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THURSDAY, 4 October 2018

PLENARY SESSION: STATE OF THE ART FOREFOOT SURGERY

Hallux VALGUS - Marino Delmi

Metatarsalgia - Manuel Monteagudo

Metatarsalgia (metatarsal pain) is one of the most common complaints at our outpatient clinic. It is frequently associated with deformity of the hallux and toes. The origin of pain may be simple to address or it may be complex, involving the midfoot, hindfoot, gastrocnemius complex, leg, and hip. An individualized approach to possible causative factors is essential to come up with the right indication for treatment. Primary metatarsalgia (mechanical origin) encompasses abnormalities related with variations in angulation, length, attack angle, and movement of metatarsal bones. Secondary metatarsalgia involves malalignment after trauma, metatarsophalangeal (MP) instability or destruction (systemic arthritides), neuropathic pain, Freiberg disease, etc. Iatrogenic metatarsalgia is found after failed forefoot surgery resulting in abnormal shortening, plantar flexion, or elevation of metatarsals. An overview of the gait cycle is helpful in understanding biomechanical contributions to metatarsalgia. The swing phase accounts for 40% of gait, whereas the stance phase accounts for 60%. The forefoot is in permanent contact with the ground throughout half the gait cycle. During walking, the foot functions as a three-rocker mechanism.

- **First rocker**: The heel acts as the first rocker, initiated by heel strike during the first 10% of the gait cycle. First rocker metatarsalgia is only present when there is a congenital deformity, a tight heel cord, or a cavus foot. Management of these underlying conditions will relieve metatarsal pain. Primary metatarsalgia might be generated during first rocker of gait. During first rocker of gait, the presence of an extensor substitution may dorsiflex MP joints to help gain ankle dorsiflexion. So deforming forces at the MP interface might be a potential cause of metatarsal pain.

- **Second rocker**: The ankle acts as the second rocker (next 20% of gait cycle), when (under normal conditions) the entire foot remains in contact with the ground. Second rocker metatarsalgia might be generated by limited ankle motion or increased plantar flexion of the lessor metatarsals (or both). During the second rocker, the presence of a short gastrocnemius may affect the normal ankle-flexion-knee-extension-couple thus generating excessive pressure beneath the metatarsal heads. A Silfverskild test might reveal this condition and a medial gastrocnemius proximal release may be indicated in this group of patients. Excessive plantar flexion in one or more metatarsals acts during plantigrade foot ground contact (second rocker). Defined plantar keratoses are found in second rocker metatarsalgia. Proximal (BRT or Goldfarb) or distal (Suppan tilt-up) dorsiflexing/elevating osteotomies would be indicated.

- **Third rocker**: During the third rocker (final 30% of gait cycle), only the forefoot is in contact with the ground, with the MP joints dorsiflexed. Third rocker metatarsalgia accounts for most metatarsalgia cases in our practice. During the third rocker, it is metatarsal length discrepancy the most important causative factor to be considered. Propulsive (third rocker) metatarsalgia produces diffuse plantar keratosis affecting most of the metatarsal region. In the presence of hallux valgus, loading is transferred to the lesser metatarsals. First ray osteotomies are sometimes not enough to reestablish forefoot mechanical balance. The metatarsal parabola might need to be restored as part of an integral preoperative planning. Shortening of a long metatarsal is usually achieved by distal osteotomies. Weil and triple-Well and other osteotomies may be a useful and precise tool to obtain a harmonical metatarsal parabola. In cases of long-standing metatarsalgia, MP joint dislocation might need to be addressed as part of the preoperative planning. Biomechanical considerations also apply to dislocations. Second rocker dislocations are not true dislocations. The proximal phalanx dorsiflex by rolling over the metatarsal head and contact is maintained, although without mechanical efficiency. Extensor substitution may be managed by cutting the extensor digitorum tendons and transferring them to the lateral cuneiform or the base of the fourth metatarsal. Third rocker dislocations are true dislocations. The phalanx is positioned dorsally and parallel to the metatarsal. Although some authors propose plantar plate repair, shortening of the affected metatarsal (and subsequent shortening of others if needed) may allow the insufficient MP joint to regain normal working condition.

Lesser toe deformities - Adrien Ray
Civinini-Morton - Hans-Jörg Trnka
The first report of a neuroma in the literature dates back to 1835 by Civinini, 1845 by Durlacher and later by Morton in 1876. The etiology of the condition is not clear. Now generally accepted is an entrapment neuropathy of the plantar digital nerve. A particular anatomic finding at the 3/4 metatarsal web space may be the presence of a branch from the medial and the lateral plantar nerves. It is believed that this produces a larger nerve that is tethered. These characteristics are believed to cause a greater likelihood for local trauma that can result in the greater incidence of symptoms in the 3/4 metatarsal web space. Histologic studies have implicated the transverse metatarsal ligament as the primary constrictive structure. The diagnosis of Morton’s neuroma is primarily clinical. The value of MRI and ultrasound in the diagnosis is still debated. The typical patient is a woman in her fourth to sixth decade; The primary complaint is intermittent burning or electric, shock-like pain that occurs in the forefoot. Most patients state that the pain is worsened by wearing dress shoes. The most common location for the pain is between the third and fourth toes and the next common location is between the second and third toes. The classic differential diagnosis of a second webspace neuroma is a plantar plate injury with adjacent synovitis and bursitis. Nonoperative management consists of activity management, shoe wear modifications with broader toe boxes, lower heels and orthotics. Local injections with corticosteroid and alcohol may provide satisfactory results to some patients but rarely produces long-lasting pain relief. Some authors reported that injections provided complete pain relief in approximately 30% of patients, and partial relief in 30–50%. Neurectomy is the most commonly reported procedure for the treatment of an interdigital neuroma. There is a significant debate in the literature about whether a dorsal or plantar incision is more appropriate. The longitudinal dorsal approach centered on the interspace is the preferred by most surgeons. The success rate for neurectomy ranges from 51% to 85% in long-term follow-up studies.

ROUND TABLE: TRAUMA TO THE FOREFOOT AND MIDFOOT

Subtle Lisfranc Injuries - Paulo Amado
Described Jaques Lisfranc Classification QUENU E KUSS in 1909 0.2% of all injuries 20% of injuries are neglected, the importance of a good diagnosis, often undiagnosed Anatomical reductions of Lisfranc lesions correlate with lower osteoarthritis and better functional score Plaques more stable and less imperfect than screws Postoperative Protocol: 2 weeks without weight 4 weeks without load Total weight in 6 weeks Hardware Removal 4-6 months.

ORIF or fusion for severe Lisfranc injuries? - Mark B Davies
The debate continues whether either primary fusion or Open Reduction & Internal Fixation is the superior method of treatment of severe Lisfranc injuries. I aim to present the evidence from the current literature to support the notion that ORIF remains a safe treatment modality with optimal results for patients.

Base of the fifth metatarsal fractures - Xavier Crevoisier
This short presentation will give an insight in: - Classification. - Principles of treatment. - Controversies. - Selected cases.

ROUND TABLE: ARTHRITIS GREAT TOE

Manipulation, injection, arthroscopy, cheilectomy - James Ritchie
Arthritis of the great toe is a common problem. Manipulation, injection, arthroscopy and cheilectomy are all recognised treatments for the condition. The indications for, and outcomes of each modality of treatment are reviewed based on the published evidence and the presenter’s experience and the relative merits of these treatments summarised.

I operate on the proximal phalanx - Senthil Kumar
Surgical options for the management of early hallux rigidus include cheilectomy with or without a dorsiflexion osteotomy of the proximal phalanx or shortening osteotomy of the first metatarsal. This talk will cover the role of proximal phalangeal osteotomy, the advantages, technical tips and common complications one may encounter with this procedure. A review of the literature on this along with my own personal experience with this technique will be presented.
I shorten or elevate the first metatarsal - Fabian Krause

Hallux rigidus is a degenerative condition leading to pain and limitation of movement of the 1st metatarsophalangeal joint (MTP1). The role of metatarsus primus elevatus and its mechanism in causing hallux rigidus is still controversial. However, an elevated 1st ray compared to 2nd ray (MPE >5mm) could be considered a predictive factor in the presence of hallux rigidus. The technique and promising short-term results of 12 patients with a Reverdin-Green (shortening and lowering) distal 1st metatarsal osteotomy for hallux rigidus and a minimum follow-up of 12 months are presented. So far, none of the patients was converted to a MTP I fusion. The Reverdin-Green osteotomy is reliable operation to alleviate pain and discomfort of hallux rigidus, improve MTP I range of motion and impede progression of arthritis at least in the short-term.

Fusion techniques and postoperative protocol - Xavier Martin

Hallux rigidus leads to a restricted and painful motion at the first metatarsophalangeal. We present metatarsophalangeal joint arthrodesis as a successful procedure for the treatment of hallux rigidus. We undertook a systematic review of the literature about outcomes of Keller procedure, joint replacement and arthrodesis in first metatarsophalangeal. To obtain good results is fundamental position of arthrodesis and consolidation. Nowadays we use compression screw and dorsal plate as fixation for first MTPJ arthrodesis. During the postoperative as protocol we use a protective shoe wear during 6 weeks. Is necessary to compliment this specific fixation technique.

Arthroplasty (excision, interposition, prosthetic) - Michel Maestro

Arthroplasty of the great toe (excision, interposition, prosthetic) Michel Maestro-Martin Schramm Institute of Medecine and Sports Surgery (IM2S) Monaco Arthroplasty of the great toe can be mainly used in joint cartilage destruction without instability. More and more patients to day refuse arthrodesis (grade B recommendation) (1-2) Arthroplasty of the great toe has been developed more than 40 years ago and it is still in progress. Today still remains more questions than answers! Because evidence is poor or insufficient. Many papers suggest the same sentence: “further studies-ideally, high-quality Level I randomized controlled trials with validated outcome measures-are needed to allow stronger recommendations to be made.” Is this dream alive today? Apparently not yet. (3) What about the Patient satisfaction/surgeon satisfaction. Patient satisfaction seems to follow four criteria: fair aesthetic, painless foot, easy footwear, good QOL (4) Are all techniques of conservative surgery by arthroplasty (partial excision, interposition with biologic, or synthetic tissues, hemi or total replacement with inert materials) really reproducible? Some controversies exist in literature. (5-6-7-8-9-10-11-12-13-14-15-16-17-18) Don’t cut the brige of an easy revision surgery (19): it could be choosen techniques avoiding large bone removing and bone destruction with time leading to difficult salvage surgery and allergy risk to (20). Caution to materials currently used (Cobalt-Chr, PE, HAP, silicone) (21) Prefer partial excision (cheilectomy, Keller, Valenti), interposition, hemiarthroplasties, (22), rather than total prosthesis with 2 components. Promising alternatives to arthrodesis seems to be arthroplasty with Synthetic cartilage, Tri components total prosthesis without HAP, new design prosthesis (23) Pyrocarbon (24) In conclusion : we have today many possibilities to treat first MtPJ arthrosis , we must choice for the patient and according with him, the most appropriate solution relatively to the pathology, the age , the functional expectation, the condition of adjacent joints, and keep in mind the possibilities of revision surgery . The Conservatives joint salvage techniques should be the first step in a therapeutic strategy.

PRESIDENTIAL GUEST LECTURES

History of polio and the fight for eradication - Michel Zaffran

Eradicating polio – eradicating the long-term need for orthopedic surgery for polio survivors The Global Polio Eradication Initiative, launched in 1988, is a unique public-private partnership, spearheaded by the World Health Organization (WHO), Rotary International, the US Centers for Disease Control and Prevention (CDC), UNICEF and the Bill & Melinda Gates Foundation, aimed at eradicating a human pathogen for only the second time in history (after the eradication of smallpox in 1977). Since 1988, the incidence of polio has been reduced by more than 99%, from 350,000 annual cases in more than 125 endemic countries, to 22 cases of wild poliovirus and 3 endemic countries in 2017. The global effort to eradicate polio has grown into one of the largest, internationally-coordinated public health projects in history, with a network of more than 20 million volunteers contributing to its success. With fewer cases reported from fewer areas of fewer countries than ever before, and more than 17 million people today walking who would otherwise have been paralysed, the world stands on the brink of a historic public health success. Michel Zaffran, Director for Polio Eradication at WHO, will: present an overview of the main immunologic, epidemiologic and operational strategies that are being employed to eradicate the disease (and verify and validate its eradication); summarise the latest global epidemiology and remaining barriers to reaching every last child in the remaining infected areas; and, review ongoing efforts to prepare for the post-polio world, to ensure that once polio is eradicated, it will remain eradicated. The aim is to secure a world for all future generations, where no person will
ever be paralysed by polio, where no person will ever be in need of rehabilitative or surgical support as a result of this devastating infection.

**Surgery for foot deformities in polio - Antonio Viladot**

Nowadays, thanks to the polio vaccine, it is exceptional to see acute forms of poliomyelitis. The cases that come for consultation now, either originate in underdeveloped countries, or are sequels of infections contracted many years ago.

**PATHOANATOMY.** Foot deformities in polio are caused by the following reasons: 1) Paralyzed muscles. This is a flaccid paralysis. 2) Muscular imbalance. We can consider that the correct shape of the foot is due to the balance of muscles inserted in it. Depending on the paralyzed muscle, the deformities that can be found in the polio foot are very variable. 3) Dysmetrias. They lead to an alteration of posture and gait.

**TREATMENT.** The goal of the polio surgery is to allow the patient to walk independently. For this we must achieve correct alignment of the limb, correct and stabilize the deformities and seek a balance between the different muscle groups. In surgical planning we must proceed from proximal to distal, ending at the foot. As a general rule we proceed in the following order: 1) Correction of hip flexion contracture 2) Correction of knee flexion contracture 3) Correction of dysmetrias. In a severely affected limb, leaving moderate shortening can assist the development of gait. 4) In cases of quadriceps paralysis, try to replace it with a transposition of the biceps and hamstring to the patella. 5) Finally, we will proceed to correct the deformities of the ankle and foot. The correction of this depends on, and at the same time contributes to, the alignment and stabilization of the entire limb. In cases of paralysis of the quadriceps, a certain degree of equinus of the ankle facilitates passive stabilization of the knee. In phases of flexible deformity, soft tissue surgery can correct it. The most commonly used techniques are: arthrotopies, tenotomies, tenodesis and tendon transfers. When the deformity is rigid, bone surgery is necessary. We practice bone surgery according to the following rules:

- It should not be indicated to until a child is at least 8 to 10 years old.
- In corrective operations, first try to achieve maximum improvement by acting on the soft tissue, and only then proceed to perform bone resections.
- The normal shape of the foot should be preserved as much as possible, performing modeling arthrodesis and respecting normal bone relationships.
- We avoid osteotomies that, while correcting the deformity, do not stabilize the foot.
- Generally, we associate bone surgery with other interventions on soft tissues.

The most frequent bone operations are: triple arthrodesis, resection of the midtarsal joints, GRICE procedure in children's and pantalar arthrodesis.

**EFAS/SOUTH KOREAN FOOT SOCIETY: OSTEOARTHRITIS OF THE ANKLE**

**State of art primary TAR - Victor Valderrabano**

**The failed TAR - Woo Chun Lee**

Failed TAR means various conditions in which removal of metal component is necessary due to pain and disability after TAR. Those conditions include malposition of the implants, cystic change, instability, malalignment of hindfoot on coronal, sagittal or axial plane. Treatment for failed TAR is revision TAR or ankle arthrodesis. Longevity of TAR is still much shorter than hip or knee arthroplasty. Highest survival has been reported by developer or expert experienced surgeon and lowest survival has been reported by national registry. Generally, five-year survival has been reported to be in the range of 90-95% and 10-year survival has been reported to be in 84-90 %, however Swedish ankle registry reported that 14-year survival of the single-coated STAR was 47%, and the 12-year survival of the double-coated STAR was 64 %. My talk is based on my personal experience, mostly using Hintegra prosthesis and my published researches about sagittal and coronal plane positioning of the talar component after TAR. Proper positioning of tibial and talar component is critical in functional ability and longevity of TAR. Most common complication in my 100 early TAR using Hintegra was subluxation of mobile insert, which occurred in 9 ankles. The reasons for this high rate of complication are technical problem, high incidence of severe varus deformity in the series and specific design characteristics of the Hintegra prosthesis. Perfect stability should be obtained at the end of TAR surgery to prevent insert subluxation and edge loading. Ability to correct foot deformity
is required to achieve proper stability of the ankle. Infection rate decreased as the experience increased. Arthrodesis for infected TAR can be done either by one stage surgery or by two stage surgery when the infection is severe. Arthrodesis after failure of primary TAR is more difficult to obtain fusion and also functionally less satisfactory than primary arthrodesis for ankle arthritis. Etiology of cystic change may be different from the cystic change after hip or knee replacement. CT is essential for assessment of cystic change, and optimal treatment for cystic change is still not completed resolved.

**Tibial osteotomy** - Markus Knupp

**Which implant to choose?** - Hong Geun Jung

This is a very difficult topic to discuss about. To mention the conclusion first, I believe that the choice of the total ankle arthroplasty (TAA) implant is decided mainly by the surgeon’s personal preference and philosophy regarding the concept of the surgical instruments and the TAA implant that can help to achieve the best results we can get, i.e. maximum pain relief with minimum intra-operative and postoperative complications. There are a variety of total ankle implants in the market, some of the most widely used implants are STAR, Hintegra, Mobility, Salto etc. The design of the TAA surgical instruments should be mechanically precise and sophisticated to specifically facilitate the tibia and talar bony cutting that the surgeon is planning especially considering the deformities of the tibia and talus as well as the coronal-sagittal and rotational ankle deformities. The ideal instruments should be protective in preventing the inadvertent tibia and fibula bone cutting. In addition, the instruments should prevent overzealous bone cutting, especially when the talus is eroded and decreased in size or when the talus is congenitally small in size. The size line-up of the tibia and talar implants should be prepared for the small talus. Some elderly female patients especially in Asia have very small ankle with small talus that cannot sometimes accommodate even the smallest size talar implant in the market. The tibia and talar implants in the market have different designs. The tibial plate implants possess different shape of pegs that require firm initial stability and early bony integration. The peg design is important for the outcome in the aspect of pain relief, implant loosening and migration. The talar components of the different manufacturers have different designs in the aspect of talar bone cutting, metal coverage of the talar dome and the medial-lateral walls and the peg(s) design. As for the talar component design, the design is important to preserve the joint congruency and balancing as well as to ideal firm fitting in the ankle mortise. As for the firm stability of the talar component, I believe that the peg(s) fitting of the talar component is very important to prevent postoperative pain, loosening and migration which may lead to ultimate total ankle failure.

**FREE PAPERS (FP1)**

**Long term clinical results for hallux varus correction by reversed abductor hallucues transfer** - Karolien Schwagten

**Co-authors: Geoffroy Vandeputte**

**Background:** Hallux varus is a rare but incapacitating complication after hallux valgus surgery. Surgical treatment offers a wide variability of techniques, from MTP arthrodesis to different types of ligamentoplasty. For iatrogen hallux varus, a static and anatomic procedure is mostly preferred. The reversed transfer of the abductor halluces tendon was first described in 2008 and showed a good hallux alignment without symptoms at 25 months follow-up with all the patients.

**Aim:** The purpose of our report is to follow the results of this static tendon transfer on long-term (11-2009 until 06-2017).

**Method:** All patients were contacted and examined after a follow-up between 10 and 101 months. They all filled in 3 different questionnaires about their present situation: the AOFAS MTP-IP scale (American Orthopaedic Foot and Ankle Society), the SEFAS score (Self-reported foot and ankle score) and the VAS-FA scale (Visual-Analogue-Scale Foot Ankle). They also responded a general question about their satisfaction.

**Results:** Out of 16 patients we achieved a success rate of 69% (11 patients); 6 of them were fully satisfied and 5 of them were satisfied with minor reservations. These reservations included associated arthritis in IP joint, slightly stiff or swollen MTP joint or sporadic muscle cramps. 12.5% (2 patients) were satisfied with major reservations, of
which one had a recurrent hallux valgus and one a hyper dorsiflexion of the MTP joint. 19% (3 patients) were not satisfied due to the following combination of a hyper dorsiflexion of the MTP joint with a recurrent hallux valgus (2 patients) or a recurrent hallux varus (1 patient).

**Conclusion:** Our results show that on longterm the correction of the MTP alignment can only be preserved in 69% of the patients. Attention should be payed to not overtighten the medial capsulorrhaphy and place the tunnels in perfect parallel position to prevent recurrent malalignment.

**A comparative study of three types of implants for Lapidus arthrodesis - Naohiro Hio**

**Co-authors:** Atsushi Hasegawa, Satoshi Monden, Masanori Taki, Kazuhiko Tsunoda, Hiroaki Omae

**Background:** Since Lapidus arthrodesis for hallux valgus is often problematic due to the non-union, various implants have been developed in order to increase union rate.

**Aim:** The purpose of this study was to compare the clinical outcomes of three types of implants for modified Lapidus arthrodesis.

**Method:** We divided 87 joints into three groups according to the implants: interfragmentary cancellous screws (S) group included 28 joints, a plate (P) group included 20 joints and a interfragmentary cancellous screw and plate (SP) group included 39 joints. We assessed the AOFAS (American Orthopaedic Foot and Ankle Society) hallux score, hallux valgus angle (HVA), intermetatarsal angle (IMA) and union rate.

**Results:** The mean preoperative AOFAS scores in the S, P and SP groups were 54.3± 13.0, 53.4 ± 8.5 and 60.2 ± 11.9 points, and the preoperative scores were 86.3 ± 16.0, 89.3 ± 12.2 and 92.5 ± 7.0 points, respectively. The mean HVAs were improved from 42.4° ± 9.6°, 47.8° ± 13.0° and 43.0° ± 8.6° to 19.2° ± 10.4°, 20.1° ± 9.0° and 12.4° ± 9.5°, respectively. The mean IMA were improved from 18.7° ± 2.8°, 18.8° ± 2.9° and 18.2° ± 3.4° to 11.5 ± 3.9°, 11.8° ± 3.1° and 9.1° ± 2.6°, respectively. The union rates were 92.9%, 90% and 97.4%, respectively. The values in the SP group were significantly improved compared with the other groups (p<0.05).

**Conclusion:** The postoperative outcome may be improved by sufficient interfragmentary compression and performing rigid internal fixation, as in the SP group.

**Prospective Five-Year Pain, Function and Safety Outcomes of a Synthetic Cartilage Implant for the First Metatarsophalangeal Joint in Advanced Hallux Rigidus - Judith Baumhauer**

**Co-authors:** Mark Glazebrook, Chris Blundell, Dishan Singh, Gwyneth de Vries, Ian L. D. Le, Dominic Nielsen, M. Elizabeth Pedersen, Anthony Sakellariou, Matthew Solan, Guy Wansbrough, Alastair S. E. Younger, Timothy R. Daniels

**Background:** A prospective, randomized clinical trial of 1st MTP hemiarthroplasty with a synthetic polyvinyl alcohol hydrogel implant for hallux rigidus demonstrated maintenance of motion, excellent pain relief and function equivalent to arthrodesis at 2-years. Recognizing that many toe implants have initially good results that deteriorate over time, following these patients with validated instruments is critical.

**Aim:** Assess the safety and efficacy outcomes for a 1st MTP synthetic cartilage hemiarthroplasty at a minimum of 5-years.

**Method:** 135 implant patients were eligible for this study. 23 were lost to follow up; leaving 112 (83%) evaluated at 5-years. Patients completed pain (VAS), FAAM Sports/ADL scores, and 1st MTP motion at 5-years postoperatively and were compared to the previously obtained preoperative and 2-year values. Additionally, weight-bearing foot radiographs, secondary procedures, and safety parameters were evaluated.

**Results:** Of 112 implant patients available at 5-year follow-up (mean 5.8; SD ±0.7) 6 had conversion to fusion (Figure 1). The remaining 106 patients completed pain and functional assessments, VAS Pain, FAAM Sports Scores and 1st MTP motion were maintained or improved. Independent radiographic review found no bone or implants abnormalities (bone resorption, implant fragmentation, cyst formation). 93% of patients would have the procedure again.
Conclusion: Prospectively assessed clinical and safety outcomes of synthetic cartilage implant hemiarthroplasty patients for the surgical treatment of hallux rigidus demonstrated durable results with maintenance pain relief, motion, function and safety at 5.8 years.

Revisions and complications after arthrodesis of the medial Lisfranc joint line -
Leif Claassen
Co-authors: Anna Altemeier, Elina Hesse, Christian Plaass, Christina Stukenborg-Colsman, Sarah Ettinger

Background: Despite its clinical relevance there are no studies published regarding the results after arthrodesis of the medial Lisfranc joint line.

Aim: The aim of the present study was the evaluation of revisions and complications after an arthrodesis of at least two of the tarsometatarsal I-III- (TMT-I-III) joints.

Patients and methods: The present retrospective study consisted of 103 patients who received an operation between March 2009 and December 2016. In 79 cases a TMT-I-III-arthrodesis was performed, 11 patients received a TMT I-II-arthrodesis and 13 patients a TMT II-III-arthrodesis. 92 patients were female and 11 males, the mean age was 57.4 Jahre ± 10.4 (mean with standard deviation).

Results: In 28 cases a further operation after the primary operation was necessary (27,2%). 16 patients (15,5%) received an implant removal. A rearthrodesis was performed in eight patients (7,8%). In total a nonfusion occurred in 11 patients (10,7%) being asymptomatic in three cases. Four patients developed an osteoarthritis of the adjacent joints requiring an arthrodesis (3,9%). 12 patients developed wound healing disorders (11,7%) whereas a revision surgery or antibiotic treatment was not necessary. One patient each (1,0%) showed an osteoarthritis of the sesamoids und a metatarsalgia II/III.

Conclusion: The present study describes for the first-time complications and revisions after arthrodesis of the medial Lisfranc joint line. We showed a relevant number of further operations after the primary operation. Our results might improve the information of future patients prior to this operation.

Syndesmotic Instability after Total Ankle Replacement – A Neglected Problem -
Roxa Ruiz
Co-authors: Lukas Zwicky, Alexej Barg, Beat Hintermann

Background: In three-component TAA designs, the second interface allows the PE inlay to find its position according the individual physiological properties. This was believed to decrease shear forces within the ankle joint. However, it is not clarified to which extent such an additional degree of freedom may overload the syndesmosis.

Aim: The purpose of this study was to analyze all ankles after TAA that showed an overload of the syndesmotic ligaments and to determine the potential consequences.

Method: 31 ankles were treated with a tibio-fibular fusion for symptomatic instability of the syndesmosis. Criteria for fusion were the presence of at least two of the followings: (1) tenderness over the syndesmosis, (2) pain while compressing the fibula against the tibia, (3) pain while rotating the foot externally, (4) widening of the syndesmosis on ap view. Alignment of TAA and hindfoot alignment were measured on standard radiographs. Intraoperatively, the syndesmotic instability was confirmed before fusion. The PE wear was documented.

Results: After a mean of 63 months after TAA, all patients evidenced pain at the level of the syndesmosis of at least 3 months. 25 ankles (24 after posttraumatic OA) showed a widening of the syndesmotic space and 22 ankles of the medial clear space with a lateral translation of the talus. Nine ankles evidenced cyst formation, and eight ankles showed a decrease in height of the PE; whereas, in 3 ankles a fracture of the PE was found. A valgus misalignment of the heel was found in 25 ankles, a valgus TAA in 16 and a varus TAA in 11 ankles.

Conclusion: A syndesmotic instability after a three-component TAA apparently occurred mostly after posttraumatic OA, in particular if the heel was left in valgus. If the talus starts to move lateralward, the PE seems to be at risk for
increased wear and finally mechanical failure. Therefore, a valgus misaligned heel should always be corrected during TAA implantation. If there is any sign of syndesmotic instability, a fusion should be considered.

Treatment of talar cysts with bonegrafting and talo-calcaneal arthrodesis after STAR ankle replacement - Johnny Froekjaer
Co-authors: Lasse Darling Andersen, Ellen Hamborg-Petersen, Trine Torfing

Background: Periprosthetic bone cysts threatens survival of ankle replacement and treatment is still under debate. The cysts are clinically silent until mechanical instability, resulting in pain and component loosening.

Aim: We describe the results after a combination of cyst allografting and talo-calcaneal arthrodesis with one or two compression screws.

Method: Twelve patients with a primary STAR ankle replacement and symptom giving cysts under the talar component, were operated using the above described technique from 2010-2016. Cysts were evaluated with 3-D radiography before surgery and at follow up. Preoperative radiographs showed that all cysts had communication to joint or surroundings. Mean time from primary surgery to revision surgery was 74 months. 8 males and 4 females were operated, mean age was 59.9 years.

Results: Mean follow up time was 33 months. Nine patients had union of the arthrodesis, bone healing of the cysts and a good clinical result. Two patients had a non union of the arthrodesis, needed implant removal and a tibio-talo-calcaneal arthrodesis, which healed with a good clinical result. One patient with a huge cyst was diagnosed with a cyst related fracture, there was nonunion of the arthrodesis, implants were removed, the secondary arthrodesis was severely infected and the patient had a bellow knee amputation. Histological examination showed non specific inflammation, in a few cases PE particles and giant cells.

Conclusion: Bonegrafting and TC-arthrodesis without revision of metal components is a good and safe treatment of huge cysts under the talar component after STAR ankle replacement.

Autologous Matrix Induced Chondrogenesis (AMIC) Aided Reconstruction of Osteochondral Lesions of the Talus - Five Year Follow-up - Martin Wiewiorski
Co-authors: Alexej Barg, Victor Valderrabano

Introduction: Autologous Matrix Induced Chondrogenesis (AMIC) for surgical treatment of osteochondral lesions of the talus (OCLT) has shown excellent clinical and radiological results at short term follow up two years after surgery. However, no mid term follows up data is available.

Aim: 1. To evaluate the clinical outcome after AMIC-aided reconstruction of osteochondral lesions of the talus at a minimum follow up time of five years. 2. To evaluate the morphology and quality of the regenerated cartilage by magnetic resonance imaging (MRI) at on at a minimum follow up time of five years.

Methods: Seventeen patients prospectively underwent surgery receiving a AMIC-aided repair of OCLT consisting of debridement, autologous grafting, and sealing of the defect with a collagen scaffold (Chondro-Gide, Geistlich Surgery, Wolhusen, Switzerland). Clinical and radiological assessment was performed before and after a minimum of 60 months after surgery (average 78 months, range, 60-120). Clinical examination included the American Orthopaedic Foot & Ankle Society (AOFAS) ankle score and the Visual Analogue Scale (VAS). Radiological imaging consisted of MRI. The Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) score was applied.

Results: The AOFAS ankle score improved significantly from a mean of 60 points preoperatively (range, 17-79) to 91 points (range, 70-100) postoperatively (p<0.01). The preoperative pain score averaged a VAS of 5 (range, 2-8), improving to an average of 1.1 (range 0-8) (p<0.01). The MOCART score for cartilage repair tissue on postoperative MRI averaged 71 points (range, 50-90).

Conclusion: The AMIC-procedure is safe for the treatment of OCLT with overall good clinical and magnetic resonance imaging results at five year follow up.
Surgical Repair of Osteochondral Lesions of the Talus Using Biologic Inlay Osteochondral Reconstruction: Clinical Outcomes After Treatment Using a Medial Malleolar Osteotomy Approach Compared to an Arthroscopically-Assisted Approach - Boguslaw Sadlik

Co-authors: Mariusz Puszkarz, Hubert Laprus, Łukasz Kołodziej, Wojciech Klon, Graeme Whyte

Purpose: The aim of study is to provide a comparative analysis of clinical outcomes of talar osteochondral lesion (OLT) repair using biologic inlay osteochondral reconstruction (BIOR) in patients who did or didn't undergo medial malleolar osteotomy (MMO), with specific focus on lesion surface area.

Methods and Materials: Patients treated for OLT through an MMO or arthroscopically-assisted approach were prospectively followed. Surgical technique was BIOR (autologous bone graft, porcine collagen or hyaluronic acid-based matrix soaked in bone marrow concentrate). Assessment tools: visual analogue scale (VAS) and American Orthopaedic Foot and Ankle Society Ankle-Hindfoot score (AOFAS). The MRI observation of cartilage repair tissue (MOCART) score was used postoperatively.

Results: Data for 24 patients (14M/10F, mean follow-up 22 months) was analyzed. 11 underwent MMO, and 13 were treated without osteotomy using the arthroscopically-assisted technique through an anteromedial approach. Mean age after osteotomy was 35.2±13.3, and without osteotomy 32.9±14.0, BMI was 26.2±3.8 and 24.0±3.2 Kg/m², the mean lesion area was 130.6±56.4 and 120.5±35.4 mm². There were no statistically significant differences between groups with respect to age (p=0.523), BMI (p=0.213) or lesion area (p=0.977). Porcine collagen matrix was used in 13 cases, hyaluronic acid-based matrix in 11. There was no difference in follow-up duration for patients who did or didn’t undergo osteotomy (p=0.366). In osteotomy group, AOFAS increased from 57.7±13.0 preoperatively to 81.2±12.3 at final follow-up (p=0.001), VAS decreased from 5.7±1.0 to 1.9±1.0 (p<0.001). In minimally invasive approach group, AOFAS increased from 54.4±12.4 to 84.0±14.6 (p<0.001), VAS decreased from 7.6±1.7 to 2.0±1.4 (p<0.001). The change in mean score from preoperative assessment to final follow-up was not significantly different for VAS (p=0.67) or AOFAS (p=0.213) scores between groups. Comparing outcomes between different types of matrices, there was no significant difference in improvements of VAS (p=0.328) or AOFAS (p=0.480) scores at final follow-up.

Conclusion: OLT can be treated successfully by biological inlay osteochondral reconstruction technique without medial malleolar osteotomy, with good to excellent clinical outcomes.

5-year results after autologous matrix-induced chondrogenesis (AMIC) for osteochondral lesions - Markus Walther

Co-author: Hubert Hörterer, Anke Röser, Sebastian Baumbach, Oliver Gottschalk

Background: Autologous matrix induced chondrogenesis (AMIC) has gained popularity in the treatment of osteochondral lesions of the talus.

Aim: Previous studies presented promising short-term results for the usage of the I/III collagen bilayer matrix. The aim was to investigate the long-term effect.

Methods: The 5-year results of a prospective cohort study are presented. All patients underwent an open AMIC procedure for a talar osteochondral lesion. Data analysis included general demographics, preoperative MRI findings, intraoperative details and Foot-Function-Index (FFI-D) pre-, one-, and five years following surgery. The primary outcome variable was the longitudinal effect of the procedure. Various variables influence on the outcome was tested.

Results: 21 consecutive patients were included (8 female and 13 male), with a mean age of 37±15 years (15-62 years) and a BMI of 26±5 kg/m² (20-38 kg/m²). The defect size was 1.4 cm²±0.9 cm² (0.2-4.0 cm²). The FFI-D decreased significantly from pre- to one-year post-operative (56±18 vs. 33±25; p=0.003), with a further non-significant decrease between one- and five-year follow-up (33±25 vs. 24±21; p=0.457). Similar results were found on the score’s subscale function and pain. BMI and size of lesion showed a positive correlation to the level of preoperative FFI-D and its subscales.
Conclusion: The results show a significant improvement in pain and function after AMIC procedure, with a significant return to sports at the 5-year follow-up. The biggest improvement overall is seen within the first year, further clinical satisfaction amongst the patients is noticeable after 5 years.

Matrix-Associated Stem Cell Transplantation (MAST) in Chondral Lesions at the Ankle as Part of a Complex Surgical Approach- 5-Year-Follow-up in 100 Patients - Martinus Richter
Co-authors: Stefan Zech Stefan Andreaas Meissner

Background Aim: The aim of the study was to assess the 5-year-follow-up after matrix-associated stem cell transplantation (MAST) in chondral lesions at the ankle.

Method: In a prospective consecutive non-controlled clinical follow-up study, all patients with chondral lesion at the ankle that were treated with MAST from April 1, 2009 to May 31, 2012 were included. Size and location of the chondral lesions, method-associated problems and the Visual-Analogue-Scale Foot and Ankle (VAS FA) before treatment and at follow-up were analysed. Stem cell-rich blood was harvested from the ipsilateral pelvic bone marrow and centrifuged (10 minutes, 1,500 RPM). The supernatant was used to impregnate a collagen I/III matrix (Chondro-Gide) that was fixed into the chondral lesion.

Results: One hundred and twenty patients with 124 chondral lesions were included in the study. Age at the time of surgery was 35 years on average (range, 12-65 years), 74 (62%) were male. VAS FA before surgery was 45.2 on average (range, 16.4-73.5). Lesions were located at medial talar shoulder, n=55; lateral talar shoulder, n=58 (medial and lateral, n=4); tibia, n=11. Lesion size was 1.7cm2 on average (range, .8 - 6cm2). One hundred patients (83%) completed 5-year-follow-up after. VAS FA improved to 84.4 (range,54.1-100; t-test, p<.01).

Conclusion: MAST led to improved and high validated outcome scores in the mid-term-follow-up. No method related complications were registered. Even though a control group is missing, we conclude that MAST is an effective method for the treatment of chondral lesions of the ankle for at least five years.

SYMPHOSIUM ACHILLES TENDON RUPTURE

Clinical and radiological diagnosis - Jim Barrie
The diagnosis of acute Achilles tendon rupture should normally be on the basis of history and physical examination. The key physical signs are those of Simmonds’ triad (palpable gap, loss of static plantarflexion and loss of plantar flexion on calf squeeze) and the Matles test (increased dorsiflexion when the knee is flexed). Ultrasound may be useful when the clinical signs are unclear, for instance when the ankle is very swollen. It may also contribute to the decision whether to advise a patient surgical or non-surgical treatment. Plain radiography and MRI are of little value in diagnosis of acute rupture History and physical examination are also key to diagnosing the Achilles rupture that presents after a delay. However, there may not be an easily palpable gap and the calf squeeze test may be equivocal. Functional lengthening, as demonstrated by the angle of declination and the Matles test, may be more helpful. Imaging, either ultrasound or MRI, is more useful in this situation than in the acute rupture.

Non-Operative Management of Acute Achilles Rupture using the SMART protocol - Claire Topliss
The Swansea Morriston Achilles Rupture Treatment (SMART) programme was introduced in 2008. In this presentation I will summarise the current outcomes of the programme. Patients in our unit who present with an acute rupture follow a comprehensive management protocol that includes a Physiotherapist led dedicated Achilles clinic, ultrasound examination, use of functional orthoses, early weight bearing, an accelerated exercise regime and guidelines for return to work and sport. Ultrasound findings help to determine the choice for surgical or non-operative management. We demonstrate a low re-rupture rate and monitor the outcomes with Achilles Tendon Total Rupture Score (ATRS) and the Achilles Tendon Repair Score (AS). We will also comment on complications to date and an elementary cost analysis. In summary the SMART programme continues to result in a low rate of re-rupture, a satisfactory outcome, a reduced rate of surgical intervention and a reduction in healthcare costs.
Surgical treatment options - Jean Luc Besse

The treatment of acute Achilles tendon ruptures remains highly debated. There is no consensus on whether non-operative management (cast immobilisation, functional bracing) or operative treatment is superior. We described the different modalities of surgical treatment - Open repair • Percutaneous repair (Tenolig) • Mini-open repair (Magriffith, Achillon, etc...) We did literature analysis and especially the 20 meta-analysis to give current concepts based on evidence • Surgery or conservative treatment? • Post-operative rehabilitation? • Type of surgical repair (open or MIS)? In conclusion we give our opinion on the indication • Open Surgery ± early rehabilitation - gold standard for athletes (competition or leisure) • diagnosis after 10 days - Avulsion of Achilles tendon insertion • Cast immobilization ± early rehabilitation (or functional bracing) • at-risk patient (vascular disease, corticosteroids etc...) - sedentary, elderly patients - proximal rupture (at musculo-tendinous junction) • Mini-invasive surgery ++Could be interesting compromise (fewer skin problems but re-rupture rate greater than open surgery) - before 10 days - excluding insertional and musculo-tendinous junction ruptures. Patients must be informed of advantages and disadvantages of the different treatment options.

Rehabilitation protocols - Ho-Seong Lee

The most important goal in Achilles tendon rupture treatment is for the patient to be able to return to their previous level of athletic activity, without re-rupture or tendon elongation. In the modern age the general public is becoming more interested in sports-related injuries and how fast the recovery will be. In line with this trend, recent focuses of Achilles tendon rupture treatment tends to aim for earlier and quicker return to pre-injury levels of physical activity. The treatment of acute Achilles tendon rupture is still debated issue. The options for treatment include non-operative treatment, traditional open repair surgery, mini open technique and percutaneous repair. The most important point of treatment of acute Achilles tendon rupture is restoration of optimal length of tendon and plantar flexor power. We reported that in case of complete excision of infected Achilles tendon, proper rehabilitation without tendon transfer can restore Achilles integrity and function. 1) This mounting evidence suggests that in acute Achilles tendon rupture, conservative treatment can be a good treatment option. Regardless of whether the acute injury was surgically or conservatively managed, rehabilitation of patients plays a crucial role for tendon healing and long-term outcome. Prolonged immobilization results in calf muscle atrophy, muscle weakness, loss of motion, deep vein thrombosis, skin necrosis, ankle contracture, and a higher re-rupture rate. Cast immobilization for 6-8 weeks resulted in functional decrease ranging from 10% (Nistor et al.) 2) 13-20% (Bradley, Tibone et al.) 3) to 12-15% (Inglis et al.) 4). Functional rehabilitation after acute Achilles tendon rupture does not increase the rate of re-rupture or other complications 5). Re-rupture occurs at the time transition from plantar flexion position to dorsiflexion (6-8 weeks after treatment), and after 3 months, does not occur. My recommendation for the treatment of acute Achilles tendon rupture is early rehabilitation after surgical repair. My rehabilitation protocol is as follows: The patient’s limb was placed in a short leg cast with a neutral ankle position for 2 or 3 weeks after tendon repair. Immobilization with neutral ankle position was more suitable rather than plantar flexed ankle position because it allows earlier full weight bearing, and the risk of re-rupture at the time of weight bearing could be reduced. Around 2 to 4 days after surgery, tolerable weight bearing ambulation was permitted. Depends on patient’s ability, crutches can be used, but usually full weight bearing ambulation without crutch is possible before cast removal. The cast was replaced with a customized, below-the-knee walking brace after cast off. Full weight-bearing ambulation with the brace was allowed. The brace had an adjustable range of motion of the ankle joint, from 0 to 45 degrees, adjustable in 5 degree increments. For the first 3 weeks after applying the brace, dorsiflexion was restricted to 0 degrees while full plantar-flexion was allowed. During the next 3 weeks, dorsiflexion was restricted to 10 degrees, with free plantar-flexion. Patients were encouraged to perform self-exercise with the theraband frequently during the daytime for plantar flexion strengthening exercise without the brace. Indoor cycling with brace was allowed at these period. In addition, muscle strengthening exercise of the quadriceps, hamstring, and hip abductor muscles with the brace applied was encouraged. At the 8th-10th weeks postoperatively, after removal of the brace, the patients were encouraged to perform indoor cycling, single leg stance exercise, and both heel or single heel raising exercise depending on the patient’s performance. At the 10th-12th weeks postoperatively, dorsiflexion exercise and frictional massage of calf muscle and repaired tendon were encouraged. At 12 weeks postoperatively, the patients underwent single leg standing on the form pad and soft pad to recover proprioception. I encourage the patient jogging even though it is incomplete at 3 months.
FREE PAPERS (FP2)

Results And Outcomes Of Percutaneous Fixation Of Acute Achilles Tendon Ruptures: A Randomised Control Trial - Meletis Rozis
Co-authors: Ioannis Benetos, Vasilios Polyzois, John Vlamis, Spyros Pneumaticos

Background: Achilles tendon rupture is a common entity. Surgical fixation is the treatment of choice with open and percutaneous repair consisting the main operative techniques. The objective of this study was to compare the final outcomes and complication rates of these surgical options.

Aim: To evaluate the results and complications of percutaneous Achilles rupture repair, compared to open suturing.

Study Design & Methods: From 2009 to 2016, patients with clinically and radiologically confirmed acute Achilles tendon rupture, were randomised into two groups, Group A (open repair) and Group B (percutaneous suturing). Suture equipment was the same for both groups. All patients followed the same rehabilitation protocol. Functional evaluation was made using AOFAS hindfoot and ATRS questionnaires at 12 months follow up. Ankle range of motion (ROM), return-to-work time and complication rates were additionally measured.

Results: Both techniques had similar results respecting complication rates and return-to-work time. The major complication in Group A was superficial infection (7%) and skin necrosis (3%), while 3 patients in Group B developed paresthesias due to sural nerve entrapment. Patients in group B had better AOFAS hindfoot (96/100) and ATRS (95/100) scores, but the difference was not significant. ROM was similar in both groups at 12 months follow up.

Conclusions: Percutaneous suturing seems to be a safe and effective technique that offers good functional outcomes and low complication rates in patients with acute Achilles tendon ruptures.

Clinically significant gastrocnemius tightness in patients with foot & ankle pathology – how prevalent is it really? - Karan Malhotra
Co-authors: Oliver Chan, Sam Bullen, Nick Cullen, Andy Goldberg, Dishan Singh

Background: Gastrocnemius tightness (GT) predisposes to musculoskeletal pathology and there is an emerging trend for surgical release. However, it is unclear what proportion of patients with foot and ankle pathology (FAP) have clinically significant GT.

Aims: We investigate the prevalence and degree of GT in the foot and ankle population compared to the normal population.

Methods: This was a prospective, case matched, observational study comparing GT in a cohort of patients with FAP to GT in controls without foot and ankle pathology matched for age, gender, and ethnicity. GT was measured using a digital inclinometer and the lunge test. It was calculated as the difference between maximal ankle dorsiflexion with the knee extended and with the knee flexed.

Results: After 1:3 case-matching 97 FAP cases were paired with 291 controls. Mean GT was 8.0° ±5.7° (range: 0-21°) in the FAP group versus 6.0° ±3.5° (range: 0-16°) in controls (p<0.001). Subgroup analysis revealed mean GT of 10.3° ±6.0° in patients with forefoot pathology (FoP) versus 6.9° ±5.3° in other FAP patients (NFoP) (p=0.008). When comparing NFoP patients to controls, there was no difference in GT (p=0.188). 21 FAP patients (21.6%) and 12 FoP patients (37.5%) had GT greater than 2 standard deviations of the control group (>13°).

Conclusion: Based on our normal population, GT greater than 13° may be considered abnormal. Most patients with FAP do not have abnormal degrees of GT, compared with the normal population, but it is present in over a third of patients with forefoot pathology.

Treatment of chronic osteomyelitis in diabetic feet with antibiotic loaded bone graft substitute bicomposite - Noman尼亚zi
Co-authors: Anand Pillai, Efstathios Drampalos

12th EFAS International Congress, October 4-6, 2018, Geneva, Switzerland
Background & Aim: Diabetic foot ulcer is associated with a high morbidity and a common cause of non-traumatic lower limb amputations. Osteomyelitis is difficult to treat in diabetic feet with high recurrence rate. We report a prospective study of 28 patients in which adjuvant local antibiotic carrier is used to treat chronic osteomyelitis in diabetic feet.

Methods: 28 (18 male, 10 female) patients were included. Average age was 62 years (range 39 – 88). 7 patients had charcot foot deformity and 8 patients had critical limb ischemia with revascularization procedures. 82% (23 patients) were Type II diabetic. Debridement and local application of antibiotic-loaded absorbable calcium sulphate/hydroxyapatite biocomposite (Ceramet G) was used, combined with multiple sampling and culture-specific systemic antibiotics guided by a multidisciplinary team. VAC dressing was used in 5 patients.

Results: All patients were followed up after the surgical procedure until control of infection and ulcer healing for a mean of 6 months (range 3 to 11 months). 39% of patients had forefoot involvement, 14% midfoot and 46% hindfoot involvement. CRP came back to normal in all patients. The frequency of isolated pathogens was 25% (7 patients) had aerobic gram-positive bacteria and 75% (21 patients) had mixed organisms. Staphylococcus aureus (53 %) was the most common organism including 5 patients having MRSA infection. Infection was eradicated in 26 patients (93%). Out of two patients not cured, one ended in below knee amputation and other had persistent infection. In two patients the primary ulcer heals but the new ulcer developed in different part of foot. No recurrence of infection and fracture was seen.

Conclusions: Ceramet G is an effective method of local delivery of antibiotics in chronic osteomyelitis with more than 90% success rate. It helps in dead space management after excision of infected bone, eradication of infection and ulcer healing. This method effectively offers increased bone preservation, maintain bone length, improve function of foot and decreasing the need for major amputation.

How are coronal alignments of the knee and hindfoot correlated? A clinical study of 124 lower limbs using 3D weight bearing imaging - François Lintz

Co-authors: Maryama Dufrenot, Cesar de Cesar Netto, Alessio Bernasconi, the Weight Bearing CT International Study Group, Louis Dagenaux

Background: Previous literature has suggested that hindfoot and knee coronal alignments may be related and that there might be some degree of compensation between the two but focusing on the effects of knee surgery, not on preoperative relationship. New insight may be given by recent 3D weight bearing imaging technology.

Aim: To analyse the preoperative relationship between knee and hindfoot coronal alignments using bilateral weight bearing CT (WBCT) and biplanar low dose radiography (BLDR).

Material: Ethical approval was obtained for a retrospective comparative study, including 124 limbs in 62 patients. Age, gender and BMI were recorded. Hindfoot alignment was measured using a semi-automatic software (TALAS, Curvebeam, Warrington PA, USA) and given as Foot Ankle Offset (FAO). Knee alignment was measured using the EOS platform (EOS Imaging, Paris, France) and given as HKA. Distribution, demographics and correlations of hindfoot alignment in the varus and valgus knee groups were studied.

Results: Incidence of Varus hindfeet was 15.8% in the Valgus knee group and 25.5 % in the Varus knee group but the difference was not significant (p=0.82). Bland and Altman plots did not yield any additional result. No linear correlation was found between hindfoot and knee coronal alignments in the study population.

Conclusions: Our results do not confirm prior findings regarding compensatory hindfoot valgus in varus knees. In practice, these results suggest that in cases where knee and hindfoot misalignments are associated, the causes for each should be analyzed independently before any assumption is made as to hypothetical interactions.

The orthopaedic surgeon as an agent of a public health program in Brazil: the case of clubfoot - Fernanda Catena

Background: clubfoot treatment has changed in the last two decades and became more reproductible, faster, efficient and with better long-term results with Ponseti Method. Brazilian orthopaedic surgeons organized a medical educational program based on mentorship, and construction of a national net of public reference clinics aiming to
facilitate the access of children and their families and treat clubfoot in the correct way, eradicating the neglected deformity in Brazil.

**Methods:** a group of orthopaedic surgeons dedicated to diffuse and work for the correct application of Ponseti Method, the Brazilian branch of Ponseti International Association, worked together with Rotary Foundation in a grant to support training of 50 orthopaedic surgeons, already working with children with clubfoot deformity in different public services in Brazil. Ten orthopaedic surgeons were trained by ten mentors in every of the 5 parts of the program, in different cities. The medical educational program consisted of 5 days with a previous theoretical webconference course; each trainee worked with his/her mentor discussing how to implement a reference clinic, and examining, applying long leg casts and discussing about patients follow up. Involvement of community, health managers and parents associations intended to make the program stronger.

**Results:** 50 orthopaedic surgeons were trained and are developing reference public clinics, and each center is, or soon will be able to treat about 50 - 100 new children with clubfoot per year, and follow up the treated cases, watching out for relapses and actively treating them. That will cover about 2500 - 5000 children born with clubfoot in Brazil. Centers will also be able to train new professionals to amplify this net of public reference clinics to treat children with clubfoot. Orthopaedic surgeon felt empowered and stimulated to treat clubfoot deformity in the most efficient way and are well connected in a professional net being able to help each other.

**Conclusion:** This program of medical education based on mentorship seemed to be effective in expanding the public net of professionals able to treat children born with clubfeet in Brazil. If children are treated as babies, the neglected deformity will be eradicated and orthopaedic surgeons may had success in implementing a very efficient public health policy.

**Arthroscopic therapy of the subtalal impingement syndrome in patients with therapy resistant heel pain - Micha Hoyer**

*Co-authors: Tatiana Guershman, Fernanda Catena*

**Background:** The subtalal impingement syndrome often causes discomfort radiating to the heel.

**Aim:** The aim of the study was to determine whether in patients with therapy-resistant heel pain a subtalal impingement syndrome with tendinitis of the FHL tendon causes the problems and whether an arthroscopic debridement of the FHL tendon and resection of the subtalar Impinging Syndrome Patients with therapy-resistant heel pain can be treated satisfactorily?

**Method:** From 01.01.2016- 31.07.2017 in a prospective study patients with the diagnosis therapy resistant heel pain and symptom duration longer than 6 months, after MRI diagnostics as well as a positive switch-off test of the FHL tendon with local anesthesia were treated with arthroscopy of the subtalar joint, arthroscopic resection of dorsal osteophytes on the talus, arthroscopic synovectomy and an arthroscopic debridement of the FHL tendon. Postoperatively, all patients were immediately mobilized under pain-loaded full weight bearing. Preoperatively, 6 weeks and 3 months postoperatively, the AOFAS score and the VASpain score determined.

**Results:** 40 patients were included in the study (age, 57.6 years (35-77), 30% male). No wound healing problems or infection was observed in any patient: 1 patient suffered damage to the medial ramus of the posterior tibial nerve. The AOFAS Score was 3 months postoperatively on average 92.6 (86-100 points), the VAS pain score was 3 months postoperative 2.5 (0-4). Both the AOFAS score and the VAS pain score were significantly improved at the time of follow - up compared to preoperative status (p <0.05).

**Conclusion:** The differential diagnosis of subtalal impingement syndrome and tendinitis of the FHL tendon In therapy resistant heel pain treated with an arthroscopic therapy brings a significantly improvement of pain and function and is an easy procedure with low complication rate.

**Prevalence of AALTF and relevant associated MR findings in persons with and without sinus tarsi pain - Chul Hyun Park**

**Background:** Sinus tarsi pain (STP) is common, however, etiology of this condition has not been well understood.

**Aim:** The purpose of this study was to evaluate differences of MRI findings between persons with and without STP and to investigate the relationships of STP and accessory anterolateral talar facet (AALTF).
Method: We reviewed MR images of 120 ankles with STP in 115 consecutively registered patients. And age- and sex-matched MR images of 120 ankles without STP were also reviewed. We compared the presence of AALTF (Fig. 1), calcaneal cyst (CC) (Fig. 2), bone marrow edema (BME) (Fig.3), sinus tarsi fat obliteration (STFO) (Fig. 4), and coalition between persons with and without sinus tarsi pain. We also compared Gissane angle, talar inferolateral surface angle (TILSA) (Fig. 5), and calcaneal cortical thickness (CCT) (Fig. 6). Of persons with AALTF, we compared these parameters between persons with and without STP and evaluated the associations between MRI findings and presence of STP.

Results: AALTF was present in 62 ankles (51.7%) with STP and 34 ankles (28.3%) without STP (P<0.001). BME (P=0.001) and STFO (P=0.009) were significantly more frequent in persons with sinus tarsi pain. Gissane angle was significantly smaller in persons with STP than in persons without STP (P<0.001) and TILSA (P=0.032), and CCT (P<0.001) were significantly larger in persons without STP (Table 1). Of persons with AALTF, BME was significantly more frequent in persons with STP (P=0.017) and Gissane angle was significantly smaller in persons with STP (P=0.022) (Table 2). BME (P=0.016, OR 7.571) and Gissane angle (P=0.026, OR 0.891) were significantly associated with STP (Table 3).

Conclusion: The prevalence of AALTF is significantly higher in persons with STP. Presence of BME and smaller Gissane angle may be associated with occurrence of STP in persons with AALTF.

Simultaneous coalition resection and corrective osteotomies for pes planovalgus in symptomatic talocalcaneal coalition in adolescents - Mohamed Mokhtar Abd-Ella

Background: Resection of a symptomatic talocalcaneal coalition in an adolescent without correction of the planovalgus deformity aggravates the problem because the tight peroneal tendons and triceps surae pull the heel into more valgus after release of the subtalar joint.

Aim: To evaluate the clinical results of resection of symptomatic talocalcaneal coalition in adolescents with simultaneous correction of the planovalgus deformity using combined bony and soft tissue procedures.

Methods: In 24 feet in 21 adolescents (age 13 to 17) with symptomatic talocalcaneal coalition and planovalgus deformity, resection of the coalition was performed together with simultaneous medial displacement calcaneal osteotomy, lateral column lengthening, Cotton osteotomy if needed, gastrocnemius recession, and peroneal tendon fractional lengthening. Follow up evaluation was done using the AOFAS hindfoot score and subjective patient satisfaction. Complications and reoperation were reported.

Results: After a minimal follow up of one year (range 1 to 5 years), the results were classified excellent in 12 feet, good in 8 feet, and fair in four feet using the AOFAS hindfoot score. Subjective patient satisfaction was graded excellent in 14 feet, good in 6 feet and fair in four feet. Two patients underwent subsequent subtalar fusion with subsequent improvement and satisfaction. Other complications included superficial wound problems in 5 feet, and talar incomplete fracture during coalition resection which was fixed in one foot.

Conclusion: Resection of a symptomatic talocalcaneal coalition with simultaneous correction of pes planovalgus deformity is a good option for management of such problem in adolescents.

3D biometrics: A prospective comparative evaluation of the Foot Ankle Offset using weight bearing CT semi-automatic software - François Lintz

Co-authors: Shu Zhang, Jiangzhong Zhang

Background: The Foot Ankle Offset (FAO), a 3D biometric measurement using semi-automatic weight bearing CT (WBCT) software has been reported valuable for hindfoot alignment but has never been studied prospectively and compared to a traditional 2D measurement.

Aim: The objective was to prospectively assess the clinical relevance and reproducibility of the FAO value for hindfoot alignment and compare it with previous findings.

Method: After ethics committee approval, 140 feet (71 patients) were enrolled and divided into 3 groups depending on clinical alignment (65 normal, 41 valgus, and 34 varus). All patients had a bilateral WBCT, and the FAO values were recorded. The long axial view angle (HAct) was measured on Digitally Reconstructed Radiographs (DRR)
as comparison. All values were measured and compared by two different investigators. The reproducibility of FAO and HAct were calculated using intraclass correlation coefficients (ICCs) and regression analysis was conducted to study the correlation between the two methods.

Results: in the clinically normal FAO/HAct was 1.69%±2.58%/4.13±2.67, in valgus, FAO/HAct was 7.46%±3.18%/9.00±3.43; in varus, -6.11%±4.55%/7.49±6.06. The intra- and interobserver reliability were 0.991/0.992 and 0.976/0.976. HAct and FAO had good linear correlation (R²=0.778), with a 1.083 regression slope.

Conclusion: Hindfoot alignment can be measured reliably using WBCT. The present study is the first prospective comparative assessment of this technology and shows that FAO has good repeatability, correlates well with clinical examination, 2D findings and previous literature.

Does the size of os trigonum matter on flexor hallucis longus tendon lesions? - Mehmet Ali Tokgöz
Co-authors: Ulunay Kanatlı, Muhammet Baybars Ataoğlu, Yılmaz Ergişi, Hasan Hüseyin Bozkurt

Background: Os trigonum (OT) is an anatomic variation which is failed fusion of lateral tubercle secondary ossification center mostly. These anatomic variations are generally asymptomatic; nevertheless, they can be symptomatic because of posterior ankle impingement syndrome (PAIS) after repeated microtrauma and in some cases flexor hallucis longus tendon (FHL) lesions accompanied it.

Aim: In this study, we hypnotized that larger size of OT can affect FHL, so tendinitis, degeneration and partial tear can be developed.

Method: A total of 104 patients who underwent posterior ankle arthroscopy were included study. Subjects were divided into two groups according to presence of OT (50 subjects) and compared status of FHL tenosynovitis retrospectively. Sagittal length and axial width of OT were measured on MRI on 21 ankles to determine effect of OT size on FHL lesions and correlated them with arthroscopic findings.

Results: FHL tenosynovitis was identified statistically significant in OT group (p: 0.01). Statistical analysis revealed that as the length of OT increased, the frequency of degeneration (p: 0.03) and partial tear (p: 0.00) of FHL increased. No correlation was found between width of OT and FHL lesions on axial images.

Conclusion: Endoscopic OT excision for PAIS is reported in literature but the relationship between OT and FHL lesions haven't been investigated to the best of our knowledge. If length of OT increases, it affects FHL, whereas same effect cannot be detected about width of OT. According to our hypothesis, if sagittal size of OT become longer, the groove of FHL would be narrowed.

FRIDAY, 5 October 2018

PRESIDENTIAL INSTRUCTIONAL LECTURE

Deltoid and spring ligament injuries - Beat Hintermann

Although most of all ligamentous ankle injuries can be treated successfully with physical rehabilitation and nonoperative treatment, 20% to 40% of patients with ankle injuries will go on to experience chronic instability and subsequent disability. Many of these patients can be treated satisfactorily with late repair or reconstructions of the lateral ligaments. However, in spite of surgery and extended physical rehabilitation, some patients will be left with persistent disability including symptomatic instability. In these cases, the patient’s feeling of ‘giving way’ of the ankle during daily and sports activities might not be explained sufficiently by a residual mechanical and/or functional instability of the lateral ankle. One of the causes may be an impairment of the medial ankle ligament. While much is known about the kinematic changes and clinical presentation of lateral ankle instability, very little objective data is available regarding the medial ankle instability. The Spring ligament complex can often also be damaged. Subsequently to an injury to the plantar calcaneonavicular ligament (Spring ligament), which maintains the medial longitudinal arch, a progressive acquired flatfoot deformity may be developed. Reconstructing the ligamentous constraints of the medial ankle and medial arch remains a challenge, especially when associated with adult acquired flatfoot deformity. Experimental work has shown that the fixation points and lines of action of a medial
ligament reconstruction have important implications on stability of medial ankle joint complex and deformity correction of the medial arch. A repair of the deltoid and Spring ligament complex is indicated in loss of control of medial hindfoot as typically seen with pronation/eversion movement of the mid- and hindfoot when loading the foot, while the foot looks normal when unloaded. Surgical repair of the deltoid and Spring ligament complex is indicated in the case of an acute injury, e.g. where the remaining ligament stumps are strong and well preserved. In chronic rupture cases, an augmentation with autogenous tendon material can be helpful to get a strong construct. However, it must be strictly anatomical and not tenodese the medial malleolus to the navicular bone. Tendon allografts and internal braces can also be used, instead. In younger patients, subtalar arthrodesis can be considered to protect the reconstructed deltoid and Spring ligament. In older patients, calcaneal lengthening osteotomy may be used instead.

PLENARY SESSION: STATE OF THE ART HINDFOOT SURGERY

Flatfoot - Johannes Hamel

Flatfoot deformity can develop from a wide range of etiologies: congenital (vertical talus), neurogenic, posttraumatic, tarsal coalition, rheumatoid, degeneration of Lisfranc joints and others. The focus of this overview confines to the surgical options in what can be called the “idiopathic flatfoot” and describes this entity as a continuum in different age groups. Flatfoot deformity can be described with two complementary pathomorphologic phenomena: Excessive eversion of the hindfoot complex and destabilization of the medial ray, in many cases with concomitant gastrocnemius contracture. In later stages soft tissue structures tend to decompensate (especially spring ligament complex, posterior tibial tendon and delta ligament in late stages) with further deterioration of deformity. Conservative treatment with orthotics and physical therapy have limited effect on the further course.

For the foot and ankle surgeon three age groups are of interest. There is a wide range of opinions as to indication and form of surgical treatment in different age groups. The principles are as follows: 1. Arthrosis aims at temporary restriction of excessive eversion of the hindfoot complex in a child with 2 to 3 years of further growth ahead. Deformity correction is achieved by persisting stabilization of the hindfoot as well as the medial ray due to effects of guided growth. The published results are good in a high percentage of cases with low complication rates. However, there is much discussion as to the indication: Never indicated (e.g. American pediatric orthopedic surgeons), indicated only in “symptomatic” cases or frequently used if requested by the parents (some podiatrists).

The author defines the indication from a combination of anamnestic factors (pain, restricted walking capacity), clinical examination (gastroc-tightness, callosities) and standardized radiologic examination (TMT-Index). Thus, in major deformity even an “asymptomatic” child may be treated. 2. The range of recommendations for severe flatfoot in adolescents and young adults is wide as well: Some authors use isolated arthrosis even after growth arrest, others perform multiple osteotomies. However, it seems to be widely accepted, that only symptomatic cases should be treated surgically in this age group, that bony correction without soft tissue treatment (with exception of gastro-lengthening) is advisable and effective and that the procedure should include some form of joint-preserving (with exception of the NC-joint) stabilization of hindfoot complex and medial ray. Modern concepts for three-dimensional correction are for example Triple-C procedure (Rathjen and Mubarak 1998), Tarsal-Triple-Osteotomy (Hamel et al 2014) and various combinations of arthrosis, tarsal osteotomies and NC-fusion. Peritalar fusions are considered only in extreme cases. 3. In AAFD (Adult Acquired Flatfoot Deformity) surgical treatment should be initiated after a limited period of (unsuccessful) conservative treatment to prevent further damage to the soft tissues and should be somehow stage-dependent. However, because of difficulties in staging and a broad range of controversial published results with various procedures a general accepted “state of the art” still does not exist. Bony correction in moderate cases follows the same principles as in the younger age group, additional soft tissue procedures are in discussion. Some tendencies in recent literature are: a) Hindfoot stabilization should be sufficient, sliding calcaneal osteotomy being still the standard procedure for mild cases and double-arthrodesis (TN and TC-joint) for advanced cases. There is a tendency towards fusion in recent literature. b) Stability at the medial ray has the same importance as at the hindfoot and several recent studies deal with osteotomies and fusions in this region. Incomplete restoration of osteoligamentous tarsometatarsal stability has a high risk of relapse or valgus ankle development. c) Some authors are doubtful as to the necessity of additional soft tissue reconstruction, especially FDL-reinforcement. However, remarkable amount of inversion-power can be generated by tendon transfer in cases where posterior tibial tendon function cannot be restored and meticulous repair of spring ligament and deltoid ligament complex seem to have a place in the treatment concept on the other hand. d) Minimally invasive procedures gained increasing interest, such as percutaneous calcaneal slide osteotomy (which has proven to be effective), tenoscopy of posterior tibial tendon with debridement (indication and effect not yet completely clear) and hindfoot stabilization with sinus tarsi spacer (used in combination with other procedures and often only temporarily because of pain). The “idiopathic” flatfoot has different manifestations in late childhood, adolescents, young adults and the elderly. Arthrosis and joint-preserving osteotomies are effective for juvenile forms, whereas tarsometatarsal stabilization with or without soft tissue reconstruction are used stage-dependent in AAFD.
Pes cavus - Dishan Singh

Introduction: This talk will focus on the neurological pes cavus and conditions which are not neuromuscular in nature (subtle pes cavus) will not be covered. The neurological pes cavus deformity can appear to be overwhelming in its complexity to the uninitiated but modern management can be simplified by following simple principles. Pathomechanics and Aetiology Pes cavus can be considered initially in the sagittal plane deformity with 3 types:

- a plantarflexion of the first metatarsal at the forefoot on the hindfoot (Anterior cavus)
- a plantarflexion of the whole forefoot on the hindfoot (Midfoot cavus or Pure cavus)
- a dorsiflexion of the hindfoot on the forefoot (Posterior cavus)

Whilst the choice of definition could be only a matter of perspective, the forefoot perspective is primarily utilized in defining pes cavus due to the dominance, probably aetiological in nature, of the forefoot as the more rigid deforming influence of the deformity and vice versa. Initially flexible and subsequently rigid components in all three body planes, with a high longitudinal arch dominating in the sagittal plane, lead to multiple planar possibilities of associated deformities, coupled with the major sagittal plane deformity.

The more common types are: - Pes cavovarus where a secondary (initially flexible and subsequently rigid) hindfoot varus accompanies the plantarflexed first metatarsal. The deformity is 3 dimensional and in fact a forefoot pronation leading to a secondary hindfoot supination. An accompanying Achilles tendon tightness leads to an equino-cavovarus. This is the most common deformity in Charcot Marie Tooth disease (CMT or HSMN) - Pes calcaneovalgus where, for example in some polio cases, a relative weakness in the Achilles tendon leads to a rearfoot dorsiflexion with secondary valgus deformity. The need to identify muscle imbalance and its compensation is extremely important and a team approach to diagnosis will identify the prognosis and classify whether the neuromuscular deforming forces are static (eg adult presentation of cerebral palsy or spinal dysraphism), slowly progressive (CMT) or rapidly progressive (some types of myopathy or CMT). BEWARE of the unilateral pes cavus in adolescence: a spinal tumour or spinal dysraphism need to be ruled out first. A guiding principle is that a deformity that occurs in adulthood after bony growth has been completed will only deform joints. On the other hand, a muscular imbalance in childhood and adolescence will deform both joints and the bone itself. Management It is highly recommended as discussed above that all patients are managed by a team which includes a neurologist, foot and ankle surgeon, physiotherapist and orthotist. Many teams like the one I deal with at the Hospital for Neurology and Neurosurgery also include an electrophysiological testing specialist, a geneticist and a nurse adviser. Physiotherapy is important to maintain power in functioning muscles and reduce secondary deformity. Flexible deformity is corrected by corrective orthoses and fixed deformity is compensated by accommodative orthoses. The majority of patients manage adequately with physiotherapy and orthoses. The aim of surgery is to achieve a stable, plantigrade and relatively less painful foot. In my unit we adopt the Stanmore principles first formulated by Naughton Dunn:

Put the Foot below the leg • Put the Foot square to the ground

BALANCE THE MUSCLE POWERS

The latter is the aspect most ignored by those unaccustomed to treating neuromuscular disorders Place the hindfoot under the leg

Evaluating the range of dorsiflexion available with the knee straight and the knee flexed as described by Silverskiöld is considered the standard protocol to differentiate an isolated gastrocnemius tightness from a combined gastrocnemius/soleus tightness.

Bony and soft-tissue procedures may be used for the correction of equinocavus foot deformity. Commonly there is need for combined soft-tissue and bony surgery to achieve adequate correction.

The correction of hindfoot varus can be achieved by using osteotomies (joint sparing) or arthrodesis. In patients showing impingement at the ankle with limited dorsiflexion or severe hindfoot equinus, a modified Lambrinudi procedure is carried out for correction. Place the foot on the ground

The author does not believe that the plantar fascia is tight in a typical cavus foot and does not usually perform a plantar fascia release in adults.
Correction of plantarflexion of the 1st metatarsal is achieved by the Tubby extension osteotomy of the 1st metatarsal. In cases showing dynamic clawing of the great toe with hyperextension at the 1st metatarso-phalangeal joint, a modified Jones procedure which includes the transfer of the extensor hallucis longus to the 1st metatarsal bone and a fusion of the first interphalangeal joint may be added. The author does not see a role for a Jones procedure without a dorsiflexion osteotomy of the metatarsal in adults Balance the muscles • In contrast to muscular imbalance which is caused by atrophy, transfer of complete tendons in spastic deformities should not be carried out due to the danger for overcorrection. I prefer to perform a complete tibialis posterior tendon transfer in a CMT patient but would prefer a split posterior tibial tendon transfer in a stroke patient. Summary For a successful surgical treatment, a detailed evaluation of the patient in a team approach is of prime importance. Evaluation of the pathomechanics of the deformity and its underlying etiology is essential. Treatment strategy considers pathomechanics and aims to create a plantigrade, less painful and well-balanced foot. Bony procedures (ostotomies and/or fusions) and soft-tissue procedures (tendon/muscle lengthenings or releases) are routinely combined with tendon transfers for the elimination of underlying pathology and for balancing in neurogenic cavus foot. The author does not see a role for ankle replacements in progressive neuroligal pes cavus.

Peroneal tendon disorders - Kris Buedts

Background: Lateral Hind-foot Ankle pain (LHA) is a well known entity. Most research is done on pathology of the lateral ligamentous complex (LCL). Peroneal Tendon Pathology (PTP) is less know but still remains an important possibility in LHA and has to be included in the differential diagnosis process. Peroneal tendons (PT) provide hind foot eversion and plantar flexion of the ankle. The peroneus longus also act as a plantar flexion of the first ray.

Methods: A recent literature research has been performed searching for key words: “peroneal” and “tendons”, “tendinopathy”, “tendinitis”, “imaging”, “sport-injury”. Most reports are still some level III (retrospective Case Control studies) but more frequently Level IV (case series) and Level V (Expert opinions) Review articles are available with the most recent ones from 2000, 2006,2007, 2016 and 2017. (1,2,3,4,5).

Results: PTP can be a cause in LHA and is often overlooked. It can present itself as a functional instability feeling of the ankle joint, and so difficult to separate from LCL injuries. Dysfunction and pathology of the PT can be categorized into 3 families of disease - Tendinitis - Tenosynovitis - Tendon subluxation and dislocation. They can stand alone but are often interrelated. PTP can be Acute or Chronic. Acute lesions or mostly seen in the athletic population or during a violent trauma to the ankle joint. Every form of overuse can lead to a chronic PTP. Anamnesis (such as a traumatic event), high level of suspicion, and physical examination are the keystone to the diagnosis of PTP. Foot morphology can be a predisposed factor, such as cavo-varus foot, and must actively be sought for. Also a flatfoot morphology as seen in the adult acquired flatfoot disease can cause impingement of the PT due to reduce space at the level of the retro-malleolar groove. Weight Bearing standard radiographies are the basic technical examination performed. These can be completed by performing a CT scan in search for bony anomalies, MRI scans and dynamic ultra sound examination. Outcome after PT treatment, conservative or surgical, is difficult to assess. Most reports, as mentioned, are from level IV and V. The overlap and variability in pathologies makes is it even harder to draw conclusions.

Conclusion: PTP can be an import factor in LHA and is often overlooked. A high level of suspicion is warranted, and diagnosis is made on decent anamnensis, physical examination and correct adjuvant technical examinations. Conservative and surgical treatments options are often mentioned in level IV and V studies and conclusion are difficult to draw.

Posterior heel pain - Angelique Witteveen

Posterior Heel Pain Most of the posterior heel pain is caused by a retrocalcaneal bursitis, a Haglund's deformity or insertionl Achilles tendinitis or a combination. Patients may experience swelling that is quite tender to the touch. Standing, walking, and constrictive shoes typically aggravate symptoms. Many patients with this problem are middle-aged and some may be slightly overweight. Another group of patients who suffer from this condition are young, active runners. Treatment of posterior heel pain due to insertionl Achilles tendinitis consists of conservative and operative treatment. Conservative Treatment: - Heel Lift or the use of a shoe with a moderate heel - Calf Stretching - Nonsteroidal anti-inflammatories (NSAIDs). - Weight Loss - Cast or Walker boot Operative Treatment: 1. Removing the prominent excess bone associated with the Haglund's deformity. 2. Removing the inflamed retrocalcaneal bursa. 3. "Cleaning up" (debriding) the Achilles tendon. In some patients where there is excessive degeneration of the tendon, it is necessary to partially or completely remove the tendon and then reattach it. In these instances, it may be necessary to augment or even replace the completely degenerative Achilles tendon with another tendon, such as the big toe tendon (flexor hallucis longus). 4. Gastroc slide. Postoperative therapy consists
of a non-weightbearing cast for 2 weeks followed by a weightbearing cast for 4-6 weeks which is followed by strengthening exercises and stretching of the calf musculature.

INSTRUCTIONAL LECTURES: ANKLE FRACTURE AND ANKLE INSTABILITY

State of the art ankle instability - Yves Tourné
Introduction An in-depth approach for chronic ankle instability is suggested. A large number of parameters lead to ankle and hindfoot instability, by their interrelations: intrinsic factors (bone, ligaments and posture) and extrinsic one (injuries mechanism). The factors of stability and the joint kinematics of the ankle are reported while pathomechanics of ligaments and associated lesions are developed. Types of instability Instability can be divided in 2 groups: mechanical instability related to anatomic abnormalities of the ankle, usually related to ligament laxity, and functional instability related to posture defects or lack of proprioception. Assessement of the the lesions • The working diagnosis is supported by clinical and imaging tools in order to precisely locate the numerous ligamentous injuries, to identify the predisposing factors such as the hindfoot morphology, and any lesions associated with chronicity: anterolateral i

State of the art ankle fracture - Anthony Sakellariou

EFAS RESEARCH SESSION
Development and Validation - Martinus Richter
In 2013, the development and validation of the EFAS score started. As there was no adequate validated foot and ankle score in different European languages, the European Foot Federation (EFAS) became a committee (Score Committee) to develop and validate a new score in common European mother tongues. Previously, there were only a few scores in languages other than English, such as the visual analogue foot and ankle (English, German, Italian, Thai). Professor Richter inaugurated and headed the Score Committee. In 2018, development and validation were completed in 7 languages (German, English, French, Dutch, Swedish, Polish) and the score was published. Validating a new score in different languages requires language-specific validation, not just the translation of an already validated score into another language. Therefore, validation in particular has been a very elaborate statistical process involving more than 2800 questionnaires of different languages. This is followed by the validation of other languages (Spanish, Portuguese, Finnish, Greek)

EFAS RESEARCH PAPER AWARD PRESENTATIONS

Weightbearing CT and MRI findings of Stage II Flatfoot Deformity: Can We Predict Patients at High-Risk for Foot Collapse? - Cesar de Cesar Netto
Co-authors: Guilherme Honda Saito, Lauren Roberts, Carolyn Sofka, Jonathan Deland, Scott Ellis

Background and Aim: The objective of this study was to evaluate the correlation between bone deformity and soft tissue insufficiency in patients with stage II Adult Acquired Flatfoot Deformity (AAFD), using WBCT and MR images.

Methods: Retrospective comparative study. 55 patients (56 feet) with stage II AAFD, 20 men and 35 women, mean age of 52.5 years. Multiple WBCT and MRI variables related to the severity of the deformity were evaluated by four blinded and independent readers (two radiologists and two foot and ankle surgeons), including: arch collapse, hindfoot alignment angle (HAA), forefoot abduction, subtalar joint subluxation, sinus tarsi and subfibular impingement, and soft tissue insufficiency (posterior tibial tendon, spring and talocalcaneal ligaments).

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12th EFAS International Congress, October 4-6, 2018, Geneva, Switzerland
**Results:** We found overall good to excellent intra and interobserver reliability. Spring ligament superomedial component involvement was the only to correlate with decreased navicular-floor distance (p=0.03). Superomedial spring ligament and PTT degeneration were also significantly correlated with increased HAA (p=0.01). Involvement of the talocalcaneal interosseous ligament significantly correlated with increased forefoot abduction as measured by the talonavicular uncoverage angle (p<0.01). Spring and talocalcaneal interosseous ligaments degeneration significantly correlated to subtalar joint subluxation (p<0.001). Involvement of the talocalcaneal interosseous ligament was the only one to significantly correlate to the presence of subtibular impingement (p=0.02).

**Conclusion:** Our results demonstrated that progressive bone deformity in WBCT is significantly correlated to MRI involvement of the PTT and other important restraints such as the spring and talocalcaneal ligaments.

**Clinically significant gastrocnemius tightness in patients with foot & ankle pathology – how prevalent is it really? - Karan Malhotra**

**Co-authors:** Oliver Chan, Sam Bullen, Nick Cullen, Andy Goldberg, Dishan Singh

**Background:** Gastrocnemius tightness (GT) predisposes to musculoskeletal pathology and there is an emerging trend for surgical release. However, it is unclear what proportion of patients with foot and ankle pathology (FAP) have clinically significant GT.

**Aims:** We investigate the prevalence and degree of GT in the foot and ankle population compared to the normal population.

**Methods:** This was a prospective, case matched, observational study comparing GT in a cohort of patients with FAP to GT in controls without foot and ankle pathology matched for age, gender, and ethnicity. GT was measured using a digital inclinometer and the lunge test. It was calculated as the difference between maximal ankle dorsiflexion with the knee extended and with the knee flexed.

**Results:** After 1:3 case-matching 97 FAP cases were paired with 291 controls. Mean GT was 8.0°±5.7° (range: 0°-21°) in the FAP group versus 6.0°±3.5° (range: 0°-16°) in controls (p<0.001). Subgroup analysis revealed mean GT of 10.3°±6.0° in patients with forefoot pathology (FoP) versus 6.9°±5.3° in other FAP patients (NFoP) (p=0.008). When comparing NFoP patients to controls, there was no difference in GT (p=0.188). 21 FAP patients (21.6%) and 12 FoP patients (37.5%) had GT greater than 2 standard deviations of the control group (>13°).

**Conclusion:** Based on our normal population, GT greater than 13° may be considered abnormal. Most patients with FAP do not have abnormal degrees of GT, compared with the normal population, but it is present in over a third of patients with forefoot pathology.

**3D biometrics: A prospective comparative evaluation of the Foot Ankle Offset using weight bearing CT semi-automatic software - François Lintz**

**Co-authors:** Shu Zhang, Jiangzhong Zhang

**Background:** The Foot Ankle Offset (FAO), a 3D biometric measurement using semi-automatic weight bearing CT (WBCT) software has been reported valuable for hindfoot alignment but has never been studied prospectively and compared to a traditional 2D measurement.

**Aim:** The objective was to prospectively assess the clinical relevance and reproducibility of the FAO value for hindfoot alignment and compare it with previous findings.

**Method:** After ethics committee approval, 140 feet (71 patients) were enrolled and divided into 3 groups depending on clinical alignment (65 normal, 41 valgus, and 34 varus). All patients had a bilateral WBCT, and the FAO values were recorded. The long axial view angle (HAct) was measured on Digitally Reconstructed Radiographs (DRR) as comparison. All values were measured and compared by two different investigators. The reproducibility of FAO and HAct were calculated using intraclass correlation coefficients (ICCs) and regression analysis was conducted to study the correlation between the two methods.

**Results:** in the clinically normal FAO/HAct was 1.69%±2.58%/4.13±2.67, in valgus, FAO/HAct was 7.46%±3.18%9.00±3.43; in varus, -6.11%±4.55%-7.49±6.06. The intra- and interobserver reliability were
Lateral Discussion disappeared ankle fibula.

Materials and Methods: The study population comprised 10 patients treated by the lateral reconstruction of the fibula. The causes of the shortening and the deformity of the fibula were trauma (fracture; 7 cases: epiphysis injury, 2 cases and primary osteoarthritis of the ankle joint; 1 case). All cases had the various kinds of the instability of the ankle joint. Their age was in the range of 14–63 years. The follow-up period was in the range of 6 months–8 years and the average follow-up period was 2.5 years. The osteotomy site was the distal third portion of the fibular shaft. And then the fibula was elongated by Ilizarov External Fixator and some cases were fixed with the rocking plate. The patients were loaded with 2 crutches at 6 or 8 weeks after the surgery. We examined the function of the ankle joint and gait before and after surgery.

Results: Except one case, the clinical results of these patients were satisfied. The instability of the ankle joint was disappeared after surgery in all cases. The pain and the deformity of the ankle joint were improved.

Discussion: The shortening and the deformity of the fibula developed the lateral instability of the ankle joint. The Lateral Reconstruction of the ankle joint recovered the stability of the ankle joint and improved the symptoms for example the pain of the joint and the gait.
Summary: The lateral reconstruction of the ankle joint treated by the fibula elongation and correction improved the stability of ankle joint and was the useful method for the treatment of ankle osteoarthritis.

Weightbearing Radiographs as reliable tool for the stability in Ankle Fractures - Henrik Baeker
Co-authors: Harald Bonel, Fabian Krause, Marc Claudio Attinger

SER lateral malleolar fractures are common. The assessment of the stability of the ankle fracture is crucial for decision making of treatment which is associated with the integrity of the deltoid ligament (SERII-III). Slight talar shift can lead to extensive decrease of tibio-talar contact area (Ramsey 1999). Several clinical tests have been proposed of which static weightbearing radiography is used to measure the lateral talar shift with the medial clear space to detect medial instability (SERIV). However, the correlation of a stable ankle joint under weightbearing load with the structural integrity of the deltoid ligament has not been shown yet which we want to investigate. 35 patients with lateral malleolar fractures were investigated who underwent an MRI and weightbearing radiography examination. In the MRI, the deep deltoid ligament was assessed as intact, partial und complete rupture. The medial clear space was measured - distance between the lateral border of the medial malleolus and the medial border of the talus at the level of the talar dome (millimeter). 23 patients suffered from deep deltoid ligament rupture (19 partial; 4 complete). The medial clear space in patients with intact deep deltoid ligament was 2.94±0.13mm in mean, in partial rupture 2.77±0.14mm and in complete rupture 3.65±0.24mm. When focusing on the significances, the complete rupture group showed a significant higher medial clear space in comparison to the partial and intact deep deltoid ligament group (p<0.05). Our results show significant correlation between the medial clear space and the integrity of the deep deltoid ligament. Concluding, that a weightbearing radiograph allows to exclude deep deltoid ligament rupture and assess the stability of the ankle. This fact, indicates the importance of the intrinsic stability provided by the osseous contour and the ligaments of the highly congruent ankle joint. In our opinion, ankle fractures can be treated conservatively as long as ankle stability is provided under physiological load even though a deep deltoid ligament rupture (SERIV) may be identified.

Operatively treated malleolar fractures in Switzerland 2002-2012: Epidemiology and associations between baseline characteristics and fracture types - Diogo Vieira Cardoso
Co-authors: Victor Dubois-Ferrière, Cristophe Baréa, Didier Hannouche, Anne Lubbeke

Background: Malleolar fractures are common. Their incidence has been going up since the fifties - likely due to the increase of elderly, obese and athletic populations. Previous studies on the epidemiology of malleolar fractures were conducted in the US, Scandinavia and Scotland. Our objective was first to provide a current overview of the epidemiology of operatively treated malleolar fractures in men and women in Switzerland and second to evaluate the influence of age, sex, lifestyle factors and comorbidities on fracture types.

Methods: We included all consecutive operatively treated malleolar fractures presenting at a large Trauma centre in Switzerland between 1/2002 and 12/2012. Data were collected retrospectively from the electronic health care records. Information on lifestyle factors (BMI, smoking status) and comorbidities (ASA score, diabetes) were retrieved from anaesthesia records type of accident from emergency room reports, and fracture pattern from operative reports and radiographs (Weber classification; uni- vs. bi- vs. trimalleolaire, open vs. closed). Associations between baseline factors and fracture types were evaluated in multivariable logistic regression analyses.

Results: Overall, 2045 malleolar fractures were operated upon (median age 47yrs, median BMI 25.6, 50.5% men). Men and women differed significantly (p<0.001) in age (median 41 vs. 57yrs), obesity (16% vs. 23%), diabetes (5% vs. 10%), current smoking (45% vs. 24%), and accident type (domestic/daily activities 48% vs. 79%, transportation 24% vs. 9%, sports 21% vs. 8%, other 7% vs. 4%). Overall, there were 2% Weber A, 77% B, and 21% Weber C fractures. 54% were uni-, 25% bi-, and 21% trimalleolar. 7.5% of all fractures were open fractures. In multivariable regression analyses Weber C fractures (vs. A/B) were much more frequent (p<0.001) in men and with increasing BMI (lowest vs. highest category: 14% vs. 32%), but slightly less frequent (p<0.05) with increasing age and in current smokers. Trimalleolar fractures (vs. uni-/bimalleolar) were twice as frequent in women and increased with higher age (both p<0.001).

Conclusion: Men and women differed substantially in age, life style factors, comorbidities, type of accident and the type of the operatively treated malleolar fracture. The proportion of Weber C fractures linearly increased with
increasing BMI, whereas the proportion of trimalleolar fractures increased with higher age. These findings from a large recent cohort in Switzerland are consistent with previous publications from other countries.

Medium-long-term radiographic and clinical outcomes after surgical treatment of intra-articular Tibial Pilon fractures by three different techniques: a case series study - Carlo Biz

Co-authors: Andrea Angelini, Jacopo Tagliapietra, Marco Zamperetti, Filippo Marzotto, Pietro Ruggieri

Background and Aim: The goal of this retrospective, observational, case series study was to evaluate the medium-long-term clinical and radiographic results of the three most common surgical osteosynthesis techniques using for the treatment of tibial pilon fractures: ORIF, MIPO and EF.

Method: a consecutive series of patients with articular pilon fractures who underwent surgery at our institution were enrolled in this study. Fractures were classified according to the Muller-AO classification system. Overall outcomes took the following into account: radiographic quality of reduction, evaluated using Ovadia and Beals' criteria; clinical assessment, evaluated using the AOFAS questionnaire; and general health, evaluated with the SF36-v2 Health Survey.

Results: A total of 94 articular pilon fractures (34 type 43-B and 60 43-C) were evaluated with a mean follow-up of 56.34 months (range 33-101). The techniques used were ORIF, MIPO and EF in 63 (67.02%), 17 (18.9%) and 14 cases (14.89%), respectively. According to Ovadia and Beals' criteria, good, fair and poor results were reported in 61 (64.89%), 26 (27.66%) and 7 (7.45%) cases, respectively. The mean AOFAS score was 82.41 for the MIPO, 79.83 ORIF and 50.57 for EF, respectively. Thirty-nine patients (41.49%) presented early and/or late complications.

Conclusion: satisfactory outcomes using the three different techniques were reported. The radiographic outcomes were inversely proportional to the fracture comminutions, statistically different between internal and external osteosynthesis, but comparable between ORIF and MIPO techniques. On the other hand, the clinical outcomes were closely related to the soft tissue conditions and the anatomical reconstruction of the joint.

Casting Versus Deltoid Ligament Repair in SER Type IV Equivalent Ankle Fracture: A Prospective Randomized Controlled Study - Chammanni Rungprai

Co-authors: Yantharat Sripanich, Nattapol Pholpradubpet, Piriya Panichpibool, Parinya Maneeprasopchoke, Nusron Chaiprom,

Background: There remains a controversy to repair deltoid ligament in ankle fracture SER type IV equivalence. Some surgeons prefer conservative treatment with casting while others prefer deltoid repair after distal fibular fixation. However, there is a little evidence to report comparative outcomes between the two techniques.

Aim: The purpose of this study was to compare outcomes and complications between the two methods.

Method: A prospective, randomized collected data of 41 consecutive patients who were diagnosed with SER type IV equivalent ankle fracture and underwent either conservative treatment (31 patients) or deltoid repair (31 patients) between 2015 and 2018. A minimum follow-up to be included in the study was 6 months (mean, 14.2 months; range, 6 to 30 months). The primary outcome was VAS, SF-36, and FAAM. The secondary outcomes were time to return to activity of daily living, sports, work, and complications.

Results: There were 62 patients (51 male and 11 female) with mean age of 34.2 years and mean BMI of 26.1 kg/m2. Both methods demonstrated significant improvement of post-operative functional outcomes (FAAM, SF-36, and VAS (p < 0.01 all)) compared to pre-operative period; however, there was no significant different between the two groups. Functional outcomes between casting and deltoid repair groups were time to return to activity of daily living (10.4 vs 10.7 weeks), works (12.1 vs 12.9 weeks), sport (25.9 vs 23.7 weeks), weight bearing medial clear space (2.9 vs 3.6 mm), and complications included medial side ankle pain (60 vs 14%), medial side ankle instability (25 vs 0%), and painful screw post (0 vs 10%) for cast and deltoid repair respectively.

Conclusion: Both casting and deltoid repair were demonstrated significant improvement in terms of functional outcomes as measured with the FAAM, SF-36, and VAS in patients with SER IV equivalent ankle fracture. Although there was no significant difference of functional outcome in short term of follow-up, deltoid repair group was better in term of medial side ankle pain and lesser medial clear space widening.
**Arthroscopic Treatment for Ankle Joint Tuberculosis - Xiaojun Duan**

**Background:** Tuberculosis is mainly diagnosed in lungs and the treatment is still challenged. There are very few reports on ankle tuberculosis diagnosis and arthroscopic management.

**Aim:** To preliminarily investigate the clinical efficacy of ankle arthroscopic minimal invasive treatment for ankle joint tuberculosis.

**Method:** All the patients had local swelling, tenderness, and antaligic gait. 29 cases of ankle joint tuberculosis from April 2008 to January 2012 in our department were treated with ankle arthroscopy, including 16 cases of arthroscopic clearance of tuberculosis foci and 13 cases of arthrodensis due to severe joint destruction. The diagnosis was based on a smear positive for acid-fast bacilli, histopathology, or clinicroradiological findings. After surgery, the patients were given combined, regular, adequate and consistent anti-tuberculosis treatment as well as nutritional support.

**Results:** The postoperative recovery of the patients was fast, and the general condition was tolerable. With an average follow-up of more than 12 months, the ankle swelling of the 29 patients was reduced; the pain was relieved, and the erythrocyte sedimentation rate was decreased; 1 case of sinus recurrence was cured after change of dressing. According to Baird ankle function score, 16 cases were excellent, 8 cases were good, 5 cases were tolerable, and the excellent and good rate was 82%.

**Conclusion:** Ankle arthroscopy can directly observe and treat the pathological changes inside the ankle joint, offering accurate diagnosis for treating foci. Arthroscopic surgery has less trauma, quick recovery, and is more effective.

**Weightbearing CT and MRI findings of Stage II Flatfoot Deformity: Can We Predict Patients at High-Risk for Foot Collapse? - Cesar de Cesar Netto**

**Co-authors:** Guilherme Honda Saito, Lauren Roberts, Carolyn Sofka, Jonathan Deland, Scott Ellis

**Background and Aim:** The objective of this study was to evaluate the correlation between bone deformity and soft tissue insufficiency in patients with stage II Adult Acquired Flatfoot Deformity (AAFD), using WBCT and MR images.

**Methods:** Retrospective comparative study, 55 patients (56 feet) with stage II AAFD, 20 men and 35 women, mean age of 52.5 years. Multiple WBCT and MRI variables related to the severity of the deformity were evaluated by four blinded and independent readers (two radiologists and two foot and ankle surgeons), including: arch collapse, hindfoot alignment angle (HAA), forefoot abduction, subtalar joint subluxation, sinus tarsi and subfibular impingement, and soft tissue insufficiency (posterior tibial tendon, spring and talocalcaneal ligaments).

**Results:** We found overall good to excellent intra and interobserver reliability. Spring ligament superomedial component involvement was the only to correlate with decreased navicular-floor distance (p=0.03). Superomedial spring ligament and PTT degeneration were also significantly correlated with increased HAA (p=0.01). Involvement of the talocalcaneal interosseous ligament significantly correlated with increased forefoot abduction as measured by the talonavicular uncoverage angle(p<0.01). Spring and talocalcaneal interosseous ligaments degeneration significantly correlated to subtalar joint subluxation (p<0.001). Involvement of the talocalcaneal interosseous ligament was the only one to significantly correlate to the presence of subfibular impingement (p=0.02). Degeneration of the PTT was significantly associated with sinus tarsi impingement (p=0.04).

**Conclusion:** Our results demonstrated that progressive bone deformity in WBCT is significantly correlated to MRI involvement of the PTT and other important restraints such as the spring and talocalcaneal ligaments.

**Low Incidence Of Complications Of The Arthroereisis With Calcaneo-Stop For The Treatment Of Paediatric Flexible Flat-Foot At Long Term Follow-Up - Elena Samaila**

**Co-authors:** Margherita Gelmini, Erica Invernizzi, Bruno Magnan

**Background:** The most difficult aspect regarding treatment of the pediatric flatfoot is understanding who needs surgery, when it's necessary and what procedure to be done. Surgical technique can be divided in: soft tissue,
bony procedures and arthroereisis. In our therapeutic algorithm the Gold Standard treatment is arthroereisis with Calcaneo-Stop (CS).

**Aim:** Aim of the study was analyzing the long-term clinical results (max of follow-up 31 years) of CS.

**Method:** We revised 79 patients (117 feet) treated with CS from January 1985 to December 2014. Two types of calcaneal screws were used: 102 anterograde and 15 retrograde. 38 patients were treated bilaterally, 42 male [63 feet], 37 females [54 feet], 56 right side, 61 left. The mean age was 11.8 years (7-15 years). No cast is needed after surgery with immediate weightbearing as tolerated. AOFAS score, SEFAS and clinical evaluation were used clinical assessment.

**Results:** The mean follow-up was 8,3 years (24 months-31 years) with an excellent AOFAS in 110 cases (94%). All patients returned to sports 5 weeks after surgery. We observed 8 cases (6,8%) of painful sinus tarsi and low tolerance to the screw, that led to its removal after a mean period of 5.6 years, that didn't compromised the obtained correction. No major complications were found.

**Conclusion:** We consider arthroereisis with CS a simple, reliable and minimally invasive procedure. It leads to a great correction of the calcaneal valgus and function of the foot despite no major and minor complications if performed following the correct surgical indications.

**Navicular Tenosuspension With Anterior Tibialis Tendon (Young Procedure) Associated With Calcaneo-Stop For The Treatment Of Paediatric Flexible Flatfoot: Clinical And Ultrasound Study - Elena Samaila**

**Co-authors:** Margherita Gelmini, Erica Invernizzi, Roberto Valentini, Bruno Magnan

**Background:** Flexible flatfoot is one of the most common deformities in pediatric orthopaedics. Arthroereisis procedures are designed to correct this deformity. Among them, calcaneo-stop is a procedure with both biomechanical and proprioceptive properties. There could be other surgical procedure combined, such as a percutaneous Achilles tendon lengthening and the Gould (tibialis posterior retension) or Young (tibialis anterior navicular tenosuspension).

**Aim:** This study analyzed the clinical and ultrasound results of 36 patients following flexible flatfoot surgical treatment with a calcaneo-stop arthroereisis combined with Achilles lengthening and a Young procedure.

**Method:** From March 2001 to August 2014, 36 patients (54 feet) were treated with calcaneo-stop arthroereisis, percutaneous Achilles tendon lengthening and Young’s tenosuspension. Our algorithm of treatment is as following: when the Meary line is broken at the talo-navicular joint a navicular resection and retention of the tibialis posterior tendon (TPT) (Kidner-Gould) is indicated; when the Meary line is broken at the navicular-cuneiform joint a navicular tenosuspension with the anterior tibialis tendon (ATT) (Young procedure) is indicated. The clinical assessment and an ultrasound of the anterior tibialis tendon (ATT) were performed in all patients at follow-up.

**Results:** The average follow-up was 7.4 years (range 8 months-14 years) with a satisfactory outcome in 51 feet (94.5%). No major or minor complications, were observed. Ultrasound found ATT in the navicular keyhole in 51.8% at a mean follow-up of 7.4 years and no difference in function was observed. In four cases the calcaneo-stop was removed for pain and low tolerance of the patient. The AOFAS score and the talocalcaneal angle did not have statistically significant in case of ATT was or not still inserted in the navicular at the follow-up.

**Conclusions:** The calcaneo-stop procedure is a simple, reliable and minimally invasive procedure for the treatment of pediatric flexible flatfoot. Although the indications for the Young tenosuspension as an isolated procedure is very narrow, it can still be an effective procedure when combined to calcaneo-stop. The key to appropriate utilization is a thorough understanding of the biomechanics of foot function and a specific appreciation of the function of the ATT.
SATURDAY, 6 October 2018

INSTRUCTIONAL VIDEOS

Endoscopic MTP1 arthrodesis - Thomas Bauer

MIS calcaneal osteotomies - Joel Vernois
Calcaneal osteotomy is a common and powerful procedure to correct varus or valgus of the hindfoot. The classic lateral approach is well known but complications have been described. Surgeons have tried to minimize scarring to avoid cutaneous complications. The recent use of Burr to perform osteotomy offer new possibilities. we have used a percutaneous approach for several years, which has proved to be an easy and reproducible procedure with an average translation of 38%. No neurologic or vascular lesion has been reported in the literature and in our practice. The osteotomy can be straight or chevron shape.

Gastrocnemians lengthening - Marino Delmi

CT assisted syndesmotic fixation - Victor Dubois-Ferrière
Ankle syndesmotic injuries require anatomic reduction and fixation to restore the normal biomechanics of the ankle joint and prevent long-term complications. However, postoperative syndesmotic malreduction is often observed. The correct position of the fibula within the fibular incisura of the tibia may not be adequately evaluated using standard radiographs or fluoroscopy. Intraoperative CT can provide accurate assessment of syndesmotic reduction. During this video, the use of three-dimensional computer-assisted orthopaedic surgery (CAOS) with navigation of syndesmotic reduction will be presented. CAOS allows accurate syndesmotic reduction and may offer an interesting solution to avoid malreduction.

Arthroscopic lateral ligament reconstruction - Jesus Vila y Rico
Key points: Identification of the fibular insertion of the AFTL using the distal (or accessory) antero-inferior tibiofibular ligament as a reference. Drilling of the fibular tunnel using a tibial ACL econstruction guide and a 5.0 mm cannulated drill bit. Insertion of the scope through the fibular tunnel to identify the talar insertion of the ATFL. Insertion of the graft through the anterolateral portal and talar fixation using a 5.5 mm Bio-Tenodesis1 screw. Under direct visualization through the anteromedial portal, the graft is retrieved through the fibular tunnel using a nitinol suture lasso recovered through the anterolateral portal. Fibular fixation using a 5.5 mm, 20 mm Bio-Tenodesis1 screw through the anterolateral portal. Pearls: Correct identification of talar and fibular insertion of the ATFL. Preparation of the graft, ensuring a 4.0–5.0 mm diameter. An extensor carpi radialis tendon or gracillis tendon allograft is recommended. It is important that the entire talar and fibular tunnels are occupied by graft, and the interference screw does not protrude from the talus or fibula. Postoperative treatment with a posterior ankle splint for 2 weeks, followed by an ankle-foot orthosis for 8–12 weeks.

Plantar fasciitis endoscopic release - Eduardo Rabat
We show in the movie that we present to the audience the Endoscopic treatment for the Plantar Fasciitis. In our film we show the nowadays possibilities for using the “Barrett technique” with 3 different devices. We also explain the indications of this technique according to our heel pain philosophie treatment.

PLENARY SESSION: DEBATE on TALAR DOME OCD SURGERY

Does size matter? Does instability matter? - Norman Espinosa

Reparative strategies I: microfracture, injections - Stephen Hepple
Osteochondral lesions of the talus continue to cause significant pathology and morbidity. Primary treatment in most units consists of arthroscopy and micro fracture. This lecture will discuss the indications, techniques, explore the evidence of for and against as well as discuss the limitations and the shortfalls of this technique. There will also be exploration of the value of various injections into the ankle including orthobiological techniques.
Reparative strategies II: Stem cells - Ki-Sun Sung

Introduction/Purpose: The aim of surgery for osteochondral lesion of talus is to restore the damaged articular surface with a nearly normal cartilage and supporting subchondral bone. The operative treatment paradigms are still controversial. Though arthroscopic bone marrow stimulation, autologous osteochondral transplantation and chondrocyte implantation have been performed, but the limitations of these techniques necessitate innovative methods such as cell-based treatment. We investigated the safety and efficacy of human umbilical cord blood derived mesenchymal stem cell product (Cartistem™) in the treatment of symptomatic osteochondral lesion of the talus.

Methods: Between Feb 2014 and March 2015, 25 symptomatic OLT patients were enrolled and randomized into 2 groups with informed consents. They have all suffered from ankle pain more than 6 months despite of conservative treatment. The control group (12 patients) underwent the standard arthroscopic curettage and microfracture, and the study group (13 patients) had additional application of Cartistem on the defect after the same procedure. We measured and analyzed AOFAS ankle-hindfoot scale and MRI features of T2 mapping, dGEMRIC, and MOCArt scale as well as arthroscopic gross finding with ICRS (international cartilage repair society) scale at 48th week after the index surgery. Also, any adverse reactions or complications were recorded. We acquired IRB approval and registered this study at clinicalTrial.gov as NCT02338375.

Results: There was no adverse effect or complication related to procedures and test drug. Clinically AOFAS ankle-hindfoot score was improved significantly after surgery in both groups, but there was no difference between them. Radiologically both groups showed significant improvement of MRI features without any differences. However, on second look arthroscopic exam there was a tendency of better regenerative pattern (ICRS gross finding) in study group.

Conclusion: There was no adverse reaction and additional benefit of human mesenchymal stem cell product in treatment of symptomatic OLT. However, in terms of arthroscopic findings, it might help better histologic regeneration. Further investigation with longer term follow-up can guarantee its usefulness in treatment of OLT.

Replacement strategies I: Cartilage/osteochondral autograft etc, AMIC - Markus Walther

The treatment of osteochondral lesions at the ankle is still controversial, especially when microfracture (MFX) is likely to fail. MFX comes to its limits in significant bony defects and cartilage lesions bigger than 1.5 cm². The two major competing treatment concepts for those defects are osteochondral transplantation and scaffold-based systems in combination with bone grafting. Osteochondral transplantation has proven reliable results over the last 15 years, however there are some disadvantages. The first problem is, that in nearly all cases, a malleolar osteotomy is mandatory, because a perpendicular access to the cartilage surface is needed to impact the transplant. There is increasing evidence that a significant percentage of medial malleolar osteotomies leave cartilage damage at the tibial side of the joint. The other problem is donor side morbidity. Up to 50% donor side problems have been reported for the knee, so that other donor locations like the medial side of the talus or the proximal tibiofibular joint have been suggested. However, all autologous osteochondral transplants share the problem, that shape and thickness of the cartilage hardly ever fits to the defect. Scaffold based systems like AMIC or MACI combine the treatment of the bony defect with a bone graft with local cartilage cell growth enhancing concepts. The results of autologous chondrocyte implantation have never demonstrated superior clinical results compared to other (much cheaper) techniques, where cartilage cell growth in the joint is supported. This is the major reason why most of the health insurances don’t support autologous chondrocyte implantation in the ankle any more. The most widely spread technique today is autologous matrix induced chondrogenesis (AMIC, ChondroGide™ in combination with bone grafting of cystic lesions. This collagen-based membrane provides a stable coverage of the bone graft and can be fixed with fibrin glue. Recently the 5-year results of this technique have been published and documented stable clinical and radiological results. Other scaffolds are also available, however so far there is only limited data in literature. Both, osteochondral autograft as well as AMIC are well supported by literature. Both concepts are suitable to improve pain and function at the ankle. Limitations in sports, especially competitive sports are likely to persist in all treatment concepts available. Current research focuses on the use of additional stem cells, PRP and other biologic acting substances to improve the mechanical resistance of the regenerated cartilage. Today, indication for surgical treatment should be pain and functional limitations. The patient should be told that significant improvement can be achieved, however, a situation like prior injury is often not achievable.
Replacement strategies II: Osteochondral allograft and hemicap etc - Francesca Vannini

MY LIFE IN FOOT AND ANKLE SURGERY

My story as a foot and ankle surgeon - Samuel Barouk
My foot surgeon life began about 1965. It was focused initially in foot spastic deformities, then in post-operative and also female specific Footwear, then, and above all, in Forefoot static troubles, with joint preserving surgery, particularly in severe forefoot disorders, which became my main topic until the end of my carrier - in 2005-, then, at last, in Gastrocnemius tightness, first in spastic then in static deformities. In 1993, I was a founder of AFCP (Association Française de Chirurgie du Pied), a SOFCOT filial.

SPASTIC FOOT. In the 60s, on equino- varus deformity, instead of rear foot joint fusion, I performed tendon lengthening or transfer. Then I studied the role of Gastrocnemius tightness in spastic troubles, with a minimum shortness -L0- as well as observed in Static gastrocnemius tightness.

FOOTWEAR. Post-operative. In 1980 I designed a Heel support post-operative shoe. Then, I designed a special anatomic footwear adapted to the post Op period.

FEMALE FOOTWEAR. Since 1983, I studied the problems encountered as well as the solutions preserving both comfort and elegance, then I developed, - as far as manufacturing and marketing, - a shoe line featuring both suitable and elegant design.-

FOREFOOT SURGERY. -In the 60-70s, on Hallux valgus, I performed the Mac Bride, then the Regnault procedure .The years 1991 /92 were a real turning in my carrier : - In 1991, LS Weil taught me the Scarf Osteotomy, technique that I spreaded thereafter in Europ and worldwide - In 1992, during the first Scarf meeting, in Bordeaux, LS Weil performed the Weil osteotomy on the lateral metatarsals, then I contributed to spread this Osteotomy around the world. - From 1994, I emphasized and developed the Weil distal first metatarsal osteotomy for Hallux Rigidus, allowing to preserve the MTP joint even in advanced cases - From 2000, with P Ripptsein, and E Toullec we described an oblique basal elevation metatarsal osteotomy –BRT- indicated in metatarsalgia, pes cavus and revision surgery.

SEVERE FOREFOOT DISORDERS: joint preserving correction thanks to large and harmonized shortening of the metatarsals. First I noted the benefits of metatarsal shortening (Wilson, Regnauld) - Then, since I acquired good procedures to a joint preserving metatarsal shortening-Scarf and Weil osteotomies-, I performed in 1993 my first large and harmonized metatarsal shortening in a case of a very severe forefoot disorder, the shortening being focused on the ms point. - This harmonized and large shortening of the metatarsal revealed to be a simple and reliable solution of any severe forefoot disorder, whatever its cause, including revision surgery or severe rheumatoid forefoot. In 2005, I described the joint preserving PIP plantar release indicated in claw toe correction.

GASTROCNEMIUS TIGHTNESS. I developed the tendons proximal section (Proximal release), first in Spastic (1970) then in Static (1998) gastrocnemius tightness. It revealed to be very effective and harmless, avoiding or securing foot and ankle surgery, while treating bimalgia or legs problems.

CONCLUSION. Apart the Footwear studies and designing, Gastrocnemius tightness and its treatment with proximal tendons release, my work was focused on the study and development of Forefoot surgical procedures : Scarf, Weil, great toe, BRT osteotomies, These procedures were particularly involved in the correction of forefoot severe disorders, which were my main topic : I described and brought precisions on a large and harmonized metatarsal shortening, which provides a reliable correction with preservation of both forefoot joints and foot elegance, whatever the cause and importance of the deformities. My son Pierre helped me a lot: He continues in this way, bringing critical improvements, notably in mini open as well as percutaneous surgery, while following his own way.

My story as a foot and ankle surgeon - Sandro Giannini
Emeritus Professor of Orthopedic and Traumatology at the Bologna University. He was full Professor of Orthopedic and Traumatology in Bologna since 1989, then Director of the I° Clinic and Director of the Gait Analysis Laboratory at the Istituto Ortopedico Rizzoli. Author of more than 350 papers in Science Citation Index journals. He was President of the Italian Foot and Ankle Society (SICP), IFFAS president and he is member of IFAS, EFAS, AOFLAS, 

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AAOS, EFFORT, ICRS and of the Brasilian Foot and Ankle Society. During his long practice he went deep into the innovation of many different fields of orthopaedic surgery, especially in the field of foot and ankle surgery, developing new surgical techniques, creating a bioabsorbable device for the treatment of the flat foot, techniques for cartilage repair and a new design of Ankle Prosthesis. In his career he received several awards such as the Memorial K.Johnson Award and the Award of Excellence of the American Academy Orthopaedic Surgeons.

My story as a foot and ankle surgeon - Hakon Kofod
Trained in all orthopaedic subspecialties. Developed and published long-term results of ankle and 1st MTP total replacements. Pioner of HA and TiCap coating of uncemented foot and ankle replacements.

My story as a foot and ankle surgeon - Jean Marc Meyer
In 1974, as I was an intern in the Clinique Universitaire d'orthopédie in the Hopital Cantonal of Geneva, Professor Willy Taillard asked me if I would agree to specialize in Foot and Ankle surgery. I was sent to Hopital Cochin in Paris where I started to be implicated in Foot and Ankle surgery under the supervision of Professor Bernard Tomeno. Back to Geneva end of 1975, I had the responsibility of Foot and Ankle problems at the clinique d'orthopédie. From 1976 until 2003 I was a member of the board of the SFAS, becoming vice-president and president. During these years, I concentrated my scientific activity on painful instability of the ankle. 1989, I opened my own clinic in Geneva devoted to Foot and Ankle surgery and in 1995 Marino Delmi joined me for 6 months before he went to Milwaukee. After 13 years I closed my clinic in Geneva and went to the sultanate of Oman to perform Foot and Ankle surgery under the request of Prof. Wahid Kharousi. I retired in 2011.

FREE PAPERS (FP5):

Peroneal Tendoscopy Portals Safety Regarding Proximity to the Sural Nerve - Bruno Pereira
Co-authors: Helder Pereira, Ricardo Visiedo Robles, Andrés Pérez Rivas, Özgür Oktay Nar, Xavier Martin Oliva

There have been limited studies assessing the relative safety of portals for peroneal tendoscopy in terms of their distance from the sural nerve. The aim of this paper is to assess and compare the distance from the peroneal tendons sheath and the sural nerve.

Materials and Methods: Ten fresh-frozen lower extremities were dissected to expose the nerves and tendons. Anatomically important distances were measured in each point with a tachometer with three independent different observers. Statistical analysis of the data was performed using the IBM SPSS Statistics 21.0® software.

Results: The average distance between peroneal tendons sheath and the sural nerve at 5 cm, 3 cm, and 2 cm from the proximal fibular tip was 29.6 mm, 24.2 mm, and 19.7 mm, respectively. The average distance between the peroneal tendons sheath and the sural nerve at 2 cm and 1.5 cm distal to fibular tip was 9.1 mm and 7.8 mm, respectively. At the proximal fibular tip the distance to de sural nerve was 16.6 mm.

Conclusion: This study ascertained that the risk of injury to the sural nerve in the distal portals can be higher. Based on the herein presented results, we suggest performing the proximal portal first and then the distal portal in order to reduce the risk of injury the sural nerve during peroneals tendoscopy.

Clinical Relevance: This paper provides anatomical insights and suggestions for planning peroneals tendoscopy.

Minimally Invasive proximal Metatarsal Diaphyseal Osteotomy for Chronic Plantar Diabetic Foot Ulcers - Josep Torrent
Co-author: Iban Clares

Background: Diabetic foot ulcers are frequently related to elevated pressure under a bony prominence. Minimally invasive surgical offloading has good short and long-term results alleviating the pressure under the bony prominence with a lower chance of recurrence.

Aim: Our preferred technique is the MIS Proximal metatarsal Diaphyseal osteotomy. This modified osteotomy gets more ascent of the metatarsal head. We want to show our results and safetiness of the technique.
**Methods:** Twelve consecutive patients with a mean age of 66.7 (range, 35-75) years with diabetic neuropathy related foot ulcers under metatarsal heads underwent surgery after conservative treatment failure. All patients were operated by MIS technique, performing a Proximal metatarsal Diaphyseal osteotomy: 3 patients on the 5th metatarsal, 1 on the 4th, 4 on the 3rd, 3 on the 2nd and one patient on the 1st metatarsal.

**Results:** All ulcers recovered with a mean healing time of 7.9 ± 4.0 (range, 4-17) weeks. At a mean follow-up of 18.3 months (range, 12-34), no cases of ulcer recurrence were recorded.

**Discussion:** Our technique was a safe and effective method in promoting diabetic foot ulcers healing, by the reduction of the high plantar pressure under the metatarsal heads. This modified technique increases the ascent of the metatarsal head in comparison with distal osteotomies. This extra elevation could improve the rates of healing and according to our series, does not induce significant overloading of the other metatarsals as we have not found ulcer recurrences of the other metatarsals.

**Modified lateral column lengthening, a cadaveric study of structures at risk - Mohamed Mokhtar Abd-Ella**

**Background:** The original Evans osteotomy was done 1 to 1.5 cm proximal to the calcaneocuboid joint. A modified LCL osteotomy is done in the sinus tarsi just anterior to the posterior facet. The suggested advantages are: stability, less probability of spring ligament injury, and a better correction. However, no studies have assessed the risk of spring ligament injury, posterior facet injury and middle facet injury.

**Aim:** This study assessed the medial exit point of the osteotomy in relation to the medial articular structures.

**Methods:** The modified LCL osteotomy was performed in 20 fresh frozen specimens. The osteotomy was done in the sinus tarsi just anterior to the posterior subtalar facet, perpendicular to the lateral calcaneal surface. Then, the talus was removed and the relation of the osteotomy to the subtalar facets and spring ligament was documented.

**Results:** The spring ligament and the anterior facet were not injured in any specimen. The posterior facet was not injured in any specimen with an average distance of 6.45 mm between the anterior end of the lcls medial part and the osteotomy (range: 0-15 mm). In six specimens, the osteotomy passed between the posterior and middle facets, and in one specimen, it passed between the anterior and middle facets. In 13 specimens, the osteotomy passed through the middle facet.

**Conclusion:** Modified LCL osteotomy avoids injury of the spring ligament and the posterior facet. The middle facet has a chance of 65% to be traversed by the osteotomy, however the clinical implications need further studies.

**Medium-long-term clinical and radiographic outcomes of minimally invasive Distal Metatarsal Metaphyseal Osteotomy (DMMO) for Central Primary Metatarsalgia: do Maestro Criteria have a predictive value in the preoperative planning for this percutaneous - Carlo Biz**

**Co-authors:** Marco Corradin, Wilfried Trepin Kuete Kanah, Miki Dalmau-Pastor, Alessandro Zornetta, Pietro Ruggieri

**Background and Aims:** The purpose of this prospective study was first to evaluate the safety and effectiveness of Minimally Invasive Distal Metatarsal Metaphyseal Osteotomy (DMMO) in treating central metatarsalgia, identifying possible contraindications. The second objective was to verify the potential of DMMO to restore a harmonious forefoot morphotype according to Maestro criteria.

**Method:** A consecutive series of patients with metatarsalgia was enrolled and treated by DMMO. According to Maestro criteria, pre-operative planning was carried out by both clinical and radiological assessment. Patient demographic data, AOFAS scores, 17-FFI, MOXFQ, SF-36, VAS, and complications were recorded. Maestro parameters, relative morphotypes, and bone callus formation were assessed. Statistical analysis was carried out (p < 0.05).

**Results:** Ninety-three patients (93 feet) with a mean age of 62.4 (31-87) years were evaluated. At mean follow-up of 58.7 (36-96) months, all of the clinical scores improved significantly (p < 0.0001). Most of the osteotomies (76.3%) had healed by 3-month follow-up, while ideal harmonious morphotype was restored in a few feet (3.2%).

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Clinical and radiological outcomes were not different based on principal demographic parameters. Long-term complications were recorded in 12 cases (12.9%).

**Conclusion:** DMMO is a safe and effective method for the treatment of metatarsalgia. Although Maestro criteria were useful to calculate the metatarsal bones to be shortened and a significant clinical improvement of all scores was achieved, the ideal harmonious morphotype was restored only in a few feet. Hence, our data show that Maestro criteria did not have a predictive value in clinical outcomes of DMMO.

**Percutaneous Posterior to Anterior Screw Fixation of the Talar Neck: Soft Tissue Structures at Risk** - Cesar de Cesar Netto

**Co-authors:** Alexandre Leme Godoy-Santos, Martim Pinto, Jackson Rucker Staggers, Sameer Naranje, Ashish Shah

**Introduction:** Non-displaced fractures of the talar neck can be fixed with percutaneously placed screws from posterior to anterior. We aimed to enumerate number of trials for placement of two parallel screws and to determine neurovascular and tendinous structures injury rate.

**Methods:** Eleven cadaveric specimens were used. 2.0mm guide wires were percutaneously placed (under fluoroscopic guidance) into the distal posterolateral aspect of the ankle. Malpositioned pins were left intact to allow later assessment of soft tissue injury. Number of guide wires needed to achieve acceptable positioning was noted. After a layered dissection, we evaluated neurovascular and tendinous injuries, and measured the shortest distance between guide pins and soft tissue structures, using a precision digital caliper.

**Results:** Number of guide wires needed to achieve acceptable positioning for 2 parallel screws was 2.91 ± 0.70 (range, 2 - 5). Distances between guide pin and soft tissue structures were: Achilles tendon (0.53±0.94mm); FHL tendon (6.62±3.24mm); peroneal tendons (7.51±2.92mm); posteromedial neurovascular bundle (11.73±3.48mm). Sural bundle was injured in all the specimens (8/11 in direct contact with the guide pin and 3/11 been transected). Peroneal tendons were transected in 1/11 (9%) of the specimens. Achilles tendon was in contact with the pin in 6/11 (54.5%) and transected in 2/11 (18.2%) specimens.

**Conclusion:** Placement of posterior to anterior percutaneous screws for talar neck fixation is technically demanding and multiple guide pins are needed. Important tendinous and neurovascular structures are in close proximity with the guide pins and sural bundle was injured in 100 % of the cases.

**External fixation for intra-articular displaced calcaneal fractures: which destiny of the subtalar joint?** - Bruno Magnan

**Co-authors:** Stefano Negri, Roberto Valentini, Elena Samaila

**Background:** A minimally invasive procedure including percutaneous reduction and external fixation can be performed for Sanders’ type II, III and IV heel fractures in order to obtain a tridimensional reconstruction of the os calcis with a reduced risk of local complications, allowing for early motion.

**Aim:** To evaluate the long-term results of a MIS for intra-articular displaced fracture and the subtalar function.

**Methods:** 116 consecutive closed articular displaced calcaneal fractures in 104 patients were treated with a Heel Mini-Fixator. There were 20 females and 84 males. The mean age at surgery was 44.8 yo (min 21-max 78). We classified the fracture as Sanders II in 49 cases (42%), type III in 29 cases (25%) and type IV in 38 cases (33%). Patients were clinically assessed with the Maryland Foot Score, AOFAS score and SAVE score and radiographically with X-rays and CT scans.

**Results:** Patients were followed for an average of 12.44 ± 9.61 years (range, 2 to 35 years). The mean AOFAS score at FU was 78.52 ±18.87 points. Clinical results at follow-up scored excellent or good in 70/116 cases (60%), fair in 31 cases (27%) and bad in 15 cases (13%). The mean Maryland Foot Score was 83.4 with excellent or good in 87/116 cases (85%), fair in 26 cases (22%) and bad in 3 cases (3%). Mean preoperative Böhler’s angle was 15.4±13.6, while after surgery the average value was 27.9±10.2. In 82% of the cases Böhler’s angle post-op was > then 20°. C.T. scans were evaluated according to the S.A.V.E. score, showing a mean score of 24.68 ± 3.9 (max 30 points). Telhese are t complications we observed: Sudeck’s atrophy (10), pin tract superficial infections (3), thalamic displacement following early weight-bearing (3). We performed the following reinterventions due to

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pain: subtalar arthrodesis in 7 cases (6.03%), impingement removal (peroneal or plantar) in 10 cases (8.6%) for a total of 17 cases (14.63%).

**Conclusions:** Percutaneous reduction and external fixation proved to be a reliable technique in order to obtain a stable reduction of os calcis fractures. The clinical results appear to be comparable to those obtainable with the open reduction and internal fixation, with the added advantages of being minimally invasive procedure, having substantially shorter operating times and reducing risk of complications related to surgical exposure in our experience less than 15% of the cases. Despite the subtalar arthrodesis at the X ray at FU only 7 (6%) patients needed arthrodesis. Most of the patient presented a reduced ROM or ankylosis of the subtalar joint in good position and no pain, that demonstrate that is most important to restore the 3DDimensional volume of the calcaneus then a perfect reduction of subtalar facet.

**Sinus tarsi approach vs. extensile lateral approach for intra-articular calcaneal fracture: prospective (comparative) study - Methee Khongphaophong**

**Background:** The options of operative treatment for intra-articular calcaneal fracture still remains controversial. Extensile lateral approach allows excellent exposure to fracture but bring high rate of wound complications.

**Aim:** Compare the outcome of intra-articular calcaneal fracture treated with open reduction and internal fixation via an extensile lateral versus. Sinus tarsi approach.

**Methods:** Prospective study of 62 intra-articular calcaneal fractures treated by open reduction and internal fixation between 2014, December to 2017, June. 29 were treated with extensile lateral approach with calcaneal locking plate (Wright medical, Tennessee). 33 sinus tarsi approach (4 cases need additional mini medial incision approaches for SanderIII AC, BC) with mini-calcaneal locking plate (Normed, Florida). Durations until operation, operative time, foot functional index (total score), visual analog scale, SF-36, Bohler's angle, angle of Gissane, wound complications and duration of hospital stay were recorded post-operatively and minimal 6 months follow up.

**Results:** Compared 2 groups with demographic data. Average duration until operation; extensile group was 13.32 days, sinus tarsi group was 6.08 days, p <0.001. Operative time; extensile group was 123.41 minutes vs. sinus tarsi group was 91.20 minutes, p<0.001. Wound complications were 24.13% in extensile group vs. 6.06% in sinus tarsi group, p =0.045. Duration of post-operative admission was 6.68 days in extensile group vs. 3.10 days in sinus tarsi group p <0.001 FFI last visits was 25.36 in extensile group vs. 25.65 in sinus tarsi group, p =0.969, VAS activity was 29.68 in extensile group vs. 28.54 in sinus tarsi group, p=0.271.

**Conclusions:** Sinus tarsi approach with mini-calcaneal locking plate was a great option for treatment of intra-articular calcaneal fracture. This approach brought lower rate of wound complications, earlier operations, shorter operation times and shorter hospital stay compared to extensile lateral approach.

**Case Comparison Study of Two Surgical Approaches for Fixation of Calcaneal Fractures - Marcus Brookes**

**Co-authors:** Rajesh Kakwani, David Townshend, A. Murty

**Background:** Traditionally, the extended lateral approach (ELA) was the favoured approach for calcaneal fractures but has been reported to have high incidence of wound complications. There has been a move amongst surgeons in the United Kingdom towards the sinus tarsi approach (STA) due to its minimally invasive nature, attempting to reduce such complications.

**Aims:** To evaluate outcomes of ELA and STA for all consecutive calcaneal fracture fixation in our institution over a 10-year period.

**Method:** Retrospective cohort study of all calcaneal fractures surgically treated with either approach between January 2008 and January 2018. Anatomic restoration was assessed radiologically by Gissane's and Bohler's angles and calcaneal width. Post-operative complications including metalwork removal were recorded.

**Results:** 35 calcaneal fractures were managed surgically via either approach during this period (21 STA and 14 ELA). There was no significant difference (p<0.05) in any of the radiological markers. In the ELA group, 2 patients (14.3%) developed deep infections requiring metalwork removal and 1 had delayed wound healing (7.1%). No deep infections occurred with the STA; 1 patient (4.8%) had a superficial infection, treated with antibiotics. Of
patients who had metalwork in situ for more than 1 year, 37.5% of the STA group required removal due to pain compared to only 16.7% with ELA.

Conclusions: We have moved from ELA to STA. Our results have shown equivalent restoration of calcaneal anatomy but with a decrease in post-operative wound complications including infection. However, we have shown an increase in metalware removal in the STA group.

Assessment of Haglund’s syndromes with a new radiologic measure - Yves Tourné
Co-authors: Anne-Laure Barray, Renaud Barthelemy, Paul Moroney

Introduction: Regarding the lack of specificity to assess properly the calcaneal morphologic abnormalities in symptomatic Haglund’s deformity, we propose to evaluate a simple new radiographic measurement: the ratio of the length of the calcaneus X to the one of the great tuberosity Y.

Objective: To compare this ratio with the current gold standard in Haglund’s syndrome group and in a healthy control one, in order to point out calcaneus leading to posterior heel pain.

Methods: 50 patients and 50 healthy controls were included in this retrospective study. Standard measurements (Fowler and Philip, Chauveaux and Liet, Pavlov test and pitch angle of Ruch) and X/Y were performed by 2 independent assessors, to establish intra and inter observer correlations. ICC, specificity and sensitivity were performed for the different measurements. Logistic regression and ROC analyses determined cut-off values and assess sensitivity and specificity of the X/Y ratio.

Results: All the measurements were reproducible. No significant difference for specificity or sensitivity were demonstrated for the standard measurements between the 2 groups. The X/Y ratio f or the patient group was significantly lower (2.07) than the control group (2.70) (p<0.00001). Logistic regression and ROC curve analysis showed a cut off value of 2.5. The sensitivity of the X/Y ratio value of 2.5, to confirm the diagnosis of Haglund’s syndrome, was 100% (p<0.0001) and its specificity 95% (p<0.0001).

Discussion: This new radiological measurement could provide important clinical guidance in the surgical management of Haglund’s syndrome: Zadek osteotomy for a X/Y ratio under 2.5 whileisolated calcaneoplasty when over 2.5.

SEVERE INJURIES TO THE FOOT AND ANKLE

Acute compartment syndrome of the foot - Antonio Dalmau

Acute and post-traumatic compartment syndrome of the foot is typically associated with mechanisms of high-energy, multiple foot fractures, particularly those caused by crushing or trapping. Early diagnosis and treatment in view of the suspicion of an acute compartment syndrome in a traumatic foot will help prevent the effects of myoneural necrosis. Even though there are various methods of compartment pressure monitoring, the diagnosis is mainly clinical. Prophylaxis is essential and the best treatment is to prevent the development of this syndrome. To achieve this a correct clinical history and initial examination is needed, with special care in the nerve, vascular and muscle evaluation. Surgical decompression using fasciotomy must be urgent and will be mandatory to prevent the severe sequelae. Delayed treatment can have disastrous consequences, such as contracture and paralysis, infection, and sometimes amputation.

Crush injuries: salvage or amputate? Patients with sequels of crush injury around the foot and ankle in orthopedic practice - Marek Napiontek

Crush injuries of the foot are devastating phenomenon and are effect of high energy trauma. They are characterized by ischemia and reperfusion injury. Etiological factors are as follows: a compressive force, usually caused by a high-energy mechanism such as a forklift, motor vehicle or industrial accident crushes that transiently increases the pressures within the foot. Pathology. This force acts on the incompressible blood in the vasculature and leads to a dramatic rise in tissue pressures and damage to multiple tissue types, including bones, blood vessels, nerves, and soft tissues. A wide zone of injury results from a delayed inflammatory reaction involving the zone bordering the crushed cells, which may initially belie the severity of the injury. As such, these injuries go on to produce tremendous inflammation and swelling, potentially followed by compartment syndrome or other vascular damage, infection, neurological injury, and tissue necrosis (Fig. 1).
circulation, vascular dysfunctions connected with the injury usually cause permanent damage to the nerves and muscles. Those damages lead to complex deformities within the foot at different levels. Late surgical treatment usually focuses on the reconstruction of the shape and function of the foot after the soft tissues had healed. Amputation is the solution in the situation when the shape and particularly the function of the foot are impossible to be reconstructed. **Materials.** In our institution 23 patients were treated in period 2006-2017 due to sequels of crush injury. Crush injury localization was presented at shin – 8 patients, shin and foot – 1 patient and foot – 14 patients. Injury and reconstruction of the big vessels was noted in 5 patients. **Follow-up** between trauma and late reconstructive surgery range from 1 year to 35 years (mean 11). **Results.** The equino-varus deformity of the foot was observed in 8 feet. All the patients were operated on using a one-stage procedure that aimed at correction of all the elements of the deformation within the foot. The most common operative technique performed within the feet of our patients was arthrodesis combined with soft tissues release. Only 1 patient was qualified for below knee amputation. Nevertheless, it is not clear where is border line between decision about correction of the deformity and leg amputation. Decision must be taken collectively by patient and orthopedic surgeon.

**Soft tissue coverage options - Eva Rüegg**

**State of the art forefoot MIS surgery - Pierre Barouk**

MIS surgery is becoming a standard in forefoot treatment. The term MIS includes percutaneous and mini open techniques. The aim is to be as less invasive as possible. The techniques for hallux valgus are inspired from the techniques of scarf and chevron developed in the 90's and that showed good results. The actual tendency is a fixed short scarf or long chevron. For the lesser rays, the classic Weil osteotomy is turning in a mini open one. Percutaneous surgery of the lesser rays started by the DMMO (distal mini invasive metatarsal osteotomy). The "offer" is now larger, adapted to the necessity of large shortening (DOMMO, distal oblique mini invasive metatarsal osteotomy), or very small shortening (DICMO, distal intra cephalic metatarsal osteotomy). Toe shortening is likely percutaneous and toe fusion is improved by new devices. But the best mini invasive surgery is to do the smallest number of osteotomy and be the most effective possible. That is for exemple to do gastrocnemius release instead of multiple metatarsal osteotomies for metatarsalgia. Tendency is (or should be) to "think" mini invasive not only with the techniques but also for the indications.

**State of the art MIS hindfoot surgery - David Redfern**

**Tendonoscopy - Jordi Vega**

Over the last two decades, the technologic advances, the improvements in instrumentation, and the new endoscopic concepts, have increased the indications for the endoscopic techniques in the foot and ankle. Advantages of the endoscopic techniques over open procedures have stimulated the development of extraarticular endoscopic techniques. Tendonoscopy is endoscopy performed at the tendons. The working area of tendonoscopy is located between the tendon and its envelope. Two types of tendons are observed in the foot and ankle, synovialized and non-synovialized tendons. The Achilles tendon is a non-synovialized tendon, and a paratendon envelopes the tendon. A working space is created between the tendon and the paratendon when irrigation liquid is introduced in. The tibialis posterior tendon, and the peroneal tendons are synovialized tendons. The synovial sheath is a tubular bursa that envelopes the tendons. Typically, a synovial sheath has two layers that are continuous with each other, an outer parietal and an inner visceral layer. A working area is created when irrigation liquid is introduced between the two layers of the synovial sheath. The aim of this presentation is to provide the anatomical basis of the

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tendoscopy in the foot and ankle, and to expose the main indications. Due to its clinical relevance, and to the number of publications, the focus of this talk will be the Achilles tendon and the peroneal tendons.

Ankle stabilization - Stéphane Guillo
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<td>Stefano Gastaldo</td>
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<td>Peter Bock, Michel Chraim, Michael Pittermann, Stefan Rois</td>
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