Results: There was significant interobserver agreement with high correlation for the following measurements ($p < 0.0001$): distances between medial cuneiform-to-floor ($r = 0.981$) and to-skin ($r = 0.986$), navicular-to-floor ($0.992$) and to-skin ($r = 0.900$); cuboid-to-floor ($r = 0.975$) and to-skin ($r = 0.978$), and calcaneus-to-fibula ($r = 0.808$); calcaneal inclination angle ($r = 0.795$); forefoot arch angle ($r = 0.983$); and subtalar horizontal angles at 25%, 50%, and 75% of the anteroposterior joint length ($r = 0.784$, 0.891, 0.809). Significant agreement with moderate correlation was additionally demonstrated for talar-first metatarsal angle ($r = 0.553$, $p < 0.014$), medial cuneiform-first metatarsal angle ($r = 0.668$, $p < 0.001$), and navicular-cuneiform angle ($r = 0.746$, $p < 0.0002$). Level of training did not influence the reliability of any measurements except medial cuneiform-first metatarsal angle (specialist: 8.83; student: 1.61; $p < 0.01$). Statistically insignificant difference between readers ($p > 0.05$) was noted in mean talar-first metatarsal and subtalar horizontal angles.

Conclusion: While literature describes large variability for AAFD measurements from plain radiographs among readers of varying medical experience, 3D WB CBCT can yield similar measurements using predefined planes with high agreement independent of reader experience.

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39

FI2016_FreePaper_09
Dance-related foot and ankle injuries presenting to United States Emergency Departments
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Background: Dance is a favoured physical activity associated with many physical and mental benefits. However risk of injury, especially to the lower limb, is a significant issue. Previous studies have focused on professionals or particular genres, therefore the extent of dance-related foot and ankle injuries in the general population is unknown.

Aims: To describe foot and ankle dance injuries, including sex and age related associations, presenting to United States Emergency Departments (EDs) from 2000 to 2013.

Methods: Data was extracted from the nationally representative National Electronic Injury Surveillance System. National injury estimates and injury proportion ratios (IPRs) were calculated using the SPSS complex samples module.

Results: The annual national estimate of dance-related injuries presenting to ED was 17,145/year. Of these 6120 (36%) affected the ankle, foot or toe. Ankle sprains were most common accounting for 2915 injuries/year (48%), followed by foot sprains (901; 15%) and foot fractures (640; 10.5%). There was a greater proportion of ankle (IPR = 1.34; 95% CI: 1.03–1.75) and foot sprains (IPR = 2.11; 95% CI: 1.52–2.94) among females and forefoot sprains (IPR = 1.61; 95% CI: 1.06–2.46) among younger dancers. From 2000/2001 to 2012/2013, the population standardised rate of foot and ankle injuries increased by 23% ($r^2 = 0.6; p = 0.05$); however the proportion of injuries affecting the foot and ankle has not changed significantly ($r^2 = 0.3; p = 0.2$).

Summary/conclusions: Foot and ankle injuries account for 1/3 of all dance-related injuries presenting to ED and represent a concern for safe dance participation. Age and sex injury patterns exist, likely due to participation in different dance styles.

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40

FI2016_FreePaper_10
Distribution patterns of foot and ankle tumors
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Background: Bone and soft tissue tumors of the foot and ankle are not rare. Nevertheless, diagnosis is often delayed as diagnostic errors are more common than in other regions. Awareness for this localization of musculoskeletal tumors is not very high and neoplasia is often not considered.

Purpose: Bone and soft tissue tumors of the foot and ankle and their distribution pattern will be analyzed on the basis of a retrospective single-centre study with a population of 409 consecutive patients.

Patients and methods: The data of 409 patients that were treated for foot and ankle tumors between 1997 and 2014 was analyzed regarding epidemiological information, entity and localization. Exclusion criteria were incomplete information on the patient or entity (e.g. histopathological diagnosis) and all pseudotumors like ganglia, osteoarthritic cysts or Morton’s neuroma.

Results: 409 cases of tumors of the foot and ankle were included. 258 tumors involved the bone, among them 230 benign and 28 malignant. There were 151 soft tissue tumors (110 benign, 41 malignant). Compared to similar other studies, our results show only a few parallels regarding involved tumor entities. Distribution patterns of foot and ankle tumors seem to demonstrate great heterogeneities.

Conclusions: Precisely because distribution patterns seem to demonstrate a great heterogeneity, knowledge of typical appearance and common localizations of foot tumors will help to correctly assess unclear bone and soft tissue lesions and initiate the right steps in further diagnostics and treatment. Unawareness can lead to delayed diagnosis and may result in undertreatment or overtreatment.

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41

FI2016_FreePaper_11
Outcome of midfoot derotational osteotomy for midfoot–forefoot supination deformities
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Introduction: Moderate to severe midfoot–forefoot supination deformities are commonly found in several pathologic conditions especially as post-surgical complication sequelae, which is difficult to address. We evaluated the clinical and radiological outcomes of the patients with such deformities who underwent midfoot derotational osteotomy to achieve plantigrade foot.

Methods: From 2006 to 2014, 6 patients (7 ankles) with moderate to severe midfoot–forefoot supination deformities underwent midfoot derotational osteotomy. A visual analog scale (VAS) pain and the American Orthopedic Foot & Ankle Society (AOFAS) midfoot functional score were evaluated. Radiographic
parameters, including tibiocalcaneal angle (TCA) and navicular height (NH) were assessed.

**Results:** The mean patient age at surgery was 48 years (37–58). The mean VAS pain score decreased from 6.5 (2–9) to 1.3 (0–4) and the mean AOFAS functional midfoot score improved from 42.7 (34–58) to 77 (68–87) postoperatively. Two patients (28.6%) were very satisfied, and the rest (71.4%) were all satisfied with the surgical outcome. The mean TCA significantly improved from 33.8 (9.9–66.7) to 12.7 (5.1–27.6) (p = 0.018) and the mean NH decreased from 46.7 mm (32.8–67) to 42.6 (30.1–60.8) (p = 0.018).

**Conclusions:** Severe midfoot–forefoot supination deformities can be efficiently corrected by midfoot derotational osteotomy resulting in favorable clinical and radiological outcomes and high patient satisfaction.

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42

**FI2016_FreePaper_12**

**Measuring hindfoot alignment in weight bearing CT: A novel clinical relevant measurement method**

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**Background:** Weightbearing CT offers new opportunities in understanding hindfoot pathology. The objective of this study is to introduce a clinically relevant and reproducible method to measure hindfoot alignment on weightbearing CT.

**Methods:** Sixty malalignments of the hindfoot were divided in to two groups; group one containing a valgus alignment (n = 30) and group two a varus alignment (n = 30) of the hindfoot. Imaging techniques used were standard radiographs and a weightbearing CT (pedCAT®). Following angles were measured by two different authors: standard long axial hindfoot angle both on standard radiographs and on CT, clinical hindfoot, novel hindfoot angle, talus shift (distance from a neutral alignment), tibial inclination angle, talar tilt and subtalar vertical angle on CT.

**Results:** Hindfoot alignment angles showed to significantly differ from each other (P < 0.001). The novel hindfoot alignment angle showed the highest correlation with the clinical measurement method. Correlation of this novel angle with the talus shift showed a Spearman’s correlation coefficient = 0.87. Interclass correlation coefficient of the novel hindfoot alignment angle = 0.72 and was the highest among the hindfoot alignment angles.

**Conclusion:** The proposed novel hindfoot alignment angle showed to be both clinically relevant and reproducible. The lateral tibiocalcaneal shift, on which the angle is highly correlated to, can help the surgeon in determining the translation necessary to obtain a neutral alignment during a calcaneal osteotomy. Further studies/consensus meetings are needed to determine which angles should be obtained and reported in correcting hindfoot alignment.

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43

**FI2016_FreePaper_13**

**A new concept of 3D biometric for hindfoot alignment using weight bearing CT**

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**Introduction:** Hindfoot alignment measures based on 2D radiographs present many anatomical and operator-related bias. Weight-bearing CT is an opportunity to upgrade these to 3D. A new system: TALAS (Torque Ankle Lever Arm System) designed for weight-bearing CT was used to calculate a new hindfoot alignment measure: FAO (Foot Ankle Offset) which incorporates the position of the foot rather than the tibia.

**Aims:** To describe FAO in a population of anonymised datasets from clinically normal or varus cases. We hypothesized that normal and varus cases should be significantly different and that the distribution should be Gaussian in the normal population.

**Material and methods:** Thirty-four anonymous datasets (26 normal, 8 varus) from weight bearing scans (PedCAT, CurveBeam LLC, Philadelphia, USA) were obtained from an existing database (Royal National Orthopaedic Hospital (Stanmore, UK)) and screened by an independent observer to collect 3D coordinates for the weight bearing plane and the center of the ankle. Data was processed with the TALAS; system, to calculate FAO values (percentage of foot length).

**Results:** Mean value for FAO was 2.34% (SD = 2.92) in normal. −11.36% (SD = 9.19) in varus cases. The difference was significant (p < 0.005). The distribution of the normal population demonstrated a Gaussian shape.

**Conclusions:** This study suggests FAO is efficient in measuring hindfoot alignment using weight bearing CT. Further research in larger patient populations is necessary. Previous research in this field had tried to adapt 2D biometrics to weight bearing CT. TALAS; technology should enable the development of new 3D biometrics.

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44

**FI2016_FreePaper_14**

**Medial gastrocnemius proximal release in chronic plantar fasciitis. Prospective study of 75 cases**

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**Introduction:** Proximal fasciotomy is the most common surgical procedure for the treatment of chronic plantar fasciitis (CPF). However, success rates are variable. Altered leg and foot biomechanics (reduced ankle dorsiflexion) may be involved in the pathogenesis of CPF. A prospective study addresses the effectiveness of isolated proximal medial gastrocnemius release (PMGR) to treat recalcitrant CPF.
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