

Management of gunshot wound to the lumbosacral spine in a 17-year-old girl without neurological impairment.

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We report the case of a young girl (17-year-old) wounded by an accidental gunshot. The bullet entered through the skin midline over the navel area, passed through the stomach perforating the vena cava and, by breaking the right pedicle of L4, moved inside the vertebral canal (bridging the cauda equina) stopping just in front of the body of S2. Because of the sudden onset of acute abdomen due to a massive retroperitoneal hematoma, the patient underwent emergency explorative laparotomy with the evacuation of the hematoma and the suture of the perforated cava vein, the peritoneum, and the stomach. No neurological deficits were observed after the gunshot. Two weeks later, the patient underwent spinal surgery to remove the bullet from the spinal canal, which was performed successfully without any instrumentation and with no onset of new neurological signs and symptoms or surgery-related complications. Patient was discharged on day 9 after surgery in good general conditions.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Video-assisted anterior retroperitoneal approach to the lumbar spine. A minimally invasive technique improved by the use of an endoscopic camera to treat lumbar spinal diseases. Consideration over 269 patients

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We describe the technique we routinely use to perform the retroperitoneal anterior approach using a rigid endoscope coupled to a HDD screen to assist mini-open retroperitoneal anterior approach. Our experience was compared to those reported in the literature for the standard mini-open retroperitoneal approach. We retrospectively analyzed a total of 269 consecutive patients, 109 males and 160 females, underwent anterior lumbar approach in our department, using video-assisted anterior retroperitoneal approach to the lumbar spine. 202 patients had a single L5-S1 or L4-5 ALIF (75.09%), 14 patients received a double level ALIF (5.3%), while 53 patients underwent a double anterior and posterior approach (19.8%). The average preoperative VAS and Oswestry Disability Index (ODI) scores were 9.1 ± 6.3 and 79.3 ± 11.9 . At least 16 months follow-up (from 16 months to 5 years), the average VAS and ODI values had improved to 1.6 ± 1.5 and 13.1 ± 13.2 , respectively ($p < 0.05$). The mean length of stay was 4.3 ± 3.5 days. There were 6 major complications (2.2%) related to the approach: major vascular injuries (iliac vein injury) occurred in a total of 3 patients (1.1% of cases), whereas retrograde ejaculation occurred in 3 patients (2,75% of male cases in the series). No wound or deep infections occurred. In our opinion, this technique, compared with other mini-open approach, potentially reduces perioperative morbidity, length of surgery, surgical approach-related complications, and hospitalization.

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Modifications of spinopelvic parameters and acetabular orientation after spinal surgery for adult deformity in patient who underwent bilateral total hip arthroplasty

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The spine and the hip are two anatomical districts that have close biomechanical relationship. The management of their degenerative disorders involves an in-depth biomechanical analysis of the patient, in order to define the proper hip-spine relation, using different biomechanical classifications that have been proposed in recent years. The changes in the spino-pelvic and acetabular parameters induced by prosthetic hip surgery and spinal surgery must be carefully evaluated, calculated and foreseen in the pre-operative phase, as they play a crucial role in defining the clinical success or failure of the operations. In this paper we present a case of a patient who underwent spinal surgery after a bilateral THA analyzing both spino-pelvic parameters and acetabular orientation and highlighting the strict relations between spine and hip.

Use of lordotic cages in L5-S1 Anterior Lumbar Interbody Fusion (ALIF) procedures

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Anterior Lumbar Interbody Fusion (ALIF) has gained popularity in the last few years, thanks to its numerous advantages. Recently the use of lordotic cages has been described, allowing theoretically a better lordosis restoration of the lumbar disc space. We described the results obtained with the use of lordotic cages in 27 patients who underwent ALIF procedure for L5-S1 disc degenerative disease, in terms of segmental lordosis and global lumbar lordosis changes.

Novel directions in the study of osteoporosis: focus on gut microbiota as a potential therapeutic target

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Osteoporosis is a significant social health problem, not only in terms of pain and disability but also in terms of mortality rate. In recent years, there is an increasing interest in studying the relationship between gut dysmicrobiosis, immune system and bone health, therefore the term “osteomicrobiology” has been recently coined. This review aims to summarize the current knowledge about the link between gut dysbiosis and osteoporosis, in order to define a potential preventive and therapeutic strategy. Gut microbiota (GM) plays a major role in maintaining body homeostasis, since it is involved in several physiological processes; in recent years, the gut microbiota has shown to modulate not only local processes but also systemic responses including bone metabolism. Several potential mechanisms may explain how gut microorganisms could affect bone metabolism, i.e. influencing the host metabolism, immune system and hormone secretion. The relationship between gut dysbiosis, immunological dysfunction and bone loss could be explained by mainly focusing on T cells. Moreover, it should be noted that the relationship between GM and the endocrine system could also explicate how the microbiome influences bone status. In this context, Insulin-Like Growth Factor-1 (IGF-1), vitamin D, serotonin and leptin might play a central role. GM could have a significant impact on bone metabolism, therefore future clinical studies are necessary to develop a new multidisciplinary approach for osteoporosis treatment and prevention.

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Blood transfusion, hospital stay and learning curve in robotic assisted total hip arthroplasty

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Total Hip Arthroplasty (THA) has been defined the surgical procedure of the century considering its outcome and cost-benefit ratio (1). Both standard and robotic assisted procedures are increasing, thus, comparison between standard and robotic surgery become useful to understand the cost-benefit of the latter. The prerequisites of the robotic assisted arthroplasty are precision, accuracy, limitation of errors and safety but, on the other hand, its cost is the main drawback. The primary endpoint of our research was to evaluate differences in terms of blood transfusion rates between standard manual and robotic arm assisted THA. All the robotic procedures have been managed using semi active Robotic Arm interactive orthopaedic System (RIO® MAKO Stryker surgical corporation) in a group of patients who underwent primary uncemented total hip arthroplasty (THA) for osteoarthritis or avascular necrosis. Secondary endpoints were the evaluation of length of hospital stay (LOS), age category, gender and the impact of the learning curve on surgical time in the robotic surgery sample. Our retrospective cohort study was conducted between July 2014 and December 2018. Data have been collected from the Tuscany regional hospital discharge register, extracting the relative Hospital Discharge Forms (SDO). During the period of the study, 1537 patients underwent uncemented total hip arthroplasty for osteoarthritis or avascular necrosis. The sample was divided in two subgroups: 1142 patients (74.3%) operated on with standard manual technique and 395 patients (25.7%) operated on with Mako-Stryker Robotic System. In the descriptive analysis, the average values of age and days of hospitalization with 95% CI were calculated. Mean significance was assessed by the T student test. The association between surgical modality and gender was assessed with the chi-square test. The multivariate logistic regression model was used to evaluate the risk of transfusion (outcome variable), between conventional and robotic surgical techniques. The significance threshold was set up at $p < 0.05$. During the period of the study we observed a decrease in standard surgery and an increase in robotic surgery; an increasing number of women per year underwent total uncemented total hip arthroplasty. We found a statistical significance in favor of robotic procedures in terms of transfusion percentage (OR 6.10, 95% CI 2.96-12.59, $p < 0.001$), highlighting the greatest risk in women (OR 1.90, 95% CI 1.30-2.78, $p = 0.001$), length of hospital stay (Mr=4.24, SD=2.04, 95% CI 4.04-4.44) (Ms=8.04, SD=2.84, 95% CI 7.88-8.21), ($p < 0.01$). Operative time in the robotic sample decreased substantially with the rise of surgical experience (106.75±13.4 mins in 2014; 82.79±15.95 mins in 2018) ($p < 0.01$). Since the Robotic procedure is a technologically demanding process, an adequate surgical learning curve is mandatory. Our paper, comparing conventional vs robotic assisted THA, showed in favor of the robotic one, a statistically significant reduction of number of transfusions ($p < 0.001$) and length of hospital stay ($p < 0.01$).

Arthroscopic transosseous versus suture anchor repair: clinical outcomes in patients with bilateral rotator cuff tears

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The aim of our study was to define if Arthroscopic Transosseous Rotator Cuff Techniques should have comparable results to those of the suture-anchors technique in a single row configuration. We reported the preliminary results of a consecutive population of 22 patients who underwent a rotator cuff treatment on the left and right sides for average medium-sized thickness tears with minimal fatty infiltration with the two different techniques: transosseous rotator cuff repair technique on one side and single row with suture-anchors on the other side, in different times. Subjective evaluation with DASH questionnaires, Constant Scores and Numerical Rating Scale (NRS) for pain evaluation, have been submitted pre and postoperatively after both operations. A statistical analysis was performed to assess the superiority of one technique and to compare pre and postoperative ROM data and clinical outcomes. A transosseous rotator cuff repair was performed in 7 patients on the dominant arm, while the other 15 patients had dominant arm cuff tear lesions repaired by using suture-anchors technique. At last follow-up a significant improvement, in shoulder pain and function, was referred at both sides. Also, DASH, Constant Scores and NRS for pain evaluation improved with both techniques, but no statistical difference was found between them. Arthroscopic transosseous rotator cuff repair technique shows comparable results to those of the suture-anchors technique in a single row configuration.

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A survey on surgeon practice shows lack of consensus on the management of primary shoulder stiffness

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Shoulder stiffness is a condition of painful restriction in active and passive glenohumeral range of motion, which can arise spontaneously or as consequence of a known cause. Numerous therapeutic approaches are available; however, no consensus has been reached on the best algorithm for successful treatment. The aim of this study was to investigate local practice patterns regarding management of primary shoulder stiffness. Randomized controlled trials reporting results of shoulder stiffness treatment were collected and analyzed prior to study begin. Controversial elements in the treatment of primary shoulder stiffness were identified and a survey was created and administrated to clinicians participating at an annual national congress dedicated to shoulder pathologies and their treatment. 55 completed questionnaires were collected. Physical therapy was recommended by 98% of the interviewed. The use of oral corticosteroids was considered by 58% and injections of corticosteroids by 60%. Injective therapy with local anaesthetics was considered by 56% of the clinicians and acupuncture by 36%. 38% of the interviewed did never treat shoulder stiffness surgically. Various strategies to manage shoulder stiffness have been proposed and high-level evidence has been published. Numerous controversial points and a substantial lack of consensus emerged both from literature reviews and from this survey. The treatment of shoulder stiffness should be tailored to the patient's clinical situation and the stage of its pathology, aiming primarily at identifying risk factors for recurrence, reducing pain, restoring range of motion and function and shortening the duration of symptoms.

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Effect of intravenous ferric carboxymaltose supplementation in non-anaemic iron deficient patients undergoing hip and knee arthroplasty

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Preoperative anaemia and non-anaemic iron deficiency are independent risk factors for perioperative blood transfusion, morbidity, and mortality. Although the efficacy to treat anaemia with iron infusion before elective surgery has been widely studied, the literature offers few data about the efficacy of treating iron deficient, non-anaemic patients before elective surgery. This retrospective study assessed the effect of preoperative ferric carboxymaltose (FC) administration on the concentration of Haemoglobin (Hb) in iron deficient, non-anaemic individuals following total knee or hip arthroplasty. A treatment group of 83 non-anaemic iron deficient individuals scheduled for arthroplasty were administered a 1000mg FC infusion over 15 minutes 4 weeks prior to surgery. In the control group (n=62) FC was not administered preoperatively. No individual from either group was given any iron supplement following the pre-operative visit. Blood tests were performed and analysed 4-weeks before surgery, on admission, and then 2-days, 4-days and 4-weeks postoperatively. Number of blood transfusions performed and adverse events were recorded. Hb concentration did not change substantially after iron supplementation prior to surgery. No difference in the number of blood transfusions was observed. In the treatment, group postoperative Hb concentration recovered significantly more quickly compared to control (p=0.0047). No adverse event was reported. The administration of FC in non-anaemic iron deficient individuals quickens the restoration of Hb concentration following THA or TKA procedures.

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Two-stage total hip arthroplasty for septic arthritis through the minimally invasive direct anterior approach

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The use of minimally invasive direct anterior approach to perform total hip arthroplasty is gaining increasing popularity for its short-term advantages, compared to other approaches. Nevertheless, its use in hip revision surgery has been criticized. We report here the first case of hip septic arthritis treated with two-stage THA through this tissue-sparing approach, with good implant positioning and functional results.

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Effects of NGF and BDNF on chondrocytes: a microarray analysis

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Osteoarthritis (OA) represents an inflammation-driven injury of articular tissues, progressively leading to structural and functional joint impairment. The main symptom of OA is pain. Although it has been well established that OA represents a whole joint disease, the source of pain remains to be clarified. Nowadays, it has been well established that neurotrophines expression is evident in joints affected by OA. In addition, elevated NGF levels are found in the synovial fluid of patients with inflammatory or degenerative rheumatic diseases, including OA, rheumatoid arthritis and spondylarthritis. Growing evidences indicate that blocking NGF signaling using an anti NGF agent (i.e. tanezumab) provides effective pain relief. This study analyzed the effects of NGF and BDNF on cultured human chondrocytes by evaluating and their effects on chondrogenesis, chondrocyte differentiation and cartilage degeneration through a microarray analysis. The whole transcriptome analysis performed in this study highlighted how NGF and BDNF could be able to induce a proinflammatory response in human chondrocytes. Moreover, NGF and BDNF treatments seems to be able to induce the activation of several genes involved in the OA pathogenesis as IL17AR, HLA-DRB1, GDF-15, NR1D1, MCF2L and TGF-Beta.

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Posterior dynamic neutralization and hybrid stabilization in degenerative spine diseases: long-term clinical and radiological outcomes

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Dynamic spinal stabilization aims to reduce some of the problems inherent with traditional fusion. The aim of our study is to analyse clinical and radiological outcomes and to identify the causes of clinical failure in patients who underwent posterior dynamic neutralization or posterior hybrid stabilization because of degenerative lumbar spine diseases. We retrospectively analysed 80 patients at 7.1 years mean follow-up (Range: 5.1 - 8.3 years): 50 were treated with Dynamic Stabilization System (Dynesys) (mean age 47 years old) and 30 with Dynamic Transition Option (mean age 48 years old). We performed clinical pre- and post-operative evaluation using Visual Analogue Scale (VAS), Oswestry Low Back Pain Scale (ODI) and X-rays study. Results: we reported an important reduction of VAS from 7 to 2 ($p < .001$) and minimal disability in 65% of the patients, moderate disability in 18.2%, severe disability in 12.5% and crippling back pain in 4.3%. X-ray analysis showed a significant decrease of 3.5° with respect to the preoperative values, exactly 2° in neutral position postop, 1.2° in flexion postop and 2.5° in extension postop. Data showed greater reduction of extension than flexion in postoperative period. Dynamic neutralization limits more the extension than flexion. The correct preoperative planning, the careful selection of patients and the meticulous surgical technique are mandatory to avoid clinical failures. It is very important to identify the correct screw positioning and to avoid excessive pre-tensioning of the implant. Posterior dynamic neutralization and hybrid stabilization are valid alternative to spinal fusion in degenerative spine disease.

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Histological assessment of new bone formation with biomimetic scaffold in posterolateral lumbar spine fusion

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Spinal fusion procedures often require the use of bone grafts (autograft or allograft) to help bone healing and to increase stability. However, the application of autografts is frequently limited by donor site morbidity. In recent years, different synthetic bone substitutes have been introduced in the clinical practice to overcome these limitations. The purpose of this paper is to report a case where a biomimetic, synthetic and osteoconductive bone graft substitute was successfully implanted in a patient during lumbar spine arthrodesis. The case of a 58-year-old female subjected to lumbar spine arthrodesis with bone augmentation is described. The bone graft substitute RegenOss® (Finceramica, Faenza, Italy) was implanted during spinal arthrodesis. The successful bone integration was evaluated by X-rays. After 11 months, the patient underwent a second surgery due to spine imbalance; the debris of the bone graft was therefore collected and analyzed by macroscopic evaluation and by histology. The bone substitute was successfully implanted during a spinal arthrodesis procedure. Histologic evaluation of the removed bone graft debris showed the complete resorption of the implant and the formation of new bone, which was well integrated with the host bone. This bone substitute may represent a safe and effective alternative to autologous bone grafts, avoiding adverse events related to donor-site morbidity.

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Inter-rater reliability of classification systems of scapular dyskinesis

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Prevalence of scapular dyskinesis varies across records, with overhead athletes being more frequently affected than non-overhead athletes. A number of methods have been described to evaluate scapular kinematics and scapular dyskinesis. The “yes/no” and the “4-type” classification systems are widely accepted and diffusely used among orthopaedics and physical therapists. The inter-rater reliability for both the “yes/no” and the “4-type” classification systems may be different. Moreover, differences between physical therapists and orthopaedic surgeons may exist. Seven examiners (2 orthopaedic surgeons and 5 physical therapists) were asked to evaluate a mixed sequence of video recordings of healthy subjects and patients affected by shoulder, scapular or clavicular disorders and to assess scapular dyskinesis using the “yes/no” and the “4-type” classification systems. Cohen’s kappa coefficient (κ) and weighted kappa were used to measure inter-rater reliability. Twenty-four subjects were enrolled. In general, the “4-type” system has higher κ values than “yes/no” classification system and orthopaedic surgeons achieve higher reliability than physical therapists for both systems. The clinical evaluation of active shoulder movements permits reproducible assessment and classification of scapular dyskinesis, in particular for the “4-type” classification system. The “4-type” classification system can be used to assess and classify scapular dyskinesis, especially among orthopaedic surgeons.

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Bilateral THA in the same sitting for avascular necrosis of the head of the femur in sickle cell patient: our African experience

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Sickle cell anemia is protective against the malaria protozoan. The heterozygous form of the disease is not fatal, and may cause musculoskeletal disorders when sickling occurs, and small vessels are occluded. When the head of the femur is involved, this may result in hip arthritis, often bilateral, at a young age. This article describes three patients in whom bilateral total hip arthroplasty (THA) was performed in the context of a humanitarian mission in Togo, Africa.

Periprosthetic joint infection from *Mycobacterium Tuberculosis* in Togo, Africa

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Mycobacterium Tuberculosis infections are moderately frequent in developing countries. Because of migratory flows, these diseases will always have an increasing prevalence even in those countries that do not usually present these types of cases. Extra-pulmonary tuberculosis often affects the musculoskeletal system. The sites most involved are the spine (Pott's disease) and the large joints, especially hips and knees. We describe a patient with tuberculosis of the hip, who underwent total hip arthroplasty.

Management of intraoperative contamination of anterior cruciate ligament graft

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The options after the intraoperative graft contamination include sterilizing and implanting the graft, rejecting the graft and isolating another one from the other knee, rejecting the graft and using an allograft. The survey was prepared in Google Forms®. Only fully and correctly completed survey questionnaires were considered and included in this study. In total, 41 questionnaires in the study reported contamination. For the surgeon, the risk of contaminating the graft during the surgery is 0.2%. The mean contamination rate is 1.2 accidents per whole career. The statistical significance was observed in correlation between years of specialization and several accidents ($p < 0.05$). The graft contamination may be experienced by almost 30% of surgeons performing ACL reconstructions. Neither knowledge, nor experience and training can prevent an operating team from that situation. The only solution is to follow a strict protocol of graft preparation. According to the data gathered in this study, there is still no ideal protocol after the incident occurs.

Microfracture combined with anterior cruciate ligament reconstruction compared to isolated microfractures for osteochondral lesions

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There is limited evidence whether increased growth-factor and stem-cell influx during bone tunnel drilling for ACL-reconstruction enhances clinical results of microfracture treatment of small cartilage defects. The goal of this study was to compare clinical and radiological results in patients treated with microfracture alone and patients treated with microfracture plus ACL-reconstruction. A total of 67 patients that were either treated with microfracture alone (primary stable knees, n= 40) or microfracture plus ACL-reconstruction (ACL deficient knees, n=27) were included and prospectively evaluated. Subjects were preoperatively assessed radiologically using the MR-based AMADEUS-score (Area Measurement and Depth & Underlying Structures) and clinically using the Lysholm-score before the intervention. At minimum 24-month follow-up, the regenerate tissue was assessed by the MR-based MOCART-score (Magnetic resonance observation of cartilage repair tissue) and by use of the Lysholm-Tegner-score for clinical evaluation. Preoperatively both groups had similar AMADEUS-scores. The Lysholm-score was significantly higher in the microfracture group ($p < 0.001$). In the postoperative assessment there was a significant difference ($p = 0.04$) in the MOCART-score in favor of the microfracture plus ACL-reconstruction group. The Lysholm-score significantly improved ($p < 0.001$) in the microfracture plus ACL-reconstruction group and was significantly higher than in the microfracture group ($p = 0.004$). **Conclusion:** A combination of microfracture and ACL-reconstruction leads to comparable functional results, yet superior MOCART-scores as compared to microfracture alone. ACL reconstruction enhances biological healing responses in microfracture treated cartilage and thus improves clinical outcomes by additional bone marrow influx from bone tunnels.

Transosseous suture loop technique for MPFL reconstruction

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Patellar dislocation represents a rare but invalidating trauma. Indeed, 94 to 100% of patients suffer from medial patellofemoral ligament (MPFL) rupture just after the first patellar dislocation, and approximately half of these patients develop recurrent dislocations. MPFL reconstruction is a commonly performed surgery for patellofemoral instability. Anatomic reconstruction of the MPFL restores patellar stability in patients with recurrent patellar instability with neutral lower limb alignment. We describe a technique, which creates an anatomic reconstruction using trans-osseous suture loop. Conclusion: Compared to similar techniques, the described procedure has the following advantages: smaller tunnels, less donor side morbidity, reduced risk of graft failure, minimal invasiveness, more appealing cosmetic results and easily reproducible. Complications and outcomes of this technique, including the risk for patellar fracture, must be further evaluated in a larger patient cohort with longer follow-up.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Kinematic versus mechanical alignment in total knee arthroplasty: a preliminary study

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Despite the great advances of the technology in the joint prosthesis and the high execution rate of total knee arthroplasty (TKA), there are still about 15% of clinical unsatisfactory rate in this surgery. TKAs are currently performed using a mechanical alignment of the knee, correcting varus/valgus deformities with the purpose to achieve a longer implant survivorship, but this surgical technique results in an alteration of the normal knee kinematics. Nowadays, the idea to restore the pre-arthritis alignment of the knee with the goal to obtain a normal kinematics and better functional results becomes more and more consistent and the kinematic alignment (KA) was developed as alternative to the mechanical one. The aim of this preliminary study is to analyse the functional outcomes in patients who underwent KA-TKA in the short-term follow-up and to compare them with those obtained in patients treated by the mechanical alignment (MA) TKA. Therefore, skeletally mature patients, with no history of previous knee surgical procedures, who underwent isolated TKA for knee osteoarthritis, were included in this study. The patients were prospectively divided into two homogeneous groups according to the different surgical techniques performed (KA-TKA and MA-TKA groups). Clinical and functional scores (VAS, KOOS-PS, MCS-12, Final KSS, and Functional KSS) were collected pre- and postoperatively at a mean follow-up of 3 three months. As a result, 26 patients were included in the study, with a mean age of 69.3 ± 7.61 years old (range: 55 - 84 years old). There were 38.5% male and 61.5% female. There were 13 patients in KA-TKA and 13 patients in MA-TKA. Three months after surgery each of the scores tested demonstrated statistically significant better outcomes in KA-TKA, compared to the MA-TKA group. MCS-12 resulted comparable in the two study groups. This preliminary study compares the short-term clinical and functional outcomes between KA and MA in total knee replacement. Further studies are required to confirm these results and to extend the sample size to obtain reliable clinical evidences.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Restoration of the degenerated cervical intervertebral space: how much should we distract? A magnetic resonance imaging study

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The aim of the study was to quantify normal cervical disc space measurements and to generate a normal values' database. Furthermore, during operative restoration of a degenerated intervertebral disc, it is difficult to calculate the amount of distraction required to restore the collapsed space to its normal height. A secondary purpose is personalizing the anatomical correction. Therefore, we expressed disc height based on measurements of its neighboring disc as an equation, by using simple linear regression. We reviewed MRI studies from asymptomatic healthy subjects (16 men–24 women, mean age 27.25 years). We measured midsagittal anterior, middle and posterior vertebral body and disc height, and disc diameter from C3 to T1 vertebra. We calculated mean disc height, disc height index (DHI) and disc convexity index per spinal level. C6-7 mean and anterior disc height were significantly greater than all respective measurements, except C5-6 ($p<0.01$). Middle C6-7-disc height was significantly greater compared to respective measurements in every other level ($p<0.01$). C5-6, C6-7 and C7-T1 mean disc height is significantly greater in men. Middle disc height is the greatest among disc heights in every spinal level. DHI does not differ between sexes, it increases from C3-4 to C5-6 with a slight decrease in C6-7, while its value significantly decreases in C7-T1 ($p<0.0001$). These measurements could be used for anatomical, individualized restoration of the degenerated intervertebral disc; thus, avoiding overdistractio. Our data could improve preoperative templating or implant design.

Prediction of reparability of meniscal tears in athletes using magnetic resonance imaging

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Meniscal tears account for approximately 15% of all knee injuries and almost 25% of them require surgical procedures. Magnetic Resonance Imaging (MRI) is widely used for noninvasive assessment of the knee joint and is considered reliable and a powerful tool for the detection of soft tissue injuries of the knee. The aim of the study was to evaluate the sensitivity, specificity, and accuracy of magnetic resonance imaging (MRI) to predict the meniscal tears repair in sports practitioners. 104 incoming consecutive patients who underwent knee joint ligament reconstruction and/or arthroscopy for the treatment of meniscal injury at knee joint were imaged using a 1.5-T MRI scanner prior to arthroscopy. MRI images were evaluated for anterior cruciate ligament (ACL), articular cartilage, and meniscal injury. Images were correlated with arthroscopic findings, used as the gold standard. The sensitivity, specificity, and accuracy of MRI in predicting meniscal repair were 61.1%, 65.94%, and 64.58%, respectively. The agreement between MRI and arthroscopy yielded a kappa index of 0.236, indicating fair agreement. When the menisci were evaluated separately, 65.85% sensitivity, 45.45% specificity, and 54.16% accuracy were found for the medial meniscus, while 46.15%, 79.51%, and 75.0% for the lateral meniscus, respectively. The accuracy was 62.09% in those patients that arthroscopy was performed up to 3 months after MRI and 67.18% in those that this time frame was more than 3 months before surgery. The 54 meniscal injuries occurred more frequently in the posterior horn; most injuries had a longitudinal pattern and were located in the red-red (vascular) zone. We suggest that magnetic resonance imaging is only moderately accurate for the prediction of meniscus reparability.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Sport injuries in professional volleyball players

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Recently there has been a considerable surge in interest in volleyball by both physiotherapists and orthopaedic surgeons. Only few previous studies specified the nature, frequency, and demographics of volleyball injuries. The study was conducted during two league seasons. After the approvals of local bioethics committee and clubs' authorities, contact with the club's doctors was established. A special survey was designed to standardize the process of acquiring data on a weekly basis. One-hundred-and-ninety-eight women and 301 men were under supervision of the research group. On average, 45% of all players (56% males and 26% females) suffered from injuries and musculoskeletal disorders over two seasons. Relatively high incidence of injuries during matches was between 17.3 and 33.8 injuries per each 1000 hours of playing. Almost 50% of musculoskeletal problems occurred in the first phase of the season. Over 50% of musculoskeletal problems were reported during trainings. The blockers are the most affected players in both sex groups. Acute injuries mainly involved knee and ankle joints, while chronic problems affected knee, shoulder, spine and abdominal muscles. Professional volleyball is not a safe sport, especially during a league season. Attention should be especially paid to ankle, shoulder and knee joints, which are the most commonly injured structures. The study revealed that blockers were the most susceptible to injuries and should be protected by special training regime. These findings can help to prepare sports medicine personnel and to guide further related research to prevent injuries among volleyball professionals.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

One-stage Bilateral Total Hip Arthroplasty in patient with sickle cell disease and previous Girdlestone procedure on the right side: First presentation in Togo

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80% of Sickle Cell Disease cases are estimated to be in Sub-Saharan Africa. It can lead to various acute and chronic complications and osteonecrosis of the femoral head is one of these. Girdlestone procedure is an option to treat osteonecrosis in patients who could not afford arthroplasty. We report here the first case of bilateral total hip arthroplasty in a patient with a previous Girdlestone procedure on the right side and an osteonecrosis of the femoral hip on the left side.

All-inside repair of meniscal bucket handle tears: a retrospective study at mean 4-years follow-up evaluation

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Bucket-handle tears represent approximately 10% of all meniscal tears. Despite the common treatment is subtotal meniscectomy, repair is technically feasible although complex, and represents a key strategy to avoid severe meniscal tissue loss that could accelerate joint degeneration over time. The aim of this retrospective study was to determine the outcomes of arthroscopically-assisted bucket-handle tear repair, and to identify factors correlating with clinical results. Fifty-four patients affected by meniscal bucket handle tear were included in the present retrospective analysis and evaluated up to mean 4-years follow-up. All patients were treated by arthroscopic-assisted all-inside repair. The primary outcome was considered the need for a re-operation due to failure of meniscal repair. Patients were also evaluated by the following items: KOOS, Lysholm, Tegner, IKDC-subjective and Quadruple-VAS score. Subgroup analysis was performed to identify whether concurrent ACL reconstruction, side of the lesion, age at surgery and time from injury to repair could influence clinical outcome. Ten out 54 patients (18.5%) were considered failed and needed reoperation, mainly within one year from surgery. Overall, there was a significant increase in all clinical scores considered and patients were able to get back to previous sport activity level. Patients with concurrent ACL reconstruction presented a lower risk of failure (p=0.025). Patients with lateral meniscus repair showed better clinical outcome compared to medial meniscus. Timing from injury and age at surgery did not correlated with clinical outcome. Our series showed fair results in bucket handle repair up to middle term evaluation. Concomitant ACL reconstruction was associated with lower failure rate whereas lateral meniscus involvement was associated with higher functional scores at final follow-up evaluation.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Total hip replacement: a retrospective multicentric analysis on re-intervention rate after single component revision

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Total hip arthroplasty (THA) revision is a procedure consisting in the replacement of a single or multiple implant components and could take place once or more times (re-revision). The aim of this multicentre study is to evaluate the benefits of single component revision in respect of the principles that define implant stability. Two hundred and forty-two patients underwent THA revision at Orthopaedic Clinic of Pisa and Versilia (ITA) from January 2007 to December 2016. We have systematically excluded revisions due to septic or traumatic prosthesis loosening, revisions of both implant components (cotyle and stem) and replacement alone. To evaluate implant stability, we used preoperative X ray and intra-operative mechanical stress tests, applying accredited criteria. Two hundred and twenty-six patients (93%) underwent a single procedure of THA revision: 193 had cotyle replacement and 33 had femoral stem replacement. The remaining 16 (7 %) underwent at least two procedures: 10 of them had consecutive failure of the same component, while the other 6 had revision of the other component after the first procedure. Considering our cases series, we can assert that single component revision is the best choice when no signs of loosening are present on the remaining component. Nevertheless, an accurate evaluation with unanimous radiological criteria and intraoperative testing is essential for the surgeon to choose the most suitable treatment.

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Clinical anatomy of the meniscus in animal models: pros and cons

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Nowadays, despite the possibility to use *in vitro* or computer models in research, animal models are still essential. Different animal models are available for meniscal repair investigation. Although a unique perfect model for the structure of the human's knee does not exist, the choice of the proper animal model is crucial for a correct research. The principal animal models in the meniscal repair are sheep, goats, pigs and dogs. Each of these has pros and cons for their utilization. Analysing each pro and con is essential for optimizing the choice of the animal model, which depends on the experimental question, avoiding unnecessary waste of resources and minimizing the animal suffering, according to the Russell and Burch's three "Rs" principles (Reduce, Refine and Recycle). In this concise review, we resume the meniscus anatomical features of the main large animals, to help choose the most suitable animal model for subsequent studies on meniscal repair.

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Bilateral osteochondritis dissecans of the patella in an adolescent skier with patellofemoral maltracking treated with pulsed electromagnetic field therapy

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Juvenile osteochondritis dissecans of the knee typically occurs in young athletes, and usually localizes on the medial femoral condyle. Bilateral localization is uncommon. Patellofemoral involvement is rare, mainly found in basketball and soccer players, and never related to patellofemoral congenital problems such as trochlear dysplasia. We report here the first case, to our knowledge, of bilateral juvenile osteochondritis dissecans with patellar localization in a young skier with patellofemoral maltracking and trochlear dysplasia.

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Allograft versus autograft in forearm aseptic non-union treatment

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Non-union in forearm fractures is an uncommon challenging clinical condition for orthopaedic surgeons. The complex anatomy and biomechanics of the upper limb make this surgery very demanding. The accurate restoration of the normal anatomy is mandatory to obtain bone healing. Infections and important bone loss further reduce the therapeutic success. The use of bone graft in atrophic non-union may significantly reduce the bone healing time with good clinical results. The aim of the study was to compare fresh-frozen bone (FFB) allograft and autograft in the treatment of forearm aseptic non-union. Inclusion criteria were patients aged between 18 to 75 years old with forearm aseptic shaft non-union treated with plating and bone grafting. The Authors retrospectively evaluated minimum 12-month follow-up with standard X-rays and clinical outcomes. All non-unions were classified according Association for the Study and Application of the Method of Ilizarov (ASAMI) classification for long bones. The sample size was divided in two groups: patients treated with FFB allograft (Allograft Group) and patients treated with iliac crest autograft (Autograft Group). The mean patient age was 33.58±16.72 (18-75) years old in Allograft Group and 33.28±17.24 (18-75) in Autograft Group. The mean follow-up was 62.6 months (±12.3, range 12-160) in Allograft Group and 64.4 (±12.4; 12-160) in Autograft Group. The mean bone union time after the surgery was 101.6 (±14.6; 82 -156) days in Allograft while 117.6 (±14.6; 90 -180) days for autograft. The Radiographic Union Score was 26.8 (±2.2; range 24.3-30) in Allograft while 26.9 (±2.8; range 24.1-30) in Autograft. A correlation between clinical and radiographic outcomes was found (Cohen κ : 0.86±0.11 in Allograft Group; Cohen κ : 0.85±0.10 in Autograft Group, p=0.051). The preoperative surgical planning is essential to apply this technique: the adequate cortical graft length is the key point to gain adequate implant stability. A meticulous surgical technique is mandatory to obtain good clinical and radiological outcomes. The study reported a good reliability of FFB allograft for large non-union bone defects. This technique may represent a feasible alternative to bone transport or amputation, as it allows the return to daily life activities. Further studies are needed to assess the long-term clinical results of this surgical procedure.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Bone grafting combined with Sauvé-Kapandji Procedures for the treatment of aseptic distal radius non-union

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Distal radius fractures are the most common type of upper limb fractures in adults. Non-union after distal radius fracture is rare, serious and unpredictable. The aim of our paper is to analyse the clinical and radiological outcomes of bone grafting and Sauvé-Kapandji Procedures for the treatment of aseptic distal radius non-union. We enrolled 13 patients with distal radius aseptic non-union. The following parameters were evaluated: The surgical time, elbow, forearm and wrist range of motion, the subjective quality of life and the wrist function measured by Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH), Pain Visual Analogic Score (VAS) and the complication rate. Bone union was measured using the radiographic union score as described by Radiographic Union Score (RUS). The evaluation endpoint was set at 24 months after surgery. All patients achieved fracture union. Grip strength improved by 12.4 kg. There was also improvement in wrist flexion, in wrist extension, and forearm pronosupination. These ranges of motion and grip strength improvements were statistically significant. Only 6 patients returned to full activity. This surgical technique represents a reliable alternative for treatment of distal radius aseptic non-unions. Further studies are needed to assess the long-term clinical results of this surgical procedure.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Total hip arthroplasty for osteonecrosis of the femoral head in sickle cell disease: a case series from our African experience

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Sickle cell disease causes osteonecrosis (20% to 50% of patients) and collapse of the femoral head that result in secondary osteoarthritis. Total hip arthroplasty (THA) is a valid alternative for these patients. We define the difficulties that can be encountered when undertaking THA in sickle cell disease patients and give advice on how to deal with these technically demanding procedures. We undertook total hip arthroplasty procedures on 12 patients (4 females and 8 males) with osteonecrosis of the femoral head. Two bilateral prostheses were performed. We had only one type of stem, only one type of acetabular cup and only 28 mm cobalt chrome heads. The procedures were performed through either an anterior or a direct lateral approach. The average size of the Cup was 46 (Versafit, Medacta), the average size of the femoral stem was 0 (Amistem, Medacta), the most used size of the modular head was a S. Standard stem that was used in nine patients, while three patients received a lateralizing stem. Three patients had periprosthetic fracture, treated by cerclage. Total hip replacement is an excellent alternative for patients with osteonecrosis from sickle cell disease. The preparation of the acetabulum and the femur is difficult and requires attention, time and appropriate equipment.

Reliability of S.A.R.A. (sterilization and reimplantation autograft) technique in long bone open fractures

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The reimplantation of small or large extruded bone segments is one of the most complex clinical management scenarios in the treatment of open fractures. No consensus exists regarding the efficiency of this technique. The aim of the study was to analyse the clinical and radiological outcomes of Sterilization and Reimplantation Autograft (S.A.R.A.) technique in open fractures. Therefore, fifteen skeletally mature patients with Gustilo-Anderson –IIIB type fractures treated with autograft reimplantation, were included in this study. The sample size was divided in two groups: patients with a loss of small segments (Group A - less than 5 cm) and those with large segments (Group B - greater than 5 cm). Eight patients belonged to Group A and seven to Group B. The treatment of contaminated bone may be performed by the following protocols: saline rinse, povidone-iodine scrub and saline rinse, retain periosteum, immersion in antibiotic solution (clindamycin and gentamicin and metronidazole), washing with physiological solution, acute reimplantation in Group A or reimplantation after 21 days in Group B after a bone freezing at -80°C. The Radiographic Union Score (RUS), pain visual analogic score (VAS), patient satisfaction and return to work were assessed at a mean follow-up of 24 months. No cases of superficial or deep infection were reported at 2-year follow-up. The fractures achieved a complete union in 14 patients; one patient belonging to Group A had a malabsorption of the replanted bone. Furthermore, povidone-iodine scrub, antibiotic solution immersion, and washing with physiological solution preserved the articular surface morphology. This study suggests that reimplantation of extruded short or long segments may represent a reliable alternative to amputation in open long bone fractures. Further studies are needed to define the most efficient technique for sterilizing the bone autograft to reduce the complication rate.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Combined circular external fixation and flexible intramedullary nailing for pediatric bilateral open tibia fractures in blast injury

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Management of blast injuries with open fractures and extensive soft tissue damage in pediatric patients is a challenging task even in experienced hands. This article reports the case of an 8-year-old boy with bilateral open tibia fractures and soft tissue loss due to the accidental explosion of a skyrocket. After the emergency procedures with lavage, debridement and temporary bone stabilization, we performed the definitive reconstruction surgery using a combined circular external fixation and flexible intramedullary nailing technique on both legs. This technique allowed easy access to the wounds for plastic surgery procedures and early bilateral weight bearing. All implants were removed within 6 months, the fractures healed with good axial alignment and the patient returned to his preinjury activities one year after the trauma. In this case, the combined use of circular external fixation and flexible intramedullary nailing ensured optimal fractures stabilization, minimizing the damage to the soft tissues and the obstruction for plastic surgeons. We believe that this technique should be considered in pediatric patients with open fractures of the lower limbs and extensive soft tissue injuries.

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Use of ceramic bearings in hip arthroplasty: correct implantation and review of clinical and radiographic results

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Ceramic materials are widely used in hip prosthetic surgery. Faced with important developments in the design and characteristics of the materials, ceramic-on-ceramic (CoC) are today the bearings in Total Hip Replacement (THR) showing the minimal wear rate. Moreover, ceramic wear debris demonstrated the absence of local and systemic toxicity. This makes ceramic bearing particularly suitable for active patients, whatever their age. The results show excellent survival rates of THRs with ceramic components and excellent clinical and radiographic scores with follow-up close to 20 years. However, the excellent outcomes of THRs with ceramic bearings are depending on appropriate and correctly performed surgical technique.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Perioperative case series, qualitative evaluation of gait cycle and ground reaction forces in knee arthroplasty patients using a wearable insole

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Validation of a novel smart drilling system to monitor bone impedance during transpedicular screw placement: a pilot study

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Transpedicular screw placement is a high-risk procedure routinely performed in spine surgery. To decrease the rate of complications, it is necessary to find innovative solutions to assist the surgeon during screw insertion so as to avoid the chance of mispositioning. In this study, we developed a new drilling system able to estimate the mechanical properties of drilled tissues. Several investigations show that cortical bone requires a high level of thrust force and torque during drilling compared to trabecular bone. To implement an algorithm for bony breakthrough detection, a new drilling system has been built together with a mechanical support to drill the pedicle along a pre-planned trajectory. The mechanical support is equipped with a smart rotative drill that embeds force and position sensors. Ten human vertebral segments have been used to test the surgical platform, for percutaneous bone drilling. 10 transpedicular holes from L1 to L5 have been performed bilaterally. The holes were further evaluated by computed tomographic scans to measure bone density in the cortical and in the trabecular layers. To compare bone density with the bony mechanical impedance two new parameters (D_{HU} and D_{PAI}) have been introduced. The results show that in 18 out of 20 cases the D values of bone density and mechanical impedance, related to the same bone transition, differ less than 10%. The proposed system is thus able to evaluate the variation of bone density of the cortical and the trabecular layer using impedance. Therefore, it is possible to use the described system to increase the accuracy of transpedicular screw placement.

The limits and potentials of presepsin in orthopaedic surgery: state of the art and future directions

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Presepsin, i.e. the soluble cluster of differentiation 14-SubType (sCD14-ST), is an emerging biomarker for the diagnosis and evaluation of sepsis and infection. In 2004, Yaegashi et al. originally described presepsin as a potential biomarker; since then, several studies have investigated the role of presepsin in different infectious conditions, including neonatal sepsis, severe acute pancreatitis, infections in patients with haematological malignancies, severe community-acquired pneumonia, pacemaker and implantable cardioverter-defibrillator (ICD) pocket infections, surgical site infections (SSIs) and periprosthetic joint infections (PJIs). Moreover, presepsin has been also studied in the risk stratification in cardiac surgery patients, and as a biomarker in the perioperative management of patients undergoing total hip arthroplasty (THA) or total knee arthroplasty (TKA). This review aims to summarize the current knowledge about presepsin, focusing on the limits and potentials that the use of this biomarker could have in daily clinical practice. Presepsin is could be useful in daily clinical practice in orthopaedic surgery in the diagnosis and prevention of SSIs and PJIs. It is a cost-effective biomarker, but to improve its accuracy, it is important to carefully recalculate presepsin circulating values in patients with chronic kidney disease. However, further studies with larger patients' samples are needed to better validate the use of this biomarker in orthopaedics. In the future, synovial fluid presepsin might be a useful biomarker in the diagnosis of septic arthritis and PJIs.

Bridging the gap between serum biomarkers and biomechanical tests in musculoskeletal ageing

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Musculoskeletal ageing is a major public health interesting and strain due to the significant demographic modifications in the population, and it is linked to high risk of falls, loss of autonomy in elderly individuals and institutionalization with small health outcomes. Thus, this pathological status is related to high morbidity and health care rates. Bone mass and muscle mass and strength increase during late adolescence and early adulthood but start to reduce noticeably from the fifth decade of life and are closely linked. Preclinical and clinical data strongly support the muscle-bone cross-talk showing the presence of many tissue-specific factors released by the muscle that modulate bone, such as insulin-like growth factor-1 (IGF-1), IL-6, IL-15, myostatin and irisin. Bone and muscle tissues were increasingly recognized as endocrine target organs and endocrine organs themselves, interacting through paracrine and endocrine signals. It is then plausible that laboratory parameters could be involved in sarcopenia and osteoporosis diagnosis and treatment monitoring. This narrative review raises the possibility of whether this poor correlation between different muscle/lean mass assessment methods and muscle function tests could suggest that each parameter evaluates different aspects of “muscle status” or “muscle quality”. If this is true, no one test can be used to assess muscle status but rather a battery of tests is necessary for a comprehensive assessment. More research is required to provide information for researchers to optimally design studies by using the muscle assessment method that is best associated with selected specific outcomes.

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Innovations in prevention of infections in oncological megaprotheses: a narrative review

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Infection is a significant complication in oncological megaprotheses. The purpose of our study is to indagate the innovations and new trend about the prevention of infection in this kind of surgery. The research focused on the use of antimicrobial prophylaxis, the defensive antibacterial coating and the use of silver coated.

The effects of collagenase of *Clostridium Histolyticum* (CCH) in Dupuytren's disease: a histological study on cell mediated mechanisms that allow enzymatic fasciotomy

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Dupuytren Disease is a benign fibromatosis of palmar fascia of the hand, whose pathophysiology is not completely understood. The present study is intended to provide a description of the effects of Collagenase of *Clostridium Hystoliticum* (CCH) into an injected cord of Dupuytren. Our experimental study wanted to evaluate the histological effects of injection of CCH in the first 24 hours, without manipulating the specimens. Materials and Methods: Surgical specimens were injected with CCH, and then fixed in formalin every six hours, up to 24 hours. Those specimens were compared to control specimen (non-injected), fixed and analyzed at the same times. Results: In the injected specimens, the number of CD68 positive cells increased into and outside the cords compared to non injected specimens, within the same time from the surgical removal. Conclusion: CCH has a proinflammatory activity and provokes a short ray chemotactic action on white blood cells. The lysis of the cord induced by CCH stimulates the inflammatory response. The role of the inflammatory infiltration deserves to be investigated in a more accurate way, preferably by using in vivo studies.

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Bilateral total hip arthroplasty through minimally invasive direct anterior approach after Legg-Calvé-Perthes disease

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Bilateral secondary osteoarthritis of the hip may affect also young patients following bilateral hip diseases such as slipped capital femoral epiphysis and developmental hip dysplasia. We report the case of an 18-year old male with a previous diagnosis of Legg-Calvé-Perthes disease who underwent a bilateral total hip arthroplasty through minimally invasive direct anterior approach, with optimal results at 1-year follow up.

Evaluation of PD1 and PD-L1 expression in high-grade sarcomas of the limbs in the adults: possible implications of immunotherapy

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Sarcomas are a heterogeneous group of rare tumours. Improvements in immunotherapy and the important role of PD1 and PD-L1 expression in advancement and prognosis have opened new fields of research for the treatment of these neoplasia. We evaluated the immunohistochemistry of PD1 and PD-L1 expression in 60 adults' patients affected by high-grade sarcomas of the limbs. PD1 expression was 65% while PD-L1 was 68.3%. PD-L1 expression seems to correlate to Ki67 in liposarcomas, fibrosarcoma's and pleomorphic sarcomas, while it does not show any correlation to chondrosarcomas, while in rhabdomyosarcomas there is a correlation but, given the small sample size, it was not possible to perform a statistic analysis. Our study shows positivity among the different subgroups of positive PD1 lymphocytes infiltration and PD-L1 expression in high-grade sarcomas of the limbs.

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Correction of post traumatic tibial varus deviation with hexapodal external fixator

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Physeal fractures are typical in childhood and for their involvement of the germinal layer of the physis they can be followed by growth complications. Axial deviation is one of these. Considering the young age of the patients it is critical to restore articular correct alignment with the least invasive surgery possible. We report here the first case of correction of post traumatic tibial varus deviation with exapodal external fixator.

Histological assessment of new bone formation with biomimetic scaffold in the presence of bone loss in trauma surgery

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Open reduction and internal fixation (ORIF) surgery may require the use of bone grafts (usually allogeneic). In the context of traumatology surgeries, the use of autologous grafts is almost never used and allogeneic grafts are not always available. In recent years, bone substitutes have been introduced in clinical practice to overcome these limitations. The purpose of this paper is to report two cases in which the use of a bone substitute was used to overcome the bone loss during surgeries of ORIF. Two patients, one with a tibial plateau fracture (Schatzker 6) and one with a proximal humerus fracture (Neer 4), underwent ORIF surgery. In both cases, due to a loss of bone stock, a synthetic bone substitute (OrthOss®) was used. One year after surgery, the complete osseointegration of the synthetic bone substitute was seen, both radiologically and histologically. This bone substitute may represent a safe and effective alternative to autologous bone grafts, avoiding adverse events related to donor-site morbidity.

Do radiolucent lines and stress shielding of the humeral shaft really matter in shoulder arthroplasty?

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The purpose of this study is to evaluate at a mid-term follow up, the radiological survival of an uncemented humeral stem in shoulder arthroplasty. One hundred and twenty-six replacements including hemi (HA), total (TSA) and reverse (RSA) implanted from 1999 to 2008 were reviewed at a mean follow up of 7.2 years (48-144 months). The same uncemented triconical stem (SMR, Lima Corporate) was implanted. There were: 23 HSA, 43 TSA, 60 RSA. An independent observer evaluated all the patients with Constant Score. A radiologic analysis by an expert radiologist and an orthopaedic surgeon was performed: humeral component-bone interface was divided in seven zones. They judged a mobilisation if a migration or tilt of the humeral implant or if ≥ 2 mm radiolucent line in at least three zones was present. Chi-squared test, Fisher test and analysis of variance were performed and a $p < 0.05$ was considered statistically significant. No major radiological signs of loosening and no tilt or migration of the humeral component were found. Only 23 (18.2%) patients had no RL around the humeral implant. In the remaining 103 (81.7%) implants: 96 (76.1%) presented RL less than 2 mm, particularly 75 (59.5%) in less than 3 zones and 21 (16.6%) in more than 3 zones. Of the remaining 7 (5.5%) implants the presence of RL of 2 mm or greater in only one zone was seen. Apart from sepsis no revision was performed for humeral component loosening. Although a high rate of RL, uncemented humeral stem has an excellent survivorship at a mid-term follow up. Relationship between presence, position and depth of RL and internal stress shielding is commonly observed but does not appear to compromise quality of fixation or clinical outcomes in shoulder arthroplasty.

Osseointegration for lower and upper-limb amputation a systematic review of clinical outcomes and complications

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The conventional use of prosthetic custom-design socket is affected by discomfort related to well-known problems: sweating, sores or skin irritation, excessive weight and harness, impaired body image, that lead to a high rate of abandonment. Osseointegrated prosthetic implants for limb amputation are progressively evolving to overcome limitations of socket. The aim of this article is to present a systematic review of the use, safety in terms of rate of infection and complications, and reported outcomes of upper and lower limb osseointegrated prosthetic implants. A systematic search was carried out for studies that evaluated outcomes of osseointegration technique in case of upper and lower limb amputees according to the PRISMA guidelines with a PRISMA checklist and algorithm. MINORS score was used for methodologic assessment. 17 articles about the treatment of patients with upper or lower limb amputation treated with an osseointegrated prosthesis were included. The overall rate of infections was 32%. All the clinical outcomes reported were related to lower limb. No clinical data for upper limb was found. The postoperative mean value of MCS and PCS SF-36 and Q-TFA was 55.1, 45.4 and 73.8 respectively, while six minute walk test (6MWT) and the timed up and go (TUG) test scored an average value of 388 meters and 11.5 seconds respectively. MINORS score ranged from 5 to 13, with a median of 11 [interquartile range (IQR), 9-11]. The osseointegration is associated to a high rate of postoperative complications but, significant improvement in clinical outcomes compared to preoperative time are shown. The data available from the literature are limited but suggest good clinical outcomes and significant survivorship of the implants. Further clinical studies are needed to establish which kind of implant is associated to higher clinical performance and lower rate of postoperative complications and infections.

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DISCLOSURE: ALL AUTHORS REPORT NO CONFLICTS OF INTEREST RELEVANT TO THIS ARTICLE.

Frailty of the elderly in orthopaedic surgery and body composition changes: the musculoskeletal crosstalk through irisin.

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In recent years, scientific interest has been developed towards irisin, a novel molecule of the family of myokines, which is directly involved in body mass composition balance, chronic diseases susceptibility and physiologic resilience to stressful events, including surgery. In the context of musculoskeletal disease, the role of this molecule has been associated to the balance of lean and fatty mass, and the production of irisin is subordinated to a healthy lifestyle and exercise. The mechanism of action of irisin on tissues is complex, and several studies described the molecular pathways in animal model and human subjects. In particular, in adipose cells, the key-role of irisin is to stimulate the differentiation of white adipose tissue to brown adipose tissue, through the action on the uncoupling protein 1. Furthermore, in the bony tissue, irisin stimulates osteogenesis through expression of Sost and Opn genes. These features make irisin a suitable molecule to use as a biomarker of the overall musculoskeletal health of the elderly, before undergoing orthopaedic surgery. Further research on this topic should be carried out to highlight the possible clinical role and predictive value of irisin in a multidisciplinary approach to the elderly before musculoskeletal surgery.

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Weil osteotomy for the treatment of grade III hallux rigidus: a case series

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Hallux rigidus (HR) is one of the most common pathologies of the forefoot. The conservative treatment is indicated for early stages, while surgical treatment is required for advanced osteoarthritis and rigidity. Surgical treatment of advanced stages of HR is still controversial and includes joint-destructive procedures such as arthrodesis and arthroplasty, Weil osteotomy for decompression of the joint space may be a safe and effective procedure for the treatment of grade III HR. Twenty-four patients that underwent Weil osteotomy for Grade III HR were retrospectively reviewed. American Orthopedic Foot and Ankle Score (AOFAS), ROM and a subjective 5-point satisfaction scale were evaluated preoperatively, at 1 year, and at a minimum follow-up of 2 years. Joint space width and metatarsal length were assessed through radiographic examination preoperatively, immediately postoperatively and at 2 years follow up. AOFAS score was 45.1 ± 3.9 preoperatively, 84.9 ± 6.4 at 1 year and 73.7 ± 6.2 at two years of follow up. All patients were satisfied with the procedure at 2 years follow up. Mean ROM increased from 35.1° (range, 10° – 50°) preoperatively to 80.3° (range, 60° – 90°) at 1 year. Mean dorsiflexion increased from 5° (range 0° to 10°) preoperatively to 15° (range 7° to 23°) at 1 year. Both total ROM and dorsiflexion values remained constant at 2 years. The joint space was 0.5 ± 0.9 mm preoperatively, 2.0 ± 1.9 mm at 1 year and 1.5 ± 1.2 mm at 2 years. The average metatarsal shortening was 2 ± 1.4 mm. Weil osteotomy alone can be beneficial for the treatment of patients affected by advanced HR. It can improve clinical and radiological outcomes at 2 years follow up in a series of patients affected by grade III HR. Therefore, the sliding oblique osteotomy represent a valid alternative to delay more aggressive procedures.

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Gait analysis in the postoperative assessment of intertrochanteric femur fractures

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Proximal femur fractures (PFFs) are an increasing public health concern. Improving gait and mobility after surgical fixation of intertrochanteric femur fractures (IFFs) is the most important target of research efforts. The purpose of this study is to investigate the role of gait analysis in the functional assessment of over-65 patients with stable and unstable IFFs, at a minimum 6-month follow-up. Fourteen patient's over-65 with IFFs (AO/OTA 31-A) treated with intramedullary nailing (EBA-2, Citieffe Srl, Italy) were enrolled. The patients were divided into two groups according to the fracture stable or unstable pattern, according to AO/OTA classification. At follow-up appointments, clinical outcomes [Harris Hip Score (HHS)], Western Ontario and McMaster University (WOMAC) and gait parameters were assessed. Radiographs were analyzed at the time of surgery and at each follow-up visit. At 3-month follow-up, both groups showed a significantly different gait patterns, compared with control subjects. At 6-month follow-up, a significant improvement of both mean HHS score ($p=0.43$) and mean WOMAC score was observed ($p=0.43$) within groups. Nonetheless, patients with stable fractures showed a comparable gait pattern, compared with control subjects, while patients with unstable fractures still presented a worse gait pattern, compared with control subjects. Therefore, in presence of an unstable IFF, a more aggressive rehabilitative program is needed. The data provided by postoperative gait analysis, therefore, could be useful to customize the patients' rehabilitative protocol, to quickly improve their walking ability and autonomy, thus reducing the post-operative re-fall risks.

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Carbon Ion Radiotherapy for sacral chordoma: a systematic review of the literature

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The aim of the present study is to describe the clinical outcomes and the incidence of complications related to Carbon Ion Radiotherapy (CIRT) in the treatment of sacral chordoma. Through a systematic review of published investigations on CIRT, we collected the local control rates (LC), the overall survival rates (OS) and the post-CIRT adverse effects. Afterwards, we calculated their weighted average, to have a broader perspective. PubMed/Medline and Google Scholar databases were searched to identify studies on Carbon Ion Radiotherapy as a treatment for sacral chordoma. We used Medical Subject Heading (MeSh) terms and keywords. We based our systematic review on the PRISMA guidelines. No data limitations were applied in the search on Pubmed/Medline database; data limitation (from 2000 to 2019) was applied in the search on Google Scholar. Six studies were included in our review. Local control proportions reported in individual studies ranged between 77% and 96% (95% confidence interval), with respect to a 5-years follow-up. Overall survival rates ranged from 52% to 86% (95% confidence interval), with respect to a 5-years follow-up. Adverse CIRT-related events involving bone occurred in 7% of patients. Neurological and skin toxicities affected 20% and 5% of patients, respectively. Nowadays the gold standard of treatment for sacral chordoma is the surgical resection with wide margins. Whenever adequate oncological margins could not be achieved or could be achieved only by sacrificing neurological structures with consequent functional impairment, CIRT is an effective alternative which has been demonstrated to reach optimal local control and overall survival rate. The caregiver, anyway, should be aware of the potential adverse events and complications related to this kind of treatment.

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Hamstring grafts are tenogenic constructs for ACL reconstruction and Pulsed Electromagnetic Fields improve tendon specific markers expression. An *in-vitro* study

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Hamstring tendons represent one of the commonest autologous graft used during ACL reconstruction. The harvest of the tendon and the time of tendon processing on the operating table, together with the pretensioning maneuvers and the permanence out of the joint during the time of surgery, might impair tendon derived cells (TCs) viability. The aim of the study was: i) to assess the effective viability of the TCs at the end of the surgical procedure; ii) to investigate if TCs viability and the expression of tendon specific markers may be improved through exposure to prolonged pulsed electromagnetic fields (PEMF) similar to that of clinical practice. Remnants of semitendinosus and gracilis tendons (discarded at the end of the ACL reconstruction) were collected from 13 healthy donors. To isolate TCs, the tendon tissue was minced and digested enzymatically with 0.3% type I collagenase in DMEM with continuous agitation for 15 h at 37°C. The isolated nucleated cells were then plated at 5×10^3 cells/cm² in a complete medium composed of DMEM, 10% fetal bovine serum, 50 U/ml Penicillin, 50 mg/ml Streptomycin, 2 mM L-glutamine, and supplemented with 5 ng/ml basic fibroblast growth factor (b-FGF). They were maintained at 37 °C in a humidified atmosphere with 5% CO₂, changing culture medium every 3 days. When they reached 80–90% of confluence, the cells were detached by incubation with trypsin/EDTA and then cultured at a density of 5×10^3 cells/cm². TCs were cultured in complete medium for 7, 14, 21 days (in chamber slides, to optimize the final immunofluorescence analysis). The following cell cultures were set up: i) TCs cultured with differentiation medium + exposure to PEMF 8 h/day; ii) TCs cultured with differentiation medium without exposure to PEMF. The stimulation with PEMF was generated by a pair of electrical coils, connected with the generator of pulsed electromagnetic fields (PEMF generator system IGEA, Carpi, Italy, intensity of magnetic field = 1.5 mT, frequency = 75 Hz). At day 0, day 7, day 14 and day 21 immunofluorescence analysis was performed to evaluate the expression of tendon specific markers (collagen type I, collagen type VI, scleraxis) and proliferative markers (PCNA, beta-catenin). The TCs from the hamstring tendon fragments at the end of the ACL reconstruction were alive and they expressed markers of proliferation and tendon phenotype at the end of the culture period. The TCs in the presence of PEMF 8h/day showed a greater production of collagen type I, collagen type VI and scleraxis than TCs cultured without PEMF ($p < 0.05$). The expression of these markers increased from 7 to 21 days of culture. The expression of proliferative markers in the presence of PEMF stimulus was significantly lower ($p < 0.05$) than that of TCs cultured without PEMF. Hamstring tendons are not simple “tenoconductive” scaffolds but biologic alive tenogenic constructs rich in cells that can sustain tenogenic behavior and tendon matrix synthesis. Prolonged exposure to PEMF improves their phenotype. Thus, from a clinical perspective, the use of PEMF may represent a possible future strategy to positively influence the early phase of graft remodeling and, ultimately, improve the ligamentization process. Following these concepts, further studies might also exploit the anabolic role of PEMF as an adjunctive postoperative strategy in different tendon pathologies.

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When math meets surgery: how to improve femoral interference screw alignment in ACL reconstruction. A cadaveric study

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Transtibial femoral tunnel drilling is still an alternative technique in ACL reconstruction. Femoral interference screw divergence is a potential pitfall associated with transtibial tunnel technique, as angles greater than 15° jeopardize graft fixation. Our mathematical model theorizes the proper degrees of knee flexion during femoral screw insertion and the correct screwdriver position to obtain a minimal divergence of the screw in the femoral tunnel. The cadaveric study confirms our method. Mathematical model: using rototranslation matrices, a correlation is demonstrated between the ACL-tibial-guide angle, the knee flexion, and the screwdriver position. A theoretical minimal divergence between femoral interference screw and the femoral tunnel is obtainable following these assumptions: 1) knee hyperflexion during femoral screw insertion is obtained adding a flexion corresponding to the ACL-tibial-guide angle to the flexion while drilling the femoral tunnel; 2) screwdriver position (through the AM portal) is kept parallel to tibial plateau at a rotation of 15° medial to tibial sagittal plane. Cadaveric study: 24 cadaver knees were used. The transtibial tunnel was drilled with an 8 mm drill bit with the help of an ACL tibial guide set at 55°. To simulate femoral tunnel direction, a 2.4 mm K. wire was drilled through the femur with a transtibial 7 mm offset femoral drill guide. To simulate the femoral screw direction, a second 2.4 mm K. wire was drilled from the femoral entry point of the first wire through the femur, with a cannulated screwdriver. Screwdriver direction and knee flexion during the simulation were obtained following two different methods: GROUP A (mathematical model group, 12 knees), screwdriver direction and knee flexion were calculated following the mathematical model; in GROUP B (control group, 12 knees), knee hyperflexion and screwdriver medialization were manually obtained by a senior surgeon. The divergence between the femoral interference screw and the femoral tunnel was identified as the angle formed by the two wires, measured on the plane formed by the direction of the wires. Mean divergence angles between the K. wires were significantly different ($p < 0.05$) between the groups: GROUP 1 (mathematical rule): 7.25° (SD 2.2); GROUP 2 (free-hand technique): 17.3° (SD 2.9). Our study shows that a minimal divergence between the femoral tunnel and the screwdriver can be achieved simply by following a mathematical rule for correct intraoperative knee flexion and screwdriver position without the need for any specialized instrumentation. Namely, during femoral interference screw insertion through the anteromedial portal: 1) the correct knee flexion is the sum between the knee flexion angle while drilling the transtibial femoral tunnel AND the ACL tibial guide angle used during tibial tunnel drilling; 2) Correct screwdriver position is parallel to the tibial plateau, engaging the femoral tunnel with a position of 15° medial to tibial sagittal plane. This simple concept has clinical relevance in helping the surgeons in obtaining an optimal alignment between the femoral tunnel and the femoral interference screw during transtibial ACL reconstruction. Furthermore, following the assumptions of this study, a starting knee flexion angle around 70° during femoral tunnel drilling seems preferable for ACL reconstruction when the transtibial tunnel technique is used. Indeed, because ACL-tibial-guide angles range commonly from 50° to 60° and *in vivo*, the maximal intraoperative knee flexion attainable is 130°, a starting knee flexion around 70° is optimal to allow for adding flexion angles up to 60° before reaching the physiological limit value of 130°.

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Comparing different approaches in robotic-assisted surgery for unicompartmental knee arthroplasty: outcomes at a short-term follow-up of MAKO versus NAVIO system

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The popularity of unicompartmental knee arthroplasty (UKA) continues to grow among orthopaedic surgeons and robotic surgery may be helpful in obtaining a precise placement of the prosthetic components, thanks to the meticulous intra-operative computer study for simulating the prosthetic positioning. This may lead to longer implant survivorship as well as a reduction in intermediate and long-term prosthetic complications, despite the initial greater costs than those of manual UKA. In this preliminary study, from January 2017 and October 2017, 18 patients underwent UKA with MAKO robotic system assistance and 10 patients received UKA with NAVIO robotic system assistance. The two groups were homogeneous by age, BMI, degree of osteoarthritis involvement, and postoperative program. Patients were followed both clinically (Numeric Rating Scale NRS and Knee Injury Osteoarthritis Outcome Scores KOOS) and radiographically. At the end term follow up (2 years), no significant difference was observed for NRS and KOOS as well as for clinical parameters as an active range of motion. A significant discrepancy was detected regarding the duration of the surgery and time of using the robotic system, that appeared to be longer in the NAVIO group than that of MAKO group, likely due to the specific technical aspects that characterize these two different robotic systems. The main finding of this study is that favorable clinical and radiographical results may be obtained using a robotic approach (MAKO or NAVIO) for UKA positioning at a short follow up. Due to the lack of significant clinical differences observed between the two groups of patients at end term follow up, the “concept” of a robotic approach, more than a specific patented system, may be considered the key element for improving UKA technique and it is likely that in the near future the choice of a single specific robotic system will still be a “surgeon’s preference”. The results of the study add scientific evidence regarding the effective improvement of UKA results using different robotic approaches. They also show possible economic sustainability of this therapeutic strategy related to the optimal patients’ performance obtained at short term follow up, suggesting that the robotic assistance may really become a key element for better long-term survivorship of unicompartmental knee arthroplasty

Periprosthetic osteolysis: a narrative review

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Periprosthetic osteolysis is still one of the major limitations of prosthetic joints longevity. The process of this “silent” iatrogenic disease involves both mechanical and biological factors that initiate a local immune response in the periprosthetic tissue that eventually lead to implant loosening and failure. There are many causes of the primary aseptic loosening inside the periprosthetic microenvironment, but the most important elements are the wear debris and the cell-particle interactions. Together with implant position, micromotion, bearings, joint fluid pressure, and increased load on the joints drive the pathogenesis of the disease. This narrative review aims to summarise recent studies describing the biological and mechanical factors in the pathogenesis of osteolysis and some of the current pharmacological attempts to “rescue” a failing implant.

Rehabilitation protocol after simultaneous anterior cruciate ligament reconstruction and high tibial osteotomy: introducing the concept of the individualized approach

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Postoperative rehabilitation after simultaneous anterior cruciate ligament reconstruction and opening wedge high tibial osteotomy is a complex concept. Different osteotomy techniques, extremely selected patients, high expectations in returning to previous sport activities, and the different individual physical profile and performances make traditional chronological criteria impractical and unfeasible. This study presents a novel rehabilitation in which functional objective criteria are considered the key factors for standardizing a 4-step protocol. Each step is “individualized”, based on the patient’s response to the healing processes and to the different training phases, allowing for a safe return to sports competitions. This definitively implies a strict collaboration between patient, surgeon, physician and physiotherapists, as well as thorough and detailed patient education. Due to the high versatility of these new rehabilitation concepts, the application of the “individualized” steps described in this study may be broadened to include different sports medicine knee injuries that may benefit from a specific, detailed and carefully patient-centered rehabilitation project.

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Effectiveness of bone marrow aspirate concentrate (BMAC) as adjuvant therapy in the surgical treatment of congenital pseudoarthrosis of the tibia: a retrospective comparative study

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Congenital pseudoarthrosis of the tibia (CPT) is a rare disease characterised by the onset of bone anomalies or fractures, leading to deformities in paediatric patients. The aetiology of this pathology is unknown. The main theories include the presence of hamartomatous tissue related to Neurofibromatosis type 1, vascularisation deficit of the periosteum and alterations in the numbers and functions of the osteoblasts and osteoclasts *in loco*. Surgical treatment generally requires multiple operations during the patient's childhood and adolescence. The best outcomes seem to occur when using intramedullary nailing, vascularised fibular transplant and external fixation with the Ilizarov technique. The purpose of this paper is to evaluate the effectiveness of in-situ injections of Bone Marrow Aspirate Concentrate (BMAC) as an adjuvant therapy for congenital pseudoarthrosis of the tibia in patients treated with external fixation and that of radiographic healing over time compared to external fixation treatment alone. We performed a retrospective review of clinical and radiographic records of patients affected by CPT and treated in the Paediatric Orthopaedics and Traumatology Department of the Gaetano Pini Orthopaedic Institute with in-situ injections of bone marrow aspirate concentrate (BMAC) on the pseudoarthrosis site, in addition to pseudoarthrosis site excision and application of circular external fixator frame in compression (Group A). The time needed to reach the radiological consolidation of the resection site was recorded and compared to that needed for patients treated with only pseudoarthrosis site excision and application of circular external fixator frame in compression (Group B). There is a statistically relevant improvement of healing time in patients affected by congenital pseudoarthrosis of the tibia treated with external fixation and bone marrow aspirate concentrate compared to patients affected by the same pathology treated with external fixation only. Injection of MSC in the pseudoarthrosis site after focus removal in combination with circular external fixation achieves faster bone healing compared with external fixation only, and the lower refracture percentage may be associated with the better quality and structure of the new bone. However, it would be desirable to have a longer follow-up to determine if the results of the BMC as adjuvant therapy will hold up over time.

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Tips and tricks for writing a scientific manuscript

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An original scientific manuscript is the target for any researchers whose aim is to show the innovative results arising from the original intuitions that drove all their experiments. Time and patience are essential to decide how to present the data, how to conceive the tables and figures representing the main outcomes of the research, and how to read and mention the necessary references. Few basic rules may help in this difficult task. The first basic rule is: “do not follow the sequence of the paper”. On the opposite, i) start writing the “Materials and Methods (or Patients and Methods when dealing with a clinical study)”, ii) then write the “Results” section, iii) then, write the “Discussion” paragraph, in which the principal investigator explains the results and the innovations proposed, iv) then, write the “Introduction”, which should be clear and concise. The last element to be written should be the “Abstract”, which is the “interface” between the authors and the readers. The second basic rule is that any of the central chapters of the manuscript, i.e. “Materials and Methods” (MM), “Results” (R) and “Discussion” (D), should follow a methodical and sequential description of the topics in a “corresponding sequence of paragraphs”. In other words, in the R and the D chapter sequence of the paragraphs should be linked to the sequence of the concepts described and discussed in the paragraphs of the MM chapter. Thus, a sequential description of concepts will be easily followed by the writers, facilitating both the authors in the organization of the data and the reader in finding a reasonable “answer” to all the aspects of the study mentioned in the MM chapter. In this article, these two rules are extensively described and several tips and tricks for each chapter are suggested to ease the composition of a scientific paper. Indeed, it may be possible to solve the complex problem of “writing a scientific paper” by means of separating it in main sections (chapters) and subsections (paragraphs) and dealing with them one by one. Naturally, this takes time and passion, but, as affirmed by Steve Jobs, “the only way to do great work is to love what you do”.

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