone, and the other one is using full threaded screws. After reduction of the fracture line, screws can be used in one of these ways.

Although compression in the fracture line is a desirable condition in classical fractures that do not affect the growth cartilage, here it is not recommended in the surgical treatment of fractures involving growth cartilage of the distal femur. It is believed that only position protection with a screw after an anatomic reduction works. Moreover, the prediction of how the prognosis of growth cartilage fractures occurs should be done by considering the implant and compression. In addition, although this is an ex vivo simulation study, it must be assumed that comparison of in vivo studies must be made to ratify such beliefs.

Conclusions

We know that FEA is a powerful simulation tool and results must be validated by in vivo studies. Since there is no study regarding the real physeal effect about the application of screw by compressing it in vivo, we believe that results from this simulation model indicate that additional iatrogenic physeal injury occurs. Here, we took attention on wavy structure of distal femoral physis and fixation of fracture; especially, compression by screws can affect the physis.

The physeal plate is affected from von Mises, Tresca or principal stresses under the any force or moment. In biomechanical stresses, a great majority of the stresses on the physeal plate are absorbed by screws. Even if these stress values in epiphyseal plate are very small, the epiphyseal plate is likely to be damaged. Therefore, types and strength of materials such as screw used in this type of application are very important with regard to damage of bone or soft tissues. Also, you can see effects using different damage criteria. Especially, the minimum principal stresses show compressive stress better. The compressive stresses occur on the wavy surface of the epiphyseal plate. This confirms our analysis and indicates that minimum principal stresses show the compression stresses better than von Mises.

The present study found that compression in SH type 4 fractures of the distal femur created an additional stress load on the physeal plate. It is believed that screws need to be fixed without compression to avoid an additional iatrogenic physeal injury. We also believe that to find the in vivo real effect on physeal plate during compression is very difficult without applying any simulation model. Because when we think that physeal plate is very thin, the application of strain or stress gauges to this area is very difficult. Since it is premature to state that compression created an additional stress load on the physeal plate in vivo, according to our results, it has been found that lateromedial compression in SH type 4 fracture of the distal femur caused an additional stress load on the physeal plate ex vivo.

Compliance with ethical standards

Conflict of interest: There is no conflict of interest any financial funding or materials in the manuscript.

Ethical approval: Not required for used sawbones samples in this study.

References available on request
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Acute gouty arthritis is the most common form of inflammatory joint disease. The primary symptom of acute gout is pain. Optimal therapy is directed at controlling inflammation and analgesia. The aim is to study the efficacy and safety of etoricoxib in the treatment of acute gout, as compared with non-steroidal anti-inflammatory drugs (NSAIDs).

EFFICACY AND SAFETY OF ETORICOXIB COMPARED WITH NSAIDs IN ACUTE GOUT: A SYSTEMATIC REVIEW AND A META-ANALYSIS

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Acute gouty arthritis is the most common form of inflammatory joint disease in males over 40 years [1]. It is estimated that 0.5–2.8 % of males have suffered from this disease, while there is a lower incidence among females [2]. One third of female patients suffering from gout are premenopausal and have an unexpectedly high prevalence of lithiasis [3]. Epidemiologic evidence suggests that the incidence of gout is steadily increasing and is connected with longevity, obesity, coexisting comorbidities, and iatrogenic causes that contribute to hyperuricemia such as diuretic use [4]. The prevalence is much higher among individuals with a positive family history [2], but the precise mechanism is unclear. The primary symptom of acute gouty arthritis is pain and typically involves smaller appendicular joints like the metatarsophalangeal joints [5]. Therapy is directed at controlling inflammation and relieving joint pain [6]. Treatments aimed at modulating the inflammatory process have changed little over the last 40 years [7], and there are still limitations in controlling inflammation and relieving pain. In 2012, the American College of Rheumatology Guidelines for Management of Gout [8] recommended multiple modalities (non-steroidal anti-inflammatory drugs [NSAIDs], corticosteroids by different routes, and oral colchicines) as appropriate initial therapeutic options for acute gout attacks. For NSAIDs, they recommend naproxen, indomethacin, and sulindac. However, the guidelines do not recommend a specific NSAID for first-line treatment, cyclooxygenase 2 (COX-2) inhibitors are an option for patients with gastrointestinal contraindications or intolerance to NSAIDs. Several randomized controlled trials (RCTs) have been published that support the efficacy of COX-2 inhibitors like etoricoxib, lumiracoxib, and celecoxib [9–11]. However, there is still not much evidence to indicate efficacy of these

treatments. Etoricoxib is a new highly selective COX-2 inhibitor [12, 13] that has shown anti-inflammatory, analgesic, and antipyretic activities in models of acute and chronic pain and inflammation, and it has better GI tolerability compared to NSAIDs [14–16]. We performed a systematic review and meta-analysis to study the efficacy and safety of etoricoxib in the treatment of acute gout, as compared to NSAIDs.

Materials and Methods

Literature Search

We conducted a computerized search of electronic databases: PubMed, EMBASE, Web of Science, China Biology Medicine disc, and Cochrane Library. The search terms were as follows: gout, etoricoxib, indomethacin diclofenac, and NSAIDs. Articles were searched from 1983 until August 2014. A manual search of peer-reviewed English documents was performed by cross-checking the bibliographies of selected studies. If multiple articles of the same patient population were identified, we only included the published report with the largest sample size. We did not search for unpublished investigations.

Inclusion and Exclusion Criteria

We included articles with patients diagnosed according to the American Rheumatology Association diagnostic criteria for acute gout [17]. Articles were excluded if they were editorials, observational studies, case reports, author replies, review articles, opinions, comments, or any other non-RCTs. Studies not pertinent to gout, hyperuricemia, or tophus were excluded. Studies that included other arthritic diseases that could confound or interfere with efficacy evaluations or those that did not report clinical outcomes were also excluded.

Data Analysis

Data extraction was performed by SZ and checked by JW using a predefined data extraction form. Discrepancies were resolved by discussion between reviewers. For each study, reviewers extracted data that were deemed to potentially impact efficacy outcomes, such as study population (percent women, mean age, and severity of gout arthritis), study design (duration, concomitant analgesic use, and intervention method), and outcomes (patient's assessment of pain, tenderness and swelling score at endpoint, and change from baseline with measures of variance; adverse events). Two authors (SZ and YZ) assessed included articles independently and used the "assessing risk of bias" tool recommended in the Cochrane Handbook 5.0.2 to evaluate the risk of bias of included trials. The tool assesses factors including random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other biases. Another two authors (ZW and LP) settled disputes when there was no consensus.

For continuous outcomes, we pooled data with the weighted mean difference (WMD) of the final value across groups. For dichotomous data, we calculated the relative risks (RRs) and 95 % confidence interval (CI) for each study. The meta-analysis was performed on data extracted from the studies. If the standard deviations (SDs) were not reported, we calculated the SD with the 95 % CI. Before data analysis, the Q statistic was calculated to assess heterogeneity. We used the fixed effect model when the effects were assumed to be homogenous ($p > 0.05$) and the random effect model when they were heterogeneous ($p < 0.05$). All statistical tests and risk of bias were calculated with RevMan 5.2 (Cochrane Collaboration, London, UK).

> "*Cyclooxygenase 2 (COX-2) inhibitors are an option for patients with gastrointestinal contraindications or intolerance to NSAIDs.*

Results

Identification and Selection of Studies

A total of 165 records (86 from EMBASE, 5 from Cochrane Library, 13 from PubMed MEDLINE, 44 from Web of Science, 16 from China Biology Medicine disc, and 1 identified from other sources) were obtained from the initial search. All studies were selected strictly according to the criteria described. After 41 duplicates, 73 reviews, 11 conference papers, 4 case reports, 4 short surveys, 4 notes, and 3 editorials were removed. Twenty-five studies remained for the full-text review. Nineteen studies were ultimately excluded because they are not related to acute gout or the control group did not take NSAIDs. Finally, six trials were included [9, 18–22]. The selection process and reasons for exclusion are summarized in Fig. 1.

Description and Quality of Studies

In three articles [9, 18, 19] directly comparing etoricoxib and indomethacin for the treatment of acute gout, all trials reported pain relief (patients' personal assessments of pain in the study joint on a 0–4-point scale) as the primary outcome. Tenderness, swelling, patients' global assessments of response to treatment, and investigators' global assessments of response to treatment were reported as the secondary outcomes. Another three [20–22] were comparing etoricoxib and diclofenac for the treatment of acute gout, two trials [20, 21] assessed pain relief by a visual analogue scale, and another one was [22] assessed by the criteria of Mazur (1979). Both six articles reported adverse events for safety assessment. Six articles were included in this meta-analysis. Studies were evaluated with the "assessing risk of bias" tool, and results are summarized in Fig. 2.

All studies aimed to assess the efficacy and safety of etoricoxib for the treatment of acute gout. The control group in each study was indomethacin and diclofenac. All eligible patients were 18 years or older with acute gout associated with moderate, severe, or extreme pain and meeting the American Rheumatology Association diagnostic criteria for acute gout [17]. The three studies included 851 patients. Etoricoxib, indomethacin, and diclofenac were not the only drugs given to patients. Patients could take low-dose aspirin (<325 mg daily), allopurinol if taken for at least two weeks before the trials, and colchicines (<1.2 mg daily) if taken at a stable dose for more than 30 days before the trials. Studies were not included if patients were allowed any other NSAIDs or analgesics within 48 h before baseline assessments, within six hours of baseline assessments, or for the duration of the study. The demographic characteristics of patients are summarized in Table 1.

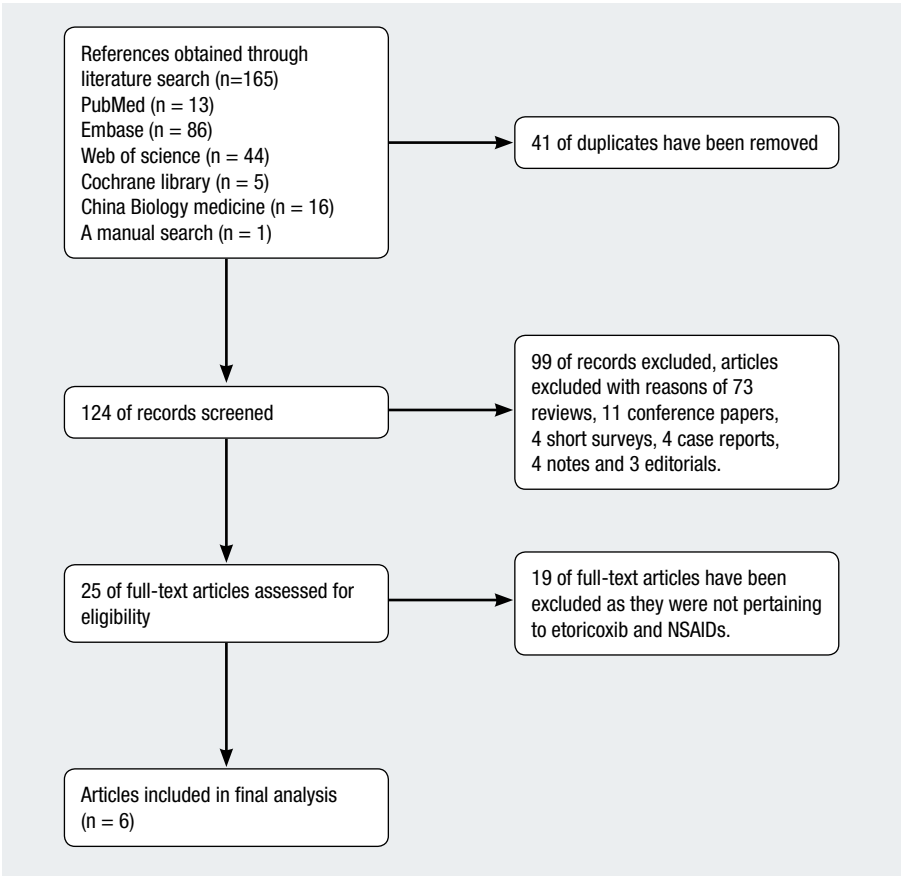

Fig. 1: Flow chart summarizing trial selection process.

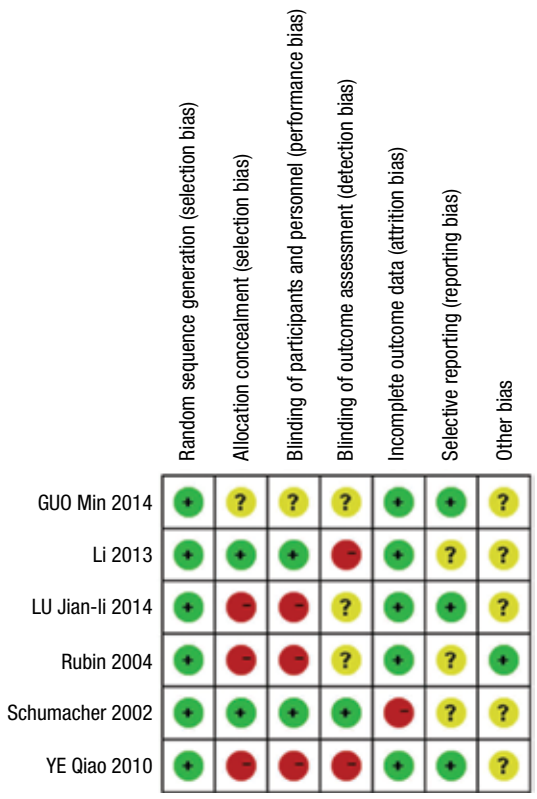

Fig. 2: Risk of bias assessment of included studies.

Efficacy of the Etoricoxib

We assessed the efficacy of etoricoxib in the treatment of acute gout by the patient's assessment of pain, investigator's assessed tenderness of study joints and swelling, patient's global assessments of response to treatment, and investigators global assessments of response to treatment. Because of high heterogeneity, for assessment of pain, the data cannot be analyzed together. Three studies [9, 18, 19] measured the pain intensity with a 0–4-point scale for 5 days, and two studies [20, 21] measured the pain relief by a visual analogue scale for 7 days, with the overall pooled WMD of −0.10 (95% CI: −0.25 to 0.06, $p = 0.22$) and −0.46 (95% CI: −0.51 to −0.41, $p < 0.00001$) as summarized in Fig. 3. It has revealed a different outcome.

For the remaining four outcomes, only three articles [9, 18, 19] have available data; we made a meta-analysis, and there were overall pooled WMDs of −0.14 (95% CI: −0.31 to 0.03, $p = 0.11$), −0.16 (95% CI: −0.33 to 0.02, $p = 0.08$), −0.10 (95% CI: −0.28 to 0.07, $p = 0.26$), and −0.29 (95% CI: −0.46 to −0.11, $p = 0.26$), respectively. There was no significant difference between the two interventions, as shown in Fig. 4.

Safety of Etoricoxib

Safety assessment for the interventions was calculated by pooling relative data. Adverse events (AEs) were reported in each trial, including any AE, drug-related AEs, and serious AEs. For any AE, the pooled RR value was 0.77 (95% CI: 0.64 to 0.93, $p = 0.006$). For drug-related AEs, the pooled RR was 0.64 (95% CI: 0.50 to 0.81, $p = 0.0003$). There was a significant difference between the two interventions for drug-related AEs. The etoricoxib group had fewer AEs than the NSAID group. For serious AEs, the pooled RR was 0.42 (95% CI: 0.09 to 1.93, $p = 0.27$) (Fig. 5).

Drug-related AEs included abdominal distention, diarrhea, stomachache, dizziness, chills, fever, edema of the legs or feet, erythema, or cardiovascular symptoms. The most disparate among the groups were dizziness and gastrointestinal side effects. The pooled RR for the gastrointestinal AE was 0.42 (95% CI: 0.27 to 0.66, $p = 0.0002$), which was significantly different between the two interventions. Patients tolerated the etoricoxib better than those in the NSAID group as shown in Fig. 6. For dizziness, because of the deficient data, we only pooled two trials [19, 9] and found a pooled RR value of 0.37 (95% CI: 0.16 to 0.85, $p = 0.02$). Dizziness was significantly more common in the indomethacin group than in the etoricoxib group as shown in Fig. 6.

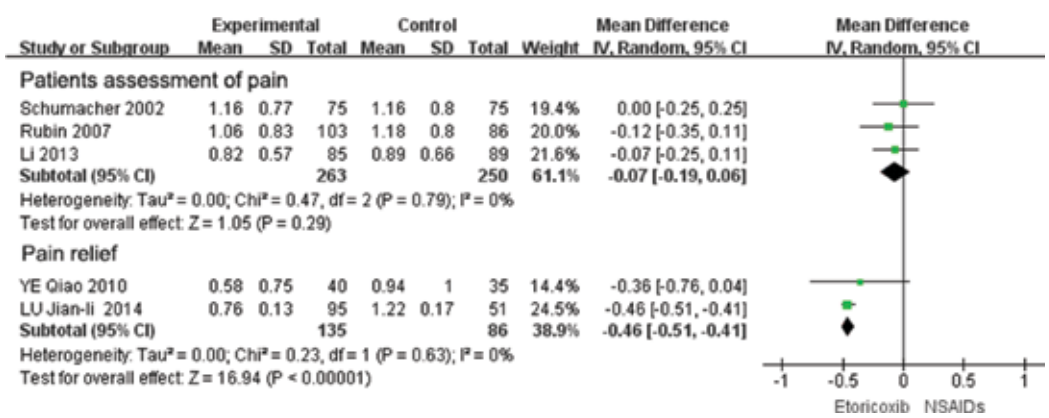

Fig. 3: Forest plot of mean difference in patient-assessed pain in the study joint and 95 % CI for 2–5 days follow-up.

Table 1: Description of the studies included in the meta-analysis.

Author, year	Study design	SS	Age EG/CG	Gender (male/female)	Severity of disease	Intervention method EG	Intervention method CG	Duration treatment
Schumacher *et al.*, 2002	RCT	150	48.5 ± 13.29/49.5 ± 13.71	142/8	A sum score >5 for pain tenderness and swelling	Etoricoxib 120 mg administered orally once daily	Indomethacin 50 mg administered orally 3 times daily	Both for 8 days
Rubin *et al.*, 2007	RCT	189	51.1 ± 13/52.2 ± 12	176/13	A total score >5 for pain tenderness and swelling, with pain score ≥2	Etoricoxib 120 mg administered orally once daily	Indomethacin 50 mg administered orally 3 times daily	Both for 8 days
Li *et al.*, 2013	RCT	178	52 ± 15/53 ± 14	166/12	A sum score >5 for pain tenderness and swelling	Etoricoxib 120 mg administered orally once daily	Indomethacin 75 mg administered orally 2 times daily	Both for 5 days
Ye Qiao *et al.*, 2010	RCT	75	42.12 ± 12.48/38.20 ± 15.51	65/10	Visual analogue scale 6.08 ± 1.85	Etoricoxib 120 mg administered orally once daily	Diclofenac 75 mg administered orally once daily	Both for 7 days
Lu Jian-li, 2014	RCT	146	48.9 ± 2.3/46.7 ± 3.4	138/8	Visual analogue scale 6.31 ± 1.16	Etoricoxib 120 mg administered orally once daily	Diclofenac 25 mg administered orally 3 times daily	Both for 7 days
Guo Min, 2014	RCT	113	40.52 ± 11.27/43.03 ± 13.02	110/3	Mazur 1979 score 2.78 ± 0.83	Etoricoxib 120 mg administered orally once daily	Diclofenac 75 mg administered orally once daily	Both for 5 days

RCT randomized controlled trial, *SS* sample size, *EG* experimental group, *CG* control group

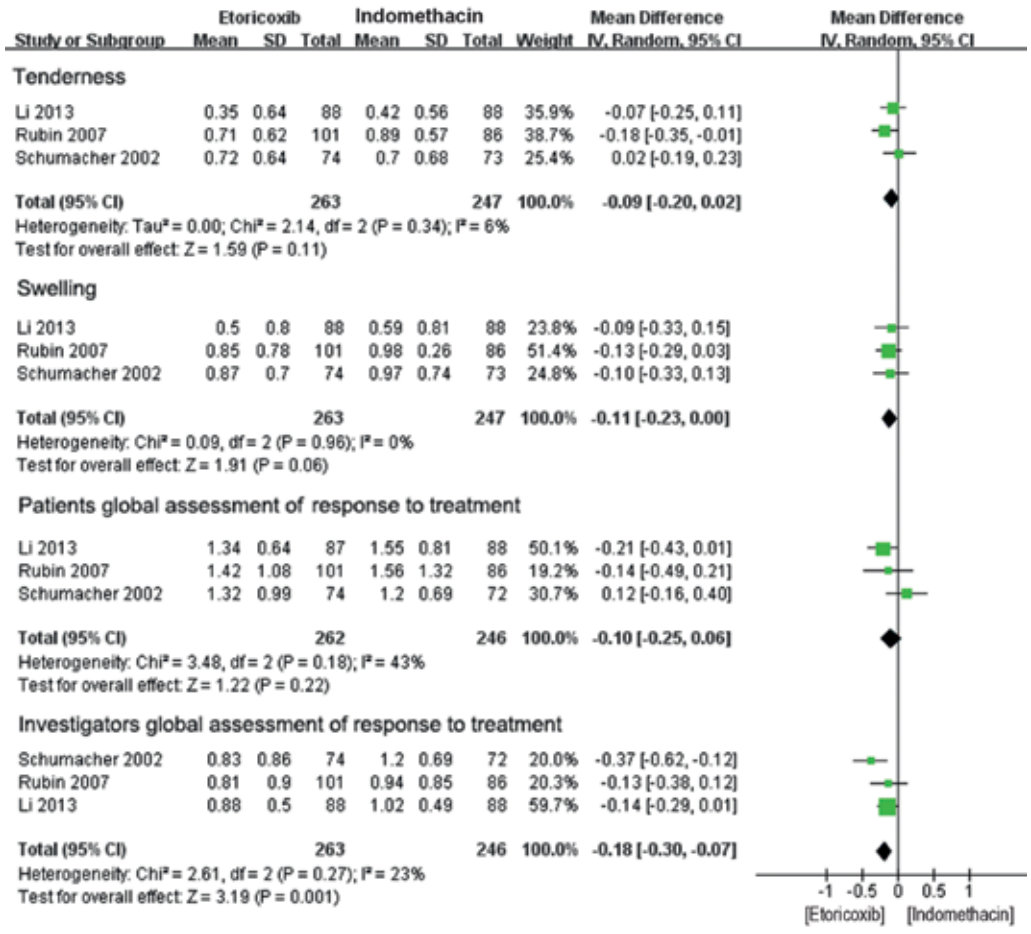

Fig. 4: Forest plot of mean difference in efficacy and 95 % CI for 2–5 days follow-up.

Discussion

Acute gouty arthritis is the most common form of inflammatory joint disease. The primary symptom of acute gout is pain. Optimal therapy is directed at controlling inflammation and analgesia [23]. NSAIDs are considered to be the most potent NSAID for the treatment of gout [1]. Etoricoxib, a novel cyclooxygenase 2 (COX-2) inhibitor, has anti-inflammatory, analgesic, and antipyretic activities in models of acute or chronic pain and inflammation in osteoarthritis, ankylosing spondylitis, and rheumatoid arthritis [24–27]. To our knowledge, this is the first quantitative comparative meta-analysis of studies directly comparing etoricoxib and NSAIDs for the treatment of acute gout. Ultimately, six RCTs were included, and a systematic review and meta-analysis were performed to replicate and confirm the results of the studies. In order to assess the efficacy and safety of etoricoxib, we extracted relative data as much as possible, and we pooled the outcome whenever possible.

For the efficacy assessment, the overall pooled WMD of −0.10 (95% CI: −0.25 to 0.06, $p = 0.22$) and −0.46 (95% CI: −0.51 to −0.41, $p < 0.00001$) is for pain relief. It has revealed a different outcome mainly because one article's [20] mean difference and 95 % CI was −0.64 [−0.51 to −0.41]. In summary, we believe there was no significant difference between etoricoxib and NSAIDs such as indomethacin and diclofenac. For the remaining four outcomes, only three articles [9, 18, 19] have available data; we made a meta-analysis, and there were overall pooled WMDs of −0.14 (95% CI: −0.31 to 0.03, $p = 0.11$), −0.16 (95% CI: −0.33 to 0.02, $p = 0.08$), −0.10 (95% CI: −0.28 to 0.07, $p = 0.26$), and −0.29 (95% CI: −0.46 to −0.11, $p = 0.26$), respectively. There was no significant difference between the two interventions, as shown in Fig. 4. The overall outcome showed there was no significant difference among the two interventions after 5 or 7 days of treatment. Therefore, etoricoxib

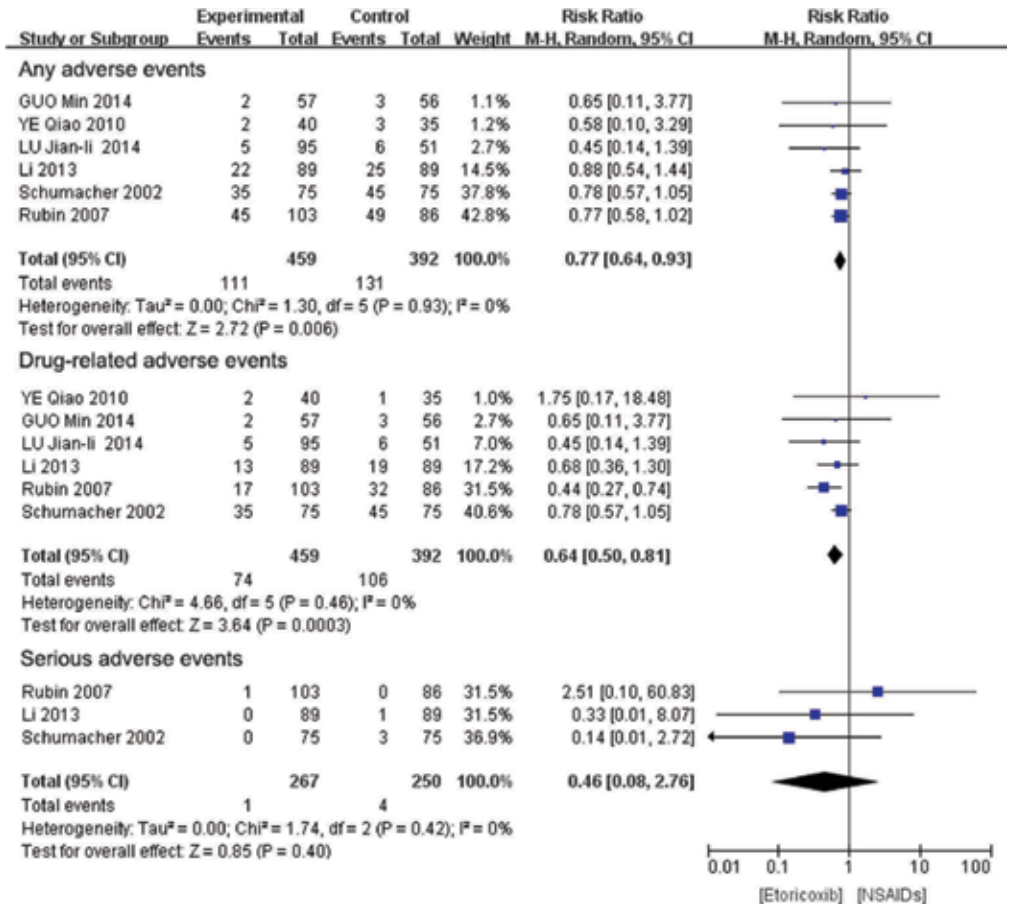

Fig. 5: Forest plot of mean difference in adverse events and 95% CI.

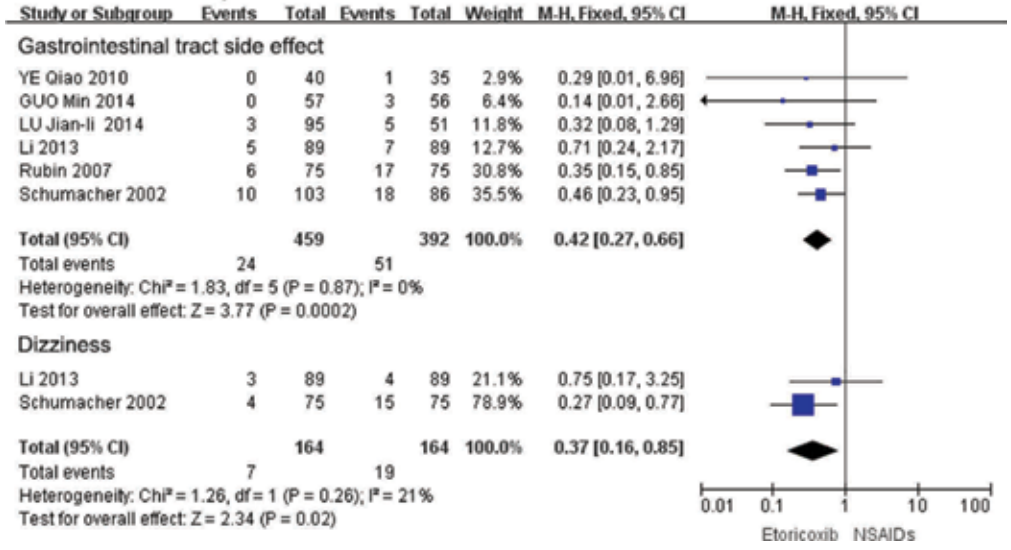

Fig. 6: Forest plot of mean difference in gastrointestinal tract side effects and dizziness and 95% CI.

120 mg administered orally once daily has the same anti-inflammatory and analgesic effects as NSAIDs.

For the safety assessment, any AE, drug-related AEs, and serious AEs, had pooled RR values of 0.77 (95% CI: 0.64 to 0.93, $p = 0.006$), 0.64 (95% CI: 0.50 to 0.81, $p = 0.0003$), and 0.42 (95% CI: 0.09 to 1.93, $p = 0.27$). These results indicate that etoricoxib has fewer complications than NSAIDs. For drug-related AEs, there was a significant difference between the two interventions, with etoricoxib having fewer complications than NSAIDs. For gastrointestinal tract side effects, the pooled RR was 0.42 (95% CI: 0.27 to 0.66, $p = 0.0002$). For dizziness, the pooled RR value was 0.37 (95% CI: 0.16 to 0.85, $p = 0.02$). Both of these AEs were significantly more common in the NSAID group than in the etoricoxib group. All trials apply the intervention methods of etoricoxib 120 mg administered orally once daily, and Leclercq [28] recommended etoricoxib at a dosage of 60 mg/day for osteoarthritis, 90 mg/day for rheumatoid arthritis, and 120 mg/day for acute gout. So we believe that etoricoxib 120 mg administered orally once daily is effective for treatment of acute gout.

As a meta-analysis for randomized studies, there are several limitations to our studies. First, this meta-analysis is limited primarily because of the small quantity of original studies, and the included studies have small sample sizes. To confirm this assessment, high-quality and more RCTs must be conducted. Furthermore, because of small sample size, subgroup analysis was not performed on polyarticular and monoarticular gouts. Second, all of the studies included in this meta-analysis are RCTs, but in some articles, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, and other biases were unclear; these studies were more likely to suffer from various kinds of bias. Furthermore, confounding factors such as underlying disease and the use of other drugs can confuse the outcome. However, there is still no way for controlling these confounding factors and bias and no established method for assessing how these confounding factors and bias affect the overall outcome. Third, no authors were contacted for further information. We extracted the data either directly from the article or through extrapolation by us.

Conclusion

We believe, from this meta-analysis, we found that etoricoxib has similar anti-inflammatory and analgesic effects as indomethacin in the treatment of acute gout. Furthermore, etoricoxib has a significantly lower risk of AEs than indomethacin. Etoricoxib 120 mg administered orally once daily may be effective for the treatment of acute gouty arthritis.

Abbreviations
NSAIDs-Non-steroidal anti-inflammatory drugs; RCTs-Randomized controlled trials; AEs-Adverse events; EG-Experimental group; CG-Control group; SS-Sample size; RR-Relative risk; WMD-Weighted mean difference.

Disclosures: None.

Author contributions: The intent of this statement is to display our idea on acute gout. SZ and JW conceived and designed the experiments. All authors participated in the literature search, assessment of bias, and data analysis. Data extraction was performed by SZ and checked by JW. SZ wrote the paper and PL made modifications.

References available on request
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Source: Shaobo Zhang, Yibao Zhang, Peng Liu, *et al.* Efficacy and safety of etoricoxib compared with NSAIDs in acute gout: a systematic review and a meta-analysis. *Clin Rheumatol.* 2016; 35(1):151–158. DOI 10.1007/s10067-015-2991-1.

Severe post-traumatic genu recurvatum is an uncommon condition in orthopedics. The typical symptoms are pain, weakness, and instability. For severe and symptomatic genu recurvatum patient, the surgical correction should be performed to relieve symptoms and prevent progression of deformity.

ANTERIOR OPEN-WEDGE HEPTA-LATERAL OSTEOTOMY FOR **SEVERE POST-TRAUMATIC** GENU RECURVATUM: A CASE REPORT AND REVIEW OF THE LITERATURE

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Genu recurvatum is the condition that there is excessive extension of the tibiofemoral joint and the knee bends backward to the axis. The two mainly etiologies are congenital and acquired. The cause of acquired genu recurvatum includes trauma, postoperative complication, Osgood–Schlatter disease, and idiopathy. The situation that deformity occurs after the injury is also called genu recurvatum traumaticum [1, 13, 18, 19]. Some patients may not have any problems. However, the deformity can progress and produce the symptom in advance in which the common issues are cosmesis, pain, instability, and abnormal gait. Management depends on the severity and the knee structure injuries, soft tissue or osseous. Three types of the operation on the genu recurvatum are arthrodesis, tibial osteotomy and soft tissue procedure [2, 3, 7, 9, 12]. We report a malunion of the intra-articular fracture of the proximal tibia with severe recurvatum that was surgically corrected with the new open osteotomy technique. And, we also reviewed the related studies.

Case Report

An 18-year-old man was presented with severe genu recurvatum and fixed equinus deformity of the left leg. Six months before coming to our hospital, he had a traffic accident and injured on the left knee. Then, he went to the first hospital, and the diagnosis was the fracture of left proximal tibia. His left leg was immobilized with long leg cast for 6 weeks. After the cast removed, he had no pain in the left knee, but he felt unstable at the knee joint while he was walking, and the sensation on the dorsal aspect of the left foot

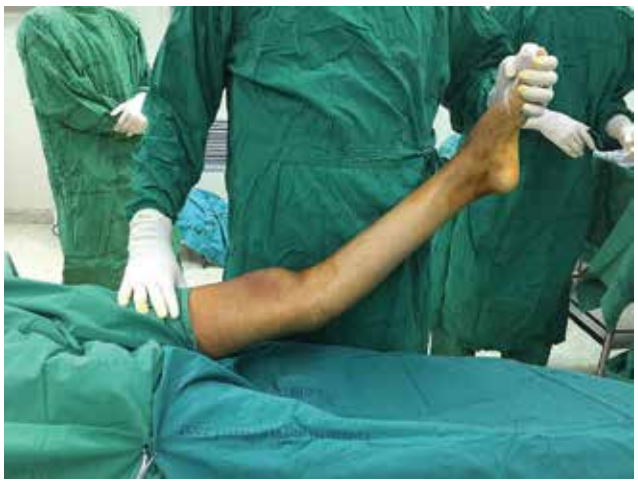


Fig. 1: Physical examination showed 45° hyperextension of the left knee, knee flexion loss about 20°, fixed equinus deformity of the left ankle about 50°.

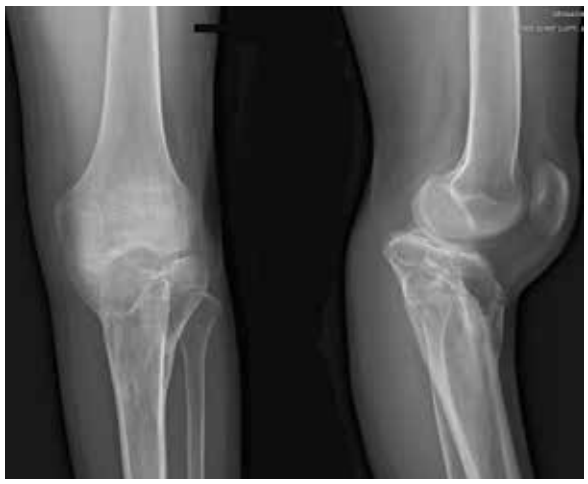


Fig. 2: The radiographic study demonstrated the malunion of the intra-articular of the left proximal tibia.

was absent. The patient was referred to our hospital. Physical examination showed 45° hyperextension of the left knee, knee flexion loss about 20°, fixed equinus deformity of the left ankle about 50° and 1.5 cm leg length discrepancy (Fig. 1). The radiographic study demonstrated the malunion of the intra-articular of the left proximal tibia (Fig. 2). The electrodiagnostic studies showed complete common peroneal nerve palsy.

First, the patient decided to receive the operation to correct the fixed equinus deformity. We performed the lengthening of Achilles tendon and transfer posterior tibial tendon for ankle dorsiflexion. After the surgery, the ankle was immobilization in the neutral position with the short leg cast for 6 weeks. Two months after surgery, the patient still had complained about the sense of unstable of the left knee during walking.

Therefore, authors decided to correct the deformity by reducing the tibial slope from 47° anterior incline to 6° posterior incline.

Surgical Technique

Surgical Approach

We approached the proximal tibia with the medial and split anterolateral incision. The patellar tendon was identified and protected, and we performed an anterior open-wedge hepta-lateral osteotomy at the left proximal tibia.

Osteotomy and Fixation

The osteotomy was begun medially below to the tibial tuberosity and extended upward and posteriorly (Fig. 3). After the osteotomy was performed, the adjustable bone spreader was inserted into the osteotomy site anteriorly. Then, we corrected the alignment gently until the intended alignment could be achieved, and there was no hyperextension of the knee. The tibial shaft was anteriorly translated to decrease the tension of the skin on the spike of the tibial tuberosity and prevent secondary deformity. The reduction was maintained with the adjustable bone spreader. Two iliac strut grafts were placed at the anterior aspect of the osteotomy site. We fixed the proximal tibia with the 3.5-mm LCP® Medial and Lateral Proximal Tibia Plates (Synthes®, West Chester, PA, USA).

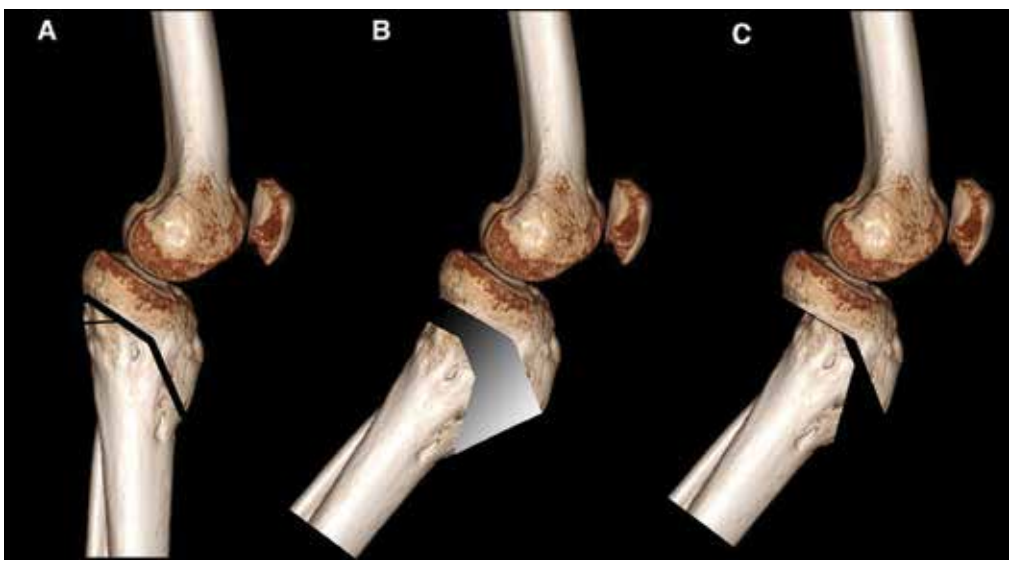


Fig. 3: Pictures demonstrated the anterior open-wedge hepta-lateral osteotomy at the left proximal tibia.

Rehabilitation

Immediately the pain reduced in few days after surgery, the range of motion exercise was encouraged. Weight bearing was avoided for 6 weeks. Bone union achieved in 3 months (Fig. 4). At 1-year follow-up, the patient can walk independently without pain. The range of motion is normal (Fig. 5).

Discussion

Traumatic genu recurvatum is not the uncommon condition in orthopedics practice. The deformity usually occurs when there is malalignment of osseous or ligamentous injuries. Treatment is based on the severity of the deformity and knee structure injuries [7, 9, 19]. In minor deformity, the patient can use the brace to relieve the symptoms [10, 16]. However, the deformity can progress in some patients in advance. If the deformity becomes more severe and produces symptom, surgery may be indicated [12, 19].

In case deformity is related to the abnormal alignment of the proximal tibia, proximal tibial osteotomy may be performed to correct the deformity. The excellent overall outcome after performing corrective osteotomy was 83% [19]. There are many types of the procedure, but there is still no standard procedure to treat this condition. Some authors performed osteotomy at the tibial tuberos-

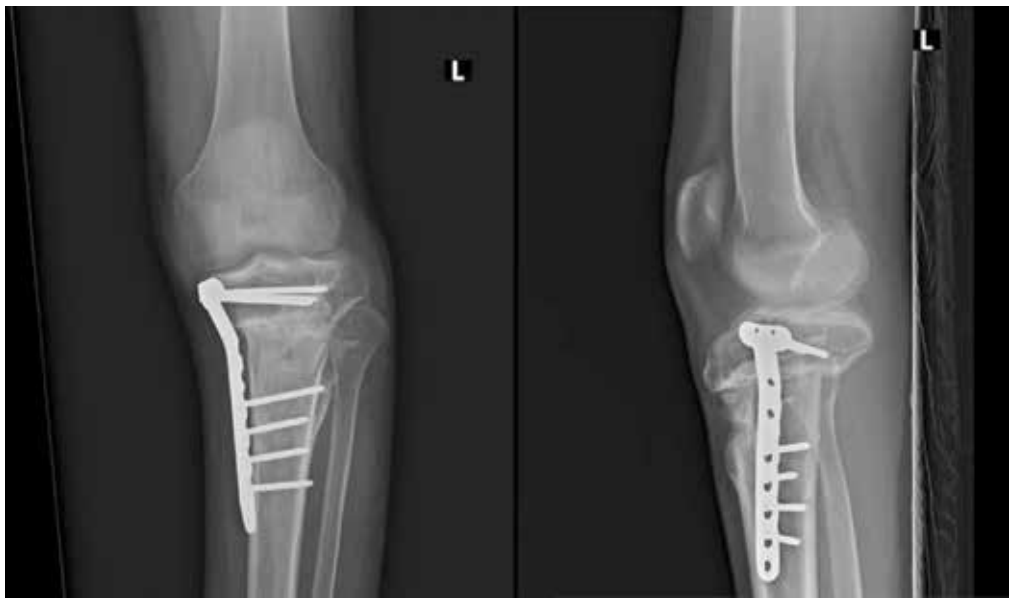


Fig. 4: The radiographic study showed the alignment of proximal tibia after performing surgical correction.

Fig. 5: At 1-year follow-up, the patient can walk independently without pain. The range of motion is normal.

ity and reflex upward. Then, the author performed the anterior open-wedge osteotomy at the level of the patellar tendon insertion [18]. An open-wedge osteotomy was proposed in which the osteotomy was performed above the tibial tuberosity. The author called this technique subarticular osteotomy [2]. Closed-wedge osteotomy was performed in some cases in which this technique could provide rapid union [3]. There were many methods to fix or maintain the correction until the union could achieve such as cast, plate and screws, external fixator and Ilizarov apparatus [4–6, 14, 18]. Treatments can be classified according to open- or closed-wedge osteotomy, the location of the osteotomy and acute or gradual correction [2–19].

The open-wedge osteotomy is more simplified than closed-wedge osteotomy because it is easy to adjust the correction during operation and can correct leg length. But, there are many considerations on this technique such as location of the osteotomy, secondary deformity, inadequate correction, anterior bone gap, nonunion, fixation method, infection and skin complication [17, 20].

Patellar baja is the most frequent problem after performing open-wedge osteotomy when the location of the osteotomy is proximal to the insertion of patellar tendon. Therefore, the tibial tuberosity transfer is necessary to correct patellar height in this group [12].

In case osteotomy is performed distal to the tibial tuberosity, frequent problems may occur such as secondary deformity and a small correction. Hence, the osteotomy is distal and far from the center of rotation angulation [8, 15]. Recently, a study reported good to excellent result after performing the simple open-wedge osteotomy in which the osteotomy was distal tuberosity. But, authors still needed to transfer the tibial tuberosity in patient with severe deformity (Table 1) [11].

Patients with genu recurvatum and valgus malalignment may be treated by anterolateral open-wedge proximal tibial osteotomy and fixation with a plate with allograft filling of the osteotomy gap [6, 7].

We reported a new technique in which the osteotomy was performed distal to tibial tuberosity aiming to preserve the insertion of the patellar tendon. Then, the direction of the osteotomy was upward and backward which could reach to the center of rotation angulation. The advantages of this technique were high degrees of correction, and patella height could be retained as the preoperative height, but the bone cut was quite tricky from others. This patient showed good result with this technique. However, the higher quality of study design should be performed to evaluate this technique in the future.

Table 1: Advantages and disadvantages of each anterior open-wedge technique for genu recurvatum.

Location of osteotomy	Advantages	Disadvantages
Proximal to tibial tuberosity	Near to the center of rotation angulation Higher degree of correction Lesser secondary deformity	Patellar baja Need tibial tuberosity transfer in some cases
Distal to tibial tuberosity	Simple bone cut Simple surgical approach	More secondary deformity Lesser degree of correction Anterior skin complication Prominent spike from the tibial tuberosity Need fibular osteotomy in some cases

Conclusion

For the patient with severe traumatic genu recurvatum and the preoperative patellar height is still in the normal range, our surgical technique shows the good result after surgical correction. The bone cut can preserve patellar height and provide the high degree of correction.

Compliance with ethical standards

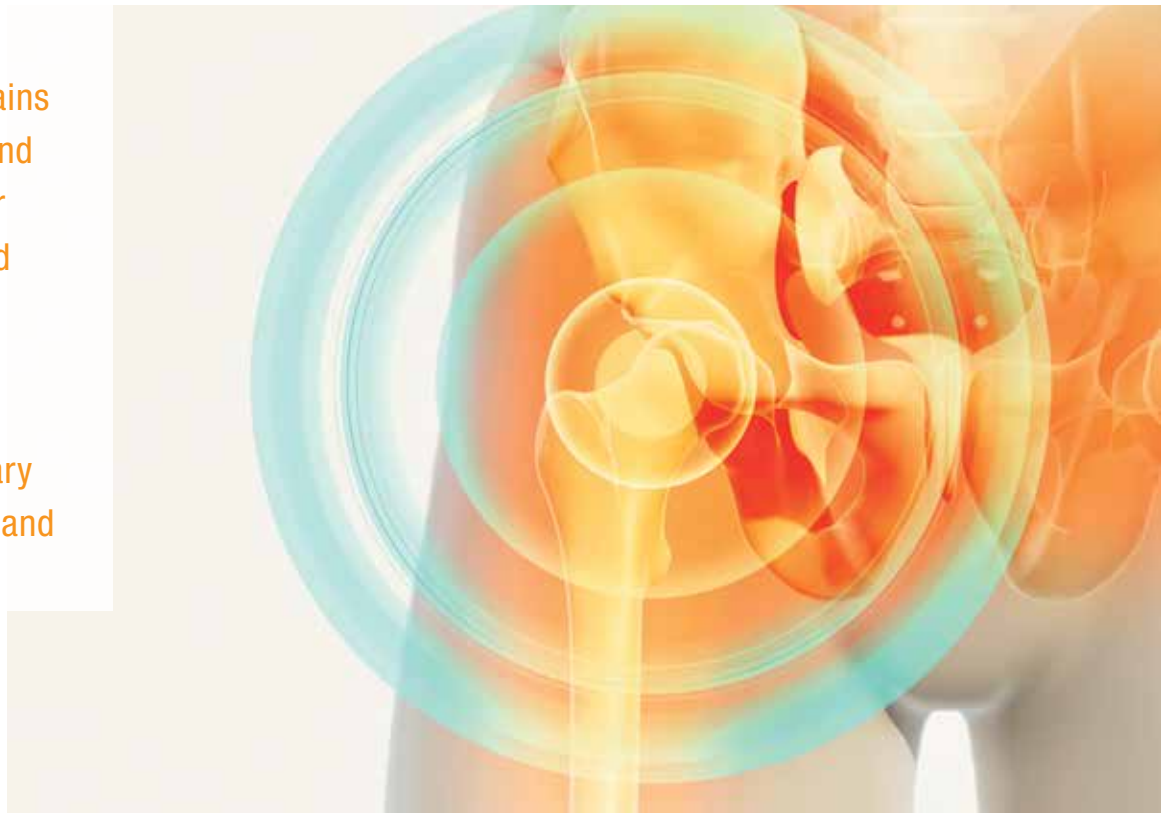
Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: Khon Kaen University Ethic Committee in Human Research, Khon Kaen University.

References available on request
Healthcare.India@springer.com

Source: Artit Boonrod, Kamolsak Sukhonthamarn, Punyawat Apiwatanakul. Anterior open-wedge hepta-lateral osteotomy for severe post-traumatic genu recurvatum: a case report and review of the literature. *Eur J Orthop Surg Traumatol.* 2019;29(2):487–491. DOI 10.1007/s00590-018-2300-1.

The majority of injuries during a football game are contusions, sprains and/or strains in the thigh, knee and ankle. Hip dislocations account for 2–5% of total hip dislocations, and they can be posterior or anterior. Major complications of traumatic hip dislocation include avascular necrosis of femoral head, secondary osteoarthritis, sciatic nerve injury and heterotopic ossification.



POSTERIOR HIP DISLOCATION IN A NON-PROFESSIONAL FOOTBALL PLAYER: A CASE REPORT AND REVIEW OF THE LITERATURE

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Football is one of the most popular sports in the world. Injuries during a football game are quite frequent, but in the majority of them are contusions, sprains and/or strains in the thigh, knee and ankle [8]. On the other hand, fractures during the game are quite rare ranging from 4 to 9%, while the probability of a fracture-dislocation of the hip is extremely rare [9].

Hip dislocations during sporting activities account for 2–5% of total hip dislocations [2], and they can be posterior or anterior. Most hip dislocations are posterior, caused by impaction of the femoral head upon the acetabulum from direct force to the distal femur. Anterior dislocations are less common and of two main types: superior, where the femoral head is displaced into the iliac or pubic region, and inferior, where the head lies in the obturator region [4].

Motivated by the case of a 33-year-old football player, who suffered a posterior hip dislocation while playing football, we will review the literature.

Case Presentation

A 33-year-old male was brought to the emergency department with right hip pain, weakness and inability to walk. The patient was injured during a football game while falling on his knee with his hip flexed. At the time of the injury the patient felt a pop and immediately after he could not move his hip. Clinical examination of the injured extremity suggested posterior dislocation of the hip. The hip was flexed, adducted and internally rotated. Neurological evaluation was normal with no signs of sciatic nerve injury.

Plain radiographs of the pelvis confirmed a posterior hip dislocation, associated with a posterior wall fracture of the acetabulum (Fig. 1). Within 6 hours past the injury, and

with appropriate analgesia, the dislocation was reduced in the emergency room using traction and external rotation of the right lower limb (Fig. 2). Post-intervention radiographs confirmed successful reduction. A computed tomography (CT) scan of the pelvis confirmed the posterior wall fracture of the acetabulum (Figs. 3, 4).

Two days past the injury, the patient underwent surgery where an open reduction and internal fixation of the acetabular fracture with two lag screws was performed using Kocher-Langenbeck approach (Fig. 5). The patient had an uneventful postoperative course and was discharged with instructions for non-weight bearing for 6 weeks.

On the 3-month follow-up, the patient was pain free, had full range of hip motion and was allowed full weight bearing. On the 12-month follow-up, the patient was still pain free and hip range of motion was normal compared to the contralateral hip. The radiologic examination of the pelvis showed no signs of either femoral head avascular necrosis or hip joint degeneration, and the patient was no further withheld from any former daily routine and sporting activities (Fig. 6).

Discussion

Hip dislocations are an orthopaedic emergency, and their immediate recognition and treatment is vital for their prognosis [11]. Traumatic hip dislocations are high energy injuries and most commonly occur during car accidents when the knee strikes the dashboard [5]. Hip dislocations as a result of sports injuries are extremely rare, accounting for 2–5% of all hip dislocations [2]. They have been reported in rugby, basketball and biking, while only six cases have been reported in football [7, 10, 12]. The most commonly reported mechanisms for posterior hip fracture-dislocation in sports are either a forward fall on the knee with the hip flexed or a blow from behind when the athlete is down on all four limbs [2]. Despite the fact that minimal force is involved, possible complications remain the same. Major complications of traumatic hip dislocation include avascular necrosis of femoral head, secondary osteoarthritis, sciatic nerve injury and heterotopic ossification. The incidence of avascular necrosis of the femoral head varies from 10 to 20% and increases when the reduction is delayed for more than 6 hours from the time of injury [1]. Delayed hip reduction is also an important factor for the development of post-traumatic osteoarthritis. Upadhyay *et al.* reported that degenerative hip arthritis occurs in 16% of hip dislocations without a fracture and 88% of hip fracture-dislocations [12]. Sciatic nerve injury is directly associated with delayed reduction with an impact of 0–20%, as reported by Cornwell and Radomisli [3]. A review of the literature by Giannoudis *et al.* [6] retrieved only one

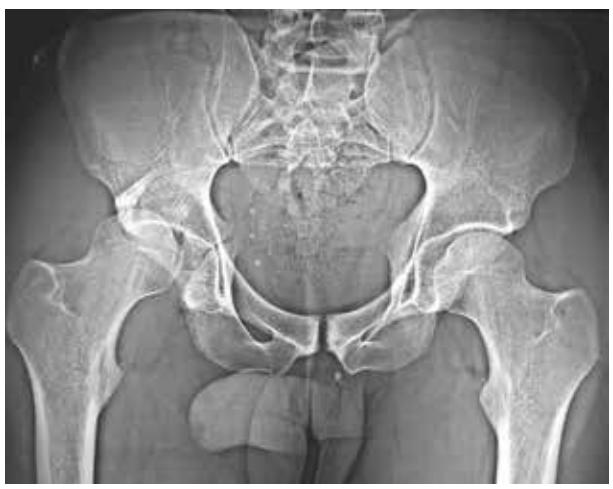

Fig. 1: Pre-reduction radiograph: anteroposterior plain radiograph of the pelvis showing dislocation of the right femoral head and fracture of the posterior wall of the acetabulum.

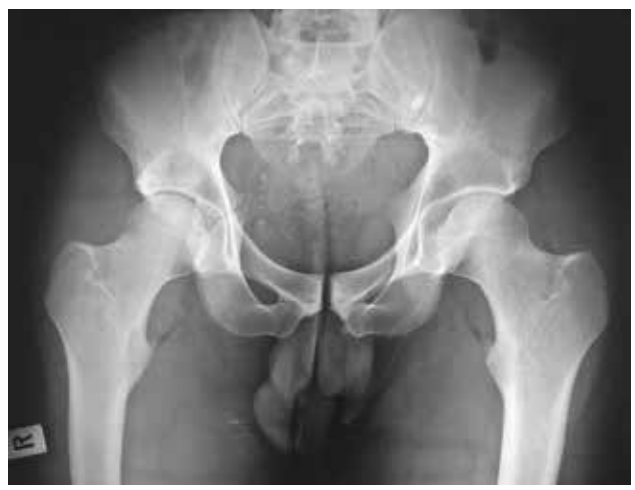

Fig. 2: Post-reduction radiograph: anteroposterior plain radiograph of the pelvis showing successful hip reduction.

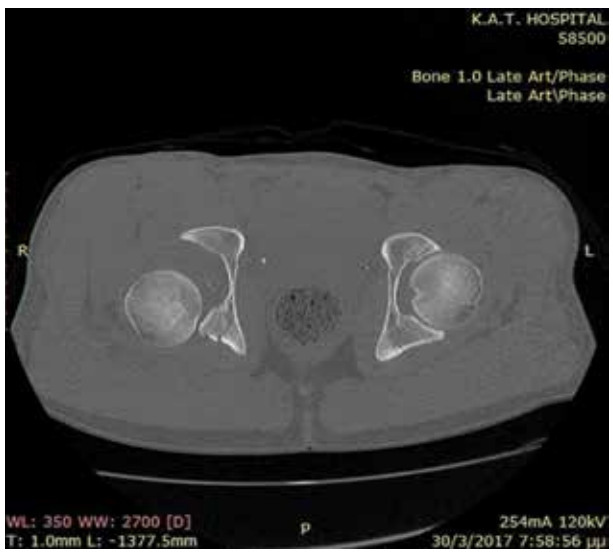

Fig. 3: Computed tomography of the pelvis: axial view showing a fracture of the posterior wall of the acetabulum.

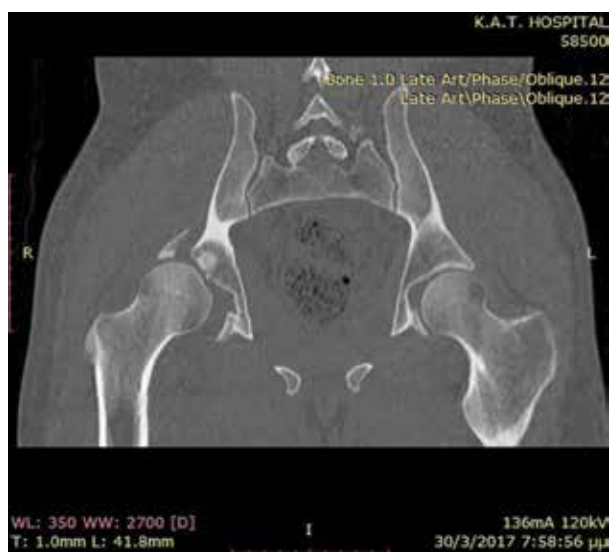

Fig. 4: Computed tomography of the pelvis: coronal view showing a fracture of the posterior wall of the acetabulum.

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The flexor carpi radialis brevis (FCRB) is a rare accessory muscle of the forearm and wrist. It is typically asymptomatic, but has been discovered either incidentally during cadaveric studies or at the time of surgery in patients with distal forearm injury. Rarely, the FCRB muscle is associated with pain.

FLEXOR CARPI RADIALIS BREVIS: A RARE ACCESSORY MUSCLE PRESENTING AS AN INTERSECTION SYNDROME OF THE WRIST

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Accessory muscles are anatomic variants that have been described in the anatomic, surgical, and radiologic literature [1–7]. The majority of such muscles do not lead to clinical manifestations and are found incidentally during cadaveric dissection, surgical exploration, or imaging examinations. In some cases, however, these accessory muscles may be accompanied by pain (e.g., when compressing a nearby nerve, vessel, or tendon) or swelling or a mass, simulating a tumor.

The FCRB is a rare accessory muscle of the forearm and wrist. It was first described by Fano in 1851 [8] and, since then, has also been referred to as the flexor carpi radialis brevis vel profundus muscle [1] and short radiocarpal flexor muscle [3]. The prevalence of the FCRB muscle has been reported to be 2–8% [3, 9, 10], although the true frequency of this muscle may be higher, often encountered as an incidental intraoperative finding during volar plating of distal radial fractures [10–12].

Symptomatic FCRB muscles or tendons are rare, with only five previously reported cases [13–17]. Further, to our knowledge, our case report is only the second to describe an intersection syndrome between the tendons of the FCRB and FCR muscles, which in our patient was accompanied by tenosynovitis and a split tear of the FCR tendon as confirmed by MRI.

Case Report

A 51-year-old right-hand-dominant woman presented with a 3-month history of pain and swelling localized to the voloradial aspect of the left wrist; she worked as an administrative assistant and, although her symptoms were intermittent, they interfered with both her work and the activities of daily living. On physical examination, there was ill-defined soft tissue swelling and tenderness at the

voloradial aspect of the wrist. Her pain was aggravated by resisted palmar flexion, but the results of both Tinel and Phalen's tests of the median nerve were negative.

Magnetic resonance imaging of the wrist (Fig. 1) demonstrated an accessory muscle at the voloradial aspect of the distal radius, situated between the pronator quadratus (PQ) muscle and the FCR tendon. The tendon of the accessory muscle coursed along the deep aspect of the FCR tendon, then crossed over the FCR tendon in an ulnar to radial direction within the FCR tunnel, and inserted into the trapezium. Portions of this tendon distally were U-shaped. There was also a longitudinal split tear of the FCR tendon, and tendinosis and extensive tenosynovitis of the FCR and FCRB tendons centered at their intersection. The clinical and imaging findings were consistent with an intersection syndrome related to the tendons of the FCRB and FCR muscles. The patient was treated with physical therapy and non-steroidal anti-inflammatory drugs for 3 weeks with marked improvement in pain, and she was able to return to work and had no difficulties with activities of daily living.

> *Symptomatic FCRB muscles or tendons are rare, with only five previously reported case.*

Discussion

The FCRB is a rare accessory muscle of the forearm and wrist. It originates from the voloradial aspect of the distal third of the radius, distal to the origin of the flexor pollicis longus muscle and proximal to the origin of the PQ muscle [3]. The FCRB is composed of a fusiform muscle belly that passes superficial to the PQ muscle proximally and deep to the FCR muscle and flexor retinaculum distally [5, 6]. At the level of radiocarpal joint, it forms a relatively short tendon [3, 10] that parallels and lies radial to the FCR tendon within the FCR fibro-osseous tunnel [5, 10, 16, 18, 19]. The tendon of the FCRB muscle may insert into the second, third, or fourth metacarpal bases; the radial aspect of a carpal bone, such as the trapezium or capitate; or retinacular septum within the FCR fibro-osseous tunnel (Fig. 2) [1, 2, 6, 10, 16, 20, 21]. The FCRB muscle is innervated by the anterior interosseous nerve and is supplied by a branch of the anterior interosseous artery [2–4]. Its function has been reported to be radial wrist flexion without thumb or finger flexion by tension application [5, 10, 22].

A symptomatic FCRB is rare; there was only one other case report in which the tendon of the FCRB muscle was associated with symptoms and signs consistent with a tendon intersection syndrome [16]. Although surgical exploration was not performed in our patient, the imaging findings are akin to those of the patient described by Peers *et al.* [16], who had involvement of the FCRB and FCR tendons and accompanying tenosynovitis. Another case report, by Smith and Kakar [14], describes a patient with wrist pain associated with FCRB tenosynovitis and a complete tear

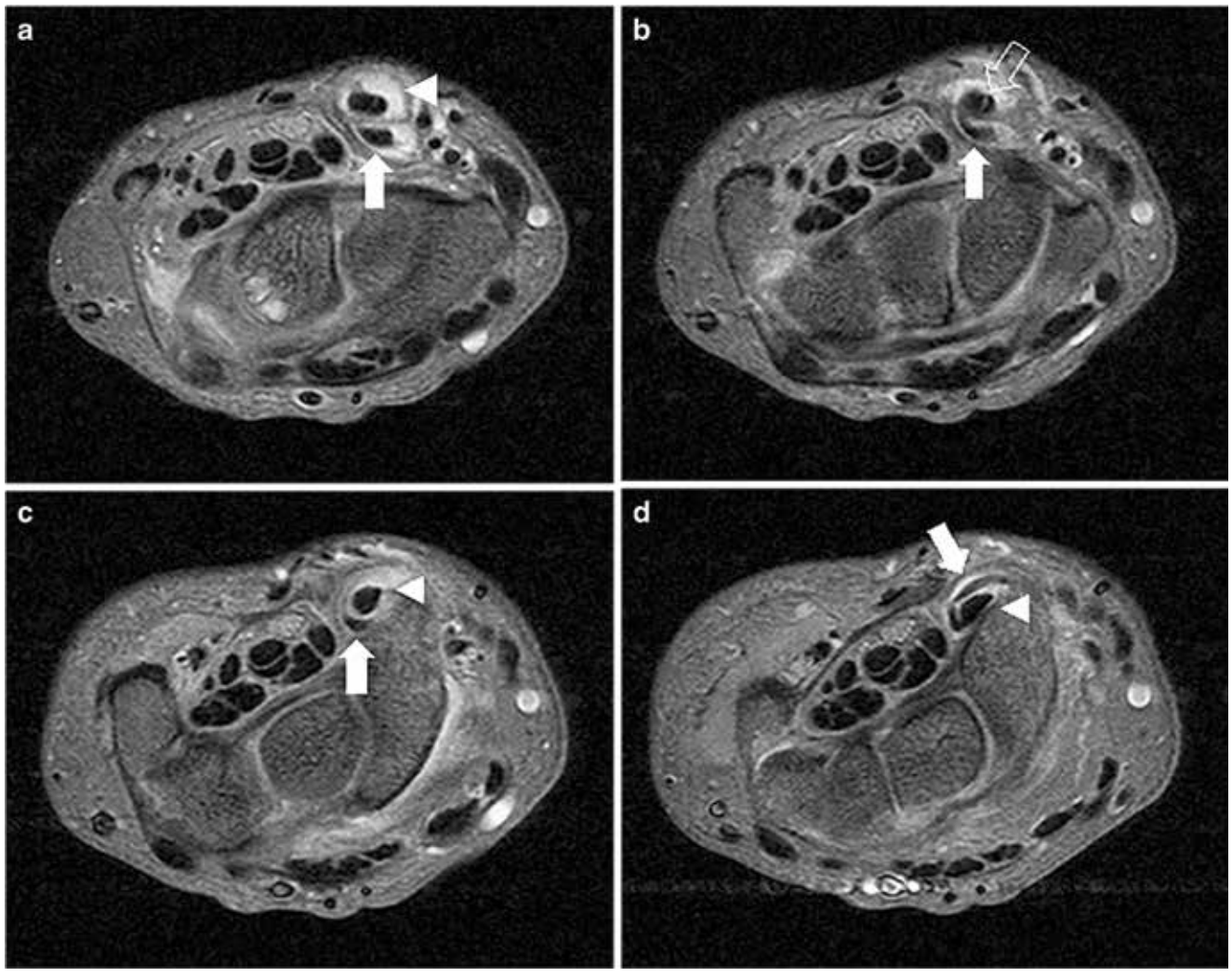

Fig. 1: Tendon intersection syndrome between the tendons of the FCRB and the FCR muscles. Axial (**a** [proximal] through **d** [more distal]) fluid-sensitive fat-suppressed sequences demonstrate tendinosis of the FCRB tendon (*closed arrows*) as it crosses over the FCR tendon (*arrowheads*) in an ulnar to radial direction with associated tenosynovitis within the FCR tunnel and an accompanying longitudinal split tear of the FCR tendon (*open arrow*).

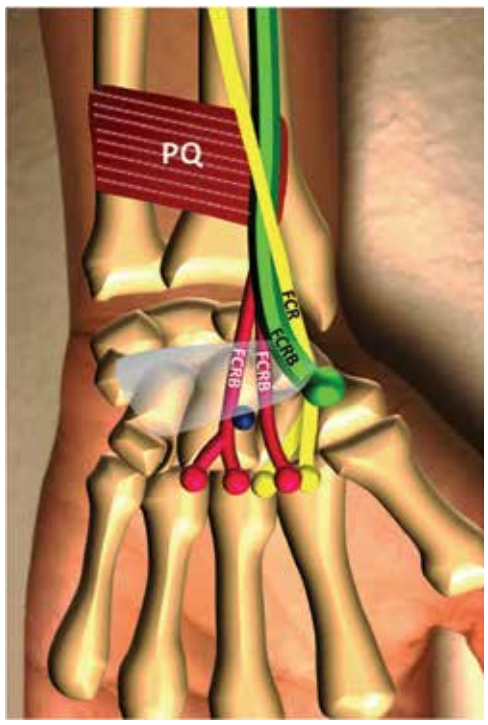

Fig. 2: Schematic of the volar wrist demonstrates the possible courses and insertions of the FCRB tendon: trapezium or retinacular septum (*green dot*), capitate (*blue dot*; please note, that a corresponding blue tendon to the capitate was omitted to maintain image clarity), or 2nd through 4th metacarpal bases (*red dots*).

of the FCR tendon without a clear description of an accompanying intersection syndrome [14].

Although tendon intersection syndromes theoretically may occur at any site in the human body at which tendons cross each other, most descriptions have emphasized their occurrence in the forearm and wrist, either proximally (between the first (abductor pollicis longus and extensor pollicis brevis) and second (extensor carpi radialis and brevis) extensor tendon compartments) or distally (between the second and third (extensor pollicis longus) extensor tendon compartments) [23–27]. The pathophysiology of tendon intersection syndromes remains unclear [28] but clinical manifestations are believed to be secondary to overuse [29] or mechanical friction related to repetitive flexion and extension of the wrist [25]. The pathophysiology of an intersection syndrome between the tendons of the FCRB and FCR muscles may relate, at least in part, to irritation by adjacent scapho-trapezio-trapezoid osteophytes [26].

Additionally, an accessory FCRB muscle may cause hypoplasia of the PQ muscle when it occupies the radial insertion of the PQ muscle [4, 5] or it may result in compressive neuropathy of the anterior interosseous nerve and downstream muscle denervation when the FCRB muscle is hypertrophied [4, 18, 30, 31]. Furthermore, the FCRB muscle can also be injured during minimally invasive volar-sided fixation of a distal radial fracture [32].

Our case report, in common with others, serves as a reminder that an accessory muscle or its tendon may cause clinical manifestations, including those associated with an intersection syndrome.

Compliance with ethical standards

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Conflict of interest: None.

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References available on request
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Source: Patcharee Hongsmatip, Edward Smitaman, Gonzalo Delgado, Donald L. Resnick. Flexor carpi radialis brevis: a rare accessory muscle presenting as an intersection syndrome of the wrist. *Skeletal Radiol.* 2019; 48(3): 457–460. DOI 10.1007/s00256-018-3034-1. © ISS 2018.

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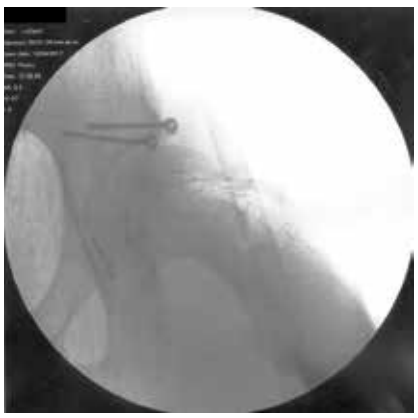

Fig. 5: Post-operative radiograph: anteroposterior plain radiograph of the pelvis showing open reduction and internal fixation of the acetabular fracture.

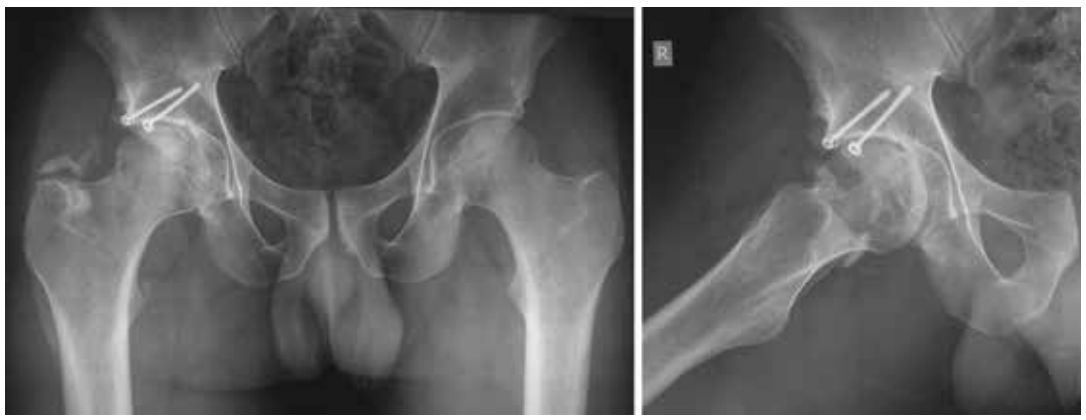

Fig. 6: Anteroposterior and lateral plain radiographs at the 12-month follow-up examination showing no signs of femoral head necrosis or post-traumatic osteoarthritis.

case of sciatic nerve-related complication following an injury due to sports. In the literature, there is no follow-up longer than 1 year for hip dislocation after sporting activities.

Hip dislocation during sports is rare but challenging, as it implicates a long rehabilitation time. In addition, serious complications can emerge in case of delayed reduction or imperfect restoration of the joint surfaces, especially in professional athletes. Operative intervention is often required to achieve anatomic reduction and, hopefully, a favorable outcome. In the presented case, surgical treatment led to a congruent joint reconstruction without any postoperative complications. Considering that femoral head necrosis has not occurred at the 12-month follow-up, the risk of this complication is significantly reduced or diminished. Nevertheless in the fore coming years, post-traumatic osteoarthritis may develop leading to activity limitation or even the need for hip joint arthroplasty.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no competing interests

References available on request
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Source: Matthaios Bakalakos, Ioannis S. Benetos, Meletios Rozis, John Vlamis, Spiros Pneumaticos. Posterior hip dislocation in a non-professional football player: a case report and review of the literature. *Eur J Orthop Surg Traumatol.* 2019; 29(1):231–234. DOI 10.1007/s00590-018-2241-8. © Springer-Verlag France SAS, part of Springer Nature 2018.

Meniscectomy is still one of the most popular and frequent orthopaedic procedures in the world. However, the long-term results, even following arthroscopic "so-called partial" meniscectomy, are not so good and the concept of meniscal preservation has, therefore, progressed over the years. However, the meniscectomy rate remains too high, even though robust scientific publications indicate the advantages of meniscal repair or non-removal procedures in traumatic tears.

SAVE THE MENISCUS AGAIN!

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Meniscectomy is still one of the most popular and frequent orthopaedic procedures in the world. However, the long-term results, even following arthroscopic "so-called partial" meniscectomy, are not so good [10] and the concept of meniscal preservation has, therefore, progressed over the years [13]. However, the meniscectomy rate remains too high, even though robust scientific publications indicate the advantages of meniscal repair or non-removal procedures in traumatic tears [4, 12]. It is worrying to note the considerable gap between these publications and daily practice. Moreover, the increase in meniscus repairs among meniscectomies is slow all over the world [3, 5].

Fight against false ideas

There are still many artificial and incorrect reasons for orthopaedic surgeons to perform meniscectomies rather than meniscal repairs. All of them have to be discussed and deleted from our subconscious minds.

1. "I think that meniscectomy is a safe, quick and easy procedure for me; so it will be the same for the patient". Wrong! There are some publications comparing meniscectomy and meniscal repair, especially on the lateral side. The time of return to sports is faster after lateral meniscectomy and the patient sometimes never recovers his/her preinjury level.
2. "The meniscal repair procedure requires a long learning curve and is only dedicated to a few simple lesions located in the vascular area of the meniscus. The failure rate is high". Wrong! All the literature reviews of meniscal repair bring together recent papers with modern techniques and old papers with devices and techniques that are no longer in use. They should be carefully separated and analysed. So the overall rate of failure and subsequent meniscectomy is around 20%. When looking at the recent literature using modern devices, techniques and selected indications, this rate is instead close to 7–10% [8]. The results have to be compared with those of arthroscopic meniscectomy for a similar lesion, that is to say, most of the time, vertical longitudinal traumatic lesions. The problem is that reparable (and

repaired) lesions are not comparable to irreparable (and resected) lesions because the indications are different. The location (red–red vs white–white zone), the quality of the meniscal tissue, the aetiology (traumatic vs degenerative) are different. Just imagine a study such as "prospective randomised evaluation of the short- and long-term benefits of meniscus repair in meniscectomies in young patients with reparable lesions". Impossible to perform!!

In any case, the respective indications for meniscectomy and repair do not conflict but are instead complementary.

> ***Meniscus repair techniques have been widely developed and many different lesions can now be repaired with good mid- to long-term results.***

3. Patient and society: "I saw professional athletes on television and they returned to their preinjury level quickly after a meniscectomy, so please, doctor, do the same for me, even if I am not a professional athlete and even if my lesion is reparable". Wrong! There are specific indications for surgery in the professional athlete that should not be extended to the global population.

Reasonably Extend the Indications

Meniscus repair techniques have been widely developed and many different lesions can now be repaired with good mid- to long-term results [8].

First, by improving the techniques not only in terms of biomechanics (strength) but also in terms of biology: vascular access channels [15], marrow stimulation [2], synovial flaps, fibrin clot [9] and PRP [14] have been proposed as additional tools for treating complex lesions. Other biological advances are currently being evaluated.

Second, and this is probably the critical point, using the correct indications.

In stable knees, the best indication for repair is a vertical traumatic tear located in the red–red zone, with "minimal" damage to the meniscal tissue; this is, in fact, a very rare entity!

Horizontal cleavage in the peripheral zone, in young athletes, can be also considered for repair [6]. These particular lesions correspond to overuse lesions. They are easily treated using an open or arthroscopic technique [7] with good mid- to long-term results [11].

The risk of failure in repaired vertical lesions located in the white–white zone or in extensive complex degenerative horizontal tears is high. Except in very young patients, these lesions can be treated by meniscectomy or left alone, depending on the symptomatology.

The question is, however, how we should treat vertical lesions associated with moderate meniscal damage and some horizontal limited cleavages, oblique tears, root lesions with some retractions and large meniscal flaps?

In these questionable indications, meniscectomy is naturally the alternative. Young age (related to meniscal damage), the degree of coronal deformity, sports activity and a lateral meniscus are the main factors indicating meniscal repair rather than meniscectomy in these complex lesions. Again, repair and meniscectomy are not two concurrent techniques. They are complementary and can even be proposed in conjunction in the same knee, enabling the removal of the unstable part of the meniscus and the repair of the peripheral rim, which is so important biomechanically.

In some cases, we are confronted by complex lesions in the meniscus occurring in young patients. In these cases, the concept of meniscal preservation should be pushed. The meniscus is not fully reparable, but it is possible to repair the majority of the lesions, while removing only the most damaged tissue. Again, this is particularly true in lateral meniscal lesions, stable or stabilised knees and young patients.

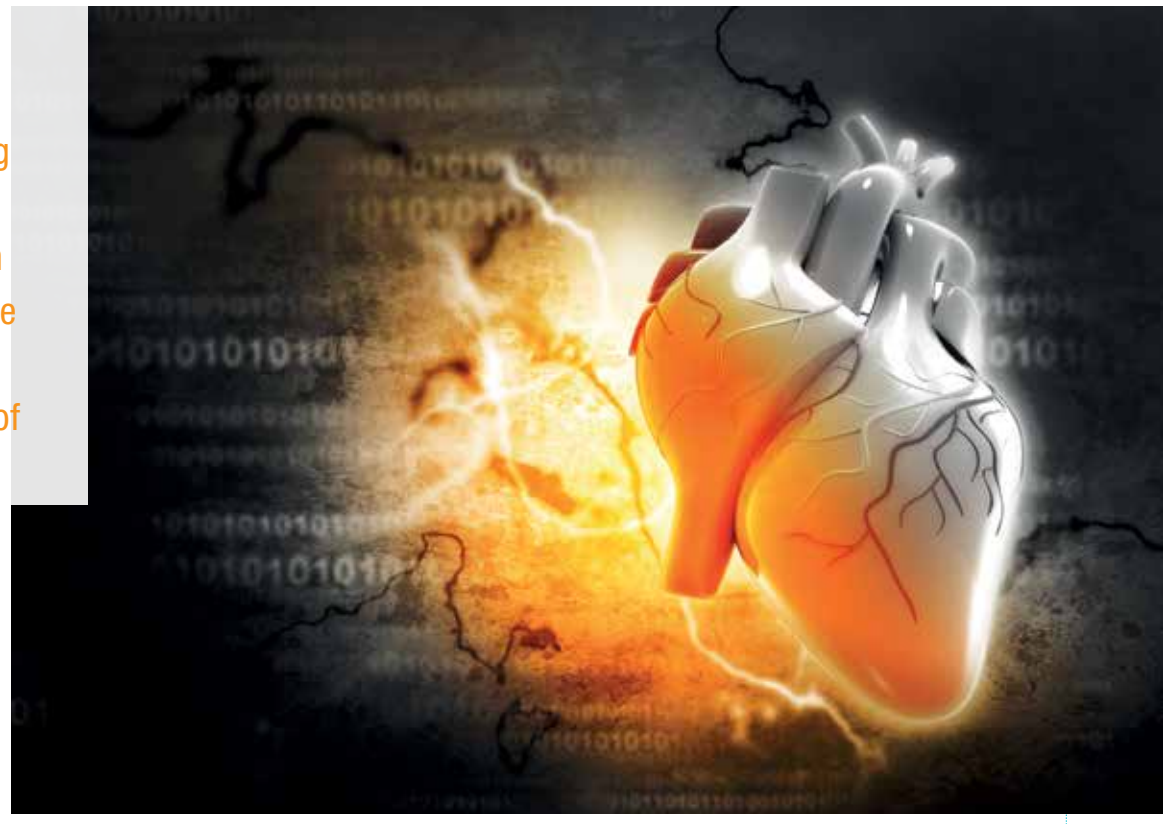
This concept: salvaging the meniscus in complex tears (with partial meniscectomy and meniscal repair) was evaluated in our study at a long-term follow-up [1]. The results were encouraging, with a low rate of complications and a good protective effect in the remaining meniscal tissue from degenerative changes.

In conclusion, the concept of meniscal repair and preservation can be extended to some specific indications. Not all meniscal lesions can be repaired. However, all reparable meniscal lesions must be repaired. If it is not possible fully to repair some complex lesions in young patients, a partial meniscectomy can be associated with the repair. Please, save the meniscus again and again!

References available on request
Healthcare.India@springer.com

Source: Nicolas Pujol, Philippe Beaufils. Save the meniscus again! *Knee Surg Sports Traumatol Arthrosc.* 2018; 1–2. DOI 10.1007/s00167-018-5325-4.

Although osteoarthritis (OA) is a common condition in older adults, the role of OA in increasing cardiovascular disease (CVD) incidence is still debated. The aim of this study was to investigate the association between OA and the onset of CVD in a large database of American adults.



OSTEOARTHRITIS INCREASES THE RISK OF CARDIOVASCULAR DISEASE: DATA FROM THE OSTEOARTHRITIS INITIATIVE

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One of the most common causes of years lived with disability are chronic musculoskeletal disorders [1]. Osteoarthritis (OA) accounts for a considerable amount of this burden [2], with lower limb OA ranked the 11th highest contributor to global disability [2]. The prevalence of OA has been estimated as 10% in men and 20% in women over the age of 60 years having OA across the world [3].

Increasing research is showing that OA might increase the risk of cardiovascular diseases (CVD) for several reasons. First, both OA and CVD share similar risk factors, namely low physical activity, hypertension, depression and obesity [4-6]. Secondly, compared to healthy controls, OA is often characterized by some degree of low-grade inflammation, another potential CVD risk factor [7]. Finally, the modifications of extracellular matrix, typical of OA [8], could further increase the risk of CVD [9].

As summarized by a recent meta-analysis including 15 cross-sectional studies and more than 32 million of participants, there is a strong association between OA and CVD [10]. Individuals with OA were almost three times as likely to have heart failure or coronary heart disease compared with matched non-osteoarthritis cohorts [10]. Conversely, the longitudinal studies are still limited and with contrasting results. Three studies [11-13] reported that the presence of OA significantly increased the onset of CVD, while another large cohort study reported no such significant association [14], particularly after adjusting for the presence of

disability. However, these studies presented some limitations, most notably for limited adjustment for potential confounders. Finally, due to the different criteria adopted, it was difficult to ascertain whether only symptomatic or radiological OA predicted the onset of CVD.

The purpose of this study was thus to determine whether: i) people with OA are at increased risk of incident CVD compared to people without OA; ii) exists any difference among sites usually affected by OA (hand, hip, knee, back/neck, other) in predicting CVD onset; and iii) if any difference between self-reported and clinical/radiological OA exists in predicting CVD onset.

Methods

Data Source and Subjects

All participants in this study were recruited as part of the ongoing, publicly and privately funded, multicenter, and longitudinal Osteoarthritis Initiative (OAI study) (http://www. oai.ucsf.edu/). Specific datasets used are those recorded during baseline and screening evaluations (November 2008) (V00) and those evaluating the participants until the last evaluation available (96 months; V10). Patients with a high risk of knee osteoarthritis were recruited from 4 clinical sites in the United States (Baltimore, Maryland; Pittsburgh, Pennsylvania; Pawtucket, Rhode Island; and Columbus, Ohio) between February 2004 and May 2006 and were eligible if they: 1) had knee osteoarthritis and reported knee pain in a 30 day period in the past 12 mo, or 2) were at high risk of developing knee osteoarthritis (e.g., overweight or obese, knee injury or operation, parents or siblings with total knee replacement, frequent knee-bending activities that increase risk, and hand or hip osteoarthritis). All of the participants provided written informed consent. The OAI study protocol was approved by the institutional review board of the OAI Coordinating Center, University of California at San Francisco.

Exposure

The diagnosis for OA in our analysis was self-reported for the most common sites usually affected by OA (knee, hip, hand, back/neck, and other joints) asking to participant if one doctor said that he/she suffers from OA during his/her life. A summary variable ascertained as the presence of at least one site affected by self-reported OA was then calculated.

Since for knee OA, radiological diagnosis was also ascertained, an additional analysis was undertaken assessing knee OA defined as a combination of the clinical reporting and assessment of pain and stiffness (i.e. pain, aching or stiffness in or around the knee on most days during the last year), and radiographical OA on the baseline fixed flexion radiograph based on the presence of tibiofemoral osteophytes (correspondent to Osteoarthritis Research Society International atlas grades 1-3, clinical center reading).

> *Individuals with OA were almost three times as likely to have heart failure or coronary heart disease compared with matched non-osteoarthritis cohorts.*

Outcomes

The main outcome of interest was the onset of CVD during the follow-up period. As for OA, CVD was recorded through self-reported information.

We defined the development of CVD as the presence of heart attack, heart failure, unclog or bypass arteries in legs, and stroke, cerebrovascular accident, blood clot in brain, or transient ischemic attack. The presence of CVD in the OAI was recorded, other than baseline, during the V3 (24 months), V6 (48 months) and V10 (96 months).

Covariates

A number of variables was identified from the OAI dataset to explore the relationship between OA and incident CVD. These included: (1) physical activity evaluated through the Physical Activity Scale for the Elderly, a validated scale for assessing physical activity level in the elderly [15]. The scale covers 12 different activities, such as walking, sports, and housework, and is scored from 0 to 400 and more (no maximum score has been defined); (2) race was defined as "whites" vs. others; (3) smoking habits as "previous/current" vs. never; (4) educational level was categorized as "degree" vs. others; (5) yearly income as < and missing data vs. > $50,000; (6) co-morbidities assessed through the modified Charlson comorbidity score, with higher scores indicating an increased severity of conditions [16]; and (7) body mass index (BMI) recorded by a trained nurse. Among the several medical conditions assessed through the Charlson comorbidity score, we reported descriptively the prevalence of some common diseases that could influence the association between OA and CVD, namely diabetes and cancer. Hypertension was diagnosed through self-reported information or in case of systolic blood pressure >140 and/or diastolic blood pressure > 90 mmHg. Blood pressure in the OAI study.

Statistical Analyses

For continuous variables, normal distributions were tested using the Kolmogorov-Smirnov test. The data are shown as means and standard deviations (SD) for quantitative measures, and frequency and percentages for all discrete variables by OA presence at baseline. P-values were calculated for continuous variables using the independent Student T-test and for categorical parameters the chi-square test by OA presence at baseline.

Multivariate Cox's regression models were conducted using as exposure the presence of OA and as outcome incident CVD at follow-up visits. People dead during follow-up period were censored. Time to event was calculated as time to first CVD event.

Factors which reached a statistical significance between participants with OA vs. those without or significantly associated with CVD at follow-up (taking a p-value<0.05 as statistically significant) were included. Multi-collinearity among covariates was assessed through variance inflaction factor, taking a cut-off of 2 as reason of exclusion, but no variable was excluded for this reason. The basic model was not adjusted for any confounders, while the fully adjusted model included baseline values of: age (as continuous); gender; race (whites vs. others); BMI (as continuous); education (degree vs. others); smoking habits (current and previous vs. others); yearly income (categorized as > or < $50,000 and missing data); PASE score (as continuous); Charlson comorbidity index (as continuous);

presence of hypertension (yes vs. no); and use of analgesic drugs (yes vs. no). Data of Cox's regression analysis were reported as hazard ratios (HRs) with correspondent 95% confidence intervals (CIs).

In secondary analyses, specific joints affected by OA (categorized as knee, hip, hand, back/neck, or other joints) and the presence of knee OA, defined through radiological and clinical criteria, were taken as exposure variables. Participants without any presence of OA were taken as reference also in these analyses.

To test the robustness of our analyses, sensitivity analyses were conducted evaluating the interaction between the presence of self-reported and radiological/clinical diagnosis of OA and selected factor (e.g. gender, race, education, smoking habits, yearly income and presence/absence of diseases at baseline) in predicting CVD at follow-up. Gender emerged as potential moderator of our analyses (p for interaction <0.001). Thus the data are presented also by gender.

All analyses were performed using the SPSS 21.0 for Windows (SPSS Inc., Chicago, Illinois). All statistical tests were two-tailed and statistical significance was assumed for a p-value <0.05.

Results

Study Participants

At baseline, among 4,796 potentially eligible individuals, we excluded 313 had already a CVD, 21 did not have any information regarding OA and 197 without data during followup evaluations, obtaining a final sample of 4,265 participants.

Baseline Analyses

Overall, 4,265 participants (1,740 males; 2,525 females) with a mean age of 60.8±9.1 (range: 45-79) years were eligible for inclusion in the current study. At baseline, 1,775 people with OA (41.6%) were compared with 2,490 participants without OA. The baseline characteristics of the OA and non-OA participants are summarized in the Table 1 in the sample as whole and divided by gender. Independently from gender, participants with OA were significantly older and used more frequently analgesic drugs than those without OA. In men, participants with OA were more frequently obese, smokers, diabetic than those without OA, whilst in women, participants with OA were more frequently whites, sedentary (as shown by lower PASE scores), more educated and with a higher presence of co-morbidities as shown by higher Charlson's score (Table 1).

Association Between Baseline Osteoarthritis and Incident Cardiovascular Disease

After a mean period of 8.2 years, 416 individuals (9.8% of baseline population) (113 developed heart attack, 190 heart failure, 151 strokes or other cerebrovascular conditions, and 72 peripheral artery disease) developed a CVD event. The global incidence rate of CVD was 16 (95% CI: 0-41) events for 1000 persons-year.

As shown in Figure 1, the incidence of CVD was significantly higher in those having OA at baseline compared to those without (OA: 17; 95% CI: 0-48 vs. no OA: 14; 95% CI: 0-37/1000 events for 1000 persons-year; $p < 0.001$).

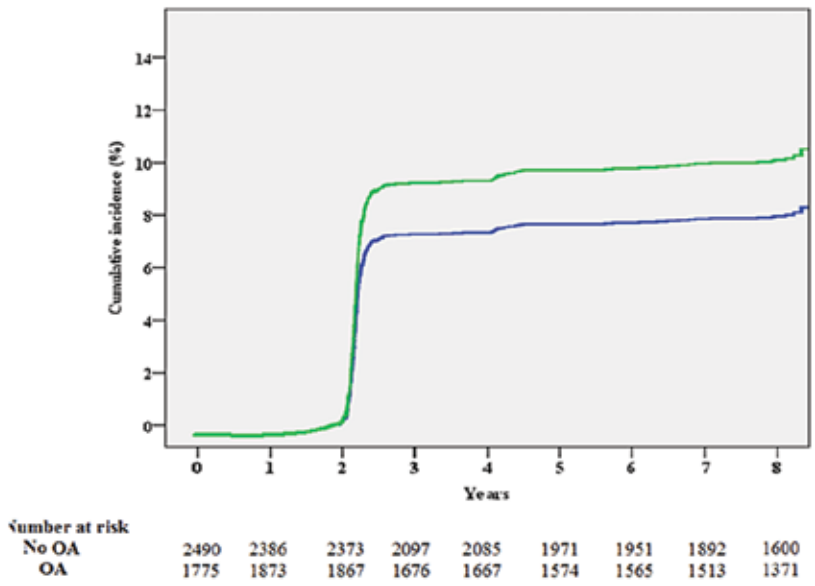
Table 2 shows the Cox's regression analyses by OA presence and for OA specific site. Taking those without any presence of OA as reference and after adjusting for 11 potential baseline confounders, OA was associated with a significant higher risk of CVD (HR=1.27; 95% CI: 1.03-1.56, p=0.02), particularly when OA affected hand (HR=1.31; 95% CI: 1.01-1.68, p=0.04). The association between any site OA and incident CVD remains significant in women (HR=1.50; 95% CI: 1.13-2.00, p=0.005), but not in men (Table 2). In women, OA affecting hip (HR=1.51; 95% CI: 1.00-2.27, p=0.048) and hand (HR=1.65; 95% CI: 1.21-2.24, p=0.001) increased the risk of CVD, whilst in men no site was at increased risk of developing CVD.

Knee OA defined through radiological and clinical presence, did not show any significant association with incident CVD in the sample as whole (HR=0.94; 95% CI: 0.76-1.15, p=0.52), nor in men (HR=1.03; 95%CI: 0.76-1.34, p=0.85) or in women (HR=0.85; 95% CI: 0.64-1.14, p=0.28).

Table 1: Baseline characteristics classified according to presence or not of osteoarthritis (OA).

	Whole sample		Men		Women	
Variable	OA (n = 1,775)	No OA (n = 2,490)	OA (n= 626)		OA (n = 1,149)	No OA (n = 1,376)
Age (years)	62.3 (8.6)	59.8 (9.1)***	61.7 (9.2)	59.6 (9.4)***	62.6 (8.6)	60.0 (8.9)***
White race (n, %)	1501 (84.6)	1937 (77.9)***	541 (86.6)	937 (84.2)	960 (83.6)	1000 (72.7)***
BMI (Kg/m^2)	28.7 (4.8)	28.4 (4.8)**	29.1 (4.1)	28.6 (4.1)*	28.6 (5.2)	28.2 (5.2)
PASE (points)	157.5 (81.4)	167.1 (83.0)***	176.8 (88.3)	181.2 (88.5)	147.0 (75.5)	155.7 (76.4)**
Smoking (previous/current)	853 (48.6)	1099 (44.8)*	335 (54.3)	500 (45.5)**	518 (45.5)	599 (44.2)
Degree (n, %)	586 (33.3)	731 (29.6)**	245 (39.6)	400 (36.3)	341 (29.8)	331 (24.3)**
Yearly income (< $50,000)	654 (36.8)	846 (34.0)	161 (25.7)	279 (25.0)	493 (42.9)	567 (41.2)
Medical conditions						
Diabetes (n, %)	125 (7.2)	162 (6.7)	56 (9.1)	70 (6.5)*	69 (6.1)	92 (6.9)
Cancer (n, %)	87 (4.9)	114 (4.6)	41 (6.5)	64 (5.8)	46 (4.0)	50 (3.6)
Hypertension (n, %)	359 (20.2)	217 (20.8)	144 (23.0)	262 (23.5)	215 (18.7)	255 (18.5)
Charlson comorbidity score	0.32 (0.71)	0.26 (0.71)***	0.32 (0.76)	0.26 (0.76)	0.33 (0.68)	0.26 (0.66)***
Use of analgesic drugs (n, %)	930 (52.5)	735 (29.7)***	293 (47.0)	305 (27.6)***	637 (55.5)	430 (31.4)***

Notes: P-value: ***: p < 0.001; **: p < 0.01; *. p < 0.05; Numbers are mean values (and standard deviations) or number (and percentages), as appropriate; Unless otherwise specified, p values are calculated with an independent Student T-test for continuous and with a chi-square test for categorical variables, respectively; Abbreviations: BMI: body mass index; PASE: physical activity scale for the elderly



Notes: *Green line* indicates the subjects having OA at baseline, *blue line* those without. Values represent the number of subjects with or without OA at risk of cardiovascular disease per year during the follow-up period.

Fig. 1: Cumulative incidence of cardiovascular disease according to the presence or absence of osteoarthritis (OA) at baseline in the sample as whole.

Discussion

In this large prospective study, we have demonstrated that the presence of OA at the baseline significantly increased the risk of CVD during follow-up period of about 27%. Among the sites investigated in our analysis only hand OA was associated with an increased risk of CVD in the whole sample whilst, in women, also hip OA increased the risk of CVD. The association of OA with CVD was significant only in women, suggesting important gender differences.

In this cohort, OA seemed to be a quite strong predictor of the onset of CVD at follow-up. Several mechanisms have been suggested to explain the association between OA and CVD [17]. Firstly, the conditions in common between OA and CVD, such as age, hypertension and obesity. Among these factors, the association between OA and hypertension is relevant. Previous research has in fact reported that, among all potential CVD risk factors, hypertension is the most common prevalent in people having OA for several reasons, including alterations of extra-cellular matrix typical of OA that could lead firstly to hypertension and finally to CVD [7, 9]. Secondly, a greater use of anti-inflammatory drugs by people with OA could contribute to the onset of CVD [18]. However, our analyses were adjusted for these potential confounders, suggesting that other pathways are probably involved. Thirdly, OA probably promotes the onset of other potential CVD risk factors during follow-up (e.g. physical inactivity, obesity, disability) that could contribute to the higher CVD risk in our association [19]. Finally, changes in extracellular matrix remodeling or an altered Wnt signaling transduction may play a role in the development of CVD in people with OA [20].

Previous longitudinal studies on the possible association between OA and CVD produced not univocal results. Whilst Nueusch *et al.* [11] found that OA increased the risk of CVD mortality in agreement with other studies [21], Hoeven *et al.* found no significant association between OA of the hand, knee or hip and CVD in 4,868 people over 55 years of age [14]. This finding is probably due to the different criteria used to diagnose OA: Hoeven *et al.* [14] used a clinical-radiological diagnosis of OA, whilst we used a self-reported information regarding the presence of OA as primary analysis. As confirmed by our results, it is likely that only symptomatic, and not to radiographic OA, is associated with a higher CVD risk.

Among the sites investigated in the sample as whole, only OA affecting the hand emerged as possible risk factor for CVD. The topic if hand OA could increase the risk of

Table 2: Associations between presence of osteoarthritis at the baseline and incident cardiovascular diseases.

Variable	Whole sample		Men		Women	
	Unadjusted hazard ratio (95% CI)	Fully-adjusted * Model (95% CI)	Unadjusted hazard ratio (95% CI)	Fully-adjusted * Model (95% CI)	Unadjusted hazard ratio (95% CI)	Fully-adjusted * Model (95% CI)
Presence of OA	1.34 (1.10-1.63) P=0.003	1.27 (1.03-1.56) P=0.02	1.20 (0.89-1.60) P=0.23	1.07 (0.79-1.45) P=0.66	1.58 (1.20-2.09) P=0.001	1.50 (1.13-2.00) P=0.005
Knee OA	1.13 (0.90-1.42) P=0.30	1.04 (0.82-1.32) P=0.74	1.04 (0.74-1.46) P=0.82	0.97 (0.69-1.389 P=0.88	1.21 (0.89-1.65) P=0.22	1.10 (0.80-1.50) P=0.58
Hip OA	1.48 (1.06-2.06) P=0.02	1.30 (0.92-1.82) P=0.13	1.29 (0.70-2.37) P=0.42	1.00 (0.54-1.87) P=0.99	1.69 (1.14-2.53) P=0.01	1.51 (1.00-2.27) P=0.048
Hand OA	1.42 (1.12-1.81) P=0.004	1.31 (1.01-1.68) P=0.04	1.02 (0.62-1.69) P=0.93	0.80 (0.48-1.33) P=0.39	1.82 (1.36-2.44) P<0.001	1.65 (1.21-2.24) P=0.001
Back/neck OA	1.34 (1.05-1.70) P=0.02	1.21 (0.95-1.55) P=0.12	1.30 (0.89-1.92) P=0.18	1.10 (0.74-1.64) P=0.63	1.45 (1.07-1.97) P=0.01	1.32 (0.96-1.81) P=0.09
Other joints OA	1.33 (0.97-1.80) P=0.08	1.31 (0.95-1.80) P=0.10	1.36 (0.83-2.25) P=0.23	1.33 (0.80-2.21) P=0.27	1.36 (0.92-2.03) P=0.13	1.30 (0.87-1.96) P=0.20

Unless otherwise specified, data are presented as hazard ratios and 95% confidence intervals. Those without any presence of osteoarthritis were taken as reference in all analyses.
Notes: *Fully-adjusted model included baseline values of: age (as continuous); gender; race (whites vs. others); body mass index (as continuous); education (degree vs. others); smoking habits (current and previous vs. others); yearly income (categorized as > or < $50,000 and missing data); physical activity scale for the elderly (as continuous); Charlson comorbidity index (as continuous); presence of hypertension (yes vs. no); use of analgesic drugs (yes vs. no)

CVD is again controversial. Some cross-sectional studies, in fact, have shown that hand OA is associated with a higher presence of CVD, also in pre-clinical forms. For example in a study involving 5,342 older participants, hand OA was associated with a significant higher presence of carotid plaques, coronary and aortic calcifications, particularly in women [22]. It is known that hand OA is linked to the menopause more strongly than other sites [23] and the subsequent decrease in circulating endogenous estrogens, a feature which has also been linked to an increase in CVD rate [24]. However, some longitudinal studies have shown that hand OA was not associated with higher risk of CVD onset [12, 25]. Therefore, other studies are needed to disentangle this topic.

“

Our study demonstrated that people with OA are significantly associated with an increased risk of the onset of CVD in middle-aged and older participants over an eight-year period.

When we analyzed our data separately by gender, OA only emerged as a significant CVD risk factor only in women, in agreement with the literature regarding this topic [26]. Even if why the association between OA and CVD is significant only in women is unclear. One hypothesis is that women make more use of analgesic drugs for these conditions than men, because they are more sensitive to pain [17]. Since these drugs have an unfavorable CVD profile, it is likely that this factor may play a role. Another possible explanation could be extracellular matrix (ECM) remodeling after menopause since, before this period of life, women are at decreased CVD risk than men. It is known that ECM is altered in OA (particularly in the cartilage joints) [27], but this process probably involves also arteries and heart [9]. Since after menopause the alterations of ECM is more rapid in women than men due to the loss of estrogens [24], it may be that these changes make the onset of CVD more likely in women than in men. Third, other researches have proposed that other pathways are probably involved in this gender difference, e.g. tool-like receptors (TLRs) pathways are more altered in post-menopausal women than men [28], and play a part in both OA [29] and CVD [28]. Finally, we should acknowledge that men are less represented in the OAI than women and so a type II error for analyses regarding men is possible.

Our findings should be considered within the limitations of our study. First, as mentioned before, the diagnosis of OA was self-reported, except for knee OA. Second, also the diagnosis of CVD and the comorbidities was self-reported and this could create a bias. The lack of data regarding medications could introduce another bias: for example, we found a prevalence of hypertension of 20%, whilst in people aging about 60 years it is estimated in about 50% [30]. Similarly, some drugs commonly used in the elderly (e.g. duloxetine) that could increase the risk of hypertension were not used as potential confounders in our analyses. Third, we don't have any information regarding CVD mortality and other cardiovascular events, such as hospitalization for CVD, that our recent research has shown been associated with the presence of OA [12]. Fifth, people with OA at the baseline had already a higher prevalence of several CVD risk factors that could increase the risk of incident CVD. Although we have adjusted our analyses for all these factors, a selection bias could be not excluded. Finally, we did not assess any inflammatory marker, although inflammation could be associated with higher CVD risk [31]. Nonetheless, allowing for these caveats, our study involves a large population and the follow-up period seems to be appropriate for our outcome of interest. Moreover, we adjusted our analyses for multiple important confounders, thus strengthening our results.

In conclusion, our study demonstrated that people with OA are significantly associated with an increased risk of the onset of CVD in middle-aged and older participants over an eight-year period. Since some interventions aiming to improve OA symptoms (e.g. increasing physical activity and weight loss reduction) seem to be effective from a cardiological perspective, further studies are needed to better understand if to treat OA is able to decrease CVD risk in these individuals.

Conflict of interest: The authors declare that there is no conflict of interest.

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Role of founding source: The funding sources did not have any role in in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

Ethical standard: This study was conducted according to the guidelines laid down in the Declaration of Helsinki (2008, including 2013 amendments) and all procedures were approved by the University Research Ethics Committee. Written informed consent was obtained from all participants. No animals were used in this study.

References available on request
Healthcare.India@springer.com

Source: N. Veronese, B. Stubbs, M. Solmi, *et al.* Osteoarthritis increases the risk of cardiovascular disease: data from the osteoarthritis initiative. *J Nutr Health Aging.* 2018; 22(3):371–376. DOI 10.1007/s12603-017-0941-0.

Etoricoxib Beneficial for Pain Relief, and Joint Function in Osteoarthritis Among Elderly

According to a recent study published in the *Bosnian Journal of Basic Medical Sciences* etoricoxib provides significant pain relief, improves joint function, quality of life and treatment satisfaction in elderly with osteoarthritis.

Etoricoxib, a selective cyclooxygenase-2 inhibitor has been shown to be associated with low risk of gastrointestinal irritation in comparison to commonly used non-steroidal anti-inflammatory drugs (NSAIDs).

Huang WN and colleagues assessed the efficacy and tolerability profile of etoricoxib in a cohort of elderly individuals with osteoarthritis related pain. Elderly patients (mean age 85.9 years) with inadequate response to NSAIDs were administered 60 mg etoricoxib once daily for 4 weeks. The main outcome assessed was pain improvement using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and secondary outcomes were Brief Pain Inventory Short Form (BPI-SF), Treatment Satisfaction Questionnaire for

Medication (TSQM), Short Form 36 (SF36), and European Quality of Life-5 Dimensions (EQ-5D). Adverse event reports were used to evaluate the tolerability.

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) index score used to measure pain and disability showed reduction after treatment with etoricoxib. Improvement in joint function during walking and performing normal work was also recorded using BPI-SF. Significant improvement in 7 out of 11 domains of SF36 was evident after treatment. Overall patient satisfaction was also observed. There were no adverse events with the therapy.

It was concluded that etoricoxib is useful in improving pain, joint function, quality of life and treatment satisfaction in elderly with osteoarthritis.

Source: Huang WN, Tso TK. Etoricoxib improves osteoarthritis pain relief, joint function, and quality of life in the extreme elderly. *Bosn J Basic Med Sci.* 2018; 18(1):87-94. DOI 10.17305/bjbms.2017.2214. © 2018 ABMSFBIH.

Below- vs Above-elbow Cast for Distal Radius Fractures: Is Elbow Immobilization Really Effective for Reduction Maintenance?

The choice of the cast length in conservative management of distal radius fractures still represents a debated controversy. Historically, the elbow is immobilized to reduce the risk of secondary displacement; however, short-arm casts are currently felt to be equally effective with less complications and better patient comfort. This paper investigates whether immobilization of the elbow is actually effective in reducing the risk of loss of reduction in conservatively manipulated distal radius fractures.

We retrospectively studied 297 consecutive patients with distal radius fractures requiring manipulation and subsequently immobilized with above-elbow cast or below-elbow cast. Maintenance of reduction, radial height, radial inclination, and volar tilt were assessed after the reduction and at 35 days. Appropriate statistical analysis was performed to correct data selection bias and to assess any difference in the effectiveness among the two treatments.

The mean difference of loss of radial height, inclination, and volar tilt between the two groups was 0.8 mm, 0.4°, and 0.9° respectively, being not statistically significant. Average difference in reduction maintenance probability between the two groups stratified with a statistical propensity score was 1.2%.

Above- and below-elbow casts had comparable performance in maintaining reduction of manipulated distal radius fractures.

Source: Tommaso Maluta, Giovanni Dib, Matteo Cengarle, *et al.* Below- vs above-elbow cast for distal radius fractures: is elbow immobilization really effective for reduction maintenance? Int Orthop. 2018 Oct 15. DOI 10.1007/s00264-018-4197-z. © SICOT aisbl 2018.

Association of Neuropathic-like Pain Characteristics with Clinical and Radiographic Features in Patients with Ankylosing Spondylitis

Ankylosing spondylitis (AS) is a chronic, progressive, and inflammatory disorder and causes chronic back pain. It is not unusual for patients with AS to have symptoms similar to neuropathic pain. We aimed to investigate the neuropathic pain (NeP) component in patients with AS using the painDETECT questionnaire (PD-Q) and to assess the relation between NeP and the disease characteristics of AS. A single-center prospective study was performed, including 105 patients. Patients with AS completed three questionnaires: PD-Q, Beck Depression Inventory (BDI), and Euro Quality of Life (EQ-5D) questionnaires. Patients were classified into three groups according to the PD-Q scores: nociceptive pain (NoP) (score ≤ 12), mixed pain (MP) (score 13–18), and NeP pain (score ≥ 19). Fifteen patients (14.2%) were classified into the NeP group, 22 (21.0%) in the MP group, and 68 (64.8%)

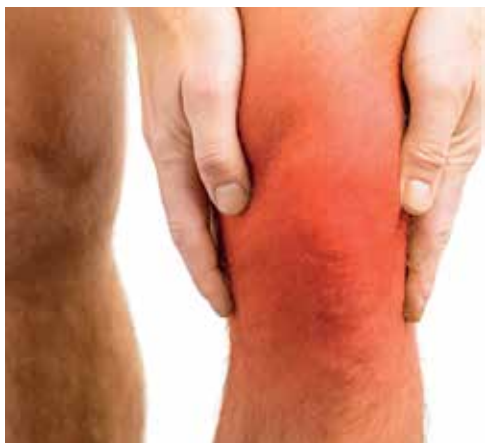
in the NoP group. The questionnaires and clinical and radiographic findings were analyzed. Patients with NeP and MP scored worse on the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI); BDI; modified Stoke Ankylosing Spondylitis Spine Score; pain-visual analog scale (VAS); and EQ-5L index and showed an increased prevalence of enthesitis and peripheral arthritis. There were no differences in objective inflammatory markers. PD-Q scores were positively correlated with pain-VAS, BASDAI, BDI, and inversely correlated with EQ-5D index. Age, BASDAI, presence of current enthesitis, and BDI score were independently associated with PD-Q scores. The findings showed that NeP component in AS was associated with age, high disease activity, presence of current enthesitis, and depression.

Source: Jung-Hye Choi, Sang-Heon Lee, Hae-Rim Kim, Kyung-Ann Lee. Association of neuropathic-like pain characteristics with clinical and radiographic features in patients with ankylosing spondylitis. *Clin Rheumatol.* 2018;37(11): 3077–3086. DOI 10.1007/s10067-018-4125-z.

What are the Factors to Affect Outcome and Healing of Meniscus Bucket Handle Tears?

The purpose of this study is to identify patient, meniscus rupture and surgical characteristics that influence the outcome and clinical healing following operative repair of bucket handle tears.

Between 02/2006 and 10/2012, a total of 38 patients (14 women, 24 men) with bucket handle tears underwent surgical meniscus repair. There were 27 isolated repairs and 11 with concomitant anterior cruciate ligament (ACL) replacement. Patients were analyzed on an average of 44.4 months (range 15–96 months) after surgery by the use of standardized subjective scoring instruments [Lysholm, International Knee Documentation Committee (IKDC), Knee Injury and Osteoarthritis Outcome Score (KOOS) and Tegner Activity Scale (TAS)]. To identify factors affecting the outcome and suture survival, patient-specific, trauma-specific as well as meniscus- and surgery-specific factors were collected. Patients were divided in two groups with healed menisci (group 1) and re-rupture subjects (group 2). Meniscus re-rupture was defined as a clinical failure.



There were 25 patients with healed menisci and 13 (34.2%) that sustained re-rupture and underwent either partial meniscectomy ($n = 8$) or re-suture ($n = 5$). Group 1 achieved slightly higher outcome compared to group 2 [Lysholm: 87.8 vs. 84.3 ($p = 0.35$), IKDC: 86.9 vs. 85.7 ($p = 0.67$), KOOS: 91.3 vs. 90.5 ($p = 0.74$)]. TAS was better for group 2 [5.9 vs. 6.8 ($p = 0.36$)]. Strong impact to result in a significantly increased outcome was identified for higher age, subjective knee joint stability, high preoperative Lysholm Score, short trauma-to-repair time, previous ACL reconstruction and a smaller number of sutures to fulfill meniscus repair. Lower patient age, male gender and higher activity level had the strongest impact to provoke re-rupture.

Clinical outcome after meniscus bucket handle suture is satisfying. Re-rupture rate among this collective was 34.2%. Clear risk factors were identified for diminished clinical healing and outcome.

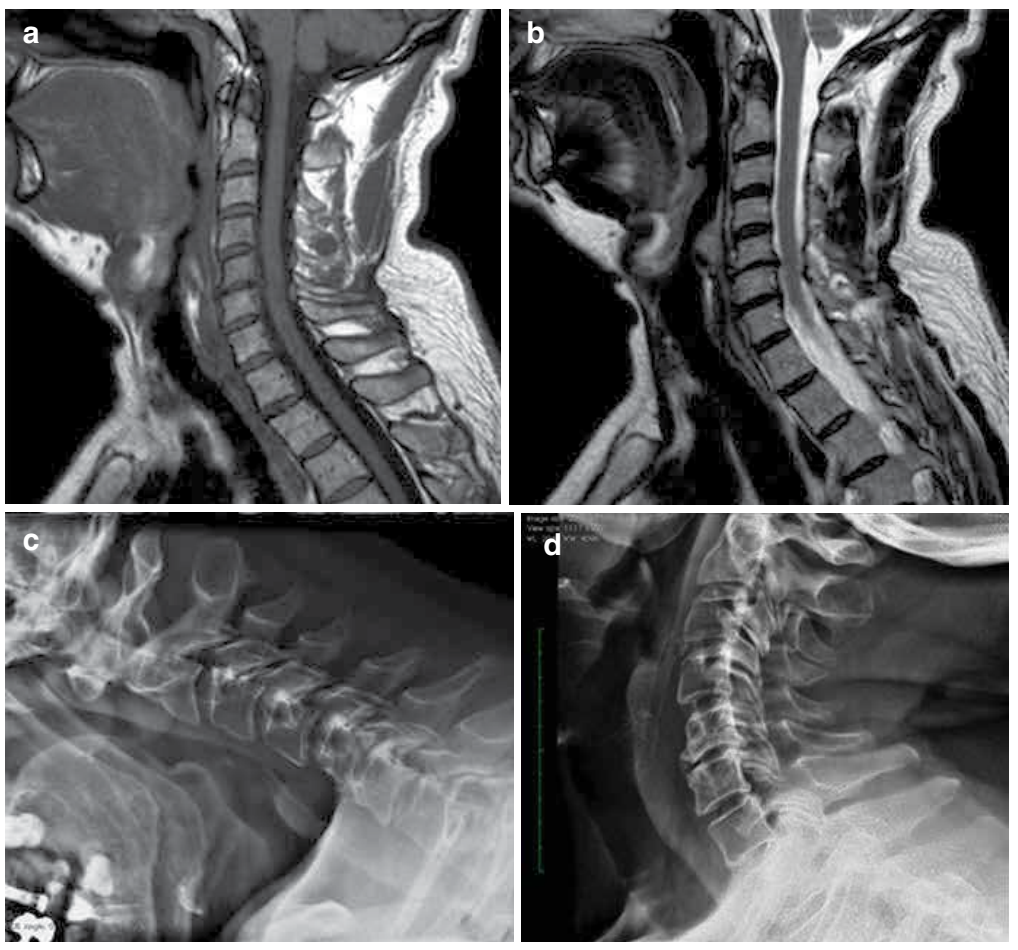
Source: Andreas Hupperich, G. M. Salzmann, P. Niemeyer, *et al.* What are the factors to affect outcome and healing of meniscus bucket handle tears? *Arch Orthop Trauma Surg.* 2018; 138(10):1365–1373. DOI 10.1007/s00402-018-2989-7.

SEPTIC ARTHRITIS

Septic arthritis. (**a**) Anteroposterior radiograph of the shoulder in an IV drug user shows focal lucency (*arrow*) at the humerus. (**b**) Radiograph 1 month later shows erosions of the humerus and glenoid. **(c)** Axial computed tomography shows humeral luncency and diffuse glenoid bone loss (*dotted arrow*). (**d**) Axial T1-weighted fat-saturated magentic resonance imaging (MRI) shows joint effusion with extensive intra-articular debris and synovial thickening (*arrows*). (**e**) Sagittal T1-weighted MRI shows large articular erosions of the bare area of the humeral head with confluent low T1 signal (*arrows*), indicative of osteomyelitis.

Source: Harry G. Greditzer IV, Dustin H. Massel, *et al.* Radiographic musculoskeletal findings indicating opioid misuse: an overview for orthopedic surgeons. *HSS Jrnl.* 2019; 15(1):84–92. DOI 10.1007/s11420-018-09654-y.

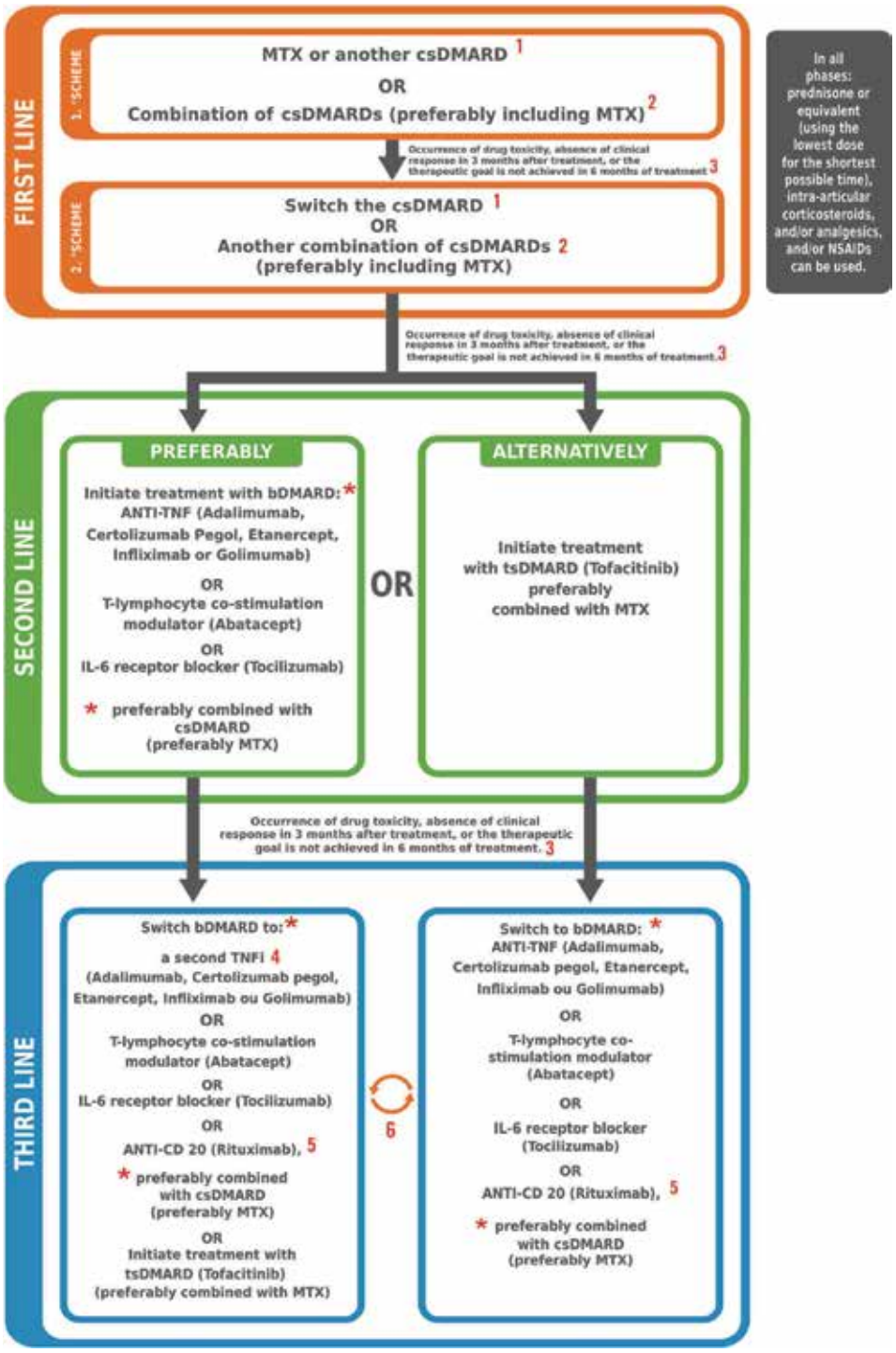
CERVICAL SPONDYLOSIS: MRI VS. FUNCTIONAL X-RAY STUDY



Cervical spondylosis: MRI vs. functional X-ray study. MRI study performed in sagittal plane with T1 TSE (**a**) and T2 TSE (**b**) weighted images. Focal central disc protrusion at C5–C6 level, without cord compression. Plain radiographic functional study in flexion (**c**) and extension (**d**) lateral view, showing minimal hypermobility at C4–C5 level on flexion image.

Source: Colosimo C., Pileggi M., Pedicelli A., Perotti G., Costantini A.M. Diagnostic Imaging of Degenerative Spine Diseases: The Technical Approach. In: Menchetti P.P.M. (ed). Minimally Invasive Surgery of the Lumbar Spine. 1st ed. London: Springer-Verlag; 2013, pp 21-47. DOI 10.1007/978-1-4471-5280-4_2.

TREATMENT ALGORITHM OF RHEUMATOID ARTHRITIS



2017 Recommendations of the Brazillan Society of Rheumatology for pharmacological treatment of rheumatoid arthritis. 1: Sulfasalazine or leflunomide may be used in cases of contraindication to MTX. Antimalarials (hydroxychloroquine or chloroquine) as monotherapy may be considered in cases of low probability of development of radiographic erosions. 2: The most used combinations in Brazil are MTX + antimalarials, MTX + leflunomide (with or without antimalarials), MTX + sulfasalazine (with or without antimalarials). 3: The goal of treatment is remission according to ACR/EULAR criteria or, in cases where this is not possible, low disease activity, as assessed by one of the composite disease activity indices defined in the 2011 SBR Consensus (5). 4: The use of a third TNFi after failure of two TNFi drugs is not recommended. 5: In Brazil, rituximab is recommended in combination with methotrexate for patients with a poor response or intolerance to one or more TNFi drugs. 6: In case of failure or toxicity to a drug used in the third line of treatment, the next step is switching to another drug (bDMARD or tsDMARD) with the same level of complexity and that has not been used previously.

Source: da Mota, L.M.H.., Kakehasi, A.M., Gomides, A.P.M. *et al.* 2017 recommendations of the Brazilian Society of Rheumatology for the pharmacological treatment of rheumatoid arthritis. *Adv Rheumatol.* 2018; 58: 2. DOI 10.1186/s42358-018-0005-0.

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