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TRAUMAS

Treatment with unilateral external fixation of humeral shaft fractures in over 65 patients

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Introduction The treatment of the humerus shaft fractures in the over 65 s is often burdened by the presence of comorbidities that require minimally invasive procedures and minimum duration. In this work we present the treatment of humerus diaphyseal fractures in patients over 65 with unilateral external fixator.
Methods In the period 2010–2012 were treated 61 patients with the technique of external fixation. The average age was 73.4 years (65–96). The average follow-up was 13.5 months (12–18). Indication was placed in the open fractures, in closed spiroid fractures (A1), in those with third fragment or comminuted (type B or C according to the AO classification). Hoffmann II external fixator was used; the method of assessment was the simple shoulder test.
Results The average healing time was 77.4 days (70–90). In seven cases it was reported delayed consolidation of the fracture resolved with dynamization of the external fixator and several cycles focal shock wave. Non-union was diagnosed in four cases, subsequently treated with autologous bone grafts. In three cases was observed pin-tract infection treated with oral antibiotics. Elbow ROM at 12 months was 90°–0°–10°. Shoulder ROM: abduction 82.5°; adduction 38.2°; flexion 73°; extension 30.8°.
Discussion The results of this less traumatic procedure describe in this study was satisfactory, with the restoration of normal daily activities of patients, despite their advanced age and reduced functional demands.
Conclusions The preservation of fracture tissue coverage guarantee the highest biological power for bone healing in an anatomical region so sensitive to changes in the blood supply. External fixation is a good method of treatment, fairly easy to perform, with a high cure rate and good functional recovery. Unilateral external fixator, which allows the constant monitoring of the fracture compression and possible realignments of the bone stumps, was often used with good results.

Comparison of the POSSUM score and P-POSSUM score in patients with femoral neck fracture

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Introduction The ageing of the population in developed countries has led to an increased number of patients with hip fractures all over the world. POSSUM and P-POSSUM scores predict morbidity and mortality of patients who will be undergoing a surgical treatment. The aim of this study was to evaluate accuracy of these two scores in hip-fractured patients.
Methods Between January and December 2012, in our department, 144 patients were hospitalised for femoral neck fractures according to the grade III or IV of Garden's classification treated with total hip arthroplasty or endoprosthesis. POSSUM scores and P-POSSUM scores were calculated for each patient with complete clinical data. We then calculated the observed and the expected ratio.
Results One hundred and thirty-four patients were eligible: 110 females and 24 males. The mean age for women was 79 years, and the mean age for men was 84 years. We observed 13 deaths and 66 complications. The POSSUM scores predicted 16 deaths and 60 complications, while P-POSSUM scores predicted 6 deaths. The O/E ratio for POSSUM mortality was 0.81 and for P-POSSUM was 2.17, while POSSUM morbidity was 1.1.
Discussion Fractures of the neck of the femur are about 8–10 % of patients admitted to the DEA (Department of Emergency and Acceptance). The presence of other pre-existing medical conditions leads this group of patients with an increase in mortality. A score of pre-surgical prediction can help in the acquisition of informed consent and identifies patients at high risk of mortality that will require more attention in the post-operative period.
Conclusions In our study, we have shown that on the one hand, the POSSUM score predicted accurately both the mortality and morbidity in patients undergoing surgery for the femoral neck fracture, while on the other hand, the P-POSSUM score underestimated them. For this reason, we believe that the POSSUM is indeed a good audit tool, which can accurately predict both mortality and morbidity in a cohort of patients.

Surgical treatment of forearm non-unions with segmental bone defect between 1 and 4 cm

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Introduction Forearm non-unions treatment represent a challenge for the orthopaedic surgeon and often requires complex surgery and long recovery time. When forearm non-unions associate with segmental bone defect the chance of healing decrease. The aim of this study is to purpose a management guideline for the treatment of forearm non-unions with segmental bone defect.
Methods We treated 27 patients affected by forearm non-unions: 15 were aseptic and 12 septic. All the non-unions treated were atrophic, with a segmental bone defect between 1 and 4 cm. Septic non-unions involved radius or ulna in ten cases and in five cases involved both bones; aseptic non-unions involved radius or ulna in nine cases while in three cases involved both bones. All of the patients received the same treatment: the bone ends were exposed and the necrotic bone removed; a plate was then applied and a cortical bone graft (bone-bank allograft) was applied opposite to the plate to fill the substance loss. In case of septic non-union, a protocol of treatment with external fixator in association with proper antibiotic therapy were applied in all cases. The mean follow-up was 11 years.
Results At the last follow-up, bone healing was observed radiographically in all cases, and a good osteo-integration of the graft and a restoration of the proper bone length and shape were achieved; VAS score was between 0 and 3 (mean = 1) and in all cases forearm function were improved.
Discussion Forearm non-unions associated with a segmental bone defect represent a challenge in terms of surgery, both for the alterations to the normal relationship between radius and ulna and the severe impairment of the forearm function. The treatment of forearm non-unions with a plate and opposite homologous cortical bone graft remains a debated topic in literature: homologous bone graft shows the advantage of being available in larger quantities if compared to

autologous bone graft, but has an increased infection risk due to the lack of osteogenic properties. Despite that, our study showed that homologous cortical bone graft achieves good osteo-integration, maintaining its bio-mechanical properties.
Conclusions In this study, combining plate and opposite homologous cortical bone graft resulted to be a very effective technique in the treatment of forearm non-unions with segmental bone defect between 1 and 4 cm, both in terms of fracture healing and functional recovery.

Hinged external fixation for Regan-Morrey types I and II fractures and fracture-dislocations

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Introduction The purpose of this study is to evaluate the use of hinged external fixation in patients with elbow dislocations associated to Regan-Morrey types I and II coronoid fractures.
Methods We treated 11 patients (8 males and 3 females, mean age 41 years) between 2009 and 2011 by applying a hinged external fixator an average of 2–3 days after the injury. All patients initially underwent pre-operative clinical examination (ROM, lateral pivot shift test, varus-valgus stress test), radiographic examination, and CT scan. Clinical and radiographic examinations were then repeated 1, 3 and 6 months after the operation. We evaluated the results by using the Mayo Elbow Performance Score, a functional assessment scale that rates four parameters: pain, ROM, stability and function.
Results The results were "excellent" in nine patients (8: 100/100, 1: 90/100) and "good" in two patients (80/100). None of the results were "fair" or "poor". Radiographic examination showed osseous metaplasia involving the anterior medial side in 6 out of the 11 patients. None of the patients had residual compartment instability.
Discussion The benefit of using hinged external fixation to treat of Regan-Morrey types I and II coronoid fractures is that it avoids the lengthy process involved in open reduction internal fixation and capsular ligament reconstruction. Indeed, external fixation improves stability, allows for early mobilization, prevents soft tissue retraction and increases the ROM.
Conclusions We therefore consider the use of hinged external fixation of the elbow to be a viable option in the treatment of Regan-Morrey types I and II fractures and fracture-dislocations.

Cement augmentation method for intertrochanteric fracture in osteoporothic elderly patients treated by intramedullary nailing: a 7-year follow-up

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Introduction Trochanteric fractures are common in elderly people and their treatment has a rate of complications due to technical failure (cut out/head rotation).
Methods We studied 68 patients (42 females, 26 males) with an average age of 86.78 years (range 78–95 years). They had an unstable trochanteric fracture, defined as fractures with three fragments or more, age more than 80 years and severe osteoporotic bone (1 or 2 Singh score). All patients were treated by Gamma Nail standard technique and augmentation was done with The Locker system (Tecres SpA) inserted through the cannulated cephalic screw at its apex. The evaluation is based on: operating time, early functional recovery using the modified Harris hip score, Rx TAD and sliding screw, mechanical and biological complications. During the follow-up we lost 34 patients. No one died because of surgical and anaesthesiological complications or other causes due to the surgical procedure.
Results The HHS average score was 50.4 after 1 month post-operation, 56.21 after 3 months, 55.7 after 6 months, 59.45 after 12 months, 60.67 after 24 months, 61.65 after 48 months and 60.86 after 84 months. The average decrement of haemoglobin was 1.82. In two cases we reported a cement migration through the femoral head. No other complications (infection, cut out and femoral head necrosis) have been reported at the follow-up.
Discussion The review of recent literature highlights the need for augmentation as support of fractures due to osteoporosis, both for the upper and the lower limbs. The poor quality of the bone tissue would not provide a sufficient substrate in which the means of synthesis can be anchored stably leading to complications in topics.
Conclusions Literature review and the observations based on the reported results allow to conclude that the cement augmentation in severe osteoporotic bone could improve the mechanical stability of the implant, ensuring early functional recovery.

Anterior combined endopelvic (ACE) approach for the treatment of the acetabular and pelvic ring fractures: a new proposal

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Introduction We present our experience of using the anterior combined endopelvic (ACE) approach which consists of combination of a newly modified Stoppa approach with the lateral approach to the iliac crest in reference to fractures reduction and fixation, technical aspects, and the incidence of complications as an alternative to the ilioinguinal approach for the treatment of acetabular fractures.
Methods We compared a consecutive group of 34 adult patients with acetabular fractures treated operatively with the ACE approach and a second group of 42 patients treated with ilioinguinal approach between 2010 and 2013 by a single surgeon. Both approach were performed to fix the acetabular fractures with main anterior displacement and the anterior and lateral parts of the pelvis. All the patients were analysed with typical X-rays projection for acetabular fractures and CT-scan. Charts and radiographs were reviewed for fracture pattern. Operative time, blood loss, quality of reduction, functional outcomes and peri-operative complications were compared between the two groups of patients.
Results The mean follow-up of patients was 26 months (6–49) with a median of 24.5 months. Among 76 patients (both groups), fifty were anterior columns of which thirty-two associated with posterior columns; ten anterior columns with posterior hemi-transverse; twelve transverse of which ten associated with posterior walls; two T-type fractures and two anterior walls. Blood loss average was 1,090 ml for ACE group and 1,200 ml for Il-In group. Anatomic or satisfactory reduction was achieved in 94 % of the acetabular fractures. Two patients had mild symptoms of the lateral femoral cutaneous nerve (one for each group) and improved within 46 months; one patient in Il-In group developed ossification Brooks grade III.
Discussion Use of the ACE approach for the treatment of acetabular fractures is highly recommended when the fracture involves the quadrilateral surface and anterior column. It provides a direct good to excellent visualization and access of the entire fracture making easier their reduction and fixation.
Conclusions The clinical outcomes were slightly better than the ilioinguinal approach. Complication rate was similar in the two groups.

We recommend the use of this technique which we considered as a viable alternative for the ilioinguinal approach when the exposure of the anterior acetabulum is required.

KNEE

Comparing flexion and extension movements in estimating knee functional axis

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Introduction Providing proper rotational alignment of femoral component in total knee arthroplasty is mandatory to achieve correct kinematics, good ligament balance and proper patellar tracking. Recently functional references, like the function flexion axis, have been introduced to achieve this goal. The purpose of this study was to analyse which factors could affect the functional flexion axis estimation by separately focusing on flexion and extension movements.
Methods Anatomical acquisitions and passive joint kinematics were acquired on 79 patients undergoing total knee arthroplasty using a commercial navigation system. Knee functional axis was estimated, from three flexion and extension movements separately acquired included in a range between 0° and 120°. Internal-external (IE) rotations and the angle between the functional axis and the transepicondylar axis in axial and frontal plane, were separately analysed for flexion and extension in both pre- and post-implant conditions.
Results The analysis of IE rotation showed a statistically significant difference between the two paths in pre-implant condition, between 25° and 35° of flexion ($p < 0.05$). The analysis of the angle showed statistical differences between flexion and extension in both pre and post-implant conditions and in both frontal and axial plane. Analogously, pre- and post-operative conditions presented statistically significant difference.
Discussion The most important finding of this study is that the estimation of functional flexion axis (FFA) identified through the FFA-TEA angle has changed in the frontal plane in relation to the movements of flexion and extension, especially considering the preoperative state. The role of the FFA in positioning of the components of a total knee replacement has been widely analysed in the literature, and several authors have defined the FFA rotation in the alignment of the femoral component. The literature agrees on the fact that FFA requires further analysis in order to get a chance to be used in daily clinical practice. This study showed that the estimated functional axis in the frontal plane is crucial. The angle FFA-TEA implantation showed higher values in the frontal plane with respect to the axial plane in both flexion and extension. This is probably due to the influence of osteoarthritis in altering the shape of the condyles own, which does not happen in the axial plane.
Conclusions The estimation of the functional axis changed in the frontal plane in relation to flexion and extension movements, above all considering pre-operative conditions, therefore from a clinical point of view it is important to consider the only flexion movement for functional axis estimation during navigated TKA.

Anterior cruciate ligament (ACL) reconstruction and return to sport activity: postural control as the key to success

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Introduction The risk for re-tear following anterior cruciate ligament (ACL) reconstruction is influenced by several hormonal, neuromuscular, bio-mechanical and anatomic factors. One of the most important negative prognostic factors which markedly increase the risk for re-tear of the ACL is the presence of high knee abduction moment (KAM) which can be measured immediately after a vertical jump landing on both feet. In this study we evaluate the values for KAM in two groups of patients who underwent ACL reconstruction followed by a specific rehabilitation protocol focusing on recovery of muscular strength, proprioception and joint stability.
Methods Since October 2011, we conducted a prospective study on two groups of 20 female professional athletes (the sample was uniform for age, body weight, height, sport practised and time to surgery) with clinical and radiological evidence of ACL tear. One group of patients underwent reconstruction using hamstring tendon graft, while for the second group a patellar tendon graft was used as graft choice. Post-operative rehabilitation was identical for both groups. Clinical outcomes were evaluated pre-operatively, at 3 months and at 6 months postoperatively by measuring clinical scores (IKDC and Lysholm scores) and by performing functional test for stability (single leg hop, time hop, crossover triple hop, KAM test).
Results All patients showed statistically significant clinical improvements in when compared to preoperative values ($p < 0.0001$). No inter-group significant difference was observed in all clinical scores and functional tests with the exception of KAM test. The group treated undergoing reconstruction with hamstring tendon graft had values for KAM exceeding the normal range (1°–3°) while in the other group values were within this range. This difference was statistically significant ($p < 0.0001$).
Discussion ACL reconstruction using grafts obtained harvesting hamstring muscles was recognized as the gold-standard technique in women since it's less invasive and provide better aesthetic results; however women showing high KAM values in their healthy knee with high functional demand (elite athletes) could not benefit from this approach because of its higher risk for re-tear in this population.
Conclusions ACL reconstructive surgery using patellar tendon graft, in association with a particular rehabilitation protocol centred on strength, proprioception and stability restoration can produce satisfactory values for KAM within the physiological range.

Influence of component alignment on clinical outcome after total knee arthroplasty in varus knees

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Introduction In the light of the concept of the constitutional varus, it was recently shown that slight under-correction after TKA in varus knees might result in a better clinical and functional outcome. The question how to obtain this under-correction in terms of alignment of the femoral and tibial component and thus joint line orientation remains however unanswered. The purpose of this study was therefore to determine the effect femoral and tibial component alignment on clinical and functional scores following total knee arthroplasty in a cohort of patients with preoperative varus deformity.
Methods A cohort of 132 consecutive patients (143 knees) with preoperative varus alignment (hip-knee-ankle, HKA, angle >3°) receiving the same implant was evaluated with a mean follow-up period of 7.2 years. Full-limb standing X-rays were obtained from all patients pre- and post-operative according to Paley's criteria. Patients were stratified into three groups according to the postoperative HKA-angle (neutral, HKA-angle ± 3°; mild varus group, HKA-angle >3° and <6°; and severe varus group, HKA-angle >6°), three groups for

the femoral component alignment (varus, >92°; neutral, 90° ± 2°; valgus, <88°) and two groups for tibial component alignment (neutral, 90° ± 2°; varus, <88°). These groups were compared with respect to clinical and functional outcomes using the International Knee Society Score (KSS) and the Western Ontario and McMaster University Osteoarthritis Index (WOMAC).
Results No revisions occurred in any of the groups at midterm follow-up. All patients had post-operative improvements in KSS. Knees with a HKA-angle in mild varus scored significantly better for the KSS and the WOMAC, compared with knees that were corrected to neutral and knees that were left in severe varus exceeding 6°. When component alignment was combined with leg alignment, a neutrally aligned tibial component with an HKA-angle in slight varus (3°–6°) showed the best results. When component position was analysed independently of limb alignment, a significant better knee sub-score was found for the neutrally aligned tibial component and the neutrally aligned femoral component. The worst results were obtained with the combination of a varus aligned tibial and a varus aligned femoral component.
Discussion In patients with pre-operative varus osteo-arthritis of the knee, a slight under-correction of the alignment resulted in a better clinical outcome after TKA. This under-correction should be done carefully avoiding a combination of varus alignment of the femoral and tibial component greater than 2°.
Conclusions More then component alignment, the overall limb seems to be main determinant for clinical outcome after TKA.

Single or double-bundle medial patello-femoral ligament reconstruction

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Introduction Objective patellar instability has several causal factors and, consequently, different surgical techniques have been developed to solve them. In 98 % of patellar dislocations the medial patello-femoral ligament (MPFL) is torn. Consequently, MPFL reconstruction, isolated or in combination with other surgical gestures, is emerging as a fundamental technique in the treatment of patellar instability. In literature there are several techniques, different in the type of transplant used, in single or double bundle reconstruction, in the type of fixation. There is no a technique superior to the others. The aim of this study is to compare the short-term results of isolated single-bundle MPFL reconstruction with quadriceps tendon and double-bundle reconstruction with semi-tendinosus.
Methods Twenty-two patients with objective patellar instability, absence of patella alta, TA-GT <20 mm, no high-grade trochlear dysplasia (type B or D according to Dejour) were included in the study. All patients had isolated MPFL reconstruction: 11 with single bundle quadriceps tendon and 11 with double bundle semi-tendinosus. Clinical results were evaluated with IKDC, Kujala and Tegner score. Postoperatively, eight patients had a CT scan, so in this subgroup the change in patellar tilt was evaluated.
Results Mean follow-up was 34 months (24–50). No patient had further patellar dislocation. IKDC score increased from 46.8 to 80.8 in the single-bundle group and from 41.3 to 81.2 in the double-bundle group; the Kujiala score changed from 54.0 to 93.3 and from 44.8 to 94.1, respectively. Tegner score increased from 3.0 to 4.0 in the single-bundle group and 2.6–4.1 in the double-bundle group. The bone patellar tilt changed from 29.9° (22°–41°) to 11.5° (8°–16°).
Discussion Both techniques, although different in the graft used and in its mechanical behaviour, showed excellent results at a short follow-up. Functional and instrumental evaluation showed no differences between the techniques used.
Conclusions Isolated MPFL reconstruction in patients with objective patellar instability without patella alta, high-grade dysplasia and pathological TT-TG is safe and effective regardless of the technique (single or double beam) or graft (quadriceps or semi-tendinosus) used.

Patello-femoral pain syndrome in water polo players

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Introduction Water polo is physically demanding sport, combining swimming, wrestling, and repetitive throwing. Vigorous training with numerous repetitions of kicks may result in overuse injuries. Leg work accounts for 40–55 % of the game, depending on the position of the players and game tactics. The athletes can swim up to four to five kilometres in 1 h game. For water polo players, knee problems can seriously interfere with training and competing. Twenty-five percent of players can have knee pain once during their competitive career. The majority (86 %) of water polo players have experienced knee pain once in their career and 47.2 % of them have had this problem at least one time every week.
Methods Eighteen athletes (4 men, 14 women, 10 bilateral knee) with anterior knee pain were evaluated clinically to investigate the relationship between athletic movement and patello-femoral pain The mean age at the time of evaluation was 19 years (range between 14–22 years). External tibial torsion, Q angle, patellar mobility, pain during range of motion or in palpation of P–F joint were evaluated: Lysholm, Kujala and Knee Society Score were used. Players underwent 6 months of functional training to improve athletic movement.
Results There was a significant improvement of Lysholm, Kujala and Knee Society Score after correction of the athletic movements. After 6 months of training to improve the eggbeater kick the mean Knee Society Score significantly improved from 72 (range 63–79) to 94.6 (range 83–100) of ($p < 0.001$),while the mean Kujala score 68 (range 57–81) to 92 (range 87–100) ($p < 0.001$). The mean Lysholm improved from 76.2 (range 70–84), to 89 (range 81–100) ($p < 0.001$).
Discussion Although water polo athletes will not have often knee problems, knee pain may occur in competitive ones. Water polo players perform the "eggbeater" kick: the right leg rotates counterclockwise while the left rotates clockwise. Essentially, the action is designed to "scull" the feet to produce forces to raise the body. During this athletic movement knee joint is forced in flexion, valgus forces and tibial external rotation. The result is an increase in shear forces on the patello-femoral joint and a subluxating vector on the patella. The rotation of the knee and compression on the medial aspect of the joint can cause degenerative changes on the patello-femoral joint.
Conclusions Pathogenesis of this syndrome is the consequence of altered athletic movement. The treatment of knee pain in water polo players is conservative and is based on the correction of the "eggbeater" kick's technique to avoid overuse injury.

ARTHROSCOPY

How to avoid collision between PCL and MCL femoral tunnels during a simultaneous reconstruction

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Introduction The purpose of the present study was to assess the risk of femoral tunnel collisions between the medial collateral ligament (MCL) and the posterior cruciate ligament (PCL) tunnels during a simultaneous PCL and MCL reconstruction.
Methods Forth generation medium and large synthetic femur bones were used. On each femur, a MCL tunnel and a PCL tunnel were reamed. The MCL tunnel was drilled at 0°, 20° and 40° of axial and coronal angulations. The PCL femoral tunnel was reamed to simulate two different tunnel directions that could be obtained through an inside-out and outside-in technique. Tunnels were filled epoxy resin augmented with $BaSO_4$ and multidetector CT exams of the specimens were performed.
Results It was found a high rate of tunnel collision when the MCL femoral tunnel was reamed proximally and with an axial angulation of 20° and 40°. The rate of tunnel collision significantly decreased when the MCL tunnel was reamed proximally with an axial angulation of 0°. No differences were found between PCL tunnel directions in terms of tunnel collision.
Discussion This study provides new information regarding the risk of tunnel collision when a MCL reconstruction is performed in the setting of a concurrent PCL reconstruction. In order to minimize such potential complications the MCL tunnel should be drilled with a proximal angulation between 0° and 20° and 40°, limiting the axial angulation.
Conclusions The results of this study can help surgeons to better direct the femoral MCL tunnel in order to avoid a collision between femoral tunnels during a combined MCL and PCL reconstruction.

Arthroscopic treatment of meniscal tears with suture in children and adolescents

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Introduction Meniscal tears have been always treated with complete or partial meniscectomy, but in the last few years surgeons have paid attention to the consequences of this procedure. Today, in most cases surgeons do not remove meniscus, but they only regularized or suture it. Many studies have demonstrated that meniscal preservation protects articular cartilage from degenerative changes, and that this changes are directly connected to the amount of the removed meniscus. Based on this consideration it is very important to preserve meniscus, mainly in young patients, to avoid the beginning of osteoarthritis process.
Methods This retrospective study includes 11 patients, with a mean age at intervention of 11.7 years (range 7–16). Among them, eight presented lateral meniscus tears and three medial meniscus tears. In six cases the surgery was programmed for the treatment of discoid meniscus; in the other three cases patients underwent to ACL reconstruction and during the procedure the meniscal tears were sutured. Ten patients were treated with the out-in technique and one with the all-inside technique. At an average follow up of 18 months (range 16–32), clinical evaluation was made using IKDC, Lysholm and Tegner scale.
Results No adverse events or post-operative complications were reported. The technique has led to very satisfactory results, both subjective and objective (IKCD normal/nearly normal). All the patients returned to the pre-injury sport activity level accordingly to the type of sport. In consideration of the young age of the patients no radiological post-operative examination was performed.
Discussion This results allow to consider crucial the preservation of the anatomy of the knee in pre-adolescent and adolescent patients to obtain satisfactory medium-long term results. However surgeon must be aware that the meniscal suture could expose these patients to a higher risk of failure in the first months from treatment and to a longer and more difficult post-operative recovery in consideration of their young age.
Conclusions Our results show that this technique is very satisfactory in the medium term in this class of patients. For this reason, we believe that this treatment should be preferred in all cases, including the border-line ones, rather than the partial meniscectomy.

Anatomic anterior cruciate ligament reconstruction: transtibial technique (TT) versus translateral technique (OUT-IN)

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Introduction The location of femoral tunnel in anterior cruciate ligament (ACL) reconstruction is crucial to obtain high clinical results and better return to pre-injury level. Restoration of anatomic femoral ACL footprint should be the aim of the operation but not all the techniques used allow to reach these area. The purpose of our study is to compare accuracy of transtibial technique (TT) versus translateral technique (OUT-IN) to restore ACL anatomic femoral footprint.
Methods We prospectively followed 40 ACL reconstructions with femoral tunnel performed through two different techniques: TT (20) and OUT-IN (20). Clinical evaluation was done using IKDC and KOOS score and radiographic analysis with specific 3D-CT scans. Tunnel coordinates were calculated using Bernard-Hertel quadrant method to define the insertion point of ACL. Tunnel length was measured as distance between the centre of entry point and the exit point. Tunnel inclination was determined as the angle between longitudinal axis of the tunnel and knee joint line in frontal plane.
Results Excellent clinical results were reached in both groups with comparable IKDC and KOOS scores. The mean distances of the femoral tunnel centre location parallel to the Blumensaat line were 31.1 ± 2.5 % in OUT-IN and 39.4 ± 1.9 % in TT, measured from the posterior border of the medial wall of the lateral condyle [normal value (NV) = 27.3 %]. While the mean distances perpendicular to the Blumensaat line were 30.2 ± 2.7 % in OUT-IN and 10.5 ± 1.5 % in TT, measured from the roof of the intercondylar notch (NV = 34.35 %). The mean femoral tunnel inclination was 33.9° in OUT-IN and 59.9° in TT. The tibial tunnel position and length were similar in both techniques.
Discussion Many reports described the limitations of TT technique to restore ACL anatomic femoral footprint. The TT frequently produces a vertical nonanatomic femoral tunnel because of constraints in the direction of the tibial tunnel. According to literature we demonstrated that better restoration of ACL anatomic femoral footprint is possible with OUT-IN technique compared to TT technique.
Conclusions OUT-IN technique is more accurate to restore ACL anatomic femoral footprint than TT technique. Moreover OUT-IN technique determines a shorter and less vertical femoral tunnel compared to TT technique.

Indications to arthroscopic treatment of femoral patella instability in adolescent patient

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Introduction In our study we evaluated the efficacy of arthroscopic surgical treatment of medial retinaculus retension in adolescent patients affected by anterior knee pain by chronic patellar instability, without episodes of patella post-traumatic dislocation.
Methods Before surgical treatment all patients were treated by physical therapy for at least 1 year. From February 2008 to November 2010 we operated 14 patients affected by anterior knee pain by chronic patellar instability by arthroscopic medial retinaculus retension using arthroscopic plications by PDS wire. No patient presented post-traumatic patella dislocation. In no patient we performed lateral release. Ten patients were females, four males. Mean age at surgery was 15 years 8 months (range 13–17 years). Three patients were operated at both knees. Before surgery patients have been clinically examined evaluating patella mobility with medial–lateral glide test. Lysholm Tegener test has been performed before surgery and at follow-up. All patients before surgery have been examined by standard knee X-rays and axial patella X-rays and by MRI in order to exclude intra articular lesions associated with possible lesion of medial patella femoral ligament. In six patients axial patella X-rays shown a significant lateral patella inclination, confirmed by alteration of congruent patella femur angle and of lateral patella movement. In six patients with significant lateral patella inclination axial patella X-rays have been performed 1 year after surgery.
Results At a mean 46 months follow-up (range 39–72 months) 92.85 % patients (13/14) is completely satisfied of surgery. Symptoms improved in all patients. In Lyshom evaluation mean value improved from 51 to 93. We had 10 excellent results (71.42 %), 3 good results (21.42 %) and 1 average result (7.14 %). Average result was in an obese patient, who however had symptoms improvement. Activity level in Tegener evaluation improved from mean 3.1 value to 6. A significant improvement was obtained in patella mobility. Lateral glide test improved from mean value 2.9 to 1.2; medial glide test improved from 1.9 mean value to 1.2. In six patients with significant lateral patella inclination, axial patella X-rays show an improvement in femur-patella alignment. We had two minor complications (one case of emarthrus and one case of PDS intolerance), both resolved in few months.
Discussion Arthroscopic medial retinaculus retension is a surgical procedure that, in our experience, has precise and limited indications. We use this procedure in patients with chronic patella instability without patella dislocation. In adolescent patients we use this procedure only after skeleton maturation.
Conclusions Our cases show that arthroscopic medial retinaculus retension is an effective treatment in patella femur instability not associated with trauma in adolescent patients.

SHOULDER AND ELBOW

Clinical results of surgical treatment of complex fracture-dislocations of the proximal ulna and radius: prospective study of 39 cases classified and treated according to "proximal ulnar and radius comprehensive classification system"

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Introduction Complex fracture-dislocations of the proximal ulna and radius (FDUR) are challenging conditions to treat and often yield unpredictable results. The aim of this study was to analyse the clinical results of a large patient series treated with the diagnostic and therapeutic algorithm of a new classification: Proximal Ulnar and Radius Comprehensive Classification System (PURCCS).
Methods We studied 38 patients (39 elbows) with a mean age of 56 years. All patients underwent standard radiograph, computed tomography and intra-operative fluoroscopy. Each injury pattern was classified and treated according to the PURCCS. Heterotopic ossification prophylaxis with indomethacin was administered and early rehabilitation was prescribed in all patients. Clinical results were evaluated by MEPS, m-ASES and Q-DASH scores.
Results Patients were followed for a mean of 23 months. Mean MEPS was 91.2 points (60–100), with excellent, good and fair results reported in 72, 20 and 8 % of patients, respectively. Mean DASH and m-ASES scores were 14.9 (0–45.5) and 83.9 (46.3–100), respectively. At the last follow-up, mean extension, flexion, pronation and supination were 19°, 136°, 81° and 79°, respectively. Complications were: one case of transient ulnar neuropathy, two of wound dehiscence, one of early hardware mobilization, two of asymptomatic chronic instability, one of ulnar delayed bone healing and four of stiffness in the flexion–extension plane (one severe, two moderate and one mild); furthermore, three cases of elbow with radio-ulnar synostosis were observed: two underwent re-operation, which yielded good final functional results.
Discussion We analysed the clinical results of a series of patients with FDUR classified and treated according to the PURCCS algorithm. Despite a significant number of minor and major complications, satisfactory clinical outcomes were observed in the majority of patients, confirming that the PURCCS may help improve the clinical outcome of these complex injuries. An accurate diagnosis and thorough evaluation of the main lesions in FDUR are essential for correct surgical management. The PURCCS alphanumeric system helps identify all lesions of each injury pattern, whereas the accompanying therapeutic algorithm provides appropriate surgical guidelines. This treatment approach, followed by early rehabilitation, yielded satisfactory clinical results in more than 90 % of cases, together with a lower prevalence of major complications and re-operations than reported in other studies.
Conclusions This study yielded encouraging clinical results, thus suggesting that PURCCS may be useful when drawing up guidelines for the management of fracture-dislocations of the proximal ulna and radius.

The "coverage angle" of the ulnar greater sigmoid notch: bone and cartilage contribution

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Introduction Despite the crucial role of the greater sigmoid notch (GSN) in elbow stability, no study has calculated the GSN coverage angle of the humeral trochlea (π angle) or investigated whether there are any morphological variations between humans. Our aims were: (1) to quantify the π angle and its variations, (2) to assess the contribution of the olecranon and coronoid process cartilage tips to this angle.
Methods We performed high-definition MRI on 78 healthy elbows in 19 men and 20 women (mean age 28 years; range 21–32). We used a DICOM viewer software on the elbow sagittal plane passing through the olecranon and coronoid tips to measure four angles: α angle (ulnar

bone coverage angle), identified by two lines from the trochlea centre to the olecranon and coronoid bone-cartilage junction; β angle (olecranon cartilaginous coverage angle), identified by two lines from the trochlea centre to olecranon bone-cartilage junction and olecranon cartilage tip; μ angle (coronoid cartilaginous coverage angle), identified by two lines from the trochlea centre to coronoid bone-cartilage junction and coronoid cartilage tip; lastly, π angle was yielded by angles α + β + μ. Pearson correlation and Student's *t* test were used for the statistical analysis.

Results The mean α, β and μ angles were 182° (153°–204°), 6° (2°–12°) and 9° (2°–16°), respectively. No correlation was found between the three angles. The mean π angle was 198° (167°–222°). A π angle <180° was observed in 8 % of cases. No significant differences emerged for side, gender or patient height.

Discussion The study describes, for the first time, and analyses the GSN coverage angle of the humeral trochlea, named π angle. Our results show a marked variation in the GSN coverage angle, revealing a wide spectrum of shapes of the GSN contour on the sagittal plane. We identify and define two main morphotypes of the GSN, defined as "closed-shaped" when π angle >180° (92 % of cases), and "open-shaped" when π angle <180° (8 % of cases). We believe that a larger GSN coverage angle might be associated with increased intrinsic elbow stability than a smaller angle, which reveals the humeral trochlea to a greater extent.

Conclusions The GSN coverage angle displays significantly different shapes, with differences in cartilage tips making a contribution that is not correlated to that of bone or the other parameters examined. These anatomical variations may be clinically relevant in the elbow instability setting.

Rotator cuff tendinopathy classification system (RCTCS)

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Introduction Rotator cuff tendinopathy (RCT) is a leading cause of shoulder pain and a significant source of disability and loss of work. While several classification systems exist for rotator cuff tears, there is no classification for assessing rotator cuff tendinopathy. The aim of this study was first to propose a system of Rotator Cuff Tendinopathy Classification (RCTCS) using MRI; then, to study its inter- and intra-observer reliability.

Methods The study sample included 520 patients complaining shoulder pain aged between 40 and 65 years old. All subjects underwent MRI exam of the shoulder. Presence of cuff tendinopathy was assessed and classified using of a new classification system, with five types: type I, cuff with sufficient thickness and homogeneously low intensity on each image; type II, cuff with sufficient thickness and with partial high intensity area; type III, cuff with less than half of the thickness of normal cuff, but without discontinuity; type IV, presence of a minor discontinuity in only one or two slices on both oblique coronal and sagittal images, suggesting a small full-thickness tear; type V: presence of a major discontinuity observed in more than two slices on both oblique coronal and sagittal images, suggesting a medium or large full-thickness tear. MR images were studied by three researchers for three times per each. Intra and inter-observer agreement were assessed.

Results The Rotator Cuff Tendinopathy Classification System revealed 75/520 (14.42 %) patients with a type I postero-superior cuff; 110/520 (21.15 %) with a type II; 131/520 (25.15 %) with a type III; 137/520 (26.34 %) with a type IV and, finally, 67/520 (12.18 %) with a type V. Intra- and inter-tester agreement were 0.91 (CI 0.863–0.978) and 0.784 (CI 0.692–0.856), respectively. The results show that there is a very high intra-tester and an high inter-tester agreement.

Discussion The results of this study show that the Rotator Cuff Tendinopathy Classification System (RCTCS) is a valuable and reproducible classification for the classification on MR of degeneration status of cuff tendons. This system has been developed on the basis of rotator cuff integrity developed by Sugaya et al. and it has been modified to describe a tendon which has not been surgically treated.

Conclusions This new classification system may be useful to describe degeneration of cuff tendons in five degrees of severity.

Shoulder arthroplasty: glenoid component medialization with severe bone loss

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Introduction Glenoid morphology is considered an important determinant for clinical outcomes after shoulder arthroplasty. Glenoid bone deficiency with primary osteoarthritis (OA) may lead to catastrophic glenoid component failure. In the presented study our goal was to evaluate the outcomes of patients with OA and severe glenoid bone loss who had total shoulder arthroplasty (TSA) or reverse total shoulder arthroplasty (RTSA).

Methods We included in the study 64 patients who had severe glenoid bone loss and an intact rotator cuff. Thirty-two patients (34 RTSAs) were considered as the study group (RTSA group) and 32 patients (34 TSAs) were the control group (TSA group). The mean follow-up was 35.2 months (range 24–61). All patients were evaluated through physical examination, Western Ontario Osteoarthritis Shoulder index, Simple Shoulder Test, American Shoulder and Elbow Surgeons, L'Insalata, and Constant scores. Radiographs were taken for all patients in order to rule out any radiolucency line or scapular notching, graded according to Sirveaux classification.

Results The RTSA group had significant improvements in pain level; active range of motion for abduction, flexion, and rotation; and all five patient-reported outcome measures. One patient had a failed RTSA (3 %; aseptic wear) and required revision surgery. The RTSA group had significantly better improvement in pain, active external rotation, and the Simple Shoulder Test score than the TSA group. There were no significant differences in the other outcome measures between the two groups. In the TSA group there were 8 cases of scapular notching (23 %): 5 cases (14.7 %) were grade 1, 2 (5.8 %) were grade 2, and 1 (2.9 %) was grade 4.

Discussion In this study we have demonstrated that in patients with symptomatic osteoarthritis who have significant glenoid bone loss can be successfully treated with a reverse total shoulder prosthesis without bone grafting by reaming the glenoid to a flat surface. This approach to glenoid bone loss resulted in a short term failure rate of only 3 % and lead to significant improvement in pain relief and joint specific patient outcome measures. Lastly, there were significant improvements in shoulder range of motion despite medialization of the glenoid baseplate.

Conclusions Reverse total shoulder arthroplasty seems to be a viable option for treating severe glenoid bone loss in patients with OA without bone grafting.

Scapular dyskinesis after Latarjet or a modified Eden-Hybinette procedure

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Introduction We hypothesised that scapular dyskinesis occurring after gleno-humeral stabilization may be related to the type of stabilizing procedure. Purpose of this study was to evaluate scapular position and motion patients who underwent a Bristow-Latarjet (BL) or a modified Eden-Hybinette procedure (J-Bone Graft) (EH).
Methods Forty-six consecutive patients treated for anterior recurrent (more than one) shoulder dislocation in two centres between 2010 and 2012 were retrospectively enrolled in this study. Twenty-three were treated with a BL and 23 a EH procedure. Twenty BL and 20 EH were available for follow-up examination at a mean follow-up of 20 months (12–60). Three independent researchers evaluated each patient, three times per each. We measured Western Ontario Instability Index (WOSI), Rowe Score and Subjective Shoulder Value (SSV). Scapulo-thoracic position was studied following the protocol described by Kibler and Burkhart et al. and evaluation of scapular motion was performed with the DYSKINESIS YES/DYSKINESIS NO method. Intra- and inter-observer reliability of dyskinesis assessment was calculated.
Results Scapular dyskinesis was found after 5/20 BL and after 0/20 EH procedures ($p = 0.047$). Two of the five scapular dyskineses reached the SICK scapula syndrome definition. Intra- and inter-observer reliability for assessment of scapula dyskinesis was high (0.8 and 0.73, respectively). Scores did not show statistical differences.
Conclusions Scapular dyskinesis was found in 5 of 20 of patients who underwent a BL procedure, but it did not negatively affect the clinical result. Dyskinesis may be related to the detachment of pectoralis minor, coracobrachialis and short head of the biceps.

PROSTHETICS

Unicompartmental knee replacement with an all-poly tibial component: satisfactory 10-year implant survivorship regardless of BMI

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Introduction Some papers recently reported conflicting results on implant survivorship in all-poly tibial UKRs. Furthermore, the influence of BMI on this specific implant survivorship remains unclear, since existing reports are often based on small series of non-consecutive patients with different follow up durations, enabling to generate meaningful conclusions. The main purpose of the present study was to determine the 10-years survival rate of an all-poly tibial UKR in a large series of consecutive patients and to investigate whether a correlation exists between a higher BMI and an increased risk of revision for any reason.
Methods A retrospective evaluation of 273 patients at 6–13 years of follow-up was performed. Clinical evaluation was based on KSS and WOMAC scores. Subjective evaluation was based on a VAS for pain self-assessment. Radiographic evaluation was performed by three independent observers. A Kaplan–Meier survival analysis was performed assuming revision for any reason as primary endpoint. Reason of revision was determined basing on clinical and radiographic data.
Results The 10-years implant survivorship was 90.8 %. Twenty-five revisions (9.2 %) were performed and aseptic loosening of the tibial component was the most common failure mode (11 cases, 4 %). No significant correlation was identified between failure and patients' BMI. Mean post-operative results for KSS and WOMAC score were 87.0 (standard deviation 14.6) and 87.37 (standard deviation 11.48), respectively. VAS showed a significant improvement ($p < 0.0001$) respect to pre-operative condition.
Discussion Discordant results of the literature are mostly based on small series of consecutive patients with short follow-up. Unlike the latter, the present study is based on a large group of 273 patients followed for a mean follow-up of more than 10 years. The calculated survival of 90.8 % confirms the effectiveness and reliability of unicompartmental knee replacement with all-poly tibial component, which are further supported by excellent clinical results. Is also confirmed the absence of influence of the high BMI on implant survival.
Conclusions Unlike some recent reports, this study demonstrated a satisfactory 10-years implant survivorship using an all-poly tibial UKR. A higher BMI does not reduce survival rate at 6–13 years of follow-up.

The adductor tubercle as an important landmark to determine the joint line level in total knee arthroplasty: from radiographs to surgical theatre

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Introduction The restoration of the normal joint line (JL) is important both in primary and revision total knee arthroplasty (TKA). However, the assessment of the femoro-tibial JL is still controversial. A strong correlation between femoral width (FW) and distance from adductor tubercle (AT) to JL was found on radiographs, with a ratio of 0.54. The hypothesis was that this ratio was applicable also in the surgical theatre by using measurements obtained intra-operatively with a caliper.
Methods Femoral width, AT to JL distance and the ratio between AT to JL distance and FW of 40 patients who underwent TKA were measured on radiograph and intra-operatively. Bland–Altman agreement tests with repeated measurements and linear regression analysis were used. The ratio was used to estimate the distance between JL and AT.
Results The AT to JL distance/FW ratio calculated with linear regression resulted 0.54 for radiographic measurements and 0.53 for intra-operative measurements. There was no difference (0.009 ± 0.03) between the calculated ratios on radiographic and intra-operative measurements, and the correlation between intra-operative and radiographic measurements was 0.5 ($p = 0.0016$).
Discussion This study shows that the validity of the radiographic method which uses an AT to JL distance/FW ratio to determine the level of the JL is confirmed also when using intra-operatively acquired measurements.
Conclusions This ratio represents a reliable tool to determine the JL level even in challenging prosthetic revision cases when the anatomical JL is missing simply by multiplying the FW with the value of the coefficient 0.53 derived from the ratio.

Clinical and radiological findings with a new short stem: the GTS experience at a minimum 3-year follow-up

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Introduction Standard uncemented stems have demonstrated excellent clinical and radiographic results in the long term. However, they could cause significant removal of bone from the trochanteric region, long stem in the femoral shaft and stress shielding. GTS stem is a new short implant to address the growing demand for bone and tissue sparing in primary hip replacement (THA). In this prospective case series, we evaluated the clinical and radiographic results of this new short stem.
Methods From January to December 2010, 400 patients (M:F = 237:188) (425 hips) who underwent primary THA with a mean age of 57.8 years (range 17–87) were enrolled. Pre-operative diagnosis was primary osteoarthritis (73 %), osteoarthritis secondary to hip dysplasia (16 %), post-traumatic arthritis (5 %), avascular necrosis of the femoral head (3 %) and other (3 %). The mean follow-up was 41.7 months (range 36–48).
Results The Harris Hip Score increased from 40.6 ± 4.3 pre-operatively to 96.9 ± 7.8 post-operatively ($p < 0.0001$). No patient reported thigh pain or clicking/squeaking sounds coming from the prosthesis. Clinical picture after surgery was rated as very satisfactory and satisfactory by 77 and 19 % of patients, respectively. At radiographic follow-up, no patients showed stress shielding. Cortical hypertrophy in the femoral shaft was detected in 4 (1 %) hips. Heterotopic ossification was found in 51 (12 %) hips, but none required surgical removal. Varus positioning (3°–5°) of the stem was reported in 53 (12.5 %) hips. Intra-operative peri-prosthetic fractures were reported in 6 (1.4 %) hips. Two (0.5 %) stems were revised because of aseptic loosening, and two (0.5 %) because of subluxation or dislocation.
Discussion GTS stem has been designed to spare the trochanteric region and limit the invasion of the femoral canal. The conical shape, the fins on anterior and posterior surfaces and the compaction of metaphyseal cancellous bone ensure the anchorage in the metaphysis and primary rotational stability. Two different values for neck-shaft angle (133° and 122°, standard and varus, respectively) allows to restore the native morphology of the proximal femur. The absence of proximal femoral bone resorption and the very low frequency of cortical hypertrophic suggest the property of the stem to ensure a physiological transmission of loads in the proximal region of the femur.
Conclusions GTS stem provides excellent clinical and radiological findings in patients undergoing primary THA at minimum 3 years of follow-up.

Control of blood loss after total knee replacement: a prospective randomized study

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Introduction Extensive blood loss after total knee arthroplasty (TKA) may be a potential problem since it leads to anaemia, increased need for transfusion and prolonged hospitalization. Aim of this study was to investigate the effects of postoperative knee flexion after TKA on blood loss and the need for transfusion.
Methods One hundred consecutive patients undergoing primary TKA from 2012 to 2013 were randomly divided into two groups. In one group, the knee was extended for the first 6 h after surgery, whereas in the other was flexed at 90° for the same time. Two doses of endovenous tranexamic acid were administered in all subjects. Patients were homogeneous for all the possible confounding factors.
Results Calculated blood loss was 846 ± 197 ml in the flexion group and 1,242 ± 228 ml in the extension group ($p < 0.05$). Drop of haemoglobin levels at 24 h in the study group and the control group was 1.9 ± 0.8 and 3.0 ± 0.5 g/dl, respectively ($p < 0.01$). Drop of haematocrit at 24 h was 4.5 ± 0.2 % in the flexion group and 6.7 ± 0.3 % in the extension group ($p < 0.05$). Blood transfusion was necessary in five patients in the control group and was not necessary in any patient of the study group. Average knee flexion at day 7 was 105° ± 4° in the flexion group and 98° ± 7° in the extension group.
Discussion Knee flexion at 90° after TKA, associated with the intra-operative use of tranexamic acid is an effective method to reduce blood loss and the need for blood transfusion.
Conclusions The routine use of the present protocol is effective in reducing social costs and length of hospitalization of TKA procedures.

The Italian arthroplasty registry (RIAP)

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Introduction Recent failures of some prostheses worldwide recalled from the market, moved EU Commission to highlight the need of establishing arthroplasty registries, to support medical devices market vigilance and surveillance. The Italian Ministry of Health is defining a decree that will follow what stated in the Law 221/2012 by implement several surveillance systems among them also the Italian Arthroplasty Registry (Registro Italiano Artoprotesi-RIAP). Aims of an arthroplasty registry are the evaluation of the performance of the implanted device (measurement as survival) and the immediate recall of patients in case of failure of the implanted prosthesis. Coverage is a fundamental requirement and must be higher than 95 %. RIAP is funded by the Italian Ministry of Health.
Methods RIAP organisation is based on three main pillars: be a federation of regional registries, use hospital discharge records (Schede di Dimissione Ospedaliera, SDO) integrated by a Minimum DataSet (MDS) related to the procedure and the implanted devices, characterise the medical devices linking the RIAP and the Health Ministry database. Lombardia, Toscana, Marche, Lazio, Abruzzo, Puglia, Basilicata, Calabria, Sicilia, the Autonomous Provinces of Trento and Bolzano and the "Livio Sciutto" Foundation are participating in the project. Data collection include hip, knee and, since 2014, shoulder replacement. Lazio and Toscana are working to integrate the MDS into their already existing health information systems. Local registries (regional/provincial) have been instituted in Lombardia, Puglia and Bolzano making data collection mandatory.
Results RIAP includes more than 100,000 admissions for arthroplasty (>65,000 hips and >40,000 knees). Data quality is checked. Descriptive analyses are performed by procedures, sex, diagnosis, operated side, approach.
Discussion RIAP founds its activity on the active cooperation of the involved stakeholders (public health institutions, surgeons,

manufacturers and patients). Essential requirements for RIAP are to correctly identify and characterise the implants and the traceability of the patients. Cooperation with manufacturers and informed consent of the patients are keystones of the whole process.
Conclusions Participation of all the hospitals performing joint replacements will be made mandatory by the institution by law of the national arthroplasty registry. A high quality of the data collected will allow the Registry to reach its aims and the surgeons to make an evidence-based choice of the device resulting in both increasing the quality of the provided healthcare and containing the related costs.
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Trabecular metal augments for the management of severe bone defects in acetabular reconstructions

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Introduction Management of severe acetabular bone defects is challenging. The use of trabecular metal (TM) acetabular implants has widely increased. The aim of this retrospective case series was to assess the clinical and radiographic outcomes of TM augments associated with cementless TM acetabular components for the management of Paprosky type III defects in acetabular reconstructions.
Methods Sixty-four patients (M:F = 23:41) (65 hips) undergoing acetabular reconstruction with tantalum-coated cup and tantalum augments were included. At the time of surgery, the average age was 62.8 years (range 26–86), and the average body mass index was 25.9 kg/cm^2 (range 17–40). Bony defects were Paprosky type IIIA in 50 and type IIIB in 15 hips. Hip range of motion (ROM) and Harris Hip Score (HHS) were performed pre-operatively and post-operatively. The average follow up was 56 months (range 35–105).
Results The average HHS increased from 39.1 (range 24–52) pre-operatively to 89.5 (range 61–100) after surgery ($p < 0.0001$). The final scores were excellent and good in 55 % and 35 % of patients, respectively. The average value of flexion changed from 80° (range 45°–100°) before surgery to 115° (range 80°–130°) at the last follow-up ($p < 0.0001$); abduction changed from 25° (range 10°–45°) to 40° (range 20°–50°) ($p < 0.0001$); adduction changed from 15° (range 0°–30°) to 30° (range 15°–45°) ($p < 0.0001$); internal rotation changed from 10° (range 0°–20°) to 20° (range 10°–35°) ($p < 0.0001$); and external rotation changed from 20° (range 5°–30°) to 35° (range 20°–45°) ($p < 0.0001$). Five (7.7 %) out of 65 hips underwent revision of acetabular prosthetic components, with a cumulative success rate of 92.3 %. Four cases of loosening (6.2 %), and one of recurrent instability (1.5 %) were reported. Heterotopic ossifications were reported in 15 (23 %) out of 65 hips, but none required surgical removal.
Discussion The management of severe acetabular bone defects aims to restore the physiological centre of rotation of the hip with an anatomic reconstruction of the defect. TM is a three-dimensional biomaterial with high porosity (70–80 %), high friction and low modulus of elasticity. Moreover, the variability in terms of dimensions and shapes of the augment guarantees the modularity necessary to reconstruct the bone defect.
Conclusions The use of TM-coated cups and augments represents an effective management of Paprosky type III defects in acetabular reconstruction providing good clinical and radiographic outcomes in the midterm.

INFECTIONS

Silver-coated megaprostheses in patients at high risk for infection: evaluation of clinical results and silver ion levels in body fluids in a series of 22 patients

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Introduction Deep infection is one of the most frequent and harmful complications in megaprostheses. Silver coating was recently introduced for orthopaedic and other internal implants to reduce infection rate due to silver antibacterial effect.
Methods From 2010 in infected or high-risk patients, we began to use a modified MegaC System megaprosthesis with an innovative surface modification producing a peripheral silver-added layer of titanium alloy (PorAg). From June 2010 to December 2013, 22 PorAg implants were implanted (10 proximal femur, 8 distal femur, 1 total femur, 3 knee arthrodesis) after infection following previous prosthesis (9) or fracture (6) or in patients at risk for local or general conditions (7).
Results Average follow-up was 19 months (1–41). No occurrence or recurrence of infection was detected so far. Urine and blood levels of silver were monitored. At 1 year from surgery, levels of 0.1–1.5 μg/l were detected in urine and levels of 0.24–3.9 μg/l in blood. Higher levels were usually detected in the first months after surgery. No local or systemic side effects related to silver were detectable.
Discussion The use of silver coating for internal orthopaedic and vascular implants is spreading due to the promising results followed the first experimental and clinical experiences. In our study, a very satisfying early result was found for infection control with no septic complications in a high risk group of patients, mostly affected by previous infections. The absence of side-effects and the circulating silver levels detected confirm in our experience the safety of silver-coated prostheses.
Conclusions Silver coating for mega-prostheses may constitute today an important aid in the treatment of patients at high risk of septic complication. If their effectiveness is confirmed in reducing the incidence of postoperative infections, the higher cost of implants is compensated not only from better quality of patients' life, but also by reduction overall costs for Healthcare System. Longer follow-up is needed both to confirm long-term results and to monitor silver levels in body fluids on the long term.

Ankle arthrodesis using Ilizarov device in chronic osteomyelitis of tibiotalar joint

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Introduction Treatment of chronic osteomyelitis of the tibiotalar joint is often complex and not easily solved. In these cases it occurs the total destruction of the joint and ankle arthrodesis is a recognized treatment. Authors present their experience using the Ilizarov method for achieving arthrodesis of ankle joint in chronic osteomielitis.

Methods From January 1982 to December 2011, 43 patients with chronic osteomielitis of the tibiotalar joint underwent ankle arthrodesis after several unsuccessful procedures of internal fixation. (13 M, 30 F, mean age 67.3 years). Fifteen patients were treated with monofocal technique removing up to 2 cm; 28 patients were treated with bi- or trifocal bone transport and removal of bone from 3 to 7 cm. The mean follow-up was 3.8 years (2–5). The index AOFAS was used before and after treatment.
Results The removed amount of bone tissue was between 2 and 7 cm. Patients holded the apparatus for an average of 18 months. Forty-three surgical revisions were provided with grafts at the docking site, in 32 cases corrections of apparatus were performed, 2 skin coverings were employed. Consolidation occurred in all cases; infection recurred in 4 patients from 10 to 18 years. The average index of preoperative AOFAS was 42/100 while postoperatively was 83/100. Residual limb length discrepancy was on average of 1.2 cm.
Discussion There are only few publications concerning arthrodesis for cases of post-traumatic joint infection, what makes comparison of the results of post-traumatic arthritis and septic cases difficult but for cases of joint infection there is consensus, that external fixation is the first choice treatment.
Conclusions Considering all complications, and by a careful evaluation of literature, authors found out that the use of circular fixator, in cases of osteomyelitis of the tibiotalar joint, provides stable fixation with immediate loading and maintains the integrity of soft tissues allowing possible "corrections in progress" to avoid the risk of infection recurrence. However, it remains a convincing alternative to amputation.

Treatment of surgical site infections in trauma surgery with the ICS system: our experience

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Introduction Surgical site infections (SSI) incidence in trauma surgery ranges from 0 to 2 % in closed fractures and rises up to 50 % in open fractures. Antibiotic prophylaxis, adequate peri-operative ORP behaviour and the use of a meticulous surgical technique have reduced sensibly these infection rates. Nevertheless the onset of a SSI is a major concern for the trauma surgeon that has to deal not only with the infection but also with the bone healing process and the hardware presence. Meani et al. have presented a classification and treatment protocol for SSI mainly based on three parameters: the presence of signs of infection, callus formation and implant stability. The results reported for the application of this protocol have been promising, but all the studies were conducted in centres highly specialized in the treatment of orthopaedic infection. This study is intended to verify the utility and efficacy of the ICS system for the treatment of SSI in trauma in a district hospital.
Methods Between November 2012 and March 2014 we operated on 13 trauma patients with an ISS. According to the ICS system fractures were classified as group I (infection present, callus formation, hardware stable), group II (infection and callus + but unstable) and group III (infection + no callus no stability). Treatment consisted in antibiotics administration in association with: surgical debridement (for group I infections), hardware exchange (group II) or implant removal, debridement and delayed re-osteosynthesis (group III). Healing was defined as bone consolidation in absence of humoral or local signs of infection. The mean follow-up for this series was 13 months.
Results There were 4 patients in group I, 3 in group II and 6 in group III. Patients underwent a mean number of 3.2 additional surgical procedures. In 11 patients consolidation, in absence of infection signs, was achieved within 5 month. Two patients did not heal: one 70 years old woman with an infected (group III) distal tibia fracture and a severe soft tissue sufferance that has been amputated below the knee, and a very similar group III fracture of a 80 years old woman who refused amputation and decided to be treated in another hospital. At 17 months of follow-up consolidation was not achieved yet.
Discussion The ICS system proposes a classification and a treatment protocol that is relatively easy to use and reproducible also when adopted in wards not specifically dedicated to the treatment of orthopaedic infection.
Conclusions We think that our results in terms of consolidation rate and time were satisfactory. Great attention should be paid to the patient's co-morbidities and to the local soft tissues healing potential, in order to identify those lesions that, independently of the ICS group, have no chance to heal.

Therapeutics algorithm in infected tibial non-union: considerations and results on 347 patients

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Introduction Infected nonunion is not a rare occurrence and is extremely serious. In fact, it is a problem for the patient, the physician and for society, due to long treatment times and frequent complications. Authors wish to expose their cases regarding the treatment of infected nonunion of the tibia with the Ilizarov method, based on the stimulation of revascularization of the infected region by corticotomy.
Methods In this study were considered 347 patients with PSAI of the tibia, observed between 2002 and 2013. Nonunions examined were: 73 after intramedullary nails, 274 after plates and screws. All of these were treated with the bone transport technique with the Ilizarov apparatus, whose effectiveness is enhanced by appropriate antibiotic therapy and specific diagnostic tests, always associated with an adequate debridement of the infection site. Transport was monofocal in 224 and bifocal in 123 cases.
Results The Ilizarov frame was removed after an average of 243 days. The consolidation of the fracture was achieved in 284 cases. The infection healed in 250 cases. In 47 were done an internal nail fixation. In 64 patients there was a recurrence of infection.
Discussion The Ilizarov frame was the most versatile technique that allowed us to address many of the problems posed by this disease, thanks to its various building options, but is not free of complications. However, it is considered by the authors a still relevant method in the treatment of infected nonunion with bone loss, due to a better stabilization and a multi-planar control, with the simultaneous management of related problems.
Conclusions The use of the method, must be addressed in selected cases as it needs serial controls, good patient compliance and more time compared to other treatments. The Ilizarov method allows to be radical but not demolitive.

TUMORS

Impending fractures in bone metastases: a difficult diagnosis

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Introduction The surgical treatment in patients affected by bone metastasis in a possibility to improve their quality if life and maintaining their functional autonomy is an ambitious goal into prevent pathological fractures. The diagnosis of impending fracture is far to be standardize and each classification has a limits in itself. In the present paper the authors have analysed the current literature in order develop the diagnostic criteria of impeding fracture with the aim to identify the current diagnostic criteria.
Methods We conducted the analysis of literature on MEDLINE using the word "impending fracture". The inclusion criteria were: bone metastasis, impending fracture classification, surgical treatment of pathological/impending fracture. The period was from 1953 to 2014. The papers which matched this criteria were 41.
Results All the papers analysed had intrinsic limitations starting from the most used one, the Mirel's classification. It is proposed a critical definition of impending fracture with the fundamental points for the diagnosis.
Discussion The concept of impending fracture even if clear by intuition to everyone id not always under objective criteria. In daily clinical practice if often made by the surgeon that decide to treat it. The current classification, the Mirel's one, has different advantages, because is easy to use but up to the clinical judge when the score is around 7, and confusing about the pain in multiple metastasis.
Conclusions The pathological fracture is dramatic for a patient with bone metastasis and has a very negative impact on prognosis. Every effort should be performed to avoid this complication. Some diagnostic criteria are underlined in this revision but further studies and more effort are necessary to clarify this pathological condition.

Role of local adjuvant in the therapeutic evolution of giant cells tumors

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Introduction Giant cell tumour (GCT) is a benign neoplasm but a locally aggressive tumour, characterized by an extensively vascularised tissue with proliferating mononuclear stromal cells and multinucleated osteoclastic giant cells uniformly distributed. This disease mostly affects young adults, mainly between the second and fourth decade. There is a slight prevalence in females (56 %) compared to males (44 %). Knee is the more frequent localization (distal femur, proximal tibia and proximal fibula), followed by the distal radius, proximal humerus, pelvis, spine, distal tibia and the proximal femur.
Methods Authors present a series of 65 GCT, from 1980 to 2013. GCT were mainly localized at the proximal tibia and in the meta-epiphiseal region of the femur. Mean age was 31.5 years (range 11–52) with a male to female ratio of 3:4. All patients were assessed with X-ray, CT, MRI and scintigraphy. Pre-operative exams were subsequently integrated with diagnostic biopsy, to confirm diagnosis. Surgical treatment was in all patients curettage, followed by local application of adjuvants, such as liquid nitrogen or phenol, and acrylic cement.
Results Radiologically the tumours showed an expansive osteolytic area with characteristic "soap bubble" appearance, peripheral localization and well-defined borders. All patients were followed at least 3 years. None presented local recurrence or functional limitations.
Discussion Clinical presentation was typically characterized by severe pain and increasing local swelling, tenderness of the affected area and joint limitations. No pathological fractures were experienced. The most frequently affected location was the knee (distal femur and proximal tibial meta-epiphysis) followed by distal radius.
Conclusions The GCT is a pathology with local aggressiveness but benign character that almost always requires, according to the staging, a conservative approach to restore skeletal continuity; curettage with adjuvants is a feasible first-choice treatment option, with good oncological outcome and joint preservation. Local recurrence rate was in recent years widely reduced through the acrylic cement and phenol intralesional adoption. These local adjuvants allow to preserve soft tissues from thermal injury, that in previous years was related to liquid nitrogen application. Resection should be reserved to GCT classified as grade 3. Clinical results at last follow-up were satisfying in all patients included in this study.

Fibular osteosarcoma: oncologic and functional results in 61 patients

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Introduction Fibula is a rare site for osteosarcoma (OS) and, historically, fibular OS was associated with worse prognosis than other sites.
Methods Between 1985 and 2011, 61 patients with high-grade fibular osteosarcoma were treated: the location was proximal fibula in 53 patients and distal fibula in 8 patients. Amputation was performed in 15 patients and resection in 46 patients. Tumour volume was calculated in 45 patients. Oncological results were analysed with Kaplan–Meier curves; complication and functional result were analysed.
Results At a mean oncological follow-up of 9 years (min 9.6 months, max 27.4 years), 31 patients were continuously disease free (NED), 5 were disease free after treatment of relapse, 1 was alive with disease (AWD) and 24 were dead of disease (DWD). The Kaplan–Meier curve showed a disease-free survival of 54.5 % at 10 and 20 years. Disease-free survival was lower in patients with OS that involve proximal fibula than in patients with OS that involve distal fibula ($p = 0.0144$) and in patients treated with amputation than in patients treated with resection ($p = 0.0196$). Tumour volume was higher in patients that had amputation than in patients that had resection ($p < 0.001$) and in proximal fibula than in distal fibula ($p = 0.260$). The disease-free survival of patients with tumour volume >400 cc was lower than disease-free survival of patients with tumour volume <400 cc ($p = 0.0392$). Complications were not found in patients that had amputation, while patients that had resection developed complications: equinus talipes in one patient that had resection and reconstruction of distal fibula, claw toes in one patient that had resection without reconstruction of distal fibula, and varus-valgus knee instability in two patients that had resection of proximal fibula. Functional results, according to MSTS system, were excellent or good in all patients, better after resection.
Discussion Tumour volume was an important factor that could influence the prognosis: tumour volume was higher in patients that had amputation and in proximal fibula osteosarcoma.
Conclusions Given the complexity of the anatomical structures at the level of the fibula, fibular OS is associated with a worse prognosis compared to other localization. Actually, limb salvage is the treatment of choice for fibular osteosarcoma. However, amputation remains a viable alternative to achieve local control, in case of neurovascular involvement. Functional results were satisfactory in all cases, with better result for patients that had resection.

Results of surgical treatment of pelvic chondrosarcoma

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Introduction The pelvis is one of the most frequent sites of occurrence of chondrosarcoma (CS) of bone, and axial CS were seen to behave more aggressively than appendicular skeleton lesions. The purpose of the present study was to review the patients treated for chondrosarcoma of the pelvis at authors' Institution and to identify risk factors for local and systemic control of disease.
Methods Fifty-two patients with diagnosis of pelvic CS, treated at authors' Institution between 1994 to 2013, were included in the study. The diagnosis was central CS (CCS) in 40 cases and peripheral CS (PCS) in 12. In two cases, the CCS was a local recurrence after previous surgical treatment. The hystological grading of 40 CCS was: G1 in 6 cases, G2 in 23, G3 in 4 and G4 (de-differentiated) in 7. The hystological grading of 12 PCS was: G1 in 8 cases, G2 in 4. The surgical treatment of 40 CCS was resection in 30 cases, intralesional curettage in 3 and hemipelvectomy in 7 cases. The surgical treatment of 12 PCS was conservative resection in all cases.
Results At a median follow-up of 52 months (2–209), 34 patients were continuously disease free (CDF, 65 %), 3 patients were alive with disease (AWD), 13 patients had died of disease (DOD) and 2 patients had died of another cause (DOC). A local recurrence was observed in 13 patients (25 %). Local recurrence free survival was 64.3 % at 5 and 15 years and overall survival was 66 and 52.8 %, respectively at 5 and 15 years. Histological grade of malignancy and local recurrence showed a statistically significant correlation with survival.
Discussion The review of our experience on pelvic CS confirmed their worse prognosis on respect to appendicular skeleton localizations. In 52 % of cases the tumour involved the acetabular area. CCS were most frequently G2 (58 %) and PCS were most frequently G1 (67 %). Limb salvage rate in our series of pelvic CS was 83 %. The histological grade of malignancy and the event of local recurrence were found to correlate statistically with patients' survival.
Conclusions In conclusion, the review of our series of CS pelvis confirmed the importance of resection with adequate surgical margins to prevent local recurrence and ensure an adequate local control of the disease. Local recurrence and histological grade are considered the main risk factors for survival.

Periacetabular reconstruction after pelvic resection for bone tumors: experience of the Rizzoli Institute

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Introduction Local control, maintenance/improvement of function and quality of life are the objectives of different types of pelvic resection (and reconstruction). Purposes of this retrospective study were: (1) to assess the outcome and local recurrence rate after limb-salvage surgery with reconstruction for periacetabular bone tumours; (2) to analyse complications and their relationship with type of reconstruction.
Methods We analysed 99 patients treated with pelvic periacetabular resection and reconstruction between 1990 and 2009. Mean follow-up was 6.5 years (2–19 years). Histological diagnosis was chondrosarcoma in 66 cases, Ewing's sarcoma in 11, osteosarcoma in 11 and other less frequent histotypes in 14 cases. Twenty-five patients had type II resections, 23 type I–II, 40 type II-III and 14 type I-II-III. Reconstruction consisted of prosthetic composite allografts in 64 cases, with allograft only in 11 cases, with prosthesis only in 10 cases, with saddle prosthesis in 13 cases and arthrodesis in one case.
Results Margins were wide in 90 cases (17 focally contaminated), marginal in 4 and intralesional in 5. At a mean of 6.5 years, oncological outcome showed: 55 patients continuously NED, 7 NED after treatment of relapse, 10 AWD, 23 DWD and 4 dead of other causes. Survival was 76 and 67 % at 5 and 10 years, respectively. Local recurrence rate was 23.2 % (23 patients) and was observed in 22 % of patients with wide margins *vs* 30 % of patients with inadequate margins ($p = 0.312$). Metastasis rate was 30 % (30 patients). Deep infection was observed in 22 cases (22 %) at median follow-up of 1.7 months. No statistical difference was found between reconstructions with/without allograft ($p = 0.089$). Reconstruction with saddle prosthesis had the worst survival to infection compared with other reconstructions. In 13 cases, finally external hemipelvectomy was performed.
Discussion The surgical treatment of pelvic tumours is affected by a high incidence of local recurrence and complications, and is associated with a worse functional outcome compared with tumours in other locations.
Conclusions Favourable oncological and functional outcome can be achieved with conservative surgery in selected patients with pelvic bone tumours. Infection is a frequent major complication that require further surgery but rarely an amputation. The use of allografts did not increase risk of infection. External hemipelvectomy is rarely needed, in case of local recurrence or infection.

SPORTS TRAUMATOLOGY

Are sports traumas in youth athletes genetically predictable?

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Introduction To date, the tears of the Achilles tendon or anterior cruciate ligament remain constant finding in the sports population, thwarting any kind of prevention. The advancement of knowledge about the human genome has allowed also in sports traumatology conducting numerous studies on genetic polymorphisms of athletes suffering from these traumas. They have identified several polymorphisms in high-level athletes in some sports such as swimming, soccer, rhythmic gymnastics, triathlon, judo. The aim of the study was to identify genomic markers related to broken TA or LCA in a group of healthy young athletes practising different sports and verify prospectively their trauma history.
Methods One-hundred and ten Caucasian males aged between 13 and 17 years, practising at a competitive level football, volleyball, athletics, basketball, rugby competitions in different categories were recruited after informed consent of the parents. The characteristics identified were: the type of activity (contact, strength or speed); the absence of recent episodes of knee sprain or tendinitis or back pain or muscle cramps associated to exercise; previous injury to the knee or

Achilles tendinopathy in the family. All participants were subjected during the season to a blood test, which was followed by the genotypical detection for variants of the genes COL5A1, COL1A1, COL12A1.

Results The 4 % of the subjects ran into an ACL injury within 2 years of assessment while 19 % in an episode of tendinopathy (no rupture). A 5 % tested positive for COL1A1, 10 % for COL12A1, 12 % for COL5A1. A positive correlation was detected between the various polymorphisms and the musculo-skeletal disorders.

Discussion These preliminary data of the presence of genetic polymorphism in adolescent athletes practising different disciplines confirm the potential risk to suffer musculo-skeletal injuries during sports injuries at a young age. In all disciplines, from those with frequent physical contact to those with high demand for physical performance, there is a genetic predisposition to injury or musculo-skeletal problems. So, although it is still necessary to confirm these preliminary data with the further expansion of the population and of the observation period, it is clear that some serious sports injuries are incidental.

Conclusions This study opens a new horizon on the profile of physiological characterization of athletes and suggests to consider the genetic predisposition for the adoption of the best strategies for injury prevention from a young age.

Factors influencing graft biologization in ACL reconstruction using ST e GR: a comparative clinical and MRI study between two different techniques

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Introduction Reconstruction of the anterior cruciate ligament (ACL) has become a common procedure with many techniques described in literature. Mini-invasive surgery is therefore mandatory to reduce patient's morbidity and to enhance graft ligamentization process. Aim of this report is to describe the results of a comparative clinical and MRI study between two different ACL reconstruction techniques encompassing a complete tunnel or a socket on the tibial side.

Methods Since July 2012, 40 patients with unilateral ACL injury (mean age 27.5 $\pm$ 9.5) were enrolled in the study. Twenty patients underwent the all-inside anatomic ACL reconstruction (group A) with the creation of a tibial and femoral socket, while 20 patients underwent a standard ACL reconstruction (group B) with the creation of a complete tibial tunnel. Patients were evaluated clinically and by means of the IKDC score pre-operatively and a minimum follow-up of 6 months. The bone-tendon graft integration on the tibial side and graft ligamentization were evaluated with MRI 6 months after surgery following the parameters described by Figueroa.

Results Significant improvement was seen on Lachman test and Pivot-shift test between pre-operative and last follow-up in both groups. Average IKDC subjective score at follow-up was 82.4 $\pm$ 10.3 in the group A, and 77.2 $\pm$ 11 in the group B. In the group A the IKDC objective score was normal (A) in 15 cases, nearly normal (B) in 4 cases and abnormal (C) in 1 case (traumatic rupture). In the group B the IKDC objective score was normal (A) in 11 cases and nearly normal (B) in 9 cases. MRI evaluation according to the parameters described by Figueroa showed a mean value of 3.35 $\pm$ 0.9 points and of 4 $\pm$ 0.8 points, respectively in the group A and group B.

Discussion Both techniques are able to provide good clinical outcomes at a short term follow-up. In the group A the anatomic all-inside ligament reconstruction with the use of sockets instead of complete tunnels achieved the best clinical objective and subjective outcomes. However MRI results of the bone-tendon integration and graft ligamentization showed better results in the group B.

Conclusions All inside technique achieved good clinical results; however the creation of complete tibial tunnel can improve the ligamentization process.

Elastosonography as a novel follow-up method in Achilles tendon percutaneous surgery: a pilot study

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Introduction Recent studies identified sonoelastography, evolution of B-mode ultrasound, as a tool to analyse the deformation of soft tissues. The purpose of this pilot study is to evaluate the elastosonographic characteristics of Achilles tendon after percutaneous repair and to identify the potential aid of this tool in the diagnosis and follow-up of tendon pathology.

Methods During 2012–2013, 29 patients were treated for acute Achilles tendon rupture with percutaneous tenorrhaphy. The evaluation was performed using Philips iU22 sonograph with a probe of 5–12 MHz. The evaluation of tendon thickness was performed at myotendinous junction (MTJ), tendon body/lesion site (TB/LS) and osteotendinous junction (OTJ). Same was done both on contralateral and treated tendons. This assessment was repeated at 40 days, 6 months and 1 year after treatment. Using standard windows of 4 $\times$ 1 mm the Strain Index (SI) was calculated as a de-formability index. At the same time, the clinical outcome was assessed through the ATRS (Achilles Tendon Rupture Score) and correlated with the elastosonographic findings. Also the thickness and SI of 60 healthy tendons have been evaluated.

Results and Discussion Following exclusion criteria, 25 patients (22 M, 3 F, mean age 42.1 $\pm$ 9.0 years) were recruited. At elastosonographic examination treated tendons showed a progressive stiffness during follow-up, especially at the level of MTJ and TB/LS, appearing significantly stiffer than the healthy and contralateral untreated tendons. Moreover the SI of the contralateral was lower than physiological values. At 6 months, the treated tendons showed a greater thickness with a tendency to decrease at 1 year, but without ever reaching physiological values. The clinical outcome, evaluated through the ATRS, has improved significantly between 6 months and 1 year, but it is inversely related with SI.

Conclusions Elastosonography is a valuable tool in tendon diagnostics. However, some clinical-instrumental correlations are, in our opinion, due to some compensatory mechanisms not clarified.

Epidemiological study of injuries in the Italian national alpine ski team in relation with the main equipment changes from 1985 to 2010

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Introduction From season 1996/1997, the FIS (International Ski Federation) introduced new rules concerning materials (length and shape of the skies, elevation of the boots from the ground) and since then they have been updated regularly. These changes brought to an adaptation of the athletes during skiing and therefore this produces a modification of the incidence of injuries. The aim of this study was to evaluate the trend of traumas in the agonist seasons between 1985 and 2010 in the alpine ski athletes, in particular ACL ruptures, and correlate it to materials evolution.
Methods This study analysed the athletes of the Italian ski team ($n = 2218$, aged 22 ± 3.4 years) who raced in the World Cup, Europe Cup and FIS races between 1985 and 2010. We considered all the injuries during races and trainings (in slopes and athletic trainings). All the different lesions were analysed focusing mainly on the capsulo-ligament lesions of the knee.
Results The peak of incidence of injuries was around 20 years of age for both male and female athletes. Thirty-five percent of athletes had at least one injury requiring the stop of sports activity during his career. Lower limbs were involved six times more than upper limbs. Fifty percent of the injuries concerned knees (44 % sprains), of which 23 % were ACL lesions. The rate of injuries was 4 every 100 athletes.
Discussion The introduction of new materials and ski shapes reduced the number of leg fractures. Knee sprains were increased although the global prevention security during sports was improved. This could be a reason of the increase of race speed. Total injuries increased in the first period of introduction of the new materials, but after 4 years they decreased, probably due to the adaptation of the athletes to these changes.
Conclusions FIS is working to make new shapes, materials and tracks safer than now. Currently athletes are asked to report and suggest how to avoid dangerous situations as security today has a primary role in sports.

Ankle and sports: one step bone marrow derived cells transplantation for the treatment of osteochondral lesions in athletes

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Introduction Treatment of osteochondral lesions of the talus in athletes is still a challenge due to articular cartilage limited ability to restore the damage. Recently, clinical results obtained by one step bone marrow derived cells transplantation (BMDCsT) have demonstrated to be a good option at medium term, overcoming limitations of previous techniques. Furthermore, histological analysis and MRI with T2 mapping has confirmed the nature of the hyaline regenerated. The purpose of this study is to present clinical and radiological results with MRI T2 mapping of a series of 61 athletes treated with BMDCsT for osteochondral lesions of the talus.
Methods Sixty-one athletes (mean age 31.4 ± 10.4 years) were treated with one step BMDCsT. Mean lesions' size was 2.24 ± 1.23 cm^2. In 10 cases, lesions were deeper than 5 mm and required also use of autologous bone or de-mineralized bone matrix (DBM). Patients were evaluated clinically (TEGNER and AOFAS score) and radiologically (MRI T2 mapping) to follow-up seriated, reaching a mean follow-up of 59 ± 10.7 months.
Results At mean follow-up of 59 ± 10.7 months, 54.6 % of the athletes were engaged in lower impact sport activities to the stage pre-injury. The remaining 45.4 % returned to the pre- injury sport activity and, in particular, 33.1 % of the patients returned to the same level as before the injury. Mean Tegner score, calibrated for lesions of the talus, passed from 6.26 ± 1.9 before injury to 4.68 ± 2.4 pre-operatively; at the final follow-up after surgery mean Tegner score was 5.24 ± 2.1. Mean AOFAS score (pre-operative value of 57.6 ± 15.7 points) reached 82 ± 19.9 points at 72 months ($p < 0.005$). Adverse prognostic factors with impact on the final clinical outcome were average age at surgery, traumatic etiology of the lesion, depth of the lesion and presence of impingement. The analysis of MRI T2 mapping has shown a percentage of regenerated hyaline-like tissue (T2 map values: 35–45 ms) in 80 % of cases. In case of percentage of regenerated more than 80 %, was also associated with a better clinical outcome.
Discussion BMDCsT one-step technique has permitted return to sport activities. Furthermore, the quality and quantity of the regenerated tissue, evaluated with RMN T2 mapping, has correlation with best and longest clinical results.
Conclusions One-step technique has proved satisfactory and lasting results, allowing an early return to sports, including high impact activities and professional levels.

ORAL COMMUNICATIONS

PROSTHETICS 1

Computer-assisted system *versus* conventional instrumentation in total knee replacement at 10-year follow-up

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Introduction Total knee replacement (TKR) is a reliable, effective and reproducible technique to treat the advanced arthritic knee. In TKR a computer-assisted system (CAS) is expected to result in better clinical outcomes and longer implant survivorship than conventional instrumentation (CI) due to a more accurate targeting of the neutral mechanical axis (MA) and relevant bone preparation. Nowadays only few studies have compared the two techniques at a long term follow-up in terms of clinical outcomes, mechanical alignment and survivorship of the components. The aim of this study is to compare two groups of patients who underwent total knee replacement using computer-assisted system (group A) and conventional instrumentation (group B), in terms of clinical outcomes, final neutral mechanical axis restoration, and survival rate at a minimum of 10 years follow-up.
Methods One-hundred and twenty consecutive TKR operated 10 years ago at the Rizzoli Orthopaedics Institute in a total of 100 patients (80 monolateral and 20 bilateral) were evaluated. All the available patients were clinically assessed using the Knee Society Score (KSS) and Knee Injury and Osteoarthritis Outcome Score (KOOS). The radiographic evaluation was performed measuring the MA from a long-leg X-rays. Values of MA larger than 3° were considered as outlier. Cases who underwent revision surgery, who died or were not available at such long-term follow-up were recorded. Statistical analysis between group A and group B was performed.
Results Sixty TKR were performed using the CAS technique (group A) and 60 TKR using the CI technique (group B). The mean follow-up was 10.8 years. Seven TKR (11.7 %) in group A and 8 TKR (13.3 %) in group B were not available at the last follow-up. In group A 3 TKR were revised, this represents the 5.6 % of revision among the 53 available TKR in group A. In group B 5 TKR were revised, this represents the 9.6 % of revision among the 52 available TKR in group B. In group A 3 TKR (5 %) died, and 5 (8.3 %) in group B. No one case of total knee replacement revision was observed among the patients who died before the 10 years follow-up. The mean KOOS value was 82.6 in group A and 79.1 in group B. The mean KSS value was 173 in group A and 170 in group B. The mean MA was calculated as the standard deviation from the ideal MA of 0°, and the mean MA measured on the long-leg X-rays was 1.8° in group A and 2.2° in group B. In group A 4 outliers values were found, and 3 in group B.
Discussion At 10-years of follow-up the two groups did not show statistically significant differences in terms of clinical KSS and KOOS scores, and of percentage of MA outliers. The percentage of implant revisions were slightly higher in group B (CI TKR) than in group A (CAS TKR).
Conclusions In total knee replacement at a minimum 10-years of follow-up, the use of computer-assisted system did not results in better clinical or radiographic outcomes than conventional instrumentation; there is a different percentage in implant survivorship.

The patello-femoral joint in different models of total knee arthroplasty: clinical results

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Introduction Total knee arthroplasty (TKA) was always assessed by scores focusing mainly on femoro-tibial articulation, today it is evaluated by clinical and functional patello-femoral joint scores. The aim of the study was the evaluation of the clinical and radiographic results of TKA with particular reference to patello-femoral joint, examining three different types of modern prosthesis (Genesis II, Advance and Sigma).
Methods We analysed prospectively 145 patients (101 females and 44 males) underwent implantation of TKA between January 2012 and March 2013. The sample was divided into 3 groups according to the prosthesis 88 Genesis II (mean age 69.5 years), 47 Advance (mean age 74.5) and 10 Sigma (mean age: 74.6). The patella was replaced in 56 cases. Patients in each group were operated by four surgeons with the same access and technique. All patients were assessed at 3, 6 and 12 months after surgery by means of analysis of motion (ROM), the Knee Score System (KSS) and Patellar Score (PS). Radiographic evaluation was performed with antero-posterior and lateral projections and axial displacement of the patella and a CT scan to study: patellar tilt angle, lateral patellar displacement and posterior condyle angle.
Results All patients had a minimum follow-up of 1 year. The average values in KSS were 92.91 points for Genesis II, 90.25 and 90.83 for Advance and Sigma. The Functional Score showed a score of 80.2, 85.74 and 82.99, respectively, while the patellar Score was 86.60, 85.20 and 83.82. The patellar tilt angle was on average 1.6° in Genesis II, 2.29° and 3.6° in the Advance and Sigma. The lateral patellar displacement was 4.3, 7.25 and 6.37 mm, while the posterior condyle angle was 3.2°, 3.74° and 3.26°. In no case, however, has been verified a statistically significant difference.
Discussion The clinical and functional outcomes and radiographic parameters showed slightly better values for the Genesis II probably related to the average age of the youngest patients at the time of surgery. We found no differences between the TKA with and without patellar resurfacing. The clinical outcome was satisfactory with optimal scores (> 80 points) regardless of the choice of the system.
Conclusions Nowadays it's possible to obtain a good clinical results for the patello-femoral articulation regardless of the plant used, provided that it is an advance implant but primarily by following correct indications and surgical principles stringent.

Tibial component alignment in total knee arthroplasty may improve by setting extra-medullary instrumentation to the proximal tibia only

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Introduction A varus malalignment of tibial component has been reported in 2 to 40 % of TKA. This result may partially be due to tibial torsion, which cause a lateral shift of the anterior projection of the mechanical axis at the ankle joint compared to a-p axis of proximal tibia. In this study we investigated the accuracy of a new surgical technique in which the influence of tibial torsion on the alignment of the tibial component is bypassed by positioning the extra-medullary rod in line with the proximal tibia only.
Methods Eighty-six consecutive patients (94 knees) who underwent conventional TKA were included in the study. The extra-medullary

guide for the tibial cut was set, at the proximal tibia, in line with an anterior projection of mechanical axis connecting the posterior tibial notch with the medial 1/3 of the tibial tuberosity. At the distal tibia, the extra-medullary rod was set, in the first 47 knees (group 1), to a point located 5 mm medially to the centre of the intermalleolar distance, while in the following 47 knees (group 2), it was left free to rotate in the axial plane according to the proximal tibial alignment. Mechanical femoro-tibial angle (MFT) and tibial component alignment was assessed postoperatively on long standing radiographs.

Results The mean MFT angle was 3.4° ± 1.9° in group 1 (range −3° to 7°; 95 % CI 2.9°–3.8°) and 2.7° ± 1.8° in group 2 (range −2° to 6.5°; 95 % CI 2.2–3.1) ($p = 0.07$). A MFT angle in the normal range was found in 36 knees (77 %) in group 1 and 40 (85 %) in group 2 ($p = 0.2$). A malalignment of the tibial component >3° in the coronal plane was present in 16 knees of group 1 (34 %); in 2 of them it was greater than 4°. In group 2, two knees showed a malalignment of the tibial component >3° (4 %) ($p = 0.0001$ *vs* group 1), none of whom greater than 4°.

Discussion A major issue in achieving a correct coronal alignment of tibial component in TKA is tibial torsion, which causes a rotational mismatch between proximal and distal epiphysis. If the extra-medullary rod is not translated medially at the ankle joint to compensate for tibial torsion, a varus tibial cut is likely to occur. In keeping with this, a varus malalignment of the tibial component is the most frequent error found when extra-medullary systems are used.

Conclusions Our results demonstrated that malalignment of tibial component in coronal plane may be reduce using a surgical technique in which he possible effects of tibial torsion are bypassed by setting the extra-medullary rod in line with proximal tibial references only.

Risk of PCL avulsion during the tibial cut in cruciate retaining TKA and sagittal slope of tibial plateaux

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Introduction Fluoroscopic investigations have shown that femoral rollback is more often preserved in posterior stabilized (PS) than posterior cruciate-retaining (CR) implants. Possible explanations include degenerative changes of PCL and iatrogenic division of PCL fibres during the tibial cut. In this study we evaluated the effects of tibial cuts with different degrees of posterior slope on PCL insertion and whether a correlation does exist between the entity of PCL avulsion during the tibial cut and patients sagittal slope of tibial plateaux.

Methods We analysed 83 MRI of the knee of patients with mild or moderate knee pain with no history of previous knee surgery or trauma. There were 42 males and 41 females, with a mean age of 49 years (range 45–52 years). The sagittal anatomical axis of the tibia was first identified on MR images and translated in the sagittal scan in which PCL fibres insertion in the tibia was best visualized. In the latter, tibial cuts with angles of different posterior slope (0.3°, 5° and parallel to the tibial plateaux) were simulated. The effects of each tibial cut on PCL fibre insertion was assessed. We also evaluated whether any correlation was present between the entity of PCL avulsion due to the tibial cut and the degree of posterior slope of tibial plateaux.

Results A tibial cut of 0° caused a detachment of 63 % of PCL fibres insertion; this figure raised to 70 and 75 % when a 3° and 5° tibial cut was performed, respectively. The greatest percentage of PCL fibres avulsion (85 %) was found with a tibial cut parallel to the sagittal slope of patient's tibial plateaux. The percentage of PCL avulsion for each tibial cut was found to be significantly higher in patients showing a mild sagittal slope (<5°) than in those with a marked sagittal slope (>8°) of tibial plateaux.

Discussion In this study we analysed the effects of different tibial cuts on PCL preservation. Our results demonstrated that any tibial resection angle we used for tibial cut caused a PCL avulsion greater than 50 %. Patients with a marked sagittal slope of the tibial plateaux showed reduced PCL avulsion compared with those with mild sagittal slope. However, even in the former group, a PCL avulsion greater than 50 % was observed.

Conclusions When performing a CR TKA, most of PCL fibres may be lost during the tibial cut. As a result, techniques to preserve PCL insertion should be planned to avoid that a CR TKA is implanted without a functioning PCL.

SPORTS TRAUMATOLOGY 1

When and why do our ACL reconstructions fail? Analysis of the causes and treatment strategies

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Introduction We conducted a retrospective study designed to determine the causes of failure of surgery for reconstruction of the anterior cruciate ligament (ACL) in our unit, and to evaluate possible strategies to reduce the rate of failure, avoiding complicated techniques revision.

Methods From January 2008 to February 2014 were performed 163 ACL reconstruction with harmstrings tendon autografts and 34 with anterior or posterior tibialis tendon (allograft); in 21 cases, subsequent checks was instrumentally documented by MRI and/or CT and clinical failure of the surgical procedure, also evaluated arthroscopically in 14 cases.

Results The etiology of failure of ACL reconstruction resulted in malposition of the tunnels in two cases, trauma in three cases, lack of graft's integration in nine cases, failure of fixation in four cases, lack of treatment of associated ligament injuries in three cases.

Discussion In our study we found substantial differences than reported in literature, in particular is classically attributed to a malposition of bone tunnels greater responsibility for the failure of this surgery, on the contrary, we have detected a high number of cases of non-integration of the graft and/or failure of femoral fixation. This discrepancy could be explained by the characteristics of the systems used and the technical requirements (diameter of the tunnels) they require.

Conclusions The case studies in literature do not always offer analysis that discerned in an analytical way the various techniques used and the various fixation systems for ACL reconstruction: the careful examination of our failures has allowed us to take some technical measures that will reduce our failure rate in reconstructive surgery of the ACL.

Immediate kinesthetic recovery with ACL reconstruction: first clinical evidence

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Introduction The recovery of joint proprioception after reconstruction of the anterior cruciate ligament (ACL) is still a topic of

discussion for the early return to sports activities. This period is fixed at 6 months after surgery. However neurosensory events that happen in this period have not yet been fully understood. The purpose of this study was to determine if already in the first days after the ACL reconstruction is possible to detect a modification kinesthetic ability.
Methods Twenty-eight athletes between 18 and 29 years, with isolated ACL rupture were recruited. All have undergone ACL reconstruction with autologous + G ST. Twenty-five other athletes without any previous distortion of the knee were considered as the control group. The kinesthetic ability was measured by means of a stabilometric platform pre-operatively, within 7 days and 1, 2, 3 months after surgery. The protocol provides for the execution of two tests and two tests monopodalic and bipedal stance.
Results An improvement in all tests stabilometric was observed after surgery. During the first seven days is already detectable significant improvement in test bipedal stance. An additional and incremental improvement kinesthetic was recorded between the first and the third month. A minimum statistically significant difference was observed at 3 months among patients operated and the control group. An alteration of the values was also observed in tests on healthy knee monopodalic; the healthy leg showed an early improvement compared to the operated despite having followed a similar trend. It has also highlighted a high variability in the pre-operative quantitative distribution that has started to decrease after 2 months.
Discussion Preliminary data show that the proprioceptive recovery after ACL reconstruction is immediate though they need at least 3 months to reach levels comparable with respect to the healthy population. The confirmation is also highlighted by the initial data being compromised kinesthetic of the healthy side that are retrieved in less time post-operatively. The large quantitative distribution of values depends on various compensatory mechanisms that each patient develops according to their morphological characteristics.
Conclusions The clinical relevance of this study lies in the demonstration of the immediate post-operative kinesthetic recovery and the importance of ACL reconstruction to obtain a complete functional recovery of the knee, also in proprioceptive terms. Therefore, in view of the important and significant proprioceptive recovery in the first 3 months, it is possible that the return to sporting activity takes place even before the traditional 6 months reported in the literature.

Minimally-invasive repair of Achilles tendon rupture with Achillon: our experience

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Introduction Controversy persists regarding the best technique for repair of the ruptured Achilles tendon. Open surgical repair seems to provide significantly lower incidence of re-rupture than conservative treatment, but it has a higher complication rate, including infection, adhesion and nerve injury. Percutaneous techniques seem to provide a lower incidence of wound problems, but not of sural nerve lesion. A minimally-open technique may offer the advantages of directly watching the rupture plus a limited aggression of the soft tissues.
Methods Authors present a series of 105 ruptures of the Achilles tendon treated with a limited 1.5–2 cm skin incision, the Achillon (Integra) device and the technique described by M. Assal et al. (2002). The indications for the use of Achillon device are: acute ruptures (within 10 days after the trauma), located between 2 and 8 cm above the calcaneum; local previous surgery is a contraindication. Following surgery a plaster cast immobilization is applied for 3 weeks in equinus position, without weight bearing; then the cast is dismissed, a CROM walker boot without weight-bearing is applied and progressive, self-managed mobilization is allowed to recover dorsiflexion during week 4–6; then weight bearing is allowed during weeks 7–9, using the walker boot fixed in a 90° position.
Results Two re-ruptures occurred: in a case for accidental weight bearing without the walker boot; in another the patient was non-compliant with the prescription of off-load and mobilization. In both cases a surgical revision was performed with different technique. A third patient suffered sural nerve transitory paresthesia.
Discussion Both soft tissue problems of open surgery and sural nerve injury of percutaneous technique are lowered using this device and a minimally-open access. The re-ruptures seem to be associated to non-compliance with the post-operative regimen, as reported in other trials. Patients does not follow guided rehabilitation protocol on a standard basis; they usually recover dorsiflexion by self-managed active exercises. Respecting the device indications is the only main limitation of the method.
Conclusions The use of a minimally-invasive technique and the Achillon device, for the Achilles tendon rupture repair, resulted in satisfactory results and limited complication rate.

Meniscal tears retention at time of anterior cruciate ligament reconstruction

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Introduction Management of meniscal tears at time of anterior cruciate ligament (ACL) reconstruction is still controversial. The purpose of this study is to evaluate the long term results of conservative treatment for meniscal tears identified at time of arthroscopic phase of ACL reconstruction. We analysed joint conditions, meniscus location and type of tears with best chance of healing.
Methods We retrospectively reviewed 183 cases of ACL reconstruction with 230 meniscal tears performed from 2006 to 2012 by senior author. In 91 patients (49.7 %) we found a meniscus tear less than 1 cm conservatively treated. Of 132 medial meniscus tears, 61 (46.2 %) were left in situ, and of 98 lateral meniscus tears 30 (30.6 %) were left in situ. We evaluated patients with main follow-up of 40.89 ± 22.019 months (2–72 months). Evaluation was performed with pre and postoperative IKDC and Tegner Activity Score.
Results Nine patients failed during the follow-up period: three patients underwent an ACL revision with treatment of medial meniscus, five patients underwent medial meniscectomy and one patients lateral meniscectomy. In our series conservative treatment of medial meniscus resulted a failure rate of 8.2 and 3.3 % of lateral meniscus. The 94.7 % of patients with meniscal tear left in situ at time of ACL reconstruction returned of pre-injury sport level.
Discussion Traumatic or degenerative tears identified at time of ACL reconstruction represent an important risk factor for the development of knee osteoarthritis. ACL rupture are often associated with meniscal tears and in case of peripheral and stable lesions, conservative option has an high rate of natural healing. All the cases of failure was associated with residual knee instability, therefore an excellent graft balance represents the necessary condition for optimal tear healing. Regardless of ACL reconstruction technique used, lateral meniscus, more than medial meniscus, if damaged in red zone, has an higher healing rate.
Conclusions Partial meniscectomy and meniscal suture may cause severe complications and sequelae therefore conservative option for stable tears in red zone is a viable option. A stable meniscal tear within well vascularised peripheral zone of meniscus is preservable. A well balanced knee and an excellent tightness of ACL graft is the essential condition for good outcome.

Reconstruction of posterior cruciate ligament (PCL) with all inside technique: preliminary results

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Introduction Lesions of the posterior cruciate ligament (PCL) are a source of serious instability of the knee. They are becoming more and more important in clinical practice because of the increase of high-energy trauma, even in sports. These lesions are considered very challenging in orthopaedic field but also as far as the rehabilitative treatment; moreover there is not consensus if it must be preferred the conservative or the surgical treatment and, specifically, which technique should be chosen. In order to get a more anatomical reconstruction, it was recently introduced the all-inside technique which allows the preparation of independent tunnels and introduces a system of cortical fixation that permits a progressive tensioning of the graft.
Methods From November 2011 to October 2013 we operated 17 patients for primary isolated PCL reconstruction with all-inside technique. They were between 14 and 56 years old and the male: female ratio was 16:1. In 11 cases we used semitendinosus and gracilis tendons; in other six patients we chose allograft tendons (in case of previous use of the hamstring for other surgical procedures). In four cases we observed meniscal tears that were therefore treated with selective meniscectomy or, where possible, the suture of the lesion. The arthroscopic technique used entails the execution of a postero-medial access that is useful to prepare the area of the tibial insertion of the original PCL. After this passage, the tibial tunnel is prepared with a special guide and a dedicated tool-kit which allows a retrograde milling. Similarly, the femoral tunnel is carried out with the same out-in retrograde milling technique. The patients were evaluated at baseline (T0) with Lysholm, Tegner, and VAS and were then re-evaluated with the same scales to 2 years after surgery (T1).
Results The results are excellent in terms of functional recovery of motion, activities of daily living and return to the sport though, the complete follow-up at 2 years was achieved only from a limited number of patients.
Discussion This technique, in our opinion, represents an excellent improvement because it allows the construction of independent bone tunnels and so an anatomical positioning of the graft.
Conclusions This surgical treatment is effective in terms of safety, reproducibility and it is of course a minimally-invasive surgical technique.

Surgical treatment for chronic midportion Achilles tendinopathy: faster recovery with the soleus fibres transfer technique than longitudinal tenotomies

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Introduction Midportion Achilles tendinopathies realizes 66 % of overuse Achilles tendon diseases. First-line treatment is conservative, but it is ineffective in 24–45 % of cases. We developed a novel surgical technique consisting in transferring some soleus fibres in the area of tendinosis in order to improve its vascularisation and remodelling. The aim of the study is to compare the mid-term results of the soleus fibres transfer with the most common surgery for midportion Achilles tendinopathy, i.e. longitudinal incisions.
Methods Fifty-two athletes (minimum Tegner score = 5) with midportion Achilles tendinopathy, resistant to conservative treatment were followed prospectively after surgery. Twenty subjects had longitudinal incisions 32 the soleus fibres transfer. Patients were assessed pre- and post-operatively by AOFAS and VISA-A scores, time to return to walk and run and thickening of the tendon.
Results Mean follow-up was 4 years (18–92 months). Average AOFAS score in the longitudinal incisions group increased from 72.0 pre-operatively to 93.7 at 6 months and 89.8 at 4 years, while in soleus fibres transfer group from 69.0, to 98.5, to 95.1, respectively. The VISA-A score improved from 53.4, to 93.3 at 6 months and 88.7 at the last f-u in the longitudinal incisions group and from 51.9, to 96.5, to 94.4, respectively, in the soleus fibres transfer group. They also needed less time to return to run: 98.9 $\pm$ 17.4 days compared to 122.2 $\pm$ 26.3 days for the longitudinal tenotomies group ($p = 0.0019$). The soleus transfer group had a greater prevalence of tendon thickening (59.4 % compared to 30.0 % in the longitudinal tenotomies group, $p = 0.037$).
Discussion The goal for the treatment of midportion Achilles tendinopathy is to permit the patient to return to the desired level of physical activity without residual pain and with a recovery time as short as possible. Open surgical treatment offers excellent medium-term functional results. Soleus transfer allows a faster recovery but has a higher incidence of tendon thickening.
Conclusions The soleus fibre transfer technique offers an accelerated recovery compared with longitudinal incisions but more frequently led to tendon thickening. These results should suggest the use of the soleus graft technique only in high-level athletes.

PROSTHETICS 2

Selection algorithm of the knee revisions constraint

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Introduction Along with the increase in primary total knee replacement, there was an increase in the number of revisions. The aim of this study was to propose a selection algorithm of the knee revision constraint according to the state of ligaments and to the bone defects AORI classification. The hypothesis was that this algorithm facilitates the appropriate choice of the prosthesis constraint so providing stable components and a good long-term survivorship of the knee revisions.
Methods Sixty consecutive revision knee arthroplasties in 57 patients were prospectively evaluated. Prostheses implanted at revision included postero-stabilized, condylar constrained and rotating hinged, relatively to the state of ligaments and of the bone loss around knee. The median follow-up was 9 (4–12) years.
Results The median IKS knee and function scores and HSS score were 41 (15–62), 21.5 (12–43) and 34 (23–65) points, respectively, before the operation, and 81 (48–97), 79 (56–92) and 83.5 (62–98) points ($p < 0.001$) at the latest follow-up evaluation. The median ROM increased from 74° (29°–110°) pre-operatively to 121° (98°–132°) ($p < 0.01$) at the final follow-up. Re-revision was necessary in 5 (8.3 %) patients.
Discussion Constraint choice in revision TKA depends on the state of ligaments and on the severity of bone loss around knee. A simple algorithm of selection of the revision implant constraint could be so proposed. A primary PS system can be used if the ligaments are intact and the bone stock is quite preserved (type 1 defects according to AORI classification). Semi-constrained CCK prostheses can be used in case of insufficiency (but not absence)

of the collateral ligaments, and moderate (type 2) bone loss. Hinged prostheses can be used in the presence of complete disruption/absence of the ligaments with moderate (type 2) or severe (type 3) bone loss.
Conclusions A selection algorithm of the revision implant constraint based on the state of ligaments and the bone loss AORI classification could provide stable knee reconstructions and the long-term success of the knee revisions.

SPORTS TRAUMATOLOGY 2

The proximal tibial epiphyseal and apophyseal lesions in children sports injuries

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Introduction The fracture of the tibial tuberosity associated with proximal epiphyseal lesions in children are very rare, corresponding to 1 % of all physis's injuries. They are morphologically complex and affecting young athletes very often due to high-energy trauma. We present the surgical treatment results of these lesions.
Methods We carried out a retrospective review of seven tibial apophyseal and epiphyseal fractures surgically treated. Were examined the age, the weight, the injury mechanism, the radiological classification, the surgical technique and the clinical and radiographic long term results.
Results Our series includes seven apophyseal and epiphyseal fractures (6 M/1 F), mean age of 12.75 years, average weight of 51.25 kg, mean FU 1.6 years. All injuries occurred during sports activities (6 soccer/1 athletics high jump). All patients were treated in emergency. One of these patients was treated with internal fixation with Kirschner wires, the other with screws. In none of the cases there has been a compartment syndrome. All athletes returned to sports after about 6 months. In one case (female athlete) there has been patellar pain in a slight tibial varus deformity.
Discussion The apophyseal fractures associated with proximal tibial epiphyseal lesions requires the immediate reduction and osteosynthesis in emergency. These lesions, often affecting the joints, are not adequately documented by simple X-ray images and require a second level of imaging (CT/MRI) for a complete pre-operative classification, a correct surgical planning and a right prognostic evaluation. Is recommended to perform a surgical approach with complete exposure of the lesion based on the frequent presence of periosteal flap and/or muscle that are interposed between the fragments, making it impossible closed anatomical reduction. The fixation can be performed with screws that can be placed in the epiphyseal without damage of the growth plate. It is recommended in all cases to remove, as early as possible, the surgical fixation to minimize any interference with the growing plate.
Conclusions Our experience in the treatment of these children rare sports injuries emphasizes the need for a pre-operative diagnostic evaluation based on a three-dimensional study, suggests the need for a new classification of 3D, requires an intra-operative balance of the soft tissues injuries and recommend a wound closure at different times to reduce, as much as possible, the risk of compartment syndromes. If these lesions are correctly treated the long term risk of tibial deformity is low but higher for female athletes in whom also the risk of femoro-patellar malalignment is more common.

Ultrasound-guided viscosupplementation in glenohumeral microinstability in sports athletes

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Introduction Glenohumeral microinstability (AIOS, aquired instability in overstessed shoulder), often found in athletes who perform overhead activities (e.g. tennis, water polo, volley, swimming) is put in relation to the repeated glenohumeral extreme movements of abduction, external rotation and extension typical of some athletic gestures. These, combined with intrinsic factors specific of the athlete (ligamentous laxity, loss of muscle tone etc.) and extrinsic (technical failures or overload etc.), cause a conflict-crushing of the insertion of supraspinatus tendon between the greater tuberosity of the humerus and the glenoid labrum at the level of the posterior superior edge of the glenoid called posterior superior impingement (PSI) thus representing ground for reduction in sports performance.
Methods Eighteen athletes (14 men, 4 women) suffering from non advanced grade AIOS (no partial and/or total tendon tear) were selected by clinical and instrumental examination (MRI). The patients were treated with ultrasound guided infiltration (5–13 MHz multifrequency linear probe with lateral guide) of capsular region with low molecular weight ialuronic acid (three intra-articular infiltration with once-weekly basis) and subsequent physiokinesitherapy with active exercises with rubber bands. All patients were assessed by rating scale of Constant and MRI. Were recorded, also the time to return to sports activity.
Results In 90 % of patients was obtained, at the end of the treatment cycle of infiltration, a significant reduction of shoulder pain assessed by VAS, so as to allow them a quick return to sports activity.
Conclusions The infiltrative treatment with hyaluronic acid was effective in reducing pain and rapid recovery of athletic movement in patients with gleno-humeral microinstability.

Anatomic mini-invasive repair of distal biceps tendon ruptures

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Introduction Distal biceps tendon rupture is not common and the literature is mainly limited to case series. The preferred treatment of distal biceps tendon ruptures is by operative repair. There are several methods for the refixation of the distal biceps tendon. These include suture anchors, cortical button, and interference screw fixation which show a variable complication rate, mostly neural lesions and heterotopic ossifications. The best approach for repair (single or double) is still debated. The aim of the present study was to evaluate the clinical outcome and complication rate after distal biceps repair with a two incision mininvasive cortical button technique not needing a radial preparation. Radial preparation is the main cause of complications, as emerges from the literature.
Methods Clinical results, complications, strength of elbow flexion and supination and radiological evidence of heterotopic ossification were evaluated in 11 male patients submitted to distal biceps tendon repair with a two incision transosseous repair with cortical fixation not needing a radial preparation. Six of the 11 patients were high level

competitive weight lifters, mean age 36.0 years (33–38). Mean follow-up 11 years (6 months–20 years). Results were evaluated with the Mayo Elbow Performance Index (MEPI) and an isokinetic examination. Dominance was controlled as a confounding factor. Student *t* test was used for statistics.
Results The mean MEPI score was 100. There were no significant differences regarding mean flexion and supination strength of the involved side relative to the uninvolved side ($p > 0.05$). No neurovascular complication occurred. There was no clinical or radiological evidence of heterotopic ossification in any case. All the patients resumed their previous unlimited activity. The six weight lifters could resume their previous sports activity at the same international level. All athletes graded their subjective results as excellent. The contour of the biceps muscle was restored in all cases.
Discussion Despite requiring a two incision cortical button, the technique used reveals to be minimally invasive. This procedure is not subject to those complications occurring with other surgical techniques presented in the literature, as not needing radial preparation.
Conclusions An anatomic two incision mini-invasive radial refixation of the biceps tendon allows excellent long- term results even in high level weight lifters.

The effects of growth factors on skeletal muscle lesions: an experimental study

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Introduction Skeletal muscle injuries are common causes of severe long-term pain and physical disability. Despite this frequent occurrence and the presence of a body of data on the patho-physiology of muscle injuries, none of the treatment strategies adopted to date have been shown to be really effective in strictly controlled trials. Most current muscle injury treatments are based on limited experimental and clinical data and/or were only empirically tested. The aims of correct treatment of muscle injuries are to limit the consequences of the damage on the tissues involved in the trauma, to prevent future damage, and to ensure the athlete's prompt return to competitive activity while nevertheless respecting the necessary biological healing times. In the majority of cases, this healing process results in the formation of regenerated muscle characterized by an area of fibrotic scar tissue and by incomplete restoration of functional capacity. Scarring and fibrosis are both obstacles to complete muscle recovery following injury. Regulation of fibrosis is one of the goals of the use of GFs and platelet rich plasma (PRP) in the management of muscle lesions.
Methods Unilateral muscle lesions were created on the *longissimus dorsi* muscle of Wistar rats. The lesion was filled with a PRP intramuscular injection at different concentrations after 24 h from the surgical trauma. A group of rats was left untreated. Animals were sacrificed at 3, 15, 60 days from surgery. Histological, immunohistochemical and histomorphometric analyses were performed to evaluate muscle regeneration, neovascularization, fibrosis and inflammation and the presence of metaplasic zones, calcifications and heterotopic ossification.
Results The PRP-treated muscles showed better muscle regeneration, more neovascularization and a slight reduction of fibrosis compared with the control muscles. We observed an increase of muscle regeneration and a reduction of fibrosis directly proportional to the increase of the concentration of growth factors in the groups treated with different concentrations of PRP. There were no areas of metaplasia, calcification and heterotopic ossification.
Discussion The preliminary results of this study suggest that myogenesis induced by PRP could be a dose-dependent process.
Conclusions These experimental results on muscle healing after PRP administration are, however, an incomplete representation of the clinical situation; data on pain and functional recovery are lacking.

Reconstruction of posterior cruciate ligament (PCL) with all inside technique: preliminary results

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Introduction The patello-femoral joint is made up of a complex system of static and dynamic factors of patellar stabilization. Among the static factors, the medial patello-femoral ligament (MPFL) plays the major role in limiting the lateral movement of the patella. However, its important function has emerged only in recent years. There are different techniques for the reconstruction of the ligament as consequence of patellar dislocations, including those with single suture anchors that allow the positioning of the semitendinosus tendon at level of proper anatomical landmarks.
Methods From November 2011 we treated 12 patients with a diagnosis of recurrent dislocation of the patella. The inclusion criteria were: age over than 15 years old and less than 45 years old, both male and female, post-traumatic dislocation of the patella with at least two dislocations, absence of either osteochondral patellar defects or other lesions involving menisci and ligaments. The patients were evaluated before surgery (T0) with VAS and Lysholm and Tegner scales and then have been re-evaluated with the same tabs after a median follow-up of 24 months (T1). After harvesting the semitendinosus tendon, a trench is prepared on the medial margin of the patella where three single suture anchors are inserted while additional two anchors are placed at the level of the adductor tubercle of the femur. At this point, the graft is fixed on the patella and the femur after having checked the reduction and stabilization of the patella at about 25° of knee flexion.
Results The results are excellent in terms of range of motion and functional recovery in particular no new episodes of patellar dislocation were observed in treated patients.
Discussion The proposed technique is effective because it avoids the creation of patellar tunnel that can cause fractures. Besides it allows anatomical reconstruction of the MPFL in a minimally invasive way aggressiveness. All these features would promote a more rapid recovery, although comprehensive data have not been collected yet. Moreover, the fixation can be considered biological thanks to a large contact surface between the bone and the graft and thanks to the local release of growth factors. Finally, the absence of metal implants allows greater accuracy of magnetic resonance imaging in the case of following checks.
Conclusions This technique therefore constitutes a viable method for the treatment of recurrent dislocation of the patella in particular in patients with post-traumatic instability.

Collateral ligament injuries of the finger proximal interphalangeal joint in athletes

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Introduction IPP collateral ligaments lesions in long fingers are less frequent than the same injury at the MP, joint. The reason of that rare frequency is due to the anatomical situation: long fingers have a

position fit for reciprocal protection during sport activities, in latero-lateral direction above all. The injury generally occurs when the ligament is tensioned in flexed finger position. IPP stabilisation structures are made by a triangular dorsal part, a middle one (this is the real collateral ligament) and a fanwise volar part deeply connected to the *flexor superficialis* expansion. The volar plate is responsible for a large part of the IPP stability.

Methods Lesions are classified in: (1) first degree (isolated ligament lesion without interruption); (2) second degree (low laxity of the collateral ligament); (3) third degree (complete laceration or disruption of all anatomical structures and of the volar plate). A X-ray examination even in static or in dynamic position must always be performed (using local anesthesia). It consents to evaluate some bone detachments and laxity degree. Sports causing long fingers sprains are ball activities (basket, volley, handball). Less frequent are open-sports such as soccer, rugby, cycling (mountain-bike firstly). We treated twenty-six athletes in our casistic. Twenty lesions were recent and six inveterate. Basket was the cause of the most of injuries followed by volelyball; less frequent in soccer, rugby and bike.

Results The injury must be always repaired in flexed IPP position at about 30° to avoid stiffness risks due to an excess of suture tension. The surgical approach must be reserved to severe lesions after accurate IPP evaluation under X-ray, local anesthesia and in flexion.

Discussion The surgery is directed towards avoid painful instabilities, secondary deformities as consequence of second and third degree lesions.

Conclusions Collateral ligaments lesions are frequently underestimated and misunderstood by patient but by doctors too.