FM34 Intraoperative fluoroscopy for ORIF of distal radius fractures

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Introduction: intraoperative fluoroscopy is the only readily available tool to assess quality of reduction and implant placement in operative fracture treatment. Although of key importance in the everyday practice of the orthopaedic surgeon, there are no commonly accepted guidelines in the use of intraoperative fluoroscopy in terms of application, incidences, anatomic landmarks, assessment of reduction and implant placement.

Method: we have compiled and analysed the recent literature and our own experience on radiologic assessment of distal radius fractures during operative treatment. We selected appropriated techniques for intraoperative use with fluoroscopy in order to assess 1) extraarticular reduction, 2) reduction of the radiocarpal joint, 3) the DRUJ, 4) dorsal screw penetration 5) articular screw penetration, and 6) correct implant placement. In anatomic specimens we marked the anatomic landmarks with lead in order to identify them under fluoroscopy. We then reproduced the described radiologic techniques to assess their feasibility in an intraoperative setting using fluoroscopy. Standard projections were also investigated in order to give guidelines for their correct use.

Results: we identified several additional radiologic views of the wrist joint that can be used intraoperatively using fluoroscopy. An algorithm was then developed with the correct use of standard projections and additional projections to intraoperatively assess reduction and implant placement in the operative treatment of distal radius fractures.

Conclusion: Intraoperative fluoroscopy of the wrist can be standardised during operative treatment of distal radius fractures in order to correctly assess reduction and implant placement and minimise surgical errors.
**FM35  Does implantation of a denatured cellulose adhesion barrier improve finger function after P1 fracture ORIF**

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**Introduction:** Postoperative extensor tendon adhesions after osteosynthesis of finger P1 fractures often lead to results with dissatisfactory functionality. The idea of an adhesion barrier has often been mentioned. Due to unconvincing results, however, they have not reached a level of acceptance among hand surgeons. This means that the problem of postoperative adhesions remains unresolved. It is the aim of our prospective randomised trial to evaluate the value of a product consisting of denaturised cellulose.

**Methods:** 38 of 42 projected patients have been included between February 2010 and February 2013, of whom 32 were conclusively evaluated. The trial included all isolated and closed P1 fractures which had an indication of plate osteosynthesis. The trial excluded patients with multiple injuries and those with pre-existing functional deficits. Pre-operative randomisation into two groups (with or without application of the adhesion barrier). Measurement after 6 weeks and 6 months after surgery of range of motion as an expression of functionality of the affected finger in comparison with the unaffected opposite side and measurement of DASH score. Recording of need for intraoperative tenolysis as part of the metal removal six months after osteosynthesis.

**Results:** After six weeks, the group which had been treated with an adhesion barrier showed a significantly better ROM and DASH score. After six months, both groups showed practically identical measurements. One patient refused further checks, two patients had to be excluded due to infection or excessive screw length.

**Conclusion:** The results after six weeks are interesting, as they indicate clearly better results for the group with adhesion barrier. It remains to be discussed why the results of both groups were practically identical after six months. The risk of infection where cellulose matrix is used will have to be critically monitored. One infection has to date been detected in a patient with adhesion barrier. After analysis of the so far acquired data the use of such a device has at least to be questioned. Final results of the entire patient group will have to be obtained before conclusive recommendations to the standardised use of adhesion barriers can be made.
FM36 Treatment of highly comminuted distal radius fractures with temporary distraction plate: case reviews

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**Introduction:** Support of highly comminuted distal radius fractures in elderly patients with poor bone quality or in young polytrauma patients need a surgical technique in order to rebuild an anatomical alignment. The aim of the study was to show post-operative results in 10 patients with temporary bridge plate and complementary osteosynthesis.

**Methods:** A retrospective review was performed in 10 patients with comminuted distal radius type C3 by the AO classification that had temporary distraction plate in our service since 2011. All patients had pre and post-operative x-ray and a pre-operative CT-scan. We obtained a data base with radiological (radial length, pre and post-operative ulnar variance, radial inclination, time of consolidation), surgical (additive procedures on the radius or ulna apart from the distraction plate), and clinical information (age, professional activity, post-operative clinical examination).

**Results:** We treated 10 patients with mean age of 58 y (from 17y to 92 y). Half of patients were retired, we had one engineer, one nurse, one student and one unemployed. Apart from the fracture 2 patients had an acute carpal tunnel syndrome. Concerning ligament injuries we had one TFCC lesion, one DRUJ instability associated with ulnar styloide fracture, and 2 radio-triquetral lesions. All patients had one single dorsal incision from distal radius to the third metacarpal. We used locking compression plate 3.5 mm for the majority of the patients expect for 2 patients that had Buchler plate 2.4-3.5 mm. 3 screws were placed in the distal radius and 3 in the third metacarpal. All patients had a supplemental fixation to complete the radio-carpal reduction with: pins in the styloid in 8 patients, anterior VA plate in 2 patients, screws in 4 patients. 5 patients had bone graft on the radius. Only 2 patients needed an additive fixation of the ulna: one Darrach and one DRUJ stabilization with TFCC reinsertion. Moreover, 3 patients had carpal tunnel surgery. Concerning radiological results the mean pre-operative ulnar variance was + 1.4 mm, post-operative ulnar variance was + 0.69 mm, radial inclination was 18° and radial length was 9.7 mm. All patients had CT-scan before removal of osteosynthesis material in order to see distal radius articular surface and congruous position. 3 months after surgery 6 patients had removal of their material, one patient after 2 months. Mean post-operative range of motion was F/E: 38/0/68 and P/S: 43/0/58.

**Conclusion:** Temporary bridge plate is indicated in highly comminuted distal radius fractures in elderly patients with poor bone quality and young polytrauma patient. Indeed, the plate is acting like an external fixator but is internal closed to the bone maintaining radial length. Like this, during radius healing patients, without protection, can perform activities of daily life thanks to intrinsic stability. This is an advantage compared to the external fixator. This kind of fractures can be associated with ligament injuries. Visualization and repair of these injuries are permitted through one single dorsal incision. During closure, the extensor retinaculum is used to protect the tendons from the distraction plate. In our study we noticed we always had to add a surgical gesture on the
radius with pin, screw or additive plate. However, all the materials were removed in the same time as the distraction plate. One disadvantage of this technique is that the plate needs to be removed during a second operation. We know that a second surgery in the population of older patient might be a risk factor that should be kept in mind and explained to the patient before the surgery.
FM37 Ligament origins are preserved in distal radial intraarticular two part fractures: A computed tomography based study

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Background: Operative fixation of displaced intraarticular distal radius fractures is increasingly common. A greater understanding of fracture patterns will aid surgical fixation strategy. Previous studies have suggested ligamentous insertions may less commonly be involved, but these have included heterogenous groups of fractures and have not addressed listers tubercle.

Hypothesis: Fracture lines of distal radial intraarticular two-part fractures (DRIF’s) have reproducible fracture patterns. They propagate through the cortical bone between ligament origins and do not involve Lister’s tubercle.

Methods: Axial CT scans of 2 part intraarticular distal radius fractures were assessed. The fractures were mapped onto a grid and the cortical breaches measured and expressed as a percentile of the total radial width or length. The cortical breaches were compared to the known ligamentous insertions on the distal radius of the long and short radiolunate, the radioscaphocapitate, dorsal radio carpal ligaments and listers tubercle. Associated injuries were also documented.

Results: The cortical breaches occurred between the ligamentous insertions in 85%. Lister’s tubercle was not involved in 95% of fractures. Three major fracture patterns emerged; radial styloid, dorsal and volar. Each major fracture had 2 subtypes. Associated injuries were common. Scapholunate dissociation was associated with all types, not just the radial styloid fracture pattern.

Conclusion: The fracture pattern of 2 part intraarticular fractures mostly involved the interligamentous zones. Three major groups were identified. Radial styloid Dorso-ulnar, and volar. Lister’s tubercle was preserved with fractures tending to pass radial or ulnar to this structure.
Infection and functional outcome of hip and knee Prosthetic Joint Infection - A retrospective multicenter study

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Introduction: Prosthetic joint infections (PJI) lead to significant long-term morbidity with high costs of healthcare.

Objectives: We evaluated outcome of hip and knee PJI in two centers over a 14-year period.

Methods: Hospital charts of patients aged >18 years presenting with a hip or knee PJI from 1995 to 2008 were reviewed, stratified according to whether a treatment algorithm (Zimmerli W. NEJM 2004) was followed. Good outcome was defined as functional prosthesis in place and significant reduction of pain allowing return to normal daily activities.

Results: We included 272 episodes, 193 hip and 79 knee PJI (median age 72 years, range 19-102 years, 53% males) with a median follow-up of 3.4 years (range 0.1-4.2 years). PJI were treated with (i) debridement & retention without change of mobile parts in 30 cases (11%), (ii) debridement & retention with change of mobile parts in 99 cases (36%), (iii) 1-stage exchange in 21 cases (7%), (iv) 2-stage exchange in 100 cases (37%), and (v) definitive prosthesis removal in 18 cases (6%). 170 patients (63%) were treated according to the algorithm. The infection outcome was overall favorable in 82% and differs according to surgical treatment: 40% for debridement without change of mobile parts, 81% for debridement with change of mobile parts, 76% for 1-stage exchange, and 92% for 2-stage exchange. Microbiological cure was reached in all patients, but in 34 cases by definitive prosthesis removal. Final functional outcome was significantly better when treated according to the algorithm (76% vs 24%, p<0.0001). The best functional outcome was achieved with debridement & retention with change of mobile parts (93%), compared to 70% for debridement & retention without change of mobile parts, 80% for 1-stage exchange, and 70% for 2-stage exchange.

Conclusion: Debridement & retention without change of mobile parts is often associated with failure. Debridement & retention with change of mobile parts have excellent results. Eradication of infection was associated with a good functional outcome in 76% if the algorithm was followed, compared to 24% when it was not.
Does spacer usage in prosthetic joint infections influence infect resolution?

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Background: Since two-stage exchange is the most common strategy treating prosthetic joint infections the use of spacers during the interval before reimplantation remains discussed controversially. We investigated the influence of antibiotically loaded cement spacers on prosthetic joint infect resolution in total knee and hip replacement.

Methods: 120 consecutive patients with confirmed infection of total hip arthroplasties [THA] or total knee arthroplasties [TKA] were treated with a two-stage exchange concept. Patients were retrospectively allocated in two groups: patients with and patients without spacer implantation. Our hypotheses were primarily, that spacer implantation improves the overall success rate regarding infect resolution and secondary, that spacer implantation reduces the success rate in patients with bacteria graded as “difficult to treat”.

Results: Patients with and without spacer implantation did not vary significantly in age, sex, weight, height, and body mass index (BMI). A backward-stepwise multivariate logistic regression model neither showed an association between spacer use and definitive infect resolution with an adjusted odds ratio of 1.2 (95%CI 0.4 to 3.2) at a p-value of 0.756 nor between spacer use and clinical infect resolution with and adjusted odds ratio of 4.0 (95%CI 1.0 to 17.0) at a p-value of 0.056. Again spacer use and “laboratory infect resolution” with an adjusted OR of 4.3 (95%CI 0.7 to 27.9) at a p-value of 0.127 did not show a significant correlation. Additionally we were not able to show any adjusted significant association between infectious organisms graded as “difficult to treat” and spacer use effectiveness.

Conclusion: Our data does not support the use of spacers regarding infect resolution in prosthetic joint infections treated in a two-stage exchange. Infectious organisms “difficult to treat” did not show a significant association with infect resolution and spacer use either.
FM40  Increased risk of infection in MIS total hip arthroplasty with an anterior approach?

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Introduction: MIS hip replacement has an increasing popularity but there is a lack of data concerning probable complications. The minimally invasive direct anterior approach (Smith Peterson, MIS) was introduced as routine procedure at our hospital. Patients were followed in a prospective cohort study and we observed problems in wound healing. The purpose of this work is 1) to evaluate the prevalence of infection and 2) to identify patient-related risk-factors for infection.

Methods: 601 consecutive hips in 551 patients (286 males, mean age 70 years) undergoing MIS primary hip replacement since 03/2009 have been included, no patient was lost to follow-up. Standardized clinical and radiological data were collected. Infection was diagnosed in case of presence of symptoms, delayed wound exudation, a fistula, at least two positive microbiological samples or positive histology.

Results: There were 12 cases of infection (2.0 %). Coagulase-negative staphylococci were the most frequent pathogens (9/12, 75%). In 58% of cases, polymicrobial infections were present. Among them, pathogens that can be attributed to fecal flora (enterococci, enterobacteriaceae, anaerobes) were found in 42%. Ten infections occurred within ninety days after operation, the median time to the diagnosis of infection was 13 days (range, 10 to 416 days). All infected hips were re-operated. In nine cases, an early debridement was performed and three cases got an exchange of the implants (2 two-stage revisions and 1 one-stage revision).

A higher BMI (mean BMI 33.6 vs 26.9, p<0.001) and a higher ASA Score (p<0.001) were found for the infected Group. Gender, age, diagnosis, elective/nonelective or transfusion/no transfusion showed no differences.

Conclusions: The infection rate for the studied MIS cohort was rather high (2.0%) compared to published data in conventional hip replacement (0.5 to 1.0 %). The high proportion of polymicrobial infection and fecal pathogens points to a critical role of the skin flora in the groin and near the incision site. A more lateral incision leading away from the groin might be preferable, especially in obese patients. But further data are necessary to ensure that infection is not the major disadvantage of the MIS anterior hip replacement.
Performance and cost evaluation of Gram and Acridine staining for prediction of septic arthritis stratified among different patient populations

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Background: Gram staining has a low sensibility in the diagnosis of native joint septic arthritis. Little is known about the accuracy of other staining techniques or among patients with arthroplasty infections, ongoing antibiotic medication, immune suppression, gout or other crystal arthropathies.

Methods: Cohort study with cost evaluations at the Orthopedic Service of Geneva University Hospitals January 1996-October 2012.

Results: Among 500 arthritis episodes (196 with immune suppression; 227 with underlying arthroplasties; 69 with gout or other crystals in microscopic synovial count), Gram staining revealed pathogens in 146 episodes (146/500, 29%) or in 146 of 400 culture-positive episodes (37%), while acridine staining yielded pathogens in 100 of 400 culture-positive episodes (25%). Correlation between the Gram and acridine staining of the same examination was good (Spearman 0.85). Overall, the sensitivity, specificity, positive and negative predictive values for the predilection of culture-positive arthritis was 0.37, 0.99, 0.99, and 0.28, respectively. Sensibility values were similar for substrata of the study population. It was 0.33 for arthroplasty infections, 0.40 in immune suppressed patients, 0.36 in patients under antibiotic administration and 0.52 with concomitant synovial crystals. For culture-negative cases, the Gram and the acridine staining caused 45% of all laboratory costs, for culture-positive cases both stainings made 25% of the expenditures.

Conclusion: The sensitivity of Gram or acridine staining for the predilection of culture-positive arthritis is low, independently of underlying material, immune suppression, or antibiotic therapy. The sensitivity in presence of synovial fluid crystals is moderate. Acridine orange reveals the same performance as Gram staining. Considering the costs, both staining cannot be supported as necessary diagnostic tool for septic arthritis.
Are infantile non tuberculous spondylodiscitis mostly due to Kingella kingae? A prospective study.

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Study design: Prospective study to gather clinical, paraclinical, and radiographic data of spondylodiscitis of children aged between 6 and 48 months, and to test a new bacteriological diagnosis’ approach.

Objectives: To analyze and assess the clinical, laboratory, and radiologic findings in children aged between 6 and 48 months, and to document the efficacy of a new approach of bacteriological diagnosis based on K. kingae-specific real-time polymerase chain reaction (rtPCR) assays from peripheral blood and throat swabs.

Background Data: Infantile form of spondylodiscitis is a rare entity that often presents a mild-to-moderate non-specific clinical picture. Laboratory studies generally demonstrate an increased ESR, whereas WBC count and CRP can be normal or slightly elevated. Blood cultures are usually negative, and identification of the causative can be difficult even on disk or vertebral aspiration. Assessment of the clinical manifestations, and of the biologic microbiologic characteristics is essential for prognosis and for justification of the nonoperative treatment.

Methods: Ten children (4 girls and 6 boys) with a mean age of 24 months (range: 13 to 39 months) were hospitalized for spondylodiscitis between January 2009 and December 2012. Parameters related to the duration of symptoms, clinical manifestations, diagnostic workup, and course of the treatment were prospectively collected.

Results: All the children presented with uncharacteristic signs and symptoms. The laboratory markers of inflammation were only moderately elevated. The diagnosis of spondylodiscitis was established in average after a delay of 29 days (range: 3 to 62 days). Blood cultures taken as initial investigations were all negative. K. kingae-specific rtPCR assays were positive in peripheral blood in two cases, whereas the test was always positive on throat swabs.

Conclusions: Our study shows that the course of spondylodiscitis in children aged between 6 and 48 months is characterized by a mild-to-moderate clinical and biologic inflammatory response. It suggests also that detecting K kingae DNA in the oropharynx provided strong enough evidence that this microorganism is responsible for the spondylodiscitis. Early bacteriological diagnosis can thus prevent unnecessary testing and invasive intervention.
FM43  Is there a place for conservative treatment of osteomyelitis of the hallux sesamoids? A monocentric case series study

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Introduction: Osteomyelitis of the hallucal sesamoids in young and healthy patients is a rare entity, and may originate from a hematogenous spread. But in diabetic patients with peripheral neuropathy it often results from direct contiguous seeding from adjacent ulceration. In our institution, all patients are treated conservatively, before eventually requiring a surgical procedure. We present a monocentric case series, in order to determine the effectiveness of a conservative therapy for osteomyelitis of hallucal sesamoids. To our knowledge, no such study has been conducted yet.

Material & Method: We reviewed 18 patients (4 women and 14 males) / 18 feet with a clinical and radiological diagnosis of osteomyelitis of the hallucal sesamoids treated in our institution during a 13 year period (2000-2012). The inclusion criteria were a signal alteration on MRI, CT or conventional radiography, combined with a deep ulcer. Conservative therapy consists in frequent wound treatment, immobilisation in a cast or other device, and empirical oral antibiotics.

Results: Among the 18 patients, 11 were diabetic, 14 had a peripheral neuropathy, 10 had a peripheral arterial disease and 5 were immunosuppressed. After a period ranging from 4 weeks to several month of conservative therapy, 83% (15/18) patients/feet required surgical debridement, excision, internal resection or amputation.

Conclusion: Most of the patients in the present study (14/18) are either diabetic, vascular or have a peripheral neuropathy. In this population, conservative therapy does not seem to be a valuable option. Patients should be advised, before starting a conservative therapy, that treatment takes long and is demanding, and very often ends with a surgical procedure.
**FM44 Surgical Treatment of Calcaneal Osteomyelitis in the Diabetic Patient**

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**Introduction:** Calcaneal osteomyelitis (CO) is a common complication of diabetic foot ulcers. Below-knee amputation is often the treatment of choice; however it is associated with loss of integrity and need for prosthetic fitting. Total and subtotal calcanectomies are considered to be an alternative to amputation. Purpose of the present study was to compare these three techniques in diabetic patients with regard to complications and the need for revision surgery.

**Methods:** Nineteen diabetic patients (mean age 61±11 years; female 8, male 11) (19 feet) were enrolled and analyzed retrospectively after they underwent surgical treatment for CO between 01/2002 and 09/2012. Nine patients underwent subtotal calcaneectomy, two total calcaneectomy, and eight below-knee amputation. Demographic and clinical characteristics at time of diagnosis, complications during follow up and need for revision surgery were documented.

**Results:** Mean follow-up after initial diagnosis was 76±36 months (range 3 – 140 months). Sensory neuropathy was present in all 19 patients (100 %), additional peripheral vascular disease in twelve (63 %) and nicotine abuse in eight (42 %). Most isolated pathogenic microorganisms were coagulase-negative Staphylococci, followed by Staph. aureus and E. coli. Patients who initially underwent subtotal calcaneectomy required secondary below-knee amputation in two cases (22 %) and secondary total calcaneectomy in one case (11 %). One patient with primary total calcaneectomy needed secondary below-knee amputation (50 %). In one patient with primary below-knee amputation, secondary knee exarticulation was necessary (13 %). Four out of five patients (80 %) with revision surgery had additional peripheral vascular disease, one out of five (20 %) nicotine abuse. Four patients died during follow up due to reasons not directly related to the interventions.

**Conclusions:** (Sub-)total calcaneectomy in diabetic patients with calcaneal osteomyelitis is associated with a high rate of secondary below-knee amputations. In patients with additional risk factors as peripheral vascular disease it can therefore not be recommended as an alternative to below-knee amputation.