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Effect of Progressive Collapsing Foot Deformity on the Activity of Large Muscle Groups of the Lower Limb

Dev A Galagali

Introduction: A shift in conceptual understanding of dysfunction of the medial longitudinal arch from pes *planus* to progressive collapsing foot deformity (PCFD) is underway across the world. There are various deformities described in the spectrum of PCFD which not only have adverse effects on the foot but also ripple them up the entire lower limb. Early lower limb muscular fatigue and pain during exertion is the most common complaint of patients with PCFD. This may be attributed to the muscular forces continuously counteracting the deforming forces from the foot. Surface electromyography provides an accurate and convenient assessment of muscle activity. In this study, we aim to compare the activities of quadriceps, hamstrings, and gastrosoleus muscle groups of patients with PCFD with normal lower limbs and correlate the radiological parameters of PCFD with the activities.

Materials and methods: A total of 30 patients with bilateral PCFD and 30 controls underwent weight-bearing anteroposterior, lateral, and hindfoot alignment radiographs of the foot. Radiographic parameters of PCFD were assessed. Surface electromyography was used to assess the quadriceps, hamstrings, and gastrosoleus activities during the change of position from sitting to standing. This was compared between the two groups and correlated with radiological measurements of PCFD.

Results: Electrical activities of quadriceps, hamstrings, and gastrosoleus muscle groups were significantly higher in cases than controls ($p = 0.005$, 0.002, < 0.001, respectively). Meary angle had a significant correlation with hamstrings activity ($p = 0.013$). The hindfoot moment arm had a significant correlation with gastrosoleus activity ($p = 0.027$). All other correlations were not significant.

Discussion and conclusion: Progressive collapsing foot deformity causes a significant increase in the activity of large muscles of the affected lower limb. These muscles act on joints other than those in the foot. This major finding may be due to several compensatory mechanisms by the muscle groups to counteract the deforming forces in PCFD. This may be a cause for early fatigue complained by patients, especially children with PCFD. However, most radiological parameters did not correlate with muscle activities and a larger study size may be required for further association.

Surgical Management of Flexible Cavovarus Deformity: Experience of a Tertiary Referral Center

Dhrumin Sangoi

Introduction: Flexible cavovarus deformities are a challenging condition to treat due to the three-dimensional deformity, different underlying pathologies, and different presentation of symptoms. We performed this study to evaluate our outcomes and understand the rationale of surgical techniques used to correct flexible cavovarus foot deformities.

Methodology: Data was collected retrospectively for patients operated at our hospital in 2021–22. Patient demographics like age, sex, and laterality were noted. Details of different tendon and bony procedures done were evaluated and intraoperative decisions were studied. Complications during or after surgery were noted. Manchester-Oxford Foot Questionnaire's (MOXFQ) scores were evaluated for patients who had filled out their questionnaires.

Results: A total of 35 patients with flexible cavovarus deformities had a deformity correction surgery during the 2-year period. The most common combination of surgical procedures was tibialis posterior tendon transfer, tendo-Achilles lengthening, lateralizing calcaneal osteotomy, and first metatarsal dorsiflexion osteotomy carried out in 14 patients (40%). Three patients had the above combination without Achilles lengthening and two patients had Strayer procedure instead. Four cases (11.4%) did not need calcaneal shift as the hindfoot varus was corrected with tendon transfer and dorsiflexing of the first metatarsal. A total of 11 patients (31.4%) needed lesser toe management as well in the form of flexor tenotomy or interphalangeal joint fusion. Eight patients had symptomatic hallux clawing needing a Jones-type procedure. Three patients had severe cavovarus with an apex at midfoot needing wedge tarsectomy. Three patients needed lateral ligament stabilization in addition to deformity correction. Three patients had their peroneus *longus* tenodesed to peroneus brevis. MOXFQ scores were evaluated for 14 patients who submitted their preoperative and postoperative 6-month scores. The postoperative MOXFQ score demonstrated a poorer result for two patients, no change for two patients, and improvement in 10 patients. There was a 29-point improvement in the mean metric MOXFQ index score.

Discussion and conclusion: We conclude that most flexible cavovarus deformities can be managed surgically with a combination of tendon and bony procedures as described above to achieve a stable foot tripod with improvement in patient outcomes scores. However, additional procedures may be needed as per symptomatology and some procedures can be avoided depending on intra-operative correction achieved.

Restoration of Talar Dimension Using Fibula Graft in Tibiotalocalcaneal Nail Fusion with Significant Talar Defect

Chandan Narang

Introduction: It is challenging to manage talus bone loss caused by multiple etiologies. Taking into account contralateral normal

tibiocalcaneal height, we have adopted a single technique in this study to target the cases with talar defects due to diverse etiologies without compromising the tibiocalcaneal height. Ipsilateral fibular strut graft utilized with retrograde hindfoot nail for the union of the hindfoot and ankle.

Materials and methods: Sixteen patients were divided into five groups with different etiologies who underwent tibiotalocalcaneal (TTC) fusion utilizing fibular graft in a bamboo manner along with a hindfoot fusion nail were clinically and radiographically reviewed to evaluate fusion rates and functional outcomes.

Results: Our case series of 16 patients had a 100% union rate with insignificant differences in the TTC height. With one complication of implant prominence in one patient. The functional outcome measured using the American Orthopaedic Foot and Ankle Society score improved by an average of 44.

Conclusion: Covering up of talar defect due to multiple etiology *via* a single incision approach for harvesting the graft and preparing the joint and aligning the graft in a bamboo fashion along with hindfoot fusion nail is a novel approach associated with less postoperative pain, less blood loss and operative time, giving excellent results of fusion. The limitation of our study is the number which is still less but compared to the previously published study of talar defect it's more.

New Innovative Patient-specific Distal Tibial Plating System through Posterior Approach: An Overview of the Future Plating System

Sathish Kumar

Background: Distal tibia fractures constitute 3–10% of all tibia fractures which are becoming common nowadays, and their treatment is of great importance not only due to the increased incidence of nonunion but of prime importance to ankle function. Currently, no personalized anatomic plate for distal tibia fractures particularly with application on the posterior aspect is available.

Aim and Objective: To design an innovative anatomic plate for the treatment of distal tibia fractures applied through a posterior approach that is patient-specific.

Materials and methods: Department of Orthopaedic Surgery @ Stanley Government Hospital, Chennai, Tamil Nadu, India in collaboration with National Hub for Healthcare Instrumentation Development, Anna University, Chennai, Tamil Nadu, India innovated and developed this prototype.

History: The proximal tibia plates which were used early were larger than the bone casing soft tissue irritation and the distal radius plate was very small with inadequate strength and smaller screws length (3.5 system). Hence the search for a new plating system matching the anatomy of the prevailing population started.

Scientific inputs: A total of 100 human tibias (50 males and females with an equal number of right and left sides) were scanned by spiral computed tomography and their three-dimensional (3D) images were captured as DICOM images and used for the geometric data of distal tibia (posterior slope angle and mediolateral width distance), an anatomical plate for distal tibia was designed and constructed initially with polylactic acid biocompatible material using advanced 3D printers and the final construct was obtained in stainless steel (316 LVM).

Results: Biomechanical tests showed that plates were able to withstand adequate bending and torsion forces. Compared to the available imported locking plate, this plate provides a better fit to the geometry of the distal tibia with a unique combination of two distal rows (3.5 system) and proximal dynamic (4.5 system).

Conclusion: The newly designed anatomic plate for the posterior distal tibia will provide fixation with the strength of the 4.5 system and the agility of the 3.5 system and could bring in a new revolution "personalized plating system" just like personalized patient-specific alignment in knee arthroplasty.

Keywords: Anatomic plate, Distal tibia fractures, Posterior approach.

A Prospective Cohort Study to Evaluate the Functional Outcome in Early Mobilization vs Immobilization of Surgically Treated Ankle Fractures

Suhas Aradhya

Introduction: The ankle is the most common fracture among the young population, and rehabilitation protocol equally plays an important role like surgery. The hypothesis of the study constitutes early mobilization will improve function and better patient satisfaction and reduce the age-old comfort casting associated with ankle stiffness.

Materials and methods: In a prospective randomized study, 40 patients who met inclusion criteria were randomly allocated to two groups: patients in group I (early mobilization) and group II (immobile for 2 weeks). All patients were assessed for up to 6 months using a visual analog score, the range of motion of the ankle, Olerud–Molander ankle scoring system.

Results: Visual analog score was 5.55 ± 0.89 (group I) and 4.90 ± 0.72 (group II), postoperative swelling using (1) intermalleolar method—1.13 ± 0.25 (group I) and 1.28 ± 0.41 (group II), (2) figure of "8" method—1.72 ± 0.89 (group I) and 1.99 ± 0.60 (group II), calf wasting—1.3 ± 0.571 (group I) and 2.25 ± 0.851 (group II) mean range of dorsiflexion motion at the end of 24 weeks was 17.2 ± 2.31° (group I) 14.45 ± 2.70° (group II), mean range of plantarflexion motion at the end of 24 weeks was 25.05 ± 3.07° (group I) 21.55 ± 5.06° (group II) mean Olerud-Molander score was 90.00 ± 6.28 (group I) and 81.25 ± 7.05 (group II), mean Maryland Score was 92.25 ± 4.89 (group I) and 85.50 ± 6.22 (group II), return to work was 14.65 ± 10.83 weeks (group I) and 14.45 ± 10.64 weeks (group I), there was one case of deep surgical site infection ended up requiring implant removal, there was no single case of venous thromboembolism.

Conclusion: Early motion is beneficial for pain relief, range of motion, swelling, return to work, and better patient satisfaction. But the longevity of the same remains questionable. Rehabilitation protocol should be tailored from patient to patient and must be of the personal choice of the patient.

Level of evidence: A prospective cohort study (level II).

Keywords: Ankle fracture, Prospective study, Removable cast mobilization.

Percutaneous Fixation of Intra-articular Calcaneal Fractures: Functional Outcome

Pallav Agrawal

Introduction: Surgical fixation of calcaneus fractures is necessary for intraarticular depressed fractures to restore acceptable functional outcomes. Aggressive surgeries with open reduction and internal fixation may lead to unwanted complications.

To avoid soft tissue complications minimally invasive techniques, with percutaneous cannulated screws were used. We operated on 30 patients with a minimally invasive technique and studied parameters like postoperative functional outcomes and complications.

Materials and methods: Patients above 18 years with closed intra-articular calcaneal fractures (Sanders II–IV) were included. A 6.5 mm and optional 4 mm cannulated cancellous screws were used in all patients. Techniques of reduction like the Essex–Lopresti maneuver and the three-point distraction method (Foran and Zadravec) were used intraoperatively to aid in reduction. The fracture was fixed with cannulated screws under image intensification. The operated limb was immobilized for 8 weeks postoperative. Functional outcomes of all patients were assessed at regular follow-ups using Maryland Foot Score.

Results: Mean functional outcome at the end of 2 months was 59.31, at the end of 4 months it was 65.97, at the end of 6 months it was 71.45, and at 12 months it was 78.40. Hence there was a significant improvement in the functional scores from the 2nd to 12 months. The mean functional score was highest in Sanders type II cases, that is 83.58 at the end of 12 months. That for type III and type IV were 76.2 and 56.33, respectively. 78.40% of patients had excellent to good outcomes, while the rest had fair to poor outcomes. Two patients had complications like deep infection and collapse of fracture due to early weight-bearing.

Discussion and conclusion: A minimally invasive technique with percutaneous screw fixation aids anatomical reduction of fracture and acceptable bony alignment, without soft tissue insult. The indications have not clearly been defined but with better understanding, are now expanding. This surgical technique is preferred in compromised soft tissue conditions and patients with peripheral vascular disease, diabetes, or in chronic smokers. With growing experience, the indications are increasing.

Mueller–Weiss Syndrome: Uncommon Cause of Midfoot Pain

Harshitha S Reddy

Introduction: Mueller–Weiss syndrome is a rare condition that involves spontaneous dysplasia and fragmentation of the tarsal navicular. It is a developmental condition that begins in adolescence but presents in 3rd or 4th decade of life. Frequently bilateral and predominantly affecting females, the pathogenesis of microwave diathermy (MWD) remains unclear. The typical presentation of MWD is a long period of subtle discomfort followed by prolonged disabling pain, especially on standing, without any traumatic history along with a history of difficulty in walking for over a year. Radiological investigation shows osteonecrosis of navicular bone more often on its lateral aspect. Operative treatment should be considered for the failure of conservative therapies *longer* than 6 months. The indication for surgery is the severity of symptoms rather than the severity of deformities. Operative treatment options include core decompression, internal fixation of the tarsal navicular, open or arthroscopic triple fusion, talonavicular or talonavicular-cuneiform arthrodesis, and navicular excision with reconstruction of the medial column. Midfoot fusion with bicolumnar plating is the mainstay of treatment.

Materials and methods: We performed comprehensive evaluations of four patients with this disorder who underwent a midfoot fusion with bicolumnar plating in a tertiary care hospital.

Following parameters will be assessed before the surgery and 6 months after the surgery:

- Clinical assessment—American Orthopaedic Foot and Ankle Society score.
- Weight-bearing radiological investigations.
- Computed tomography.

Results: Bicolumnar plating showed reduced pain, increased productivity, early recovery, and early return to work.

Discussion and conclusion: The goal of this report is to add insight into the possible pathogenesis of this unusual condition and familiarize with the conventional radiographic and magnetic resonance characteristics of osteonecrosis involving the tarsal navicular.

Arch Reconstruction and Deformity Correction with Superconstruct Fixations for Midfoot Charcot's Arthropathy

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Introduction: Midfoot Charcot presents with arch collapse, forefoot abduction, and midfoot instability leading to chronic nonhealing ulcers in the foot.

Purpose: The study is to determine the results of long-segment fusion with intramedullary screw and plate augmentation (super-construct fixations) and the prevention of foot ulcers.

Methods: Retrospective study of midfoot Charcot's arthropathy (June 2012–January 2022). A minimum follow-up of 2 years was included. Hindfoot and ankle Charcot were excluded. Intraoperative restoration of the anatomic foot axes of the medial and lateral columns was achieved in all cases. Patients data collected are age, sex, duration of diabetes mellitus, duration of symptoms, random sugar level, erythrocyte sedimentation rate, C-reactive protein, hemoglobin A1C, time to union, complications, talometatarsal angle in anteroposterior view and lateral view (Meary's angle), joints involved, preoperative, and follow-up midfoot American Orthopaedic Foot and Ankle Society (AOFAS) score and Foot and Ankle Outcome Score (FAOS) and complications were documented.

Results: $n = 98$ patients with a mean age of 53.7 years and mean follow-up of 36.5 (range 24–61) months. 33 patients on the right foot and 38 left, 53 males and 18 females, Mean random blood sugar was 202.12, the mean hemoglobin A1C was 8.1, the mean preoperative erythrocyte sedimentation rate was 38.4, the mean C-reactive protein was 20.9, mean postoperative midfoot-AOFAS score was 85.6 and FAOS score was 95.3 which showed significant improvement ($p < 0.001$). Mean preoperative talonavicular angle improved from 17.580 ± 4.50 to 2.750 ± 0.90($p < 0.001$) and Meary's angle improved from 13.08 ± 2.10 to 4.20 ± 0.80($p < 0.001$). The complete union of both columns was seen in 30 patients, partial union in 25, and nonunion in 16. 10 patients had implant break, postoperative cellulitis was seen in seven patients, deep infection and implant removal in seven, exostectomy in nine, and amputations in three.

Conclusion: Superconstruct fixations yield arch reconstruction, deformity correction, and stable midfoot. However, secondary collapse, implant breakage, and deep infection are common complications seen in 10–15% of patients. Amputation may be needed for recalcitrant infection and exostectomy in the bony prominent sole.

Talus Stop Procedure for Symptomatic Flatfeet

Sakti P Das

Background: The incidence of flatfoot is approximately 5% in children and adults. The symptomatic form of a flexible flatfoot produces subjective and objective complaints, including gait

disturbances. Surgical intervention is considered when conservative management fails. The arthroereisis procedure provides a stable foot and durable correction. However, to the best of our knowledge, no study has evaluated the effectiveness of this procedure on gait parameters.

Methods: Fifteen children with painful flatfeet (10 males; five females) with a mean age of 12 years and 6 months underwent the talus stop procedure. Radiographic, gait analysis and functional measures were evaluated to assess the changes pre- and postoperatively.

Results: All children were followed up for a mean period of 4 years and 6 months. The overall results of the study exhibited statistically significant improvement for all radiographic variables, functional measures, and range of motion investigated in the study ($p < 0.05$). Although the study showed improvement in all temporal parameters ($p < 0.05$) measured in the gait analysis, the results demonstrated there were no statistically significant differences in the kinematic and kinetic variables ($p > 0.05$) before and after surgery.

Conclusion: Although there was no significant improvement in the kinematic and kinetic variables investigated, this study supports the calcaneo-stop procedure as a reliable and effective procedure for treating pediatric flexible flatfoot.

Treating Achilles Tendinopathy Using Speed Bridge Technique: Review of 12 Patients

Prabhav Pokhrel

The surgical approach for treating Achilles tendinopathy involves excising the Haglund's deformity, debriding the retrocalcaneal bursa, detaching some or all parts of the Achilles tendon, debriding the degenerated part, and reattaching the tendon to calcaneum.

In our recent study, we utilized the double-row suture technique also called the SpeedBridge technique with flexor halluces *longus* (FHL) transfer when required to treat Achilles tendinopathy. we assessed the safety and effectiveness of this method with accelerated rehabilitation protocol in the Indian population.

We performed a review of 12 patients. The mean age was 53.9 years (range 29–77). The mean follow-up period was 7.5 months (range 1–15). The mean preoperative American Orthopaedic Foot and Ankle Society (AOFAS) score was 57.33 (range 50–71). The mean postoperative AOFAS score was 90.66 (range 85–100). The mean preoperative Patient-Reported Outcomes Measurement Information System (PROMIS) score was 29.5 (range 26–43). The mean postoperative PROMIS score was 46.33 (range 43–52). The mean interval to weight-bearing was 7.58 days (range 5 to 10). The mean interval to return to activities of daily living was 7.08 weeks (range 6–9). Among 12 persons one had skin healing issues and one had a foreign body reaction after 5 months. A concomitant procedure like FHL transfer was performed in 10 out of 12 cases.

The overall finding was favorable for the SpeedBridge technique. However, it is too early to conclude that because of the small sample size and a smaller number of follow-up durations.

Functional Outcome of Surgically Treated Insertional Achilles Tendinosis with Haglund's Deformity

Nikhil J Martin

Introduction: Haglund's deformity is a degenerative process and is one of the commonest causes of posterior heel pain. Surgical management is warranted once conservative treatment fails. We prospectively evaluated the clinical and functional outcomes of operative treatment with debridement of the retrocalcaneal bursa and the Achilles tendon using a central tendon-splitting approach.

Aim of the study: To prospectively evaluate the clinical, radiological, and functional outcomes of the patients who underwent surgical procedures for Haglund deformity.

Materials and methodology: All patients who underwent surgery for Haglund deformity from 2016 to 2022 were included in the study. All patients underwent clinical assessment of a decrease in swelling and a decrease in tenderness during the follow-up period. Parallel pitch lines and Fowler-Philip angle are used for radiological assessment. The patient's functional outcome was evaluated using the American Orthopaedic Foot and Ankle Society (AOFAS) score.

Results: A total of 30 patients were included in this study of which 18 women and 12 men participated. Among them, 20 patients had right heel involvement, 10 had left side involvement, and no dropouts in the follow-up. The age of patients ranged from 25 to 60 years with a mean age of 44.5 years. The mean follow-up period was 26 months. Achilles tendon calcification was evident on lateral view radiographs in 22 (73%) cases. Postoperative outcome was measured by observing the final outcome in terms of the patient's satisfaction with wound dehiscence, tendon avulsion, and pain relief. The mean pre-op AOFAS score was 57.85 and the score improved to 93.8 in the post-op period. There were no wound problems, painful scars, or Achilles insertion avulsions. The majority of patients in our study reported alleviation of pain and returned to activities of daily living by the end of 3 months. Of the 30 patients, 27 were very satisfied with their current foot and ankle symptoms, two were somewhat satisfied, and one was neutral.

Conclusion: Our findings suggest that surgical management of the Haglund bump by intratendinous debridement, excision of the Haglund bump, and retrocalcaneal bursa with reinforcement of the Achilles tendon with suture anchor results in good clinical, functional outcome.

Keywords: Achilles tendinosis, Chronic Achilles tendinopathy, Haglund's deformity.

Ankle Fractures with Chaput Fragment: A New Classification System with Insights into Morphology, Classification, and Surgical Management

Sandeep Patel

Background: Chaput fragment, a bony avulsion of the anterolateral margin of the distal tibia, is a less commonly discussed fracture pattern in ankle injuries. Its significance in ankle fractures and the optimal fixation technique remains unclear due to limited literature. This study aims to describe the morphology of ankle fractures with Chaput fragments, introduce a new classification system, and describe fixation techniques for each fracture type, thus providing insights for improved clinical management.

Materials and methods: This retrospective case series analyzed 33 patients with ankle fractures and associated Chaput fragments treated at our institution between January 2018 and December 2020. Data on patient demographics, fracture classification, surgical approach, and fixation method were collected. A novel classification system for Chaput fragments was proposed, and various fixation techniques were employed.

Results: The most common fracture pattern was pronation-external rotation (42.4%) followed by posterior-anterior (30.3%). Four distinct morphological types of Chaput fragments were

identified (types I–IV), and three newer variants of trimalleolar fractures were identified (anterior, lateral, and medial variants). Type I Chaput fragment was the most prevalent (60.6%), followed by type II (24.3%), type IV (9.1%), and type III (6.1%). The fixation methods included screw fixation, plate fixation, suture fixation, and combinations of these techniques. Around 90% of type I fractures did not need direct fixation and were stable with a syndesmotic screw. Two patients with type I fracture were fixed with a suture anchor. Type II and type III needed screw or plate fixation and type IV fractures needed disimpaction and buttressing of the comminuted fragment.

Conclusion: Our new classification system based on morphology includes all possible variants of Chaput fracture that can guide clinical decision-making and surgical fixation. Further research is needed to confirm these findings and evaluate the long-term outcomes of different treatment options.

Surgical Management of Pes Planus: A Radiological Comparison between Two Procedures

Harshita S Reddy

Introduction: In pes *planus* deformity, the heel shows excessive eversion during weight-bearing, and the forefoot is usually abducted, producing a midfoot sag with lowering of the longitudinal arch, so that the talar head and navicular tuberosity appear to be in contact with the floor. The medial column of the foot appears *longer* than the lateral column.

Surgical modalities like soft tissue releases, arthrodesis, osteotomies & arthrodesis are current modes of treatment. They can be used alone or adjunct to each other.[3]

Extraosseous talotarsal stabilization (EOTTS) is a relatively new intervention whereas triple C osteotomies is a conventional treatment modality in the treatment of adolescent pes planovalgus.

There is a need to compare both treatment modalities in terms of radiological outcomes.

Material and methods: This study will include a minimum of 10 subjects with pes planovalgus in each study group.

Who has been operated in a tertiary care hospital?

Following parameters will be assessed before the surgery and 1 year after the surgery:

- Clinical assessment
- Weight-bearing AP X-rays T2MA angles.[4]

Results: The average difference in T2MA comparing EOTTS and triple C osteotomy is 26 and 27.3, whereas the percentage change is 60–76%, proving that degree of correction is better with osteotomy. Since both the surgery gives statistically significant results of < 0.05 in the correction of a flatfoot, disproving the hypothesis that osteotomies are a better modality of treatment than EOTTS.

Discussion and conclusion: This proves that EOTTS is comparable to osteotomies for the correction of flatfeet.

Extraosseous talotarsal stabilization (EOTTS) is minimally invasive and also has minimal morbidity compared to triple C osteotomy and also has the advantage of early weight-bearing.

Triple C osteotomy is cost effective whereas EOTTS stent cost is high.

Triple C osteotomy has a better degree of correction than EOTTS.

Extruded Talus Injuries are Associated with Significant Complications: A Double Center Series with a Minimum 1-year Follow-up

Ankit Dadra

Introduction: Extruded talus (ET) injuries are rare, but high-energy open pantalar dislocations. Literature on these injuries is sparse and optimal treatment protocols are ill-defined. The current study documents the clinical and radiological outcomes in cases seen at two centers, in an attempt to determine whether surgeons should choose primary reimplantation or primary talectomy and fusion for these injuries.

Methods: Patients with ET injuries were identified from the database of two hospitals. Baseline demographics and treatment details were evaluated, and patients were called for follow-up. Radiological evaluation was conducted, and function was evaluated by the American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot score. Outcomes and complications were compared between patients who had undergone primary talectomy versus primary reimplantation. Predictors of poor functional outcomes were determined.

Results: Of 23 patients seen by us, 15 were available for follow-up at 45.7 ± 22.2 months. Of these 19 had undergone reimplantation and four had a talectomy with tibio-calcaneal arthrodesis. The mean percentage AOFAS score was 66.2 ± 14.6 at follow-up. Avascular necrosis was noted in five, ankle arthrosis in 10, subtalar arthrosis in four, and infection in four cases; no patient needed salvage arthrodesis during this time. There was no difference in baseline demographics, range of motion, AOFAS scores, or complication rates between patients undergoing primary reimplantation vs primary talectomy. The number of complications per patient showed a negative, moderate correlation with the AOFAS score (Pearson's correlation coefficient 0.6, *p*- value =0.02).

Conclusion: Despite the best treatment, ET injuries result in significant impairment of functional outcomes and complications. Within the numbers available, no difference in outcomes or complication rates was noted between primary reimplantation and talectomy. However, we recommend reimplantation as the treatment of first choice as this offers the chance to salvage the ankle joint and preserves bone stock for future fusion or arthroplasty.

Ankle Arthrodesis in Difficult Clinical Situations by Ilizarov Method

Srinivas Reddy

Objective: To study the results of ankle arthrodesis in some of the difficult clinical conditions performed by the Ilizarov method.

Introduction: Ankle arthrodesis still remains the most successful method of treating ankle pain resulting from various conditions.

Ankle arthrodesis enjoys high popularity despite ankle arthroplasty as the results are not much satisfactory when compared with hip and knee arthroplasty.

Ankle arthrodesis is really a challenging surgical procedure because of its moderately high failure rate. In spite of many surgical procedures described, the Ilizarov method stands ahead of other procedures especially in difficult clinical situations because of its wide array of indications and reliable and positive outcome. The indications included (1) infected arthritis, (2)Charcot's ankle, (3)

compromised soft tissue envelop, (4) insufficient/osteoporotic bone stock, (5) badly contaminated open fractures of the ankle, (6) ankle disorders associated with limb length discrepancy, (7) revision ankle arthrodesis, and (8) associated with periarticular deformities.

Material and methods: Retrospective clinical study on 14 patients between 2009 and 2022. Males—12 and females—2. Mean age—37.3 years.

The surgical procedure is to be carried out in two steps. Step one is ground preparation for arthrodesis step two mounting of the fixator. Surgery consisted of one-foot frame construction and two tibial rings. Surgery in severe forms of infection with significant bone loss was carried out in two separate stages. Bone grafting was done in four cases.

Postoperative wound care, pin site dressings, and gradual compression of the fusion site are to be followed. Physiotherapy is to be advised.

Results: Fusion was obtained in 12 patients.

Malunion—5° hindfoot varus in one patient.

Long-term results are quite satisfactory.

Fixator time—7 months and 8 days.

Complications: No major complications except for one case of Charcot's ankle which failed to unite and has undergone below-knee amputation.

Discussion: Ankle arthrodesis in difficult clinical scenarios offers many advantages when compared with other methods of fixation because of its modularity and effective biomechanical principles aid in the achievement of union.

Conclusion: Ankle arthrodesis by the Ilizarov method seems to be the most reliable option in difficult clinical conditions.

Keywords: Ankle, Arthrodesis, Ilizarov method.

Bony Balancing Technique for Treatment of Nonhealing Ulcer of Neuroparalytic Foot

Naveen Kothari

Introduction: Nonhealing ulcers in the anesthetic foot like diabetes mellitus, leprosy, and spinal injuries are very difficult to heal. Patient suffers months and years from nonhealing ulcer and this notorious problem creates a big reason for morbidity and social stigma among them.

Materials and methods: At the reconstructive surgery (RCS) center, Jabalpur, Madhya Pradesh, India. we have examined a total of 1,986 ulcer patients from January 2010 to April 2023. A total of 235 were operated on in the last 13 years by a single surgeon. All sorts of procedures were performed for the healing of these ulcers like debridement, flaps, curettage, and bone balance procedures.

Technique: Bone balancing is done by reducing the hyperextension of metatarsophalangeal joints and clawing of toes by simple K-wire fixation.

Results: A total of 235 patients with nonhealing ulcers of the foot were operated on. Out of these 124 patients were selected for bone balancing procedure. Age was 14–76 years (mean age 39 years) M:F =4:1. Majority of the ulcers were present over the forefoot, and head of the first metatarsal in 115 patients. In 9 patients' ulcers were present over head of the 5th metatarsal and lateral border of the foot. The average ulcer size was 5.25 cm^2. The average healing time was 24 days.

Discussion and conclusion: Neuro paralysis of the short muscles of the foot leads to a bony imbalance of all joints and pressure distribution of the head metatarsal was deranged, bone balancing is an effective procedure in the healing of nonhealing ulcer by correcting this imbalance by reducing the hyperextension of metatarsal phalangeal joints and clawing of toes.

An Attempt to Solve the Mystery: A Comparative Study of Dimensions of Haglund in Complete vs Partial Chronic Tendo-Achilles Rupture

Swati Patnaik

Introduction: It is difficult to assess or predict the outcome when a patient comes with Haglund syndrome. We attempt to solve the mystery of the actual dimensions of the retrocalcaneal spur which leads to either complete or partial rupture of tendo-Achilles (TA). We added the intraoperative mediolateral dimension to our study considering that the mediolateral dimension of bony spur is important in producing symptoms of Haglund syndrome.

Methods: We recruited 23 cases of chronic TA rupture (13 partial rupture and 10 complete rupture) who failed conservative treatment and were planned for open debridement of a bony spur, retrocalcaneal bursae along with repair of TA, and where required flexor hallucis *longus* transfer. Weight-bearing lateral radiographs to measure Fowler-Philip angle (FP angle) and Haglund height (HH) were done and intraoperative measurements of mediolateral dimensions of Haglund were noted. American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot preoperative and postoperative scores were documented at an interval of 6, 12, and 24 weeks.

Results: Mean FP angle of 62.7°(standard deviation (SD) = 8.7) in patients with complete tear and mean FP angle of 55.9° (SD =3.7). Mean HH of 9.6 mm (SD =0.2) in complete tear and mean HH of 9.5 mm (SD =0.4) in partial tear. The mean intraoperative mediolateral dimension of 2.5 mm (SD =0.2) in complete tear and the mean mediolateral dimension of 2.5 mm (SD =0.1) in partial tear.

FP angle was significantly higher in the group with complete tears (p = 0.02). However, no clinically significant difference was found for HH angle and mediolateral dimensions in the two groups (p = 0.5, p = 0.8). Both the groups showed good results after surgery with comparable AOFAS scores postoperatively.

Conclusion: The Fowler-Philip angle (FP angle) may be considered a parameter to predict the outcome of Haglund syndrome and may help in prognosticating patients. However, the mediolateral dimension of Haglund or HH may not have any implication in the clinical outcome of such cases. Further studies with larger sample sizes are needed.

Treading New Ground: Evaluating Kinematic and Pedobarographic Alterations in Talar Neck Malunions, and Their Effect on Functional Outcomes

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Introduction: Malunion is a disabling complication of talar neck fractures and is prevalent in approximately 17% of cases. The impact of talar neck malunions (TNM) on foot biomechanics and functional outcomes is not well established. The available evidence is primarily derived from cadaveric studies which have demonstrated that

TNMs result in reduced motion and significant alterations in contact characteristics of the subtalar joint. Owing to the paucity of literature on this subject, we conducted this study to evaluate the kinematic and pedobarographic changes and functional outcomes associated with TNMs.

Methods: In this study, adult patients with TNM without ankle arthrosis were prospectively enrolled over a 5-year period. The Rammelt and Zwipp classification was utilized to categorize the deformities. Demographic data and ankle and subtalar range of motion were assessed. Weight-bearing anteroposterior, lateral, and long axial radiographs, as well as computerized tomography scans of both feet were obtained. Dynamic pedobarography was performed to evaluate gait kinematics and plantar pressure distribution. Functional outcomes were evaluated using the Manchester–Oxford Foot Questionnaire (MOXFQ), visual analog score (VAS), and the EQ-5D questionnaire. The *t*-test was utilized to compare the range of motion, pedobarographic and kinematic parameters between the normal and pathologic foot. Furthermore, correlation coefficients were calculated to determine the strength of the association between changes in talar neck geometry, plantar pressures, kinematics, and functional outcomes.

Results: A total of 10 patients, six males, and four females, with a mean age of 32.4 years were enrolled. On the TNM side, significant increases were observed in step length and step time, while significant decreases were noted in the single limb support time and single limb support center of the pressure line. Moreover, midfoot forces were significantly increased, whereas the forefoot and hindfoot forces were significantly decreased on the TNM side. A strong positive correlation was found between midfoot force and the talar torsion angle, and a moderate negative correlation was observed between hindfoot and midfoot forces and the inclination angle. A strong positive correlation was also noted between high midfoot pressures and VAS scores, MOXFQ scores, and the EQ-5D walking and usual activities domains.

Conclusion: This study demonstrates that TNMs are associated with decreased single limb support time, increased step length and time, increased midfoot pressures, and decreased forefoot and hindfoot pressures. Additionally, an increase in talar neck torsion after TNM is linked with higher midfoot pressures, which can lead to higher levels of pain and poorer function. Our findings provide valuable insights into the altered foot biomechanics after TNMs, which can assist surgeons in offering optimal management strategies for these patients.

Hindfoot Fixations in Open Calcaneus Fractures with Significant Bone and Soft Tissue Loss

Arun Kamal

Introduction: Posttraumatic open calcaneus fractures with significant bone and soft tissue loss are devastating injuries with high morbidity due to multiple reconstructive procedures and chances of secondary below-knee amputations.

Methods: We report five cases from January 2015 to December 2020 who presented with open calcaneus fracture with significant bone loss and soft tissue loss in the hindfoot with a mean follow-up of 2.5 years. All were men following a road traffic accident, with a mean age of 31.3 years. Our protocol was immediate wound debridement for the open hindfoot wounds and a spanning external fixator across the ankle joint. After the soft tissue edema had subsided, wound cover was done using a microvascular-free *gracilis* flap. Once the flap wound had started to heal, these patients were discharged. After 6 weeks, the external fixators were removed, and the below-knee slab was applied. After 8 to 10 weeks from the initial debridement, these patients were readmitted for the fusion of the ankle, the talonavicular, and the medial column of the foot in a neutral position. We used the bridge plate technique, with a bent 4.5 Limited Contact Dynamic Compression Plate plate placed dorsally along with autologous iliac crest grafts.

Results: The average stay in hospital was 21.3 days. All patients were followed at 4-week intervals till union and, after that, at 3-month intervals. For the first 6 weeks, non-weight-bearing walking with walker support was followed by gradual weight-bearing after evidence of radiological union. The average time for fusion was 16.5 weeks. Neither was an infection nor was there a need for secondary procedures. The mean American Orthopaedic Foot and Ankle Society score was 82 (range 76–86), with a good outcome. At the final follow-up, there was an average of 2 cm shortening, and the patients adapted well to footwear modifications.

Conclusion: Open calcaneus fractures with bone and soft tissue loss are challenging to treat. Our staged reconstruction protocol gave predictable results and a new lease of hope for patients with significant bone and mild tissue loss of the calcaneus.

Study of Assessment of the Quality of Life after Surgical Management of Old Neglected Foot and Ankle Fractures and Its Correlation with Hindfoot Score: Case Series

Aradhana Rathod

Introduction: Fractures around the ankle make up 9% of all fractures. For a multitude of reasons, in a country like ours, we have patients presenting to our outpatient departments with injuries that are neglected, and treated by osteopaths or traditional bone setters. There is limited data available regarding the prevalence of such old, neglected injuries around the ankle.

Materials and methods: It is a prospective observational study period between January 2015 to May 2022. We treated and followed up on 10 cases of old neglected ankle fractures. The average duration from injury was 13 weeks in eight cases and 27 months in two cases. Four patients were female. Average preoperative SF 36 component scores were as follows physical score 26.5, emotional score 17.2, and social score 15. The preoperative American Orthopaedic Foot and Ankle Society (AOFAS) score was 24.7. One patient had obesity (Mueller–Weiss syndrome), one had diabetes, and one had a flatfoot. Seven patients underwent osteoclasis and fixation, one underwent additional triple fusion, one patient syndesmosis screw and deltoid repair, and two underwent ankle arthrodesis. All patients had union at an average of 13 weeks. Superficial skin necrosis was seen in 6 patients which was managed by regular dressings.

Results: Postoperative 1-year scores and difference, respectively were physical score 87 (difference—60.5), emotional score 80.6 (difference—63.4), and social score 88.8 (difference—73.8). The postoperative AOFAS score was 80.5 (difference—55.8).

Discussion and conclusion: There was a positive correlation between the AOFAS score and SF 36 physical score, emotional and social score in most of the patients but in a few positive physical scores correlation was not very well appreciated in patients of Mueller–Weiss syndrome, and flatfoot and female gender. Emotional and functional score correlation was not very

well appreciated in the female gender irrespective of radiological outcome. Salvage of the ankle in old neglected fractures of the ankle gives good results in cases who present early and arthrodesis gives good results in cases of late presentations, in terms of SF 36 and AOFAS scores.

Study of Health-related Quality of Life in Surgically Managed Patients of Charcot Arthropathy of Foot and Ankle: Case Series

Aradhana Rathod

Introduction: With a reported prevalence of 0.1–0.4% in the general population, Charcot neuroarthropathy prevails in up to 3.0% of patients with diabetes. Quality of life assessment of patients who have undergone surgery for Charcot arthropathy has not been studied in the literature in the past. EQ-5D-5L is a standardized and validated instrument to assess health outcomes.

Materials and methods: It is a prospective observational study period between January 2021 and May 2022. We treated eight cases of Charcot arthropathy of the foot and ankle. According to anatomical classification, one had type I, one had type II, two had type III, and four had both type II and III. Six were diabetic, one had sensory-motor neuropathy, and one case had meningomyelocele. Six patients had an infection (methicillin-resistant *Staphylococcus aureus* (MRSA)/*Klebsiella*/*Escherichia coli*) not responding to any antibiotics. Debridement and vancomycin cement spacer was used in two patients who had heavy bacterial growth. Seven patients underwent ring fixator application with foot rings included and two underwent internal fixation. Two of them (midfoot exostosis and subtalar dislocation) needed gradual deformity correction, arthrodesis was performed in seven patients (triple fusion in one, tibio-calcaneal in four patients, tibiotalar in one, and tibia to midfoot fusion in one). Corticotomy was performed in four patients and showed improvement in the healing of ulcers and improvement in sensation over the toes. Vacuum-assisted closure application aided in the healing of debrided sinuses and ulcers.

Results: Health-related quality of life EQ-5D-5L index scores improved drastically after deformity correction and ambulation of all patients. Bony union (24–40 weeks) in six and fibrous union in two cases was achieved for shoeable or braceable feet. One case had a recurrence of infection.

Discussion and conclusion: Deranged renal parameters, and MRSA infection/polymicrobial infection cases had delayed the healing which indirectly affected the EQ-5D-5L scores. Limb salvage of Charcot arthropathy of foot and ankle has given good results in terms of patient satisfaction and improvement in quality of life as assessed by EQ-5D-5L index scores.

Fixation in Missed Lisfranc Injuries: Should This be Attempted?

Shubham Dakhode

Introduction: Subtle Lisfranc injuries are often either missed or misdiagnosed as "midfoot-sprain" during the initial assessment. The decision regarding whether to fix such missed or chronic injuries or to do arthrodesis is still a topic of debate. So, the purpose of this study was to evaluate the outcomes of delayed fixation of missed Lisfranc injuries.

Materials and methods: A total of 10 patients with missed Lisfranc injuries (>6 weeks after injury) were included in the study. Most of the patients had a previous history of subtle, low-energy injuries to their feet which were treated conservatively. All patients preoperatively underwent weight-bearing radiographs of the foot and the distance between the lateral border of the medial cuneiform and the medial border of the 2nd metatarsal base were measured for degree of displacement. Patients were treated with open reduction and internal fixation as opposed to arthrodesis. Outcomes were assessed using the visual analog scale (VAS) score, American Orthopaedic Foot and Ankle Society (AOFAS) midfoot score, postoperative radiographic evaluation, and return to work time.

Results: Out of 10 patients, 70% were female and 30% were male. The average time interval between injury and surgery was 9.6 + 2.50 weeks, the mean age was 41.5 + 10.2 years, and the mean follow-up duration was 33.6 + 12.98 months. The average degree of displacement between the lateral border of the medial cuneiform and the medial border of the 2nd-metatarsal base was 5.14 + 0.93 mm. At the final follow-up, no patients had radiographic signs of late diastasis at the Lisfranc joint. The preoperative VAS score improved from 7.5 + 1 to 1.6 + 0.69 postoperatively. One patient had developed arthritis at the first and second tarsometatarsal joints but did not have any symptoms. The average AOFAS midfoot score pre and postoperatively was 37.6 + 10.8 and 84.2 + 6.54, respectively, with two patients having excellent outcomes, six patients having good outcomes and, two patients having fair outcomes. At the final follow-up, all patients could perform their activities of daily living and recreational activities independently and return to their preinjury work with an average return-to-work time of 3.77 + 0.68 months.

Conclusion: Subtle, low-velocity missed Lisfranc injuries can be well managed with open reduction and internal fixation. In our series, delayed fixation resulted in decreased pain scores and a fair to good functional outcome.

Role of Artificial Intelligence in Classification of Bones of Foot by Supervised Machine Learning Method

Kurian Alappatt

Introduction: Artificial intelligence (AI) is the simulation of human intelligence in machines, that can think and act like humans. Machine learning is a subset of artificial intelligence. In supervised machine learning, we give labeled data to the machine learning model for training. Based on the training of labeled data, the machine learning model can classify the newly given data. Here in this study, we are utilizing this method to identify and classify bones of the foot.

Materials and methods: In this study, we have used cadaveric dry bones of the foot. All the bones were photographed. The images were prepared for training the machine learning model. We also changed the background of the bones in the photographs to reduce errors. After the data preparation, we labeled the images for each class of individual bones. We have two separate datasets for each of the classes. One dataset is for training and the other dataset is for testing the model. Then we used the training dataset for the training of the model. After the training, the machine learning model was created. We then tested the model with the testing datasets images, that is, those that were not used for the training. We fed the testing datasets and we recorded the predictions for each class.

Results: The supervised machine learning model has successfully identified and classified each testing dataset of bones of the foot with accuracies of >90%.

Discussion and conclusion: The supervised machine learning model accurately identified and classified the bones of the foot

from the images. Hence machine learning models can be utilized in applications involving the identification of bones like in the surgical field of vision, in improving the accuracy of three-dimensional printed bone prostheses, and in forensic anthropology.

Neglected Fractures around Ankle

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Ankle injuries account for around 7%, commonly among elderly females and < 50 years of age among males. Delayed presentation is quite common in our country either after being treated by a local osteopath or maltreated by an orthopedic surgeon. The main aim of treating such injuries is to achieve anatomical reduction and stable fixation to give these patients stable, painless ankles.

After radiological evaluation and categorizing them according to fracture pattern, open reduction and internal fixation (ORIF) was done. In ORIF the main problem in achieving good reduction was a chunk of fibrous tissue all around the ankle leading to contracture and shortening fibula. The second problem was severe osteoporosis (because of a lot of hot fomentation and different types of local applicants suggested by osteopaths in our country) which prevented rigid fixation by even locked plating and at times we had to compromise by tension band wiring of both malleoli. The trick in achieving good reduction is to open all compartments of the ankle, that is, lateral, posterior, and medial simultaneously to achieve good and stable reduction.

Open reduction and internal fixation (ORIF) should always be attempted to avoid early arthrosis and to give a stable ankle even in the delayed presenter.

Keywords: Ankle, Delay, Salvage, Trauma.

Nerve Entrapments around Foot and Ankle: A Case Series and Review of Literature

Nikhil Karwande

Introduction: Advancements in understanding the pathophysiology of entrapment neuropathy from both experimental and human studies have led to an increased number of cases diagnosed with nerve compression. Entrapment neuropathy around the foot and ankle is one of the common but challenging things to diagnose and treat for an orthopedic surgeon. In our experience, we came across some common as well as uncommon cases of nerve entrapment around the foot and ankle. In this article, we have depicted our findings of some cases of entrapment neuropathy around the foot and ankle.

Methods: We presented our observation of operatively managed nine cases of entrapment neuropathy around the foot and ankle. Two uncommon cases of deep peroneal nerve entrapment, three cases of tibial nerve entrapment, three cases of Baxter's nerve entrapment, and one case of Morton's neuroma have been included in our study. Detailed history, clinical and radiological findings, details of operative procedure performed, postoperative protocols, and outcomes of each case have been thoroughly explained.

Results: Deep peroneal nerve and its articular branch was encased in fibrotic tissue in a case of posttraumatic entrapment. In the other case of deep peroneal nerve entrapment, the nerve was compressed under the deep fascia of the first web space, just distal to the Lisfranc joint. In cases of tibial nerve entrapment, a tibial nerve was compressed by varicosities in one case, and calcific tissue was found compressing the nerve in a tarsal tunnel in the other case. There was an intraneural abscess in the tibial nerve proximal to the tarsal tunnel causing symptoms in the third case. Baxter's nerve was found compressed by deep fascia of the abductor hallucis muscle in all three cases. Morton's neuroma was excised with a good outcome. Satisfactory outcomes were seen with operative management in all the cases presented in this series.

Conclusion: High index of suspicion, thorough knowledge of nerve anatomy and possible entrapment sites, a detailed history, meticulous clinical examination, and appropriate radiological investigations are important in the diagnosis and management of nerve entrapments around the foot and ankle.

Correlation between Progressive Collapsing Foot Deformity and Malalignment of the First Metatarsophalangeal Joint and Knee

Alphy Philips

Introduction: Progressive collapsing foot deformity (PCFD), previously "pes planus," is a common peritalar condition that is encountered. Cases of hallux valgus and varus were seen more in cases than in controls of the patients included. Disruption of the weight-bearing axis can be expected in joints that are present above or below this joint in the lower limb due to altered biomechanics. There is a lack of literature studying the effects of PCFD on the 1st metatarsophalangeal (MTP) joint and the knee.

Materials and methods: A retrospective study of 21 patients presenting with PCFD was assessed with anteroposterior (AP), lateral X-rays of both feet and ankle as well as bilateral lower limb scanograms. A total of 21 patients (42 feet) were included. At the 1st MTP joint, the hallux valgus angle and intermetatarsal angle were considered. For PCFD, Meary's angle, calcaneal pitch, lateral, and AP talocalcaneal angle, talocalcaneal uncoverage angle, and the knee, the tibiofemoral angle was taken into consideration.

Results: The most common malalignment that was seen is genu varus with normal 1st MTP joint alignment. However, genu varum was associated with both hallux varus and hallux valgus. Genu valgum was associated much less frequently with malalignment of the 1st MTP.

None of the patients with normal knee alignment was associated with abnormalities of the 1st MTP.

Discussion and conclusion: The above findings suggest the knees are usually the first joint to be involved in malalignment from biomechanical disruption due to PCFD, 1st MTP joint malalignment is not seen unless the knees have already been involved and a more complex nonlinear pattern of deformities may occur in PCFD. Larger studies are required to further corroborate these findings.

Keywords: Genu valgus, Genu varus, Hallux valgus, Hallux varus, Progressive collapsing foot deformity.

Comparison of Hindfoot Charcot's (Brodsky 3A) vs Combined Hindfoot–Midfoot Charcot's Arthropathy (Brodsky 4) Primarily Operated with Hindfoot Nailing

Ramakanth Rajagopalakrishnan

Aim and background: Charcot's arthropathy affecting the hindfoot (Brodsky type 3A) and combined hindfoot-midfoot (Brodsky type 4), dilemma to fuse, hindfoot alone or hindfoot with midfoot, are not clearly defined yet. Our study aims to compare the outcomes and complications of primary hindfoot stabilization for the hindfoot alone versus combined hindfoot midfoot Charcot's arthropathy.

Methods: This is a retrospective study of all the patients who were operated for Charcot's arthropathy between 2018 and 2021. Included hindfoot and combined hindfoot-midfoot Charcot's arthropathy after trivial trauma/failed and neglected ankle fractures and excluded Brodsky's 1, 2, and 3B type-Charcot's arthropathy, nonneuropathic arthritis, and inflammatory arthritis. *N* = 62 patients were grouped based on Brodsky's classification: group I (41) included hindfoot Charcot's alone (type 3A) and group II (21) included combined hindfoot and midfoot Charcot's arthropathy (type 4). Patient demographic details like age, sex, duration of symptoms (months), Brodsky classification, Eichenholtz staging, random blood sugar, hemoglobin A1C (HbA1c) at admission, diabetic status (controlled/uncontrolled), duration of diabetes mellitus, duration of preoperative antibiotics, erythrocyte sedimentation rate, C-reactive protein, urea, and creatinine. Radiological and functional outcomes [American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot scale and Foot and Ankle Outcome Score (FAOS)] were compared between the groups.

Results: Average follow-up is 19.17 ± 3.1 and 19.48 ± 2.7 in groups I and II. The mean age was 58.5 ± 11.05 years and 53.3 ± 11.27 in groups I and II. Male:female is 24:17 in group I and 12:9 in group II. Both the groups were similar in terms of biochemical parameters except (HbA1C), which was significantly higher in group II ($p = 0.003$). Similarly, there was a higher number of patients with uncontrolled diabetes in group II ($p = 0.010$). The mean postoperative AOFAS hindfoot scores in both group I and group II had improved significantly compared to their preoperative value (*p*-value group I—0.005 and group II—0.005). However, no statistical significance for AOFAS and FAOS between the groups ($p = 0.202$ and $p = 0.103$). 67.2% of patients were able to walk unaided during final follow-up. Tibio-calcaneal angle in both the groups during the final follow-up was statistically more significant than their preoperative value (*p*-value; group I—0.01 and group II—0.005). However, there was an insignificant average secondary varus collapse of 4.75 ± 15.3° in group I and 5.45 ± 18.3° in group II. 11 of 41 (26.8%) in group I and 10 of 21 (47.6%) in group II had complications. Minor complication [superficial infection, *minor* implant failure(screw back-out), stable hindfoot with implant breakage], 12.2% in group I, 14.3% in group II. Major complication (deep infection, major implant failure that required nail removal/amputation, ulcer)—14.6% in group I, 33.3% in group II. Two patients needed implant removal, two required below-knee amputation and one plantar bony deformity required exostectomy.

Conclusion: Around 67.2% of patients with a good clinical and radiological outcome following hindfoot nailing were able to walk unassisted, and 95% of patients' limbs were salvageable hindfoot nailing. Patients with combined midfoot and hindfoot arthropathy were more likely to experience complications. High HbA1c is one of the significant factors that led to complications.

Keywords: Charcot's arthropathy, Diabetic mellitus, Hindfoot, Hindfoot nail, Midfoot, Tibiotalocalcaneal fusion.

Comparison of Radiological and Clinical Outcome of Treatment of Lisfranc Injuries with Dorsal Low-profile Plates and Trans-fixing Intra-articular Screws

Arvind

Introduction: The Lisfranc ligaments connect the first ray (First metatarsals and medial cuneiform) to the middle and lateral columns. Lisfranc injuries refer to a broad spectrum of injuries that include pure Lisfranc ligamentous injuries to fractures and fracture-dislocations of tarsometatarsal joints. Two treatment options are available- trans-fixing intra-articular screws and low-profile dorsal plates. The study aims to compare the radiological and clinical outcomes of both modalities of treatment.

Materials and methods: A total of 30 patients with Lisfranc injuries treated with low profile profile plates and intra-articular screws were divided into two groups of 15 patients each. Patients were followed up for radiological and clinical outcomes for a period of minimum 12 months. Clinical outcomes were assessed using American Orthopaedic Foot and Ankle Society (AOFAS) midfoot scores and radiological outcomes were analyzed based on anatomical reduction using Wilppula classification.

Results: Patients treated with dorsal plating had better clinical and radiological outcomes compared to the patients treated with screws. The AOFAS Midfoot score was 89.1 points in the dorsal plate fixation group compared to 74.5 points in the screw fixation group. As per Wilppulla classification dorsal plating group had 91% of patients with good reduction compared with only 79% of patients in the intra-articular screws group.

Discussion and conclusion: As per the literature review (Logos–Bastia, 2016), trans-fixing screws are associated with a higher rate of malreduction and an increased risk of damage to joint cartilage leading to early osteoarthritis. Screw fixation was also associated with a higher rate of late arch collapse due to malreduction and screw breakage.

In our study, we noted similar poorer radiological outcomes in terms of achieving anatomical with screw fixation compared to plate fixation. Longer studies are required to establish if these results lead to a higher incidence of osteoarthritis in screw fixation patients.

Clinical outcomes were also higher with plate fixation patients when compared to screws in the medium term.

We conclude that dorsal plating offers better radiological and clinical outcomes in the medium term compared to screw fixation for Lisfranc injuries.

Efficacy of Releasing Medial 1/4th of Plantar Fascia Using a Novel Technique in Intractable Plantar Fasciitis: A Prospective Study

Diana Surish

Aims: The aim of this study was to assess the feasibility of excising only medial 1/4th of plantar fascia using a novel technique for endoscopic plantar fasciotomy.

Methods: This prospective study was conducted from April 2019 to March 2021. Patients who underwent endoscopic plantar fasciotomy through a novel technique were assessed using standardized evaluation techniques (visual analog scale, American Orthopaedic Foot and Ankle Society).

Results: Endoscopic plantar fasciotomy using our novel technique had satisfactory results in 95% of cases by the end of 1 year. Pain and functional scores had significantly improved with minimal complications.

Conclusion: In our study, it was found that endoscopic plantar fascia excising only medial 1/4th of plantar fascia using our novel technique was a simple and cost-effective procedure with lesser morbidity and good patient satisfaction.

Case Report: 6-month-old Lisfranc Injury Treated with Open Reduction and Internal Fixation Plating

Yash Mehta

Introduction: Around 20% of Lisfranc injuries may be initially overlooked or misdiagnosed. Around 40% have no treatment in the 1st week. Lisfranc(tarsometatarsal) joint involves a base of the second metatarsal which is recessed between medial and lateral cuneiforms. The second metatarsal base is the keystone in the transverse arch of the foot. The Lisfranc ligament attaches medial cuneiform to the base of the second metatarsal. Ligamentous, bony, and soft tissue support provides for intrinsic stability across the plantar aspect of the Lisfranc joint; conversely, the dorsal aspect of this articulation is not reinforced by structures of similar strength. Clinical signs include plantar ecchymosis, piano key test, and heel grasp test. Radiological signs include fleck sign, lateral step-off, and diastasis >2 mm between the first and second metatarsal bases. Case of a 45-year-old female having a history of twisting foot injury from a *motor* vehicle accident with forceful abduction of the forefoot on tarsus. The injury was initially overlooked and managed conservatively for 6 months. The patient then developed pain in the foot.

Materials and methods: X-ray-AP, lateral, and oblique views in a weight-bearing position. A computed tomography scan showed a fracture of the second metatarsal base and medial cuneiform. Longitudinal dorsal incision centered over the first/second intermetatarsal space, allowing identification of the neurovascular bundle and access to the medial two tarsometatarsal joints. The Lisfranc joint was reduced and fixed with a spider plate and cannulated compression (CC) screw directed from the second metatarsal base towards the medial cuneiform. Non-weight-bearing cast was given for 6 weeks. Follow-up was done immediately, 6th, 12th, and 18th months. X-rays were done and the functional foot index (FFI) score was assessed.

Results: Full weight-bearing started at 8 weeks. Union identified at 12 months. FFI scores were 93, 44, 28, and 13 at immediate, 6th, 12th, and 18th months post-op. The patient had implant impingement which was removed at 12 months. This further reduced FFI to 18 months.

Conclusion: Treatment of 6-month-old Lisfranc Injury with plating-CC screw yields good functional, radiological outcomes.

Keywords: Cannulated compression screw, Functional foot index score, Lisfranc, Spider plate, X-ray.