

Planmed Verity scientific publications

Hirschmann A, Pfirrmann CW, Klammer G, Espinosa N, Buck FM: Upright Cone CT of the hindfoot: Comparison of the non-weight-bearing with the upright weight-bearing position. *Eur Radiol.* 2013 Sep 26. [Epub ahead of print] doi: 10.1007/s00330-013-3028-2

CONCLUSIONS: Cone-beam computed tomography (CBCT) offers new opportunities for musculoskeletal problems. Visualization and quantification of hindfoot alignment are possible in upright weight-bearing CBCT. Hindfoot alignment changes significantly from non-weight-bearing to weight-bearing CT. The weight-bearing position leads to a decrease in the fibulocalcaneal distance and talocalcaneal overlap. The naviculocalcaneal distance is increased in the weight-bearing position.

Koivisto, J, Kiljunen, T, Wolff, J, and Kortensniemi, M: Assessment of effective radiation dose of an extremity CBCT, MSCT and conventional x ray for knee area using MOSFET dosimeters. *Radiat. Prot Dosimetry Advance Access published July 3, 2013*, doi: 10.1093/rpd/nct162

CONCLUSIONS: Planmed Verity effective dose is 12.6 μSv for a knee scan with total dose 4-7 times lower than MDCT, and 4 times higher than planar radiography. Taking into account the potential advantages of the CBCT technique, it can be regarded as a low-dose technique for 3D knee assessment.

Collan, L, Kankare, JA, Mattila, K: The biomechanics of the first metatarsal bone in hallux valgus: A preliminary study utilizing a weight bearing extremity CT. *Foot Ankle Surg.* 19(3), 155-161 (2013), <http://dx.doi.org/10.1016/j.fas.2013.01.003>

CONCLUSIONS: When evaluating hallux valgus, the 3D weight bearing CT might be the only imaging study needed. All relevant data can be obtained in a single study and also rotational changes can be measured accurately. Knowing the rotational status of the first metatarsal bone may also guide the surgeon in the operation room.

Koskinen, SK, Haapamäki, VV, Salo, J, et al. CT arthrography of the wrist using a novel, mobile, dedicated extremity cone-beam CT (CBCT). *Skeletal Radiol.* 42(5), 649–657 (2013). doi: <http://dx.doi.org/10.1007/s00256-012-1516-0>

CONCLUSIONS: A dedicated CBCT extremity scanner is a new method for evaluating the wrist ligaments and radiocarpal cartilage. The method has an overall accuracy of 82–86 % and specificity 81–91 %. For cartilage abnormalities, the accuracy and negative predictive value were high.

Tuominen, EKJ, Kankare, J, Koskinen, SK and Mattila, KT: Technical Innovation: Weight-Bearing CT Imaging of the Lower Extremity. *AJR* January 2013 200:146-148; doi:10.2214/AJR.12.8481

CONCLUSIONS: Cone-beam CT technology with new design and flexible gantry movements allows both supine and weight-bearing imaging of the lower extremities, with a reasonable radiation dose and excellent image quality. Weight-bearing CT of joints can provide important new clinical information in musculoskeletal radiology.

Salo, J., Töyräs, J., Joukainen, A., Jurvelin, J., Kröger, H: Rustovaurioiden kehittyvä diagnostiikka - nopein hoitotuloksia parantava tekijä? *Suomen Ortopedia ja Traumatologia* Vol. 36, 256-261.

CONCLUSIONS: Routine clinical MRI is known to underestimate the area of cartilage and its sensitivity is 65 to 70%. We have tested CBCT accuracy in detecting cartilage defect in clinical patient series. Initial results show 56% detection rate for preoperative MRI and 94% detection rate for CBCT.

Kokkonen, H. T., Suomalainen, J.-S., Joukainen, A., Kröger, H., Sirola, J., Jurvelin, J. S., Salo, J. and Töyräs, J: In vivo diagnostics of human knee cartilage lesions using delayed CBCT arthrography. *J Orthop Res.* 2014 Mar;32(3):403-12. doi: 10.1002/jor.22521. Epub 2013 Nov 19. <http://onlinelibrary.wiley.com/doi/10.1002/jor.22521/full> 2

CONCLUSIONS: The delayed CT arthrography provides a novel method for diagnostics of cartilage lesions. Potentially, it can also be used in diagnostics of cartilage degeneration. Due to shorter imaging times, higher resolution and lower cost of CT over MRI, this technique could provide an alternative for diagnostics of knee pathologies.

Matikka, H and Virén, T: Radiation dose reduction in cone-beam computed tomography of extremities: evaluation of a novel radiation shield. *Journal of Radiological Protection* 34 (2014) N57–N63

CONCLUSIONS: Radiation shielding was found to significantly decrease the absorbed doses in elbow and knee imaging geometries. Furthermore, scattered radiation within the room was significantly reduced near the CT bore. The current results indicate that the radiation shielding should be used to reduce the absorbed dose to all patients, and especially in the case of pediatric or young patients and when multiple scans are taken (i.e. CBCT arthrography).

Koivisto J, Wolff J, Järnstedt J, Dastidar P, Kortenesniemi M: Assessment of the effective dose in supine, prone, and oblique positions in the maxillofacial region using a novel combined extremity and maxillofacial CBCT scanner. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2014 Sep;118(3):355-62. doi: 10.1016/j.oooo.2014.05.016. Epub 2014 Jun 14.

CONCLUSIONS: Head positioning has an important effect on the organ and effective doses. The Planned Verity CBCT scanner effective dose results were comparable with those attained on 2 conventional CBCT devices and were considerably lower than the MSCT scanner results.

Colin F, Horn Lang T, Zwicky L, Hintermann B, Knupp M: Subtalar joint configuration on weightbearing CT scan. *Foot Ankle Int.* 2014 Jul 11. pii: 1071100714540890. Published online 11 July 2014 DOI: 10.1177/1071100714540890.

CONCLUSIONS: To our knowledge, this is the first weightbearing CT study describing the ST joint configuration on an asymptomatic cohort. The CT scans used in our study presented several advantages: the images collected, with patients being in an upright, weightbearing position, resembled the physiological situation of how the ST joint is normally stressed. The image quality of the portable extremity CT scanner was considered excellent, and furthermore, the detail and accuracy of CT provides the best method nowadays for evaluating hindfoot pathology and alignment.

Halonen KS, Mononen ME, Jurvelin JS, Töyräs J, Salo J, Korhonen RK: Deformation of articular cartilage during static loading of a knee joint – Experimental and finite element analysis. *J Biomech.* 2014 Jul 18;47(10):2467-74. doi: 10.1016/j.jbiomech.2014.04.013. Epub 2014 Apr 16.

CONCLUSIONS: Novel conical beam CT-scanners offer high resolution imaging of knee structures with i.a. contrast media, even under weight bearing. The present results improve understanding of the mechanisms controlling articular cartilage strains and meniscal movements in a knee joint under physiological static loading. Ultimately a validated model could be used as a noninvasive diagnostic tool to locate cartilage areas at risk for degeneration.

Huang AJ, Chang CY, Thomas BJ, MacMahon PJ, Palmer WE: Using cone-beam CT as a low-dose 3D imaging technique for the extremities: initial experience in 50 subjects. *Skeletal Radiol.* 2015 Feb 5. [Epub ahead of print]

CONCLUSIONS: Average imaging duration was shorter for CBCT than radiographs (4.5 min vs. 6.6 min) and MDCT (7.6 min vs. 10.9 min). Average estimated effective radiation dose was less for CBCT than MDCT (0.04 mSv vs. 0.13 mSv). CBCT images yielded more diagnostic information than radiographs in 23/51 cases and more diagnostic information than MDCT in 1/7 cases, although radiographs were superior for detecting hardware complications. CBCT performs high-resolution imaging of the extremities using less imaging time than radiographs and MDCT and lower radiation dose than MDCT.

Koivisto J, Kiljunen T, Kadesjö N, Shi XQ, Wolff J: Effective radiation dose of a MSCT, two CBCT and one conventional radiography device in the ankle region. *Journal of Foot and Ankle Research* (2015) 8:8. DOI 10.1186/s13047-015-0067-8. <http://www.jfootankleres.com/content/pdf/s13047-015-0067-8.pdf>

CONCLUSIONS: Compared with the conventional 2D radiographic device, this study showed a 14-fold effective dose for a standard MSCT protocol and between a 1.3-4 fold effective dose for standard CBCT protocols. The results of this study showed a large variability in the effective dose values attained on the CBCT devices using different scan modes and FOVs. Furthermore, when compared with MSCT devices, the two CBCT devices assessed in this study offer a promising low-dose, three-dimensional alternative for ankle imaging.

Hirschmann A, Buck FM, Fucentese SF, Pfirrmann CW: Upright CT of the knee: the effect of weight-bearing on joint alignment. *Eur Radiol*. 2015 May 1. <http://link.springer.com/article/10.1007%2Fs00330-015-3756-6>

CONCLUSIONS: Knee joint alignment changes significantly in the upright weight-bearing position using CT when compared to supine non-weight-bearing CT. Tibial tuberosity-trochlear groove distance (TTTG) is less pronounced in a weight-bearing position. The weight-bearing position leads to a decrease of the lateral patellar tilt angle. Cone-beam extremity CT offers upright weight-bearing examinations of the lower extremities

Kortekangas T, Savola O, Flinkkilä T, Lepojärvi S, Nortunen S, Ohtonen P, Katisko J, Pakarinen H: A prospective randomised study comparing TightRope and syndesmotic screw fixation for accuracy and maintenance of syndesmotic reduction assessed with bilateral computed tomography. *Injury*. 2015 Jun;46(6):1119-26. doi: 10.1016/j.injury.2015.02.004. Epub 2015 Feb 21.

SUMMARY: The primary aim of this study was to compare syndesmosis screw and TightRope fixation in terms of accuracy and maintenance of syndesmosis reduction using bilateral computed tomography (CT). Syndesmosis reduction was assessed using bilateral CT intraoperatively or postoperatively, and also at least 2 years after surgery. Grade of osteoarthritis was qualified with follow-up cone-beam CT.

Suojärvi N, Sillat T, Lindfors N, Koskinen SK: Radiographical measurements for distal intra-articular fractures of the radius using plain radiographs and cone beam computed tomography images. *Skeletal Radiol*. 2015 Dec;44(12):1769-75. doi: 10.1007/s00256-015-2231-4. Epub 2015 Aug 14.

CONCLUSIONS: Plain radiographs provided a slightly poorer level of agreement. Two different measurements by the same reader or by two different readers can lead to different decisions, and therefore a standardization of the measurements is imperative.

Hirschmann A, Buck FM, Herschel R, Pfirrmann CW, Fucentese SF: Upright weight-bearing CT of the knee during flexion: changes of the patellofemoral and tibiofemoral articulations between 0° and 120°. *Knee Surg Sports Traumatol Arthrosc*. 2015 Nov 4. [Epub ahead of print]

CONCLUSIONS: Knee joint articulations change significantly during flexion using upright weight-bearing CT. Progressive internal tibiofemoral rotation leads to a decrease in the TTTG and a posterior shift of the contact points in higher degrees of flexion. This elucidates patellar malalignment predominantly close to extension and meniscal tears commonly affecting the posterior horns.

Edlund R, Skorpil M, Lapidus G, Bäcklund J: Cone-Beam CT in diagnosis of scaphoid fractures. *Skeletal Radiol*. 2015 Nov 12. [Epub ahead of print].

RESULTS: Sensitivity for radiography was 44% and for CBCT 69 % (p = 0.12). Several non-scaphoid fractures in the carpal region were identified; radiography and CBCT depicted 7 and 34, respectively (p < 0.0001).

CONCLUSIONS: CBCT is a superior alternative to radiography, entailing more accurate diagnoses of carpal region fractures, and thereby requiring fewer follow-up MRI examinations.

CBCT can thus safely replace radiography in diagnosis of carpal fractures, reduce the need for follow-up MRI, and thereby increase the cost effectiveness.

Lohse C, Catala-Lehnen P, Regier M, Heiland M: Superior performance of cone beam tomography in detecting a calcaneus fracture. *GMS Interdiscip Plast Reconstr Surg DGPW.* 2015; 4:Doc09. DOI: 10.3205/iprs000068, URN: urn:nbn:de:0183-iprs000068

CONCLUSIONS: Because of its high-resolution scans at low radiation dose, CBCT provides a highly recommended alternative tool also for detecting fractures of extremities.

Honkanen JT, Danso EK, Suomalainen JS, Tiitu V, Korhonen RK, Jurvelin JS, Töyräs J: Contrast enhanced imaging of human meniscus using cone beam CT. *Osteoarthritis Cartilage.* 2015 Aug;23(8):1367-76. doi: 10.1016/j.joca.2015.03.037. Epub 2015 Apr 10.

CONCLUSIONS: The cross-sectional distribution of CA was consistent with that reported in a previous μ CT study on bovine meniscus. The time required to reach diffusion equilibrium was found impractical for clinical applications.

Turunen MJ, Töyräs J, Kokkonen HT, Jurvelin JS: Quantitative evaluation of knee subchondral bone mineral density using cone beam computed tomography. *EE Trans Med Imaging.* 2015 Oct;34(10):2186-90. doi: 10.1109/TMI.2015.2426684. Epub 2015 Apr 28.

CONCLUSIONS: For OA diagnostics, clinical CBCT enables not only quantitative analysis of articular cartilage but also subchondral bone vBMD. Quantitative information on both cartilage and subchondral bone could be beneficial in OA diagnostics.

Krähenbühl N, Tschuck M, Bolliger L, Hintermann B, Knupp M. Orientation of the Subtalar Joint: Measurement and Reliability Using Weightbearing CT Scans. *Foot Ankle Int.* 2016 Jan;37(1):109-14. doi: 10.1177/1071100715600823. Epub 2015 Aug 20.

CONCLUSIONS: Subtalar joint orientation may be a risk factor for the development of ankle joint osteoarthritis.

Lepojärvi S, Niinimäki J, Pakarinen H, Leskelä HV: Rotational Dynamics of the Normal Distal Tibiofibular Joint With Weight-Bearing Computed Tomography. *Foot Ankle Int.* 2016 Feb 27. pii: 1071100716634757. [Epub ahead of print]

CONCLUSIONS: This study provides reference values to evaluate the dynamics of the normal distal tibiofibular joint.

Lepojärvi S, Niinimäki J, Pakarinen H, Koskela L, Leskelä HV: Rotational Dynamics of the Talus in a Normal Tibiotalar Joint as Shown by Weight-Bearing Computed Tomography. *J Bone Joint Surg Am.* 2016 Apr 6;98(7):568-75. doi: 10.2106/JBJS.15.00470.

CONCLUSIONS: This study provides reference values with which to evaluate the dynamics of the normal tibiotalar joint in order to clarify rotational stability of the ankle mortise.

Pugmire BS, Shailam R, Sagar P, Liu B, Li X, Palmer WE, Huang AJ: Initial Clinical Experience With Extremity Cone-Beam CT of the Foot and Ankle in Pediatric Patients. *AJR Am J Roentgenol.* 2016 Feb;206(2):431-5. doi: 10.2214/AJR.15.15099. 5

CONCLUSIONS: CBCT of the foot or ankle of pediatric patients is a viable lower-dose alternative to MDCT that provides important information that may affect clinical management.

Stewart RC, Honkanen JT, Kokkonen HT, Tiitu V, Saarakkala S, Joukainen A, Snyder BD, Jurvelin JS, Grinstaff MW, Töyräs, J: Contrast-Enhanced Computed Tomography Enables Quantitative Evaluation of Tissue Properties at Intrajoint Regions in Cadaveric Knee Cartilage. *CARTILAGE* First published date: September-01-2016 doi: 10.1177/1947603516665443

CONCLUSIONS: Ioxaglate-enhanced CT imaging utilizing a clinical CBCT scanner quantitatively indicates various biochemical, histological, and biomechanical properties of cartilage in an intact human knee ex vivo.

Myller KA, Turunen MJ, Honkanen JT, Väänänen SP, Iivarinen JT, Salo J, Jurvelin JS, Töyräs J: In Vivo Contrast-Enhanced Cone Beam CT Provides Quantitative Information on Articular Cartilage and Subchondral Bone. *Ann Biomed Eng.* 2016 Sep 19. PMID: 27646147 DOI: 10.1007/s10439-016-1730-3. [Epub ahead of print]

CONCLUSIONS: For the first time, dCBCTa enabled the detection of articular cartilage injuries and subchondral bone alterations simultaneously in vivo. Significant relations between ICRS grading and both cartilage and bone parameters suggest that dCBCTa has potential for quantitative imaging of the knee joint.

Venäläinen, M. S. et al.: Quantitative Evaluation of the Mechanical Risks Caused by Focal Cartilage Defects in the Knee. *Sci. Rep.* 6, 37538; doi: 10.1038/srep37538 (2016). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5126640/pdf/srep37538.pdf>

CONCLUSIONS: Computational modeling based on CBCT arthrography may provide a novel approach for diagnostics of cartilage defects. Further, the method may reveal risks for the development of post-traumatic OA particularly by recognizing locations with elevated levels of compressive and shear strains. When evaluating the mechanical response of cartilage with a defect in an individual, this approach could aid the clinical decision-making by identifying potentially harmful cartilage defects that, without an effective intervention, could promote progressive cartilage loss.

Neubauer J, Neubauer C, Gerstmair A, Krauss T, Reising K, Zajonc H, Kotter E, Langer M, Fiebich M, Voigt J.: Comparison of the Radiation Dose from Cone Beam Computed Tomography and Multidetector Computed Tomography in Examinations of the Hand. *Rofo.* 2016 May;188(5):488-93. doi: 10.1055/s-0042-101251. Epub 2016 Mar 16.

CONCLUSIONS: Although the dose of the standard protocols in the CBCT is lower than in the MDCT, the MDCT can realize a good overall image quality at a lower dose than the CBCT. Dose optimization of CT examination protocols for the hand is useful in both modalities, the MDCT has an even greater potential for optimization.

Neubauer J, Benndorf M, Reidelbach C, Krauß T, Lampert F, Zajonc H, et al. (2016): Comparison of Diagnostic Accuracy of Radiation Dose-Equivalent Radiography, Multidetector Computed Tomography and Cone Beam Computed Tomography for Fractures of Adult Cadaveric Wrists. *PLoS ONE* 11(10): e0164859. doi:10.1371/journal.pone.0164859 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5082876/pdf/pone.0164859.pdf>

CONCLUSIONS: To sum up we demonstrate that the diagnostic accuracy of RED-MDCT and RED-CBCT for wrist fractures is similar and in some parts even higher compared to radiography. Readers are more confident in their reporting with the cross sectional modalities. Our findings suggest that dose equivalent cross sectional computed tomography imaging of the wrist could replace plain radiography for fracture diagnosis in the long run.

Suojärvi N, Haapamäki V, Lindfors N, Koskinen SK. (2016): Radiocarpal Injuries: Cone Beam Computed Tomography Arthrography, Magnetic Resonance Arthrography, and Arthroscopic Correlation Among 21 Patients. *Scand J Surg.* 2016 Jul 25. pii: 1457496916659226. [Epub ahead of print]

CONCLUSIONS: Cone beam computed tomography is an emerging imaging modality that offers several advantages over computed tomography and magnetic resonance imaging. Its usefulness particularly in ligamentous injuries should be further explored in a larger study. Cone beam computed tomography arthrography seems to offer similar sensitivity, specificity, and accuracy compared to magnetic resonance arthrography and therefore serves as a valuable option in evaluating patients with wrist pain.

De Dea M, L Loizou C, Allen GM, Wilson DJ, Athanasou N, Uchihara Y, Cooke P, Cosker T (2017): Talonavicular ligament: prevalence of injury in ankle sprains, histological analysis and hypothesis of its biomechanical function. *Br J Radiol.* 2017 Mar;90(1071):20160816. doi: 10.1259/bjr. 20160816. Epub 2016 Dec 20.

CONCLUSIONS: The TNL is surprisingly commonly injured in ankle sprains. Its anatomy and histology suggest a role in tensile force transmission during the windlass mechanism in gait. Advances in knowledge: Injury to the TNL is common and has not been described. Its anatomy suggests resistance to tensile forces and its injury allows excessive movement at the TNJ.

Koivisto J, van Eijnatten M, Järnstedt J, Holli-Helenius K, Dastidar P, Wolff J (2017): Impact of prone, supine and oblique patient positioning on CBCT image quality, contrast to noise ratio and figure of merit value in the maxillofacial region. *Dentomaxillofac Radiol.* 2017 Mar 17:20160418. doi: 10.1259/dmfr.20160418. [Epub ahead of print]

CONCLUSIONS: Head positioning has an impact on CBCT image quality. The best CBCT image quality can be achieved using the prone and supine imaging positions. The oblique imaging position offers inadequate image quality except in the sinus region.

Tschauner S, Marterer R, Nagy E, Apfaltrer G, Riccabona M, Singer G, et al. (2017): Surface radiation dose comparison of a dedicated extremity cone beam computed tomography (CBCT) device and a multidetector computed tomography (MDCT) machine in pediatric ankle and wrist phantoms. *PLoS ONE* 12(6): e0178747. <https://doi.org/10.1371/journal.pone.0178747>

CONCLUSIONS: Adapted extremity CBCT imaging protocols have the potential to fall below optimized pediatric ankle and wrist MDCT doses at comparable image qualities. These possible dose savings warrant further development and research in pediatric extremity CBCT applications.

Koivisto J, van Eijnatten M, Kiljunen T, Shi XQ, Wolff, J (2017): Effective Radiation Dose in the Wrist Resulting from a Radiographic Device, Two CBCT Devices and One MSCT Device: A Comparative Study. *Radiat Prot Dosimetry.* 2017 Oct 13:1-11. doi: 10.1093/rpd/ncx210. [Epub ahead of print].

CONCLUSIONS: When compared with the effective dose for AP- and LAT projections of a conventional radiographic device, this study showed an 8.6-fold effective dose for standard MSCT protocol and between 0.7 and 2.4-fold effective dose for standard CBCT protocols. When compared to the MSCT device, the CBCT devices offer a 3D view of the wrist at significantly lower effective doses.

Jaroma A, Suomalainen JS, Niemitukia L, Soininvaara T, Salo J, Kröger H (2018): Imaging of symptomatic total knee arthroplasty with cone beam computed tomography. *Acta Radiol.* 2018 Jan 1:284185118762247. doi: 10.1177/0284185118762247.

CONCLUSIONS: Two-dimensional (2D) CBCT scanning provides reliable and reproducible data for determining the rotation of femoral and tibial components, while showing minor overestimation of tibial component loosening. CBCT is a promising new tool for the evaluation of symptomatic knee arthroplasty patients, with a substantially lower radiation dose compared to conventional 2D multi-slice CT.

Aurell Y, Andersson M, Forslind K. (2018): Cone-beam computed tomography, a new low-dose three-dimensional imaging technique for assessment of bone erosions in rheumatoid arthritis: reliability assessment and comparison with conventional radiography - a BARFOT study. *Scand J Rheumatol.* 2018 May;47(3):173-177. doi: 10.1080/03009742.2017.1381988. Epub 2018 Jan 10.

CONCLUSIONS: CBCT has high reproducibility and is more sensitive than CR in detecting erosions in this cohort of patients with long-standing RA. CBCT has the potential to become an important tool in the detection and follow-up of erosions in patients with RA.

Review articles

Suomalainen A, Koskinen SK. Kartiokeilatietokonetomografia ja sen kliiniset sovellukset. (Cone-beam CT: a review). *Duodecim* 2013;129:1037-43.

Suomalainen A, Koskinen SK, Korttesniemi M. Kartiokeilatietokonetomografia (Cone-beam CT: a review). *Suomen Lääkärilehti* 2015.

Book chapters

Vasenius, J: Die-Punch Fractures: Open and Arthroscopy-Assisted Fixation. Book Chapter in: *Distal Radius Fractures 2014*, pp 181-187. Love, LM., et al. (eds.) http://dx.doi.org/10.1007/978-3-642-54604-4_24 Springer Berlin Heidelberg 17 May 2014.

CONCLUSIONS: Reliable evaluation of radiocarpal and distal radioulnar joint congruency is not always possible with radiographs or image intensifier. Therefore preoperative computed tomograms or cone-beam computed tomogram with or without arthrography is valuable in preoperative planning.

Doctoral, master and bachelor theses

Kokkonen H. Development and Evaluation of Delayed CT Arthrography of Cartilage. *Dissertations in Forestry and Natural Sciences No 91*, 2012.

http://epublications.uef.fi/pub/urn_isbn_978-952-61-0970-1/urn_isbn_978-952-61-0970-1.pdf

Holmen Jenssen, C and Kristoffersen, M: What advantages and disadvantages are there with the use of conventional radiography and Verity CT regarding fractures in the upper- and lower extremities? Bachelor thesis. Høgskolen i Gjøvik, Avdeling for helse, omsorg og sykepleie. Mai 2014 http://brage.bibsys.no/xmlui/bitstream/handle/11250/227348/1/CHJensen_MKristoffersen_2014.pdf

Koivisto J. The use of MOSFET dosimeters and anthropomorphic phantoms in low dose dental CBCT applications. Helsinki University E-thesis Helsinki 2015

<https://helda.helsinki.fi/bitstream/handle/10138/156584/theuseof.pdf?sequence=1>

Lepojärvi, Sannamari, Normal variation of the tibiotalar joint in dynamic computed tomography. University of Oulu Graduate School; University of Oulu, Faculty of Medicine; Medical Research Center Oulu; Oulu University Hospital Acta Univ. Oul. D 1405, 2017

Planned Verity scientific presentations

Mattila KT, J. Kankare J, Korttesniemi M, et al. 2011: Cone beam CT for extremity imaging. EPOS at ECR 2011, Vienna.

Mattila KT 2011: Extremity CT. Oral presentation at Finnish Radiologic Society Winter Seminar

Mattila KT 2011: Role of CT -Do We Benefit of Weight-bearing CT? Oral presentation at 59th Nordic Radiologic Congress., 20th Nordic congress of Radiography, Mariehamn.

Kankare J 2011: Kartiokeila -TT:n käyttö muskuloskeletaali-radiologiassa. Oral presentation at XXXV Sädeturvapäivät, Tampere.

Koskinen, SK et al. 2011: CT Arthrography in the Diagnosis of Wrist Ligament Tears using a Novel Mobile Dedicated Extremity Cone-beam CT (CBCT) Scanner. Poster at American Society of Emergency Radiology Annual Scientific Meeting and Postgraduate Course. Key Biscayne, FL.

Koskinen, SK et al. 2011: CT Arthrography of the Wrist using a Novel Mobile Dedicated Extremity Cone-Beam CT (CBCT). Poster at American Society of Emergency Radiology Annual Scientific Meeting and Postgraduate Course. Key Biscayne, FL.

Koskinen, SK et al. 2011: CT Arthrography of the Wrist Using a Novel Mobile Dedicated Extremity Cone Beam CT (CBCT). Poster at Radiologic Society of North America (RSNA) 2011, Chicago, IL.

Haapamäki et al. 2012: Scaphoid Fractures: Assessment of Fracture Healing after Screw Fixation Using a Novel Mobile Dedicated Extremity Cone-beam CT (CBCT) Scanner. ePoster at European Congress of Radiology (ECR) 2012, Vienna.

Koskinen, SK et al. 2012: CT arthrography of wrist ligament tears using a novel mobile dedicated extremity cone-beam CT (CBCT) scanner. ePoster at European Congress of Radiology (ECR) 2012, Vienna.

Salo, J. et al. 2011: Imaging of ex vivo iatrogenic cartilage lesions with CBCT (Verity). Initial Results of Foot and Ankle Imaging With a dedicated extremity CBCT (Verity). Oral presentation at the Finnish Orthopaedic Society Annual Meeting, Helsinki.

Yli-Kyyny, T et al. 2012: Initial Results of Foot and Ankle Imaging With a dedicated extremity CBCT (Verity). Oral presentation at NOF 2012 Tallinn.

Salo, J. et al. 2012: High resolution diagnosis of cartilage and meniscus damage with a novel extremity-CBCT. EPoster at ICRS, Montreal.

Mattila KT 2012: Imaging in Upper Extremity Trauma. Oral presentation at Nordic Forum for Trauma and Emergency Radiology.

Mattila KT 2012: Dedicated Extremity Coned Beam CT. Oral presentation at International Skeletal Society -meeting, Rome 8

Mattila KT 2012: - Radiologiaa Uutta ja Vanhaa Oulu, 20.09. 2012 Raaja-TT traumaindikaatiossa, radiologi Kimmo Mattila, TYKS

D. J. Wilson, M. S. Watson; Oxford/UK: Cone beam CT in the assessment of elbow pain after surgery. ePoster at European Congress of Radiology (ECR) 2013, Vienna.

A. Hirschmann, C.W.A. Pfirrmann, N. Espinosa, G. Klammer, F.M. Buck; Zurich/CH: Do sagittal and coronal alignment of the hindfoot change in upright weight-bearing position? Comparison of upright weight-bearing and supine non-weight-bearing computed tomography. Oral presentation at European Congress of Radiology (ECR) 2013, Vienna.

A. Hirschmann, F.M. Buck, S. Fucentese, C.W.A. Pfirrmann; Zurich/CH: Weight-bearing CT of the knee: does the joint alignment change from supine to upright position? Oral presentation at European Congress of Radiology (ECR) 2014, Vienna.

D.J. Wilson, G.M. Allen, S. Bullock: Extremity CT and ultrasound in the assessment of ankle injuries – occult fractures. Oral presentation at European Congress of Radiology (ECR) 2015, Vienna. Insights Imaging DOI 10.1007/s13244-015-0387-z (2015) 6 (Suppl 1):S159 – S445.

D.Y. Lee et al.: 3D Computational Position Analysis based on the Articular Surface of Tarsal Bone: A Preliminary Study. ePoster at AOFAS 2015, Long Beach, CA.
<http://www.aofas.org/education/AM15%20ePosters/3dcomputationalpositionan.pdf>

T. Sillat, K. Mattila, S. K. Koskinen: Dedicated extremity CBCT scanner in musculoskeletal imaging. EPOS Poster, ESSR 2015, York <http://dx.doi.org/10.1594/essr2015/P-0130>.

J. Neubauer et. al: Comparison of Radiation Dose-equivalent Radiography, Multidetector Computed Tomography and Cone Beam Computed Tomography for Fractures of the Wrist, RSNA 2015.

D. J. Wilson, G. M. Allen et al. Predicting poor outcome from simple ankle injuries ePoster C-2371 at European Congress of Radiology (ECR) 2016, Vienna.

R. Edlund, M. Skorpil, G. Lapidus, J. Backlund: Cone-beam CT in diagnosis of scaphoid fractures. B-1181 Oral presentation at European Congress of Radiology (ECR) 2016, Vienna.

Salo, J: Kartiokeila TT - näkeekö sillä rustot. IX Sädeturvapäivät 2016.

Mattila, KT: Nilkan ja jalan kuvantaminen raaja-TT:llä – kannattaako? Sädeturvapäivät 2016.