What’s in your shoulder? Current concepts of shoulder arthroplasty
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TEACHING OBJECTIVES:
To review the current concepts of shoulder arthroplasty.
To review the normal post-operative appearance of shoulder arthroplasty including materials, design, and function.
To review the imaging appearance of common complications.

CONTENTS:
Prosthesis material, design, and terminology
Preoperative imaging assessment
Normal post-operative imaging appearance
Imaging findings of common complications

CONCLUSION: Imaging evaluation of shoulder arthroplasty predominantly utilizes radiographs. The foundation of interpretation is the knowledge of the normal appearance of the many types of shoulder replacement hardware. From this knowledge of normal, the malfunctioning shoulder arthroplasty can be assessed. A standard approach to radiographic reporting should be undertaken. Some complications have a characteristic appearance that all radiologists should recognize.

The utility of dual energy CT in musculoskeletal imaging
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PURPOSE: To discuss the mechanisms, advantages and disadvantages of dual energy computed tomography (DECT) over conventional tomography (CT) in musculoskeletal imaging as DECT provides additional information about tissue composition and artifact reduction. This provides clinical utility in detection of urate crystals, bone marrow edema, reduction of beam hardening metallic artifact and ligament and tendon analysis.

MATERIALS AND METHODS: At our institution, we use 384-slice dual source dual energy CT scanner (Somatom Force, Siemens Healthcare, Germany). Scan parameters include two tubes with peak kilovoltages of 80 kVp and 150 kVp with their corresponding detectors and automated tube current settings. Post processing occurs on a multi-modality workstation (SYNGO-VIA) and images are studied using color coded multiplanar reformations and 3D volume rendered techniques.

Gout: DECT uses a two-material decomposition algorithm, which distinctively separates and color codes calcium and urate crystals separately owing to their different molecular weights. The uric acid crystals are color-coded in green, different from calcium and bone marrow-cortical bone is coded blue, medullary bone is coded pink.

Bone Marrow Evaluation: Dual energy CT by virtue of its virtual non-calcium technique (VNCa) has been shown to be a useful tool in assessing bone marrow edema. The edema detected can be viewed as grayscale overlay, color-coded pattern or 3D depending upon availability of software and user convenience.

Metallic artifact reduction: Virtual monochromatic image spectrum is derived from DECT dataset, which is used to suppress the metallic artifacts.

Tendons and Ligaments: The set of images obtained at two different energy levels can be made to undergo three-material collagen decomposition algorithm on a multi-modality workstation.

CONCLUSION: Dual energy CT provides promising applications and benefits in musculoskeletal imaging. Some early promising results are seen in detection of bone marrow edema, reduction of metallic artifact, visualization of tendons and ligaments. However, its utility in detection of urate crystals is currently in use in clinical practice.
Correlation between dynamic contrast enhanced MRI and conventional MR features in inflammatory myopathies: feasibility and preliminary results
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PURPOSE: To investigate the correlation between dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) parameters and disease activity and conventional MR features in patients with inflammatory myopathies.

MATERIALS AND METHODS: Twenty-four patients with inflammatory myopathies who underwent conventional and DCE-MRI from July 2016 to February 2017 were retrospectively included in the study. The signal intensity time courses were smoothed using medium temporal and spatial filters due to decrease noise. Using a two-compartmental model, quantitative DCE parameters (Ktrans, Kep, Vp, Vp, AUC) was calculated according to compartment anatomy of thigh muscles (anterior, medial, and posterior). The region of interest (ROI) of each muscle were drawn three times in DCE map and mean value was used. Conventional MR features were recorded by two musculoskeletal radiologists in consensus. Correlation between DCE-MRI parameters and conventional MR features, biochemical data were analyzed using Pearson’s correlation, univariate and multivariate regression analyses.

RESULTS: Patients had a mean age of 46.7 ± 16.3 years, and 19 were female (79.2%). A significant correlation was found between edema, active inflammation, Ktrans, Vp in Pearson correlation analysis (p < 0.001). After univariate regression, a significant association remained between edema and Ktrans and Vp (r = 0.536, p < 0.001). After multivariate regression, a significant association remained between edema and Ktrans (p < 0.001) and Vp (p = 0.029). There was no significant agreement between perfusion parameters and biochemical data.

CONCLUSION: Ktrans and Vp has a positive correlation with edema and active inflammation of conventional MR features, it might be reflect the disease activity and quantification of activity in inflammatory myopathies.

CLINICAL RELEVANCE: The quantitative measurement of involved muscle using DCE-MRI might be another useful technique to correlation activity of inflammatory myopathies.

SE 07 MS-04
Fat within bone lesion
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Fat is an important clue when diagnosing bone lesions. Confirmation of fat composition of a bone lesion by MR imaging or CT is usually sufficient to confirm without the need to biopsy. Although other lesions may contain fat, they are nearly always benign. The most representative bone tumors, including fat, are hemangioma and intraosseous lipoma, which can be easily diagnosed. In addition to these two bone lesions, various bone lesions including fat.

1. Enchondroma
2. Liposclerosing myxofibrous tumor
3. Non-ossifying fibroma
4. Paget’s disease
5. Fibrous dysplasia
6. Giant cell tumor
7. Bone infarction, etc.

Knowing the image findings of these lesions can help in accurate diagnosis and treatment.
SE 07 MS-05

Three-dimensional isotropic T2-weighted fast spin-echo (VISTA) ankle MRI versus two-dimensional fast spin-echo T2-weighted sequences for the evaluation of anterior talofibular ligament injury

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PURPOSE: To compare the performance of axial images of the ankle joint on 3D volume isotropic turbo spin echo acquisition (VISTA) with that of 2D fast spin echo (FSE) T2-weighted images for the diagnosis of anterior talofibular ligament (ATFL) injury.

MATERIALS AND METHODS: This retrospective study included 101 patients who underwent both 2D FSE T2-weighted MR and 3D VISTA MR of the ankle. Signal-to-noise ratio (SNR) and contrast to noise ratio (CNR) of both sequences were measured. Anatomic identification score and diagnostic performances of both sequences were evaluated by two radiologists. The diagnostic performances of 3D VISTA and 2D FSE images were analyzed in terms of sensitivity, specificity, and accuracy for diagnosing ATFL injury. Surgically or clinically confirmed diagnoses were used as reference standards.

RESULTS: The margin sharpness scores on 3D VISTA were significantly inferior to those of 2D FSE (p < 0.001). Other scores (entire length, entire width) were not significantly different between the two imaging methods. The SNRs and CNRs of 3D VISTA were significantly higher than those of 2D FSE (p < 0.001). When we classified diagnoses as normal and abnormal, the specificity of the 3D VISTA images for the diagnosis of ATFL injury was 95.7%, significantly superior to 2D FSE (84.3%-85.7%). There were no significant differences between 3D VISTA and 2D FSE images in sensitivity or accuracy for diagnosis (p-values, 0.227-1.000), with the exception of accuracy by reader 1 (p value, 0.039).

CONCLUSION: 3D VISTA image has diagnostic performance comparable to that of 2D FSE image for the diagnosis of ATFL injury, although 3D VISTA is inferior to 2D FSE for the evaluation of margin sharpness. Replacing axial and coronal images with 3D VISTA can save scan time without negatively impacting diagnostic ability for ATFL injury.

SE 07 MS-06

Comparison of two MR grading systems for correlation between grade of cervical neural foraminal stenosis and clinical manifestations

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PURPOSE: To compare the reliability of two recently reported MR grading systems of cervical neural foraminal stenosis (CNFS) and their correlation with clinical manifestations.

MATERIALS AND METHODS: We evaluated 188 patients (M:F = 80:108; mean age, 41 years) who visited our institution and underwent oblique sagittal MR imaging of the cervical spine. Two radiologists evaluated the MRI findings for the presence and grade of CNFS at the narrowest point, with the grading systems (Park, Kim and mKim systems) suggested by Park et al. and Kim et al. More than one positive neurologic sign and more than one neurologic clinical symptom was considered a positive neurologic manifestation (PNM) of each foraminal stenosis. Inter-observer agreement between two readers was analyzed using kappa statistics. Nonparametric correlation analysis (Spearman’s correlation) was used to evaluate correlation coefficients (R) to assess the relationship between CNFS grade and clinical manifestations.

RESULTS: Both the Park and mKim systems demonstrated relatively high correlation (R = 0.714-0.764) between CNFS grade and clinical manifestation, while the Kim system yielded a moderate correlation (by reader 2). The Park and mKim systems demonstrated higher correlation values at the level of C6-7 than C4-5, while the Kim system showed no difference in correlation by cervical spine level.

CONCLUSION: Both the Park and mKim systems provide a reliable, reproducible CNFS diagnosis, while the Kim system has slightly inferior reliability. The Park and mKim systems had similar, relatively high clinical correlation.

SE 07 MS-07

Usefulness of oblique coronal magnetic resonance images of the knee after posterior cruciate ligament reconstruction

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PURPOSE: To know the usefulness of the oblique coronal view of the posterior cruciate ligament (PCL view) in the evaluation of the graft normal anatomy and
diagnostic accuracy of combining the PCL view with orthogonal views for evaluation of PCL graft failure or impingement after reconstruction procedures.

**MATERIALS AND METHODS:** This retrospective study included 54 patients who underwent PCL-view magnetic resonance (MR) imaging after PCL reconstruction surgery. Anatomic identification of graft failure and impingement was scored by two radiologists. The ability to diagnose PCL graft failure with the PCL view, orthogonal view, or combined PCL/orthogonal views was evaluated by calculating sensitivity, specificity, and accuracy.

**RESULTS:** The entire width discrimination scores and margin sharpness scores for the PCL view were significantly higher than those for the orthogonal view for both readers. The specificities and accuracies for the PCL view and the combined PCL/orthogonal views were higher than those for the orthogonal view alone, but these differences were not statistically significant.

**CONCLUSION:** The PCL view provided better anatomic evaluation than the orthogonal view with regard to the entire width evaluation and margin sharpness evaluation of the PCL graft. The combined view of orthogonal and PCL view was slightly more sensitive and accurate, but not significantly so, in the diagnoses of graft failure and impingement.

**SE 07 MS-08**

Three-dimensional isotropic T2-weighted turbo spin-echo MRI versus two-dimensional fast spin-echo T2-weighted sequences for evaluation of posterior cruciate ligament injury

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**PURPOSE:** To compare image quality between 3D VISTA with the posterior cruciate ligament (PCL) view and 2D fast spin-echo (FSE) for evaluation of PCL injury.

**MATERIALS AND METHODS:** This retrospective study included 60 patients who underwent 2D FSE and 3D VISTA of the knee between January 2015 and December 2015. The diagnostic performance of each oblique coronal view and the combined images was evaluated for sensitivity, specificity, and accuracy for diagnosing a PCL tear. The arthroscopically confirmed diagnoses were used as the reference standard. Data were analyzed with the McNemar test.

**RESULTS:** The mean CNR was significantly higher for 3D VISTA than for 2D FSE. The two imaging modalities did not differ significantly in anatomic identification ability, with the exception of margin sharpness, which was inferior for 3D VISTA with reader 2 (p = 0.038). When we classified the diagnoses of PCL injury as normal or abnormal, there were no significant differences in sensitivity, specificity, or accuracy between the PCL view of 3D VISTA and 2D FSE images (p > 0.05).

**CONCLUSION:** 3D VISTA had a superior contrast-to-noise ratio compared to 2D FSE and similar image quality in the evaluation of the PCL. The PCL view of 3D VISTA has the same diagnostic ability as 2D FSE in the diagnosis of PCL injury and can thus replace 2D FSE.

**SE 07 MS-09**

Peroneal tendon pathology evaluation using the oblique sagittal plane in ankle MR imaging

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**BACKGROUND:** Because peroneal tendons course from the lateral side of the proximal fibula through the posterior side of the distal fibula, correct diagnosis of the tendon pathology on an orthogonal sagittal plane can be difficult.

**PURPOSE:** To evaluate the diagnostic usefulness of oblique sagittal imaging (peroneal view) for evaluation of peroneal tendon pathology.

**MATERIALS AND METHODS:** This retrospective study included 69 patients at our institution who underwent routine ankle MR imaging using the peroneal view. Twenty-three patients underwent arthroscopy. Anatomic identification of the peroneal tendons on orthogonal sagittal MR imaging sequences and peroneal views were evaluated. Two radiologists evaluated the peroneal tendons based on an entire length view, an entire width view, and margin sharpness using a 4-point scale. Diagnostic accuracy using orthogonal sagittal and peroneal views was evaluated by calculating sensitivity, specificity, and accuracy. Arthroscopic or clinical findings were used as the reference standard.

**RESULTS:** Total anatomical scores on the peroneal view were higher than those of the orthogonal sagittal views (p < 0.001). Both readers were able to identify anatomy of the tendon using the full length, full width and sharp margin, and determined that the peroneal view was better when compared with the orthogonal sagittal views (p < 0.001). Although the sensitivity and accuracy of the peroneal view in the diagnosis of peroneal tendon injury were slightly higher than orthogonal view, the values were not statistically significant.

**CONCLUSION:** Peroneal views provide better anatomic evaluation of the peroneal tendons itself, although cannot show significant superiority in the diagnostic performances.
SE 07 MS-10

Three-dimensional isotropic T2-weighted fast spin-echo (VISTA) knee MRI at 3.0T in the evaluation of the anterior cruciate ligament injury with additional views
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PURPOSE: To compare the diagnostic performances of additional ACL views on VISTA with those on the 2D FSE T2-weighted images.

MATERIALS AND METHODS: This retrospective study included 78 patients who were suspected to have ACL injury and underwent both 2D TSE T2-weighted MR and 3D VISTA MR image of the knee between November 2012 and March 2013. The diagnostic performance of each oblique sagittal and coronal view and the combined images was evaluated for sensitivity, specificity, and accuracy for diagnosing an ACL tear. The arthroscopically and clinically confirmed diagnoses were used as the reference standard. The values were statistically analyzed using the McNemar test.

RESULTS: The inter-observer agreement between two readers of the additional ACL views on 3D VISTA and 2D FSE T2-weighted images were substantial on 2D FSE images and nearly concurred on the VISTA image. When considering both views of the oblique sagittal and coronal images, the inter-observer agreement between readers nearly concurred. There were no statistically significant differences in the sensitivity, specificity and accuracy between 2D FSE images and VISTA images.

CONCLUSION: The performance of the additional ACL view on 3D VISTA MR is comparable to that of 2D FSE T2-weighted MR in the diagnosis of ACL tear though the image quality of the 3D VISTA MR is not equal to that of 2D FSE MR.

SE 07 MS-11

Qualitative evaluation of US-guided single dose interscalene brachial plexus block for shoulder procedures
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INTRODUCTION: Interscalene brachial plexus block provides anesthesia and analgesia for operations on the shoulder and proximal arm. Ultrasound (US)-guided interscalene block targets the roots and proximal trunks of the brachial plexus where they are sandwiched between the anterior and the middle scalene muscles. Despite the current insufficient evidence of US-guided blocks improving success rate or decreasing complication rate, it is extensively used in clinical practice. The aim of this prospective audit was to evaluate postoperative pain relief, duration of block, incidence of nausea, complications, time spent in recovery and surgery unit after single dose interscalene block and general anesthesia.

MATERIALS AND METHODS: After registering with the trusts, audit department, this prospective audit evaluated 125 consecutive patients, who had shoulder procedure performed under US-guided single dose interscalene block and general anesthesia. Various shoulder procedures performed were 59 arthroscopic shoulder decompressions, 37 arthroscopic cuff repairs, 15 total shoulder replacement, nine examination under anesthetic-manipulation and five stabilizations. Postoperative incidence of nausea and vomiting, pain score using a scale of 0 to 4 and time spent both in recovery and day surgery was assessed.

RESULTS: There were 64 males and 61 females patients whit a mean age 56 years (17-91). The mean operating time was 75 minutes (15-200 min). In recovery pain, score was 0 in 122 (97.6%), pain score of 3 in two patients (1.6%) and pain score in one patient (0.8%). Mean time spent in recovery was 49 minutes (90-300 min). Duration of block on average was 19.72 hours (6-34 min). There were no complications due to interscalene block.

CONCLUSION: This prospective qualitative audit shows that US-guided single dose interscalene block is very effective in relieving pain in any shoulder procedure, whit a high success rate and no complications. Adequate pain control is essential for early physiotherapy and rehabilitation which is necessary for improving the outcome after shoulder surgery. There was very low incidence of postoperative nausea and vomiting with our technique, which was achieved by completely avoiding the use of morphine. Time spent by the patients in recovery and day surgery was very minimal, improving the patient experience.

SE 07 MS-12

MRI features of spinal tuberculosis lesions in adults on Mongolia
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PURPOSE: To determine the feature and signs of different lesions in spinal tuberculosis in adults on magnetic resonance imaging (MRI).

MATERIALS AND METHODS: 90 patients with clinically confirmed spinal tuberculosis who had undergone...
MRI scans at the Diagnostic Imaging Center, The First Central Hospital of Mongolia, Ulaanbaatar, from June 2015 to December 2016 were included in the study. Patients with features suggestive of tuberculous spondylitis underwent plain T1W and T2W images and T1W contrast enhanced images in both axial and sagittal sections. The data were analyzed using SPSS version 17 software and chi square test was used for comparison.

RESULTS: Study of 90 patients, 49 were males. The mean age was 43.5 years. Most common involvement was seen in the thoracic vertebrae followed by lumbar vertebrae. The most common MRI feature was abnormal signal intensities appearing hypointense on T1W and hyperintense on T2W sequences with heterogeneous enhancement of the vertebral body in all patients. The presenting complaint in 80.1% was backache, while 19 patients (20.9%) had symptoms suggestive of neural compression. Only 12 (12.8%) of our patients had a past or present history of tuberculosis. Spinal TB could affect one or more vertebrae. Our study found that 63 (68.8%) patients had lesions at a single level. Of the 27 patients with multiple lesions at separate levels. Most patients had two vertebrae involved and one patient had 8 vertebrae involved, the highest noted. The commonest vertebral level affected was the lumbar region (48.1%). Thoracic region was involved in 40.8%, and cervical region 5.2% and sacral region 5.9%.

CONCLUSION: MR imaging of spinal tuberculosis, commonly showed contiguous involvement of two vertebrae along with the intervening disc, skip lesions, and para-spiral collections and provided critical information about the involvement of spinal cord and the extent of the epidural pus in patients presenting with neurological deficits.

SE 07 MS-13

Review of MR imaging finding - gouty arthritis
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PURPOSE:
1. To review the MR imaging manifestation of acute and chronic gout and correlates with plain films and arthroscopic finding.
2. Brief discussion of epidemiology, pathology and clinical course of gout.

CONTENTS:
- Acute gout has nonspecific MR imaging such as joint effusion, soft tissue edema and bursitis.
- Chronic gout has many specific MR imaging findings.
- Tophi is chronic sequelae of gout and has T1 low and T2 variable signal nodule which depends on degrees of calcium and hydration.
- Erosion is thought to be by osteoclast activity of monosodium crystal (MSU) deposit and it has juxtaarticular localization.
- Synovitis is due to MSU deposit irritates synovium and cause inflammation.
- Effusion is also early nonspecific finding with soft tissue edema.
- Diffuse microscopic small tophi spreads over cartilage in arthroscopy, but no destruction of cartilage is not discovered.

CONCLUSION: MR finding of acute gout is nonspecific and clinically similar with septic arthritis, so careful clinical examination and history taking should be studied. Chronic gout has characteristic tophi and has differential diagnosis with PVNS and RA, etc. Early detection and proper treatment of gout leads to better diagnosis.

SE 07 MS-14

MRI and US in diagnosing the Achilles tendon new injuries referred to the National Trauma and Orthopedic Research Center
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MATERIALS AND METHODS: We retrospective revised clinical records and imaging data of 58 patients who were referred between 1st Apr, 2016 to 1st Jun, 2016. We reviewed T1W, T2W. T2W-axial STIR, with 3 mm slab thickness. US was performed using MINDRY-DC6 with linear probe. The data were analyzed SPSS 21.0.

RESULT: We included 58 subject, with F:M = 27:31 (46.5%: 53.4% ). Complete tear were reported 21/58 (36.2%) and partial tear 37/58 (63.8%) between patients who have Achilles tendon new tears. Age group: 25-35 age-32/58 (35.1%) 36-45 age-18/58 (31.0%) above 46 age-8/58 (13.7%) Gander: Female 27/58 (46.5%), Male 31/58 (53.4%) Mechanisms of injury: Athletes and people who were part apathy in sports 36/58 (62.2%) Sudden unexpected movement -11/58 (18.9%)
Accidental -8/58 (13.8%)
Systemic disease 58/39 (5.1%)
There are 8/58 (1.4%) cases didn’t diagnosed in US
Diagnostic capacity of MRI was 58/58 (100%)

CONCLUSION: In our study Achilles tendon new partial
tear diagnosed most common in men and athletes.
US and MRI are high effective diagnosing method for
Achilles tendon tear although we discussed US is cheap
and multiple effective diagnostic method.

SE 07 MS-15
High-resolution neurosonography of cutaneous
branches: lower extremity
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Ultrasonography (US) has higher spatial resolution than
MRI and can show high-resolution images of superficial
structures. US can trace obliquely-oriented target
structure in arbitrary probe angle. As the improvement in
technique and machine, it becomes possible to identify
more distal smaller branches of the peripheral nerves,
that may be helpful to localize symptoms and to guide
for intervention. To evaluate the peripheral nerves and
their branches, understanding anatomy is essential.
Here, the authors present anatomic landmarks in lower
extremity cutaneous nerves - lateral and posterior
femoral cutaneous nerves, pudendal nerve, saphenous
nerve, medial and lateral sural cutaneous nerves,
superficial and deep peroneal nerves, medial and
inferior calcaneal nerves, and common digital nerves -
with some pathologic cases.

SE 07 MS-16
Radiologic manifestation of intra- and juxta-articular
osteoid osteoma of hip
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Intraarticular osteoid osteoma occurs within or near
a joint and is considered a separate clinical entity.
Intraarticular osteoid osteoma is rare and involved
commonly in hip joint. The ankle, elbow, wrist, and knee
are less commonly affected. Its clinical manifestations
are nonspecific and not identical to classic osteoid
osteoma such as nocturnal pain and relieved by salicylate
or nonsteroidal anti-inflammatory drugs (NSAIDs).

Prominent joint tenderness and joint effusion contribute
to the diagnostic confusion. And, imaging findings
of intraarticular osteoid osteoma differ from those of
typical osteoid osteoma. Thus, diagnosis of intraarticular
osteoid osteoma is usually delayed due to nonspecific
clinical presentation and atypical imaging appearance.
In this presentation, we describe the imaging findings
of intra- and juxta-articular osteoid osteoma of hip, with
radiographic, CT, and MR imaging, including differences
between typical and intraarticular osteoid osteoma.

SE 07 MS-17
Evaluation of anchor screws with postoperative
shoulder CT in rotator cuff repair patient
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PURPOSE: To validate the effectiveness of postoperative
shoulder computerized tomography (CT) scans by
describing the imaging features and by comparing
healing process surrounding screws according to anchor
type.

MATERIALS AND METHODS: Arthroscopic correlated
consecutive 41 postoperative shoulder CT scans with
total 44 numbers of anchor screws either Helicoil anchor
screws (n = 21) or Twinfix anchor screws (n = 23)
were retrospectively reviewed by two musculoskeletal
radiologists. CT multiplanar reconstruction images with
short and long axis views oriented at anchor screws
were reviewed. The imaging features of anchor screws
used in rotator cuff repair, and differentiation of screw
types were analyzed on 41 initial CT images. Then, the
healing process surrounding screws were assessed
on 28 follow up CT images. Corrective diagnostic rate,
inter-observer agreement for differentiation of anchor
screws, and degree of healing process according to the
anchor screws was analyzed using χ² test and kappa
value.

RESULTS: Among the 41 patients (mean age, 60 years;
range, 38-80 years) with postoperative CT scans, 21
patients were repaired with Helicoil anchor screws, 23
patients were with Twinfix anchor screws. Helicoil anchor
screw was characterized by the parallel width with open
architecture and Twinfix anchor screw had tapering
width with spite or sharp end. Reader 1 (R1) detected
19 and reader 2 (R2) detected 20 Helicoil anchor screws
(sensitivity 90.5% and 95.2%, respectively). Both R1
and R2 detected 23 cases of Twinfix anchor screws
(sensitivity = 100%). Percent (%) agreement of the
screw detection between R1 and R2 and was 46.3%
with a moderate agreement (k = 0.46). Both R1 and R2
readers detected more healing process with Helicoil
anchor screws (81.8% and 85.7%, respectively) than Twinfix anchor screws (18.2% and 14.3%, respectively).

**CONCLUSION:** Postoperative shoulder CT scans are useful for differentiation of anchor screw types as well as the assessment of healing process depending on the anchor screw type. Our preliminary study shows the potential usefulness of the postoperative shoulder CT scan for predicting clinical treatment outcome and prognosis of the patient with rotator cuff repair.

**SE 07 MS-18**

**Can iterative metal artifact reduction (IMAR) improve metal artifacts effect on SUV and HU value in PET-CT? Phantom and clinical study**

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**PURPOSE:** To evaluate the value of iterative metal artifact reduction (IMAR) technique for reducing metallic artifact reduction and improving CT-based position emission tomography (PET) attenuation correction.

**MATERIALS AND METHODS:** Phantom study was performed with use 3D printer made- spine models with pedicle screw which is placed in the container filled with deionized water and 18-F FDG. A total of 15 patients with orthopedic implants were retrospectively included in this study. The Phantom and all patients were examined with a clinical hybrid PET/CT system. PET CT and conventional CT images with and without IMAR were reconstructed from the PET CT data sets. Standard uptake value (SUV) and HU number in PET CT images with and without IMAR were quantified by placement of regions of interest (ROI) within the phantom and orthopedic hardware in patients. Mean and standard deviation (SD) of HU and SUV values in each ROIs were compared between PET CT image with and those without IMAR.

**RESULTS:** In the phantom and clinical study, SD of HU was markedly decreased in the CT images with IMAR than those without IMAR (p < 0.01). There was a significant difference in mean HU in the phantom and clinical study (p < 0.05). However, Mean and SD of SUV with IMAR was not different from those without IMAR (p > 0.05).

**CONCLUSION:** PET CT imaging with IMAR examinations effectively reduce the degree of metallic artifacts produced by orthopedic hardware. However, IMAR has no significant effect on SUV value on PET CT.

**CLINICAL RELEVANCE:** The use of an IMAR algorithm in PET/CT is a promising approach for markedly improving the image quality in vicinity of metal implants.

**SE 07 MS-19**

**Paying attention to common blind spots in spine MRI: what makes radiologists different from other clinicians**

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Spine magnetic resonance imaging (MRI) is one of the most commonly obtained musculoskeletal imaging studies that remains valuable tool for providing important information for clinicians from wide ranging specialties including oncology. This imaging study consists of images obtained with relatively long scan range wide field of view, providing detailed anatomical information in the scanned regions. With its excellent tissue contrast, especially in vertebra and spinal cord, many expert clinicians are also familiar with spine MRI and able to identify and interpret abnormal findings. However, there are many potential blind spots within the scanned anatomic structures, which include retropharyngeal space, retroperitoneal organs, pelvic bones, psoas muscle, sternoclavicular joint, supraclavicular area, distal nerve roots, and etc. Identification of abnormalities in these areas can be challenging even for experienced radiologists if they don’t pay careful attention. This educational poster will highlight the potential blind spots on spine MRI and potential pathologic conditions that may arise in these areas.
SE 07 MS-20
MRI of elbow: multiplanar anatomy of normal ligaments and surrounding soft tissue with related common pathologies
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CONTEXT: Elbow is a complex joint between distal humerus, radius and ulna. Together they form a hinge joint (ulnohumeral articulation) and a trochoid joint (radio-humeral and proximal radio-ulnar articulation) allowing for flexion, extension, pronation, supination and a combination thereof at the joint. Pain in elbow joint is one of the most common clinical presentation in young athlete’s and sports personalities, especially, those involved in throwing activities. The presentation however is not limited to pain and painless swelling, nodule etc. are amongst some of the other causes for magnetic resonance imaging (MRI) referral. Excellent soft tissue contrast and improved spatial resolution from higher strength magnets make MRI the imaging modality of choice for evaluating the painful elbow. MRI clearly depicts the joint as well as surrounding soft tissue anatomy thereby clearly and separately demonstrating muscles, tendons, stabilizing ligaments, neurovascular bundle, synovium and bursae. A sound knowledge of the anatomy around elbow joint makes evaluation of related pathologies rather simpler. In this educational exhibit we aim to clearly demonstrate the anatomy and some of the related traumatic and non-traumatic pathologies around the elbow joint.

LEARNING OBJECTIVES: To learn how to identify normal anatomy of the ligaments as well as soft tissue supporting elbow joint and to facilitate accurate diagnosis of common traumatic and non-traumatic pathologies associated with it.

SE 07 MS-21
Evaluation study of MRI and standard X-rays to determination osteoarthritis knee joint
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PURPOSE: Knee joint osteoarthritis is currently diagnosed using clinical and radiographic findings. In recent years MRI use in osteoarthritis has increasingly been studied, most common chronic age-associated degenerative knee joint diseases leading to typical degradation of cartilage and reduced motion of the affected joints.

MATERIALS AND METHODS: The cohort consisted in 105 patients with knee OA (Kellgren and Lawrence grading scale) followed between 2015-2016 years Diagnostic Center the First Central Hospital Mongolia. All patients were classified from grade 0 to grade 4 at baseline, volume and thickness of cartilage of the medial tibia, the lateral tibia and the femur were assessed by MRI. MRI detected structural changes as the radiological OA grade, measuring by the K/L score increased. Main exclusion criteria were history or active presence of other rheumatic diseases that could be responsible of secondary OA, medical or surgical treatment on the knee within the last 6 months, obesity and any MRI contraindications. It also incorporated scores for the medial and lateral menisci, anterior and posterior cruciate ligaments, medial and lateral collateral ligaments and synovial distension. Lateral and medial femur-tibial joint space wide (JSW) measurements, performed by digital image analysis, were assessed from fixed-flexion, postero-anterior knee radiographs.

RESULTS: All patients with a K/L score of 4 demonstrated synovial thickening, effusion, subchondral lesions, osteophytes and cartilage erosions on MRI. One-year changes in medial femur-tibial JSW reach 7.0% (21) and changes in medial cartilage volume and thickness reach 0.6% (17.7) and 2.5% (12.3), respectively. Medial femur-tibial joint space narrowing (JSN) after 1 year, assessed by radiography, was significantly correlated with a loss of medial tibial cartilage volume (r = 0.25, p = 0.046) and medial tibial cartilage thickness (r = 0.3, p = 0.025), over the same period. All these results remained statistically significant after adjusting for age, sex and body mass index.

CONCLUSION: This study shows a moderate but significant association between changes in JSW and changes in cartilage volume or thickness in knee joint of osteoarthritic patients.

SE 07 MS-22
Musculoskeletal measurement of lower extremity
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1. Lower limb alignment
   1) Axis of lower limb
   2) Limb length
   3) Femoral anteversion and tibial torsion
2. Hip
   1) Landmark of hip on plain radiograph
   2) Femoral neck-shaft angle
   3) Acetabular anteversion
   4) Coxa profunda and Protrusio acetabuli
   5) Developmental dysplasia of the hip (DDH)
6) Femoroacetabular Impingement (FAI)
3. Knee
   1) Patella position and patellofemoral joint alignment
   2) Tibial plateau
   3) Tibial translation
4. Ankle and foot
   1) Longitudinal arch of foot
   2) Hindfoot alignment
   3) Hallux valgus
   4) Evaluation of syndesmosis
   5) Achilles thickness / heel pad thickness

SE 07 MS-23
Diverse imaging patterns of spinal meningioma
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eugene801027@gmail.com

Spinal meningioma is the second most common intradural extramedullary tumor. Spinal meningioma has various histopathological subtypes and show a wide variety of radiologic findings.

Teaching points:
1. To review the WHO classification of meningioma.
2. To review diverse imaging patterns of spinal meningiomas

Contents:
Epidemiology of spinal meningioma
The WHO classification of meningioma
Review of typical imaging findings of spinal meningioma
Case review of various imaging patterns of spinal meningioma
   - Conventional MRI
   - Diffusion weighted imaging
   - Angiography
   - Histopathology
Mimics

Summary and take-home message

SE 07 MS-25
Multimodality imaging evaluation of various axillary disease: spectrum of findings
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taloo@hanmail.net

Various diseases can occur in axillary area, from benign to malignancy. Many imaging modalities are useful for evaluation. US is the primary important modality in making a diagnosis of axillary disease. It is easy to access and no risk of radiation exposure. Currently, CT and PET/CT also play important roles as complementary modality.

We present various axillary diseases including benign (phyllodes tumor, epidermal inclusion cyst, fibroadenoma, pseudoangiomatous stromal hyperplasia, neurogenic tumor), infection (tuberculosis, Kikuchi’s disease, abscess), malignancy (metastasis from breast, liver, lung and stomach, lymphoma, sarcoma) and postoperative/traumatic complication (seroma, hematoma, contusion) with US, mammography, CT and PET/CT.

The knowledge in this exhibit will help to perform accurate diagnosis of various axillary diseases. Thus, we emphasize that combination of radiologic modalities, including US, mammography, CT and PET/CT need to be utilized.
SE 07 MS-26
Platelet rich plasma injection for partial ATFL and CFL tears presenting with pain and instability: a case report
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drnavraj@yahoo.com

CASE DESCRIPTION: A 29-year-old overweight lady developed swelling and lateral ankle pain after an inversion injury during a futsal match. Her pain was exacerbated by weight bearing with instability on walking. She was managed conservatively for 1 month with ankle stirrup and oral analgesia by the sports medicine team. Ultrasound performed noted partial tears of the anterior talofibular ligament (ATFL) and calcaneo-fibular ligament (CFL).

Setting: Musculoskeletal Interventional Radiology Clinic

Result of Clinical Course: Patient had 3 cc of platelet rich plasma (PRP) injected in divided doses into the ATFL and CFL. One month post injection, patient already reported decrease in pain and improvement in function with no more instability. Clinical evaluation noted minimal tenderness over the ATFL region. Reimaging with ultrasound revealed interval improvement. She is now awaiting her second injection appointment soon.

DISCUSSION: This is the first case to our knowledge in managing double ligamentous injury presenting with instability of the lateral ligamentous complex of ankle with PRP injection.

CONCLUSION: PRP injection maybe an effective alternative treatment in managing double ligamentous injury with associated instability of the ankle.

SE 07 MS-27
Post-operative follow-up US study protocol for shoulder rotator cuff injuries repaired arthroscopically
Tae Yong Moon, Hee Seok Jeong, Seung min Lee, Jeong min Lee
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PURPOSE: To understand the efficacy of ultrasonography (US) added to Doppler and dynamic studies as following up study for shoulder rotator cuff injuries repaired arthroscopically.

MATERIALS AND METHODS: The follow-up US was performed on post-operative 2 months, 4 months, and 1 year to evaluate anatomical repairment and functional recovery. The dynamic study with passive abduction movement of the upper arm was taken for 4 second. Coronal section images with Doppler were taken on the anterior, middle, and posterior parts of the supraspinatus repaired. Two oblique-sagittal sections were taken on the lateral part of the supraspinatus repaired. Anterior axial section images were taken on the rotator interval and the insertion portion of the subscapularis. And finally longitudinal section images along the long head of biceps tendon (LHBT) were taken.

RESULTS: Remnant suture materials, blood perfusion, functional recovery, retear, and/or impingement were noted on the repaired tissue of the rotator cuffs. Additionally greater and/or lesser tuberosity spurs, subacromial bursitis, and tenodesis of the LHBT were obtained.

CONCLUSION: Post-operative following-up US studies were easy and efficacious to evaluate anatomical repairment and functional recovery in the rotator cuff repaired previously.

SE 07 MS-28
The role of imaging in desmoid-type fibromatosis
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cordialsk@hanmail.net

TEACHING POINTS:
To review the clinical and pathologic features of desmoid-type fibromatosis
To discuss the imaging features of desmoid-type fibromatosis
To explain the utility of MRI in diagnosis and monitoring

TABLE OF CONTENTS/OUTLINE:
Clinical and pathologic features
Imaging features
Characteristic image findings
MR signal intensity of desmoid-type fibromatosis, according to the extent of collagen and degree of cellularity of the lesion (3 stage)

Treatment and prognosis
Monitoring the response
Sample cases and mimics
Summary

SE 07 MS-29
Imaging spectra of ankylosing spondylitis and its complications involving the musculoskeletal system
Seung Min Lee, Kye Young Lee, Tae Yong Moon, Hee Seok Jeong
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tymn@pusan.ac.kr

PURPOSE: To demonstrate radiological imagings about ankylosing spondylitis (AS) and its complications (Cx) involving the musculoskeletal system.

CONTENTS: 1) CT grading and MR staging for the sacroiliac joints, 2) AS and its Cx involving the spine as Romanus lesion, shiny corner sign, barrel sign, bamboo spine, dagger spine, and Andersson lesion, 3) AS and its Cx involving the hips as a collar of osteophytes at the femoral head-neck junction, axial migration of the femoral head, femoroacetabular impingement, osteoarthritis change, 4) AS and its Cx involving the knee joints as osteoarthritis change, 5) AS and its Cx involving the shoulder as hatchet deformity and osteoarthritis, 6) AS and its Cx involving the hands and feet, 7) Differential diagnoses as enteropathic arthritis, juvenile rheumatoid arthritis in cervical spine, diffuse idiopathic skeletal hyperostosis in the old age, erosive arthritis, polyarticular arthropathy, etc.

SE 07 MS-30
Classification, etiology, and imaging findings of Hallux valgus
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arisia98@hanmail.net

PURPOSE: 1. To know the anatomy, classification, and etiology of hallux valgus 2. To review imaging findings of underlying causes of hallux valgus on plain radiograph, MDCT, MRI

CONTENTS ORGANIZATION:
1. Anatomy
2. Classification
3. Etiology

4. Imaging findings

SUMMARY: Hallux valgus has a variety of underlying causes and presents various imaging findings. Here we will learn about measurement methods and classification for diagnosis of hallux valgus and its etiology with associated imaging findings.

SE 07 MS-31
Diagnosing knee injuries using 1.5 Tesla MR imaging at National Trauma and Orthopaedic Research Center of Mongolia
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tungaa_8899@yahoo.com

INTRODUCTION: Identifying clinical changes in the knee that X-ray and computer tomography (CT) could not identify.

PURPOSE: Diagnosing knee injuries using 1.5 tesla magnetic resonance imaging (MRI) at National Trauma and Orthopaedic Research Center (NTORC).

MATERIALS AND METHODS: In 2015-2016 at the NTORC a total of 1655 people that participated 810 knee MRI were included in this research using 1.5 tesla MRI device. The statistic data were analyzed using Microsoft excel and SPSS program.

RESULTS: In 810 participants the sex ratio was 1.8:1 (Male:Female), the mean age was 40 ± 5.

<table>
<thead>
<tr>
<th>№</th>
<th>Identified changes</th>
<th>Right knee</th>
<th>Left knee</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anterior cruciate ligament tear</td>
<td>188</td>
<td>236</td>
</tr>
<tr>
<td>2</td>
<td>Posterior cruciate ligament tear</td>
<td>72</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Internal meniscus tear</td>
<td>156</td>
<td>144</td>
</tr>
<tr>
<td>4</td>
<td>External meniscus tear</td>
<td>68</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Medial collateral ligament tear</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>Lateral collateral ligament tear</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Patella tendon tear</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Rectus femoris tendon injury</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>9</td>
<td>Bone fracture injury</td>
<td>268</td>
<td>252</td>
</tr>
<tr>
<td>10</td>
<td>Osteosarcoma</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Cystic Lesions of the knee</td>
<td>64</td>
<td>24</td>
</tr>
<tr>
<td>12</td>
<td>Osteoarthritis</td>
<td>32</td>
<td>68</td>
</tr>
<tr>
<td>13</td>
<td>Infrapatella fat pad impingement</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>14</td>
<td>Normal</td>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>
CONCLUSION: At the NTORC X-ray and CT of the knee did not have any significant changes but still had clinical presentations of pain and limitations of movement so MRI was conducted on the participants, mostly male participants of 35-45 age. Bone fracture injury, osteosarcoma, osteoarthritis, cystic lesions of the knee, soft tissue inflammations, knee ligament injuries and meniscus tears cannot be identified by CT or X-ray but by using MRI it can be identified and managed.

SE 07 MS-32
Not everything that's hot on a bone scan is metastasis: a review of positive bone scan uptake lesions of pelvis in follow-up of breast cancer patients
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Bone scan is widely used to assess the presence of bone metastases in the follow-up of cancer patients. Though bone scan is relative simple and extremely sensitive imaging technique for evaluating bone metastases, its specificity is low because many benign disease such as trauma, infection, inflammation, and degenerative diseases, also exhibit increased uptake of radiotracers. Breast cancer is the one of most common malignant tumors in women. The prognosis of localized early-stage breast cancer after surgical excision and additional therapy is good, but the survival rate for patients with distant metastases is poor. Bone is a common site of metastasis in breast cancer and early detection of bone metastases is crucial for appropriate treatment planning and accurate prediction of prognosis. Most bone metastases in breast cancer patient are found because of symptomatic manifestations, but about 10% of asymptomatic bone lesions can be detected by routine follow-up bone scans. A single focal uptake lesion on bone scan is almost always a cause of dilemma in diagnosis. We illustrate with examples of the pelvic lesions that can produce a newly positive bone scan at follow-up of breast cancer patients and correlate with magnetic resonance image.

SE 07 MS-33
Assessment of the shoulder disorders and injury by 1.5 Tesla MRI in National Trauma and Orthopaedic Research Center of Mongolia
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National Trauma and Orthopaedic Research Center, Mongolia.
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BACKGROUND: To solve problems of complication and treatment issues of shoulder disorders and injuries which cannot detected by plain radiography and CT, accessing the most sensitive modern modality magnetic resonance tomography that demonstrates any subtle changes and organ structures using quality of radio waves and magnetic field extremes to hydrogen atoms of the human body.

PURPOSE: To diagnose and differentiate cases of shoulder disorders and fractures, contusion, cancers, cysts, inflammation and tendon tears during injuries, utilizing PHILIPS 1.5T MRI in Department of Radiology, National Trauma and Orthopaedic Research Center.

MATERIALS AND METHODS: This hospital based retrospective correlative study was selected 310 patients from 458 patients who had performed shoulder MRI between 2014-2016 in National Trauma and Orthopaedic Research Center. The research designed to collect data and evaluate by MS Excell and SPSS analysis software.

RESULTS: Total 458 patients mean age was 40-50 and shoulder disorders and tendon ruptures male predominance has been noted.

<table>
<thead>
<tr>
<th>№</th>
<th>Identified changes</th>
<th>Normal thickness tears</th>
<th>Partial thickness tears</th>
<th>Full thickness tears</th>
<th>Chronic tears</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Long head of biceps tendon</td>
<td>26 58 12 56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Short head of biceps tendon</td>
<td>30 46 6 68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Supraspinatus tendon</td>
<td>20 84 14 47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Infraspinatus tendon</td>
<td>45 32 4 24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Subscapularis tendon</td>
<td>38 29 2 26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Posterior labrum</td>
<td>24 76 26 63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Anterior labrum</td>
<td>26 92 18 72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Teres minor tendon</td>
<td>none 15 none 8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Teres major tendon</td>
<td>none 11 none 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONCLUSION: Partial or full thickness tendon tears, chronic tears, bone fractures and bruises occurred mostly in male and older generation. Partial-thickness supraspinatus tendon tear, posterior labrum and anterior labrum partial tears and chronic tears encountered more from the other tendon ruptures. Posterior labrum, chronic tears, bone fractures and bruises occurred labrum partial tears and chronic tears encountered and fractures mainly occurred during disorders of the bone furthermore arthritis, cancer and cystic changes were listed next common disorders.

SE 07 MS-35
Ulnar and radial arteries and their branches in forearm, wrist and hand: relative positions of arteries among the surrounding soft tissues on MR and US images
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Ulnar and radial arteries are the terminal branches of the brachial artery at the elbow level. After the origin of arteries along their course a lot of branches are given off and distributed among the various soft tissues such as muscle, nerve, tendon and ligament. Correct knowledge of relative position of arteries can be helpful 1) to recognize the exact name of injured muscle, tendon or nerve, 2) to detect the arterial diseases such as arterial occlusion, rupture or aneurysm, and 3) to find the proper arteries for the flap surgery. This presentation will show the relative positions of arteries on MR and US images and present how to find the arteries during the US examinations at the levels of the elbow, the proximal forearm, the distal forearm, the wrist and the hand respectively. Clinical significances of arteries will be discussed with some clinical cases.

SE 07 MS-36
MR imaging of cystic lesions around the knee
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Cystic lesions around the knee consist of a diverse group of entities. These cystic lesions range from benign cysts to complicated lesions of various underlying disorders such as infection, inflammatory or degenerative arthritis, and malignancy. These cystic lesions around the knee...
may show similar features and may be difficult to differentiate from each other on magnetic resonance (MR) imaging. However, the management of these cystic lesions may differ. Therefore, MR imaging findings are important to guide specific management and to avoid unnecessary arthroscopy. MR imaging is the technique of choice in characterizing cystic lesions around the knee, because MR imaging provides exquisite soft tissue contrast with multi-planar imaging. In this presentation, we will discuss the etiology, histology, characteristic MR imaging findings, and differential diagnosis of cystic lesions including meniscal and popliteal (Baker’s) cysts, intra-articular and extra-articular ganglia, intra-osseous cysts at the insertion of the cruciate ligaments, proximal tibiofibular joint cysts, degenerative cystic lesions, cystic lesions arising from the bursae, and lesions that may mimic cysts around the knee including normal anatomical recesses. Radiologist and clinicians should be aware about the MR imaging findings and the difference of cystic lesions about the knee to avoid misdiagnosis and to guide to appropriate management.

**SE 07 MS-37**  
**MR imaging of patient with lateral epicondylitis: relationship between the pain and the severity of imaging features**  
Seon-Jeong Kim¹, Yoon Ki Cha², Noh Hyuck Park¹, Ji Yeon Park¹, Soo Heui Baek¹  
¹Myongji Hospital, ²Dongguk University Ilsan Hospital, Korea.  
bluesingirl@naver.com

**PURPOSE:** To determine the inter-, and intra-observer reliability of magnetic resonance (MR) imaging for diagnosing the lateral epicondylitis and to examine whether the severity of common extensor tendon (CET) injury is related with other elbow MR abnormalities. We also investigated correlation between MR abnormalities and patients’ symptoms.

**MATERIALS AND METHODS:** Total of 51 patients (M:F = 19:32; mean age, 50.0 years) diagnosed with lateral epicondylitis were included in this study. MR scoring system were used to grade the tendon and associated injuries in the elbow joint. Three independent radiologists retrospectively reviewed the MR imaging. Inter- and intra- observer reliability for diagnosing lateral epicondylitis were calculated by using kappa statistics. Spearman’s rank correlation analysis were performed to analyze the relationships between the injury degree of the CETs and the associated abnormalities of elbow joints. Correlation was considered statistically significant at p < 0.05. In the last step, using Spearman’s rank correlation, the injury degree of the CETs and the associated abnormalities of elbow joints were correlated with the visual analogue 11-point pain box scale (VAS).

**RESULTS:** Various degrees of injuries were found in total 51 CETs. Lateral collateral ligament (LCL) abnormality was the most common accompanied finding. Both inter- and intra-observer agreement in the MR grading of CET (k = 0.83, k = 0.86-0.98), and LCL injuries (k = 0.90, k = 0.90-0.99) were excellent. There was significant positive correlation between the injuries of CET and LCL (correlation coefficient r = 0.667, p < 0.01). And also there was significant positive correlation between injury degree of LCL and VAS (correlation coefficient r = 0.478, p = 0.033).

**CONCLUSION:** MR imaging showed excellent inter-, and intra-observer reliability in the evaluating patients with lateral epicondylitistis. In addition to common extensor tendinopathy, LCL abnormality was the most common accompanied finding and positively correlated with the severity of CET injury. Moreover, severity of LCL abnormality had positive correlation with severity of pain.

**SE 07 MS-38**  
**Unusual manifestation of chondrosarcoma**  
Jinkyeong Sung, Jee-Young Kim  
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jeeykim@catholic.ac.kr

**PURPOSE:** To present imaging manifestation of unusual chondrosarcoma.

**MATERIALS AND METHODS:** Six patients with chondrosarcoma showing unusual manifestation (M:F = 5:1; mean age, 44 years; range, 18-73 years) were included. Plain radiograph, CT and MR images were evaluated.

**RESULTS:** All six cases were grade 1 chondrosarcoma, including two periosteal chondrosarcomas. One case in 30-year-old man was in the distal femoral epiphysis and showed peritumoral bone marrow enhancement and periosteal enhancement, mimicking chondroblastoma or infection. Two cases were periosteal chondrosarcoma located in the proximal humerus, and one of them demonstrated concomitant intramedullary grade 1 chondrosarcoma. The size of all periosteal chondrosarcomas were 3 cm or more. Patient ages were 65 and 18 years old. Three cases were located in the small bones of hands and feet. One case involved the fifth finger metacarpal bone, one case involved the second toe middle phalanx, and one case with multiple lesions involved the calcaneus and cuboid. All lesions showed suspicious cortical breakthrough, and the lesion in the calcaneus demonstrated definite extraosseous soft tissue mass.

**CONCLUSION:** We presented atypical low grade
chondrosarcomas from the locations where malignant cartilage tumors rarely occur (epiphysis, peristeal, hands and feet), concurrent peristeal and intramedullary low grade chondrosarcomas, and chondroblastoma-like chondrosarcoma.

SE 07 MS-39
The radiologic prevalence, location and associated pathology of a subcortical cystic lesion at the subspinous region of the knee
Eunsun Oh, Ji Ye Son, Young Cheol Yoon
Soonchunhyang University Hospital (Seoul), Samsung Medical Center, Korea.
youngcheol.yoon@gmail.com

PURPOSE: To evaluate the prevalence and distribution of subcortical cysts around the attachment site of the cruciate ligaments or meniscus and to evaluate associated pathologies of the cruciate ligaments and meniscus using magnetic resonance imaging (MRI).

MATERIALS AND METHODS: We reviewed 1009 knee MRIs for the presence of subcortical cysts near the meniscus or cruciate ligament attachments and evaluated their size, location, edema of the adjacent bone marrow, and integrities of the medial and lateral meniscus and anterior and posterior cruciate ligaments.

RESULTS: The 110 cysts were found in either the middle (n = 56), posterior (n = 52), or anterior (n = 2) subspinous regions. Sixty-two were located at meniscal root insertion, including lateral meniscus anterior horn (n = 7), lateral meniscus posterior horn (n = 5), medial meniscus posterior horn (n = 48), and medial meniscus anterior horn (n = 2). All were associated with an adjacent meniscal pathology. Of the 34 cysts at the anterior cruciate ligament (ACL) insertion, 28 had ACL pathology. Nine cysts had surrounding edema in the adjacent bone marrow.

CONCLUSION: Subcortical cysts at the subspinous region of the knee were seen in 9.6% of knee MRI examinations. Most were located in closely to the menisci or cruciate ligaments with associated pathologies. This suggested that abnormal stress on the bone induces cyst formation.

SE 07 MS-40
Sonoeastography as a useful diagnostic tool for management of various benign soft tissue lesions
Eunjin Hwang, Eun Kyung Khil, Seun-Ah Lee, Jung-Ah Choi
Hallym University Dongtan Sacred Heart Hospital, Korea.
hej00918@gmail.com

PURPOSE:
1. Review the principle and major types of sonoeastography
2. Understand the key point of compression type sonoeastography
3. Understand the sonoeastography results of various benign soft tissue lesions

CONTENTS ORGANIZATION:
1. Introduction: Key concept of sonoeastography and principle of compression sonoeastography
2. Materials and methods
   - Categorization by ultrasound features of 32 lesions according to diagnoses: solid (12), semi-solid (16), cystic (4)
   - Qualitative grading as the color-code grading system (blue, green, red)
   - Quantitative grading as the relative tissue-elasticity ratio by semi-automatic range of interest (ROI) at least 3 times
3. Results
   - Solid: lymph node (1), fibromatosis coli (2), benign fibrous histiocytoma (2), lipoma (1), nodular fasciitis (3), neurogenic tumor (2) and vascular leiomyoma (1): They tend to show blue color with high value of relative tissue elasticity.
   - Semi-solid: hemangioma (2), epidermal inclusion cyst (14): They tend to show predominant green color and medium value of relative tissue elasticity.
   - Cystic: TGDC (1), abscess (2), ganglion cyst (1): They tend to show red color and low value of relative tissue elasticity.
4. Conclusion: compression type sonoeastography may be a useful diagnostic tool for management of various soft tissue lesions in MSK imaging

CONCLUSION:
1. Review the principle and major types of sonoeastography
2. Understand the results of compression type sonoeastography in variable soft tissue lesions
3. Consider compression sonoeastography as a potential diagnostic tool in MSK imaging
SE 07 MS-41
MRI and arthroscopy in diagnosing the knee injuries of young adults referred to the National Traumatology and Orthopedic Research Center
Amgalanpurev Myadag, Ukhagvasuren Gonchigsuren, Munkhsaikhan Togtobl, Undarmaa Sereglen
National Trauma and Orthopedic Research Center, Mongolia.
amgalanpurevmyadag@gmail.com

BACKGROUND: Most diagnostic studies comparing MRI and arthroscopy have shown good diagnostic performance in detecting lesions of the menisci and cruciate ligaments. Nevertheless, arthroscopy has remained the reference standard for the diagnosis of internal derangements of the knee, against which alternative diagnostic modalities should be compared.

PURPOSE: To assess the diagnostic capacity of the knee meniscal injury patterns in Mongolian young adults by MRI compared to arthroscopic findings.

MATERIALS AND METHODS: We retrospectively revised clinical records and imaging data of adults below 40 years of age who were referred between June 1st, 2016 and December 25th, 2017 to the National Center of Traumatology and Orthopedics in Ulaanbaatar, Mongolia. MRI examinations were from various institutions, therefore we reviewed T2W TSE axial, STIR sagittal and coronal, PDW TSE sagittal, PDW TSE coronal, T1W aTSE coronal, with 3 mm slab thickness. Meniscus injuries were assessed by an experienced radiologist and classified according to the Berquist classification. Arthroscopy was performed using ConMed arthroscope.

RESULTS: We included 83 subjects aged 9-40, with mean age 28 ± 7.7 and F:M = 14:69 (16.9%:83.1%). Sport injuries were reported as causative in 51/83 (61.4%), non-accidental trauma- in 13/83 (15.7%), traffic accidents in 8/83 (9.6%). Among sport injuries, MRI assessed medial menisci as having bucket handle tears in 12/51 (23.5%) and horizontal tears in 10/51 (19.6%). Arthroscopy revealed bucket handle tears in 20/51 (39.2%) and horizontal tears in 8/51 (15.7%) in medial menisci. Among sport injuries, MRI assessed lateral menisci as having bucket handle tears in 1/27 (3.7%) and horizontal tears in 4/27 (14.8%). Arthroscopy showed bucket handle tears in 3/27 (11.1%) and horizontal tears in 9/27 (8.6%) in lateral menisci. In our study Cohen's kappa was 0.269, Spearman's correlation coefficient was calculated as appropriate, and significance was set at p < 0.0001.

CONCLUSION: Although MRI is a key technology in demonstrating meniscal tears, the discrepancy between the MRI and arthroscopy findings may reflect a need for continuous training for radiologists. There is scope for more research in this area, particularly on knee pathology other than meniscus injuries. On other hand, various institutions are using different protocols, which may affect the diagnostic accuracy of MRI.

SE 07 MS-42
Clinical usefulness of real-time sonoelastography to diagnose medial epicondylitis
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PURPOSE: To determine the diagnostic performance of real-time sonoelastography for medial epicondylitis by investigation and comparison of clinically suspected and asymptomatic patients.

MATERIALS AND METHODS: This retrospective study included 47 elbows of 41 patients undergone gray-scale sonography and compression-based real-time color-coded sonoelastography from July 2016 to March 2017. Patients included 17 males and 24 females, whose mean age of 54.4 years ± 11.6 years. Patients were divided into two groups based on symptoms and signs in physical exam performed by 12 year experienced orthopedic surgeon. One group consisted of patients who were clinically suspected medial epicondylitis and the other group of asymptomatic patients. Two regions of interests; the lesion of common flexor tendon (R1) for the target area and the adjacent normal tendon (R2) for reference area were obtained for comparison and calculation. A 10 year-experienced radiologist evaluated the images of gray-scale sonographic findings (swelling, hypoechogenicity, calcification and tear) and elastographic grade using 3-point visual scale. Comparison of these sonographic findings, elastographic grade and strain ratio between patient groups was done by Mann-Whitney test. The diagnostic performance for elastographic grade and strain ratio was calculated by receiver operating characteristic curves.

RESULTS: Among total 41 patients, 16 elbows in 13 patients were clinically defined as medial epicondylitis and 31 elbows from 28 patients had no symptoms. There were no significant difference between two groups in swelling (p = 0.551), calcification (p = 0.365), and tear (p = 0.365) on gray-scale sonography finding. However, hypoechogenicity, elastographic grade, and strain ratio were found to have significant difference (p < 0.001), respectively. The areas under the receiver operating characteristic curve were 0.852 (95% CI, 0.689-0.950) for elastographic grade and 0.983 (95% CI, 0.886-1.000) for strain ratio, respectively.

CONCLUSION: Elastographic grade and strain ratio from real-time sonoelastography are valuable and can be applied as reliable supplementary assessment tools in the diagnosis of medial epicondylitis.
CLINICAL RELEVANCE: This study shows that real-time sonoelastography can be a meaningful assisting tool when gray-scale ultrasound finding for clinically suspected medial epicondylitis is not satisfactory for diagnosis.

SE 07 MS-43
The first carpometacarpal joint - what a radiologist should know
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The first carpometacarpal joint, also known as the trapeziometacarpal joint, has an important role in thumb activity. Its concavo-convex saddle shape can make it possible of wide range as well as diverse movement of thumb. Radiologists need to understand the anatomy and biomechanics of the first carpometacarpal joint to diagnose various pathologic conditions and guiding treatments.

TEACHING POINTS:
1. To review the anatomy and biomechanics of first carpometacarpal joint.
2. To review the pathologic conditions and its MR imaging.
3. To review the treatments for pathologic conditions.

TABLE OF CONTENTS/OUTLINE
1. Anatomy and biomechanics of first carpometacarpal joint
   1) Bony and articular anatomy: concavo-convex saddle shape
   2) Ligament and tendon anatomy and MR imaging:
      - Volar ligament: anterior oblique ligament, ulnar collateral ligament
      - Dorsal ligament: dorsal radial ligament, dorsal central ligament, posterior oblique ligament, intermetacarpal ligament
      - Others
   3) Movements
      - Flexion and extension
      - Abduction and adduction
      - Circumduction, opposition and apposition
2. Pathologic conditions involving 1st carpometacarpal joint
   1) Ligament and tendon injury with MR imaging
   2) Bone fracture
      - Bennett fracture
      - Rolando fracture
   3) Dislocation with MR imaging
   4) Others
      - Osteoarthritis
3. Treatment and surgery

4. Summary and Take-home message

SE 07 MS-44
Common fractures in the elderly: what radiologist should know or concern?
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BACKGROUND: As the elderly population increases and remain social activity, the number of fractures in elderly people is increasing. It is important to recognize the clinical and imaging features of common fractures in the elderly.

TEACHING POINTS:
1. To organize common fractures in the elderly according to mechanism and location.
2. To review their each radiologic findings including simple radiography or CT images.

TABLE OF CONTENTS/OUTLINE:
1. Introduction and purpose
2. Classification of common fracture in the elderly
   1) High-energy trauma: falls from a height, motor vehicle collision, sporting injury
   2) Minor trauma: osteoporotic fracture, insufficiency fracture
   3) Atypical fracture (bisphosphonate-related fracture)
3. Images of various fractures according to mechanism and location
   1) High energy trauma
      Spine: compression fracture
      Upper extremity: distal radius fracture (colles fracture), proximal humerus fracture
      Lower extremity: trimalleolar fractures
   2) Low energy trauma
      Insufficiency fracture: spine, sacrum, neck of femur, tibia (medial plateau)
      Hip: fractures of the proximal femur, including subcapital neck, intertrochanteric, subtrochanteric fracture
   3) Atypical fracture
      Proximal femur: lateral cortex of the proximal femur with cortical thickening
4. Conclusion
SE 07 MS-45
CT findings of small superficial soft tissue tumors abutting to skin
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PURPOSE: To find useful image findings for the differentiation of superficial small soft tissue masses abutting to skin on CT images.

MATERIALS AND METHODS: The CT images of thirty-four histologically proven superficial soft tissue masses of thirty-four patients (age range, 4-73 years; mean age, 35.5 years; F:M = 17:17) were reviewed retrospectively. All cases were abutted to skin, including 19 epidermal cysts, 4 pilomatrixomas, 4 hemangiomas, 2 spiradenomas, 2 dermatofibromas, 1 schwannoma, 1 angioleiomyoma and 1 papillary endothelial hyperplasia. On CT images, the shape, calcification, fat component, and connected vessel were analyzed.

RESULTS: All cases were benign and most common lesions were epidermal cyst. The size was 0.7 cm to 4 cm. The shapes of all cases were round or oval. Two dermatofibroma had spiculated margin. The masses had focal calcification in 4 cases of 3 pilomatrixomas and 1 epidermal cyst and the fat in an epidermal cyst. The connected vessel was seen in 4 cases of 2 hemangiomas and each one of papillary endothelial hyperplasia and angioleiomyoma. On contrast enhanced images, only two spiradenomas showed nodular wall enhancement.

CONCLUSION: Even CT scan has limitation to reveal the composition of the soft tissue tumors it shows some specific image findings to be helpful for the differentiation of superficial soft tissue masses abutting to skin.

SE 07 MS-46
Peripheral neurovascular diseases resulting local symptoms: what radiologists should know?
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PURPOSE: Local symptoms such as pain or discomfort are usually caused by various pathologic conditions - inflammation, trauma, infection, or tumor involving musculoskeletal structures - occurring at the corresponding anatomic locations. Based on specific localized symptoms, clinicians can suggest one or two representative differential diagnoses. - e.g., plantar fasciitis for heel pain, lateral epicondylitis for lateral elbow pain - However, imaging studies not rarely show that these suggestions are negative, instead, unexpectable neurovascular lesions near the corresponding anatomic locations. This review will describe various peripheral neurovascular pathologic cases which have local symptoms and may be easily misdiagnosed as other common local disease, and consider the diagnostic approach using various imaging modalities.

CASE PRESENTATIONS BASED ON CLINICAL SYMPTOMS:
1. Classifications: Upper extremity and lower extremity
2. Cases descriptions
   1) Clinical symptoms
   2) Clinical diagnostic suggestions
   3) Imaging findings
   4) Diagnostic approach - Gross and radiologic anatomy, fields of examination, exclusion of other possible pathologies.
      (e.g., Pain on lateral elbow and forearm --> DDX from lateral epicondylitis --> Radial tunnel syndrome - anatomy, imaging of causative lesions, diagnostic approach)

CONCLUSION: Most local symptoms are induced by local problems of corresponding anatomic sites, but rarely, they can be followed by peripheral neurovascular lesions adjacent to the sites. Besides, absent or ambiguous or vague neurological symptoms may lead to miss the possibility of neurological lesions. Knowledge for these peripheral neurovascular pathologies producing local symptoms makes radiologists to suggest correct diagnosis to patients and clinicians.

SE 07 MS-47
Imaging findings of chondroblastoma in patients older than 20 years: what’s difference from typical chondroblastoma occurring in children?
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PURPOSE: To review the radiologic and clinical features of chondroblastoma in patients older than 20 years and to compare it with typical chondroblastoma occurring in children, based on previous literature.

MATERIALS AND METHODS: Eighteen cases of pathologically proven chondroblastoma in patients older than 20 years were reviewed. The following imaging features on radiography or CT were reviewed: sclerotic rim, internal calcification, periosteal reaction, thick trabeculae/septa, and cortical disruption. On MRI, these findings were reviewed: sclerotic rim, intermediate to
high T2 signal intensity, multiloculated, thick trabeculae/septa, fluid/fluid level, intraslesional calcification/fat, bone marrow edema, periostitis, and cortical disruption.

RESULTS: The average age was 31 years (21-82 years). There were 10 males and 8 females. The most commonly involved bone was the femur (n = 5, 4 greater trochanter and 1 head), followed by the patella (n = 3), talus (n=2), calcaneus (n=2), posterior body of spine (n = 2), humerus (n = 2, 1 medial epicondyle and 1 troclea), tibial plateau (n = 1) and phalanx of foot (n = 1). On radiography or CT, the most common imaging finding was sclerotic rim (n = 12). There were internal calcification (n = 3), thick trabeculae/septa (n = 7), and cortical disruption (n = 4). MRI findings were as follows; sclerotic rim (n=12), intermediate to high T2 signal intensity (n = 9), multiloculated (n = 8), thick trabeculae/septa (n = 7), fluid/fluid level (n = 6), intraslesional calcification/fat (n = 5), bone marrow edema (n = 4), and cortical disruption (n = 4).

CONCLUSION: Adult-onset chondroblastomas share many of the radiologic characteristics seen in the children. However, they have different characteristics such as more common localization in flat bones and short tubular bones, and more accompanying aneurysmal bone cyst including multiloculated cysts with fluid-fluid levels.

SE 07 MS-48
Location of peroneus longus tendons in cuboid groove: dynamic US and multiplanar reformatted 3D fast spin-echo MRI
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PURPOSE: To evaluate the normal position of the peroneus longus tendon (PL) at the cuboid groove in dynamic ultrasonography (US) and multiplanar reformatted 3D fast spin-echo (FSE) MRI.

MATERIALS AND METHODS: In the first session, US of the PL at the cuboid groove of 20 asymptomatic feet was performed. Each PL was examined in 5 positions of ankle/foot (i.e., neutral, dorsiflexion, plantar-flexion, supination and pronation). In qualitative way, PL location was categorized as "inside" when the PL was entirely within the cuboid groove, "overlying" when some part of the PL was perched on the cuboid tubercle, or "outside" when the PL was entirely outside of the cuboid groove. For quantitative PL location, the distance between the proximal margin of the PL and the proximal border of the cuboid groove was measured. The cuboid groove size was measured. In the second session, multiplanar reformatted 3D proton density-weighted FSE ankle MRI of 58 patients without significant abnormalities were evaluated in the same manner to the first session. All MRI were taken in the neutral ankle/foot position.

RESULTS: In the first US-session, the PL location was not significantly changed, with changes in the ankle-foot position. In the qualitative assessment, the "overlying" PL location was most common in all positions. "Inside" PLs were found in only 35%, 20%, 30%, 25%, and 35% of feet in neutral, dorsiflexion, plantar-flexion, supination, and pronation positions, respectively. Quantitatively, the distance between the PL and cuboid groove was not significantly different in all positions of ankle/foot, either. The width of cuboid groove had a significant negative correlation with Quantitative PL location (p < 0.001, Pearson’s coefficient, -0.710). The second MR session showed the similar results to the first session. Most PL were overlying on the cuboid tuberosity. 34% of PL were inside-located. The cuboid groove width was significantly different according to the quantitative PL location and it was significantly negatively correlated with the quantitative PL location (p < 0.001).

CONCLUSION: 35% or fewer of the PL were inside of the cuboid tubercle regardless of the ankle/foot positional change. The location of the PL against the cuboid groove was related to the width of cuboid groove.

SE 07 MS-49
Experience of fully-integrated 18-FDG PET/MRI for characterization of musculoskeletal abnormalities in oncologic patients
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1. Introduction of fully-integrated PET/MR imaging
   - Technical challenges of fully-integrated PET/MR
   - Advantages of PET/MR
   - MR based attenuation correction
2. Malignant lesions detected on fully-integrated PET/MR
   - Bone metastasis
   - Soft tissue metastasis
3. Mimicry of malignancy detected on fully-integrated PET/MR
   - Bone marrow hyperplasia
   - Periarticular inflammation
   - Benign fracture
   - Miscellaneous
   - Indeterminate lesion
4. Diagnostic pitfalls of fully-integrated PET/MR
SE 07 MS-50
Patterns of meniscus tear at skimming fall injuries in Mongolian patients admitted to the National Center of Traumatology and Orthopedics as detected by 1.5T MRI
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BACKGROUND: Meniscal tears can be classified as acute or degenerative. Acute tears are from excessive force applied to a normal knee and meniscus. Tears can also be described based on pattern and location. These tear patterns include vertical longitudinal, oblique, transverse (radial), horizontal, meniscal root, bucket-handle, and complex. MRI has an accuracy of 90%-95% for detecting meniscal injury.

PURPOSE: To assess the knee injury patterns occurring at skimming falls in adolescents and young adults in Mongolia.

MATERIALS AND METHODS: We retrospectively revised a total of 800 MRI examinations between October 25th 2016 and January 25th 2017 at the National Center of Traumatology and Orthopedics in Ulaanbaatar, Mongolia, to select adolescents and young adults aged 13-40 who underwent a routine MRI examination. MRI protocol included T2W TSE axial, STIR aRSE sagittal, PDW aTSE sagittal, T1W aTSE sagittal, STIR aTSE coronal, PDW aTSE coronal, PDW aTSE coronal oblique, T1W aTSE coronal. Meniscus injuries were assessed by an experienced radiologist and classified according to the Berquist classification. The data were analyzed by SPSS 21.0.

RESULTS: From 200 knee MRI studies, we included 53 subjects, with mean age 26.91 ± 7.7 and F:M = 21:32 (39.6%; 60.4%). MRI was done on right knee in 22, left knee-31. The most prevailing meniscal injury was Grade 2 demonstrated in 21/53 (39.6%), from which 5 occurred in adolescents, 8 in 21-30 age group, 8 in adults above 31 years of age. No sex or laterality predilection to the severity of meniscus injury was determined (retrospectively, p < 0.282 and p < 0.29). Tears occurred in left medial meniscus in 23 (43%), and anterior horn was injured in 21 (39.6%), while posterior horn was involved in 24 (45.3%). Bucket handle tear was found in 7/53 (13.2%), with 5 in the medial and 2 in lateral menisci.

CONCLUSION: In our study MRI showed meniscal tears as a common in knee injuries of adolescents and young adults, with most prevailing tears in left medial meniscus particularly its anterior horn. Grade II tears and higher incidences of bucket handle tears in young adults may reflect pure traumatic origin of the detected meniscus damages. Future prospective, randomized controlled trials are needed to compare the meniscus acute or degenerative tears injury patterns.

SE 07 MS-51
Pre- and post-operative imaging evaluation of the diabetic foot
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TEACHING POINTS:
Radiologic finding of complication of diabetic foot
Management of diabetic foot
Radiologic finding of postop. complication of diabetic foot
TABLE OF CONTENTS/OUTLINE:
1) Pathogenesis of diabetic foot
2) Technical consideration of Imaging
3) MRI and CT findings of diabetic foot
4) Management of diabetic foot
5) Post-operative imaging of diabetic foot

Fig. 1A, B. Sinus tract and abscess.

Coronal and sagittal contrast material enhanced T1-weighted fat-suppressed MR image of right 2nd MTP joint show irregular shape peripheral enhancing low signal intensity lesion, suspected abscess, and tram-track enhancement pattern of fistulous tract from skin defect.
Coronal T2-weighted fat-suppressed and axial T1-weighted MR image show post-amputation state at mid-level of Lt. 4th metatarsal bone. Wide epidermis defect in plantar aspect of 5th toe, around MCP joint area and increased signal in surrounding subcutaneous layer, suspected cellulitis.

SE 07 MS-52
The role of imaging modalities such as MRI and CT in the evaluation of the lesions with increased uptake on bone scan
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Bone scan abnormalities in patients with primary cancer
1. Metastasis
2. Benign fractures: vertebral compression fracture, rib fracture, insufficiency fracture
3. Benign bone tumor
4. Degenerative changes: osteophytes, osteoarthritis

Bone scan abnormalities in patients with local or referred or radiating pain
1. Fracture, stress fracture, insufficiency fracture
2. Osteoid osteoma, osteoblastoma
3. Metastasis
4. Calcific tendinitis
5. Arthritis: ankylosing spondylitis
6. Miscellaneous

SE 07 MS-53
Radiologic signs in musculoskeletal imaging: case-based review and self-assessment
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Musculoskeletal (MSK) imaging remains one of the most complicated sub-specialties of diagnostic radiology. The successful interpretation of MSK imaging studies requires the recognition and understanding of the radiologic signs that are characteristic of many complex disease processes. This presentation on several radiologic signs used in MSK imaging to assist radiologists in establishing a particular diagnosis of pathologic processes affecting the MSK system has a self-assessment component and an educational component. The objectives for this presentation are for the participant to exercise, self-assess, and improve his or her understanding of important MSK radiologic signs that are useful in establishing the diagnosis of particular diseases of the MSK system.

SE 07 MS-54
How confident are you to diagnose epidermal cysts with US?
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PURPOSE: To review the characteristic and additional features of epidermal cysts on ultrasonography (US), and figure out the differences in US features of ruptured and unruptured epidermal cysts.

MATERIALS AND METHODS: We retrospectively reviewed the US features of all cases of pathologically confirmed epidermal cysts (n = 66), including ruptured (n = 10) and unruptured (n = 56) cases, from January 2012 to May 2017. Two radiologists assessed the characteristic features (well-circumscribed boundary, oval shape, heterogeneously hypoechoogenicity, and internal rod-like hypoechoic foci; keratin debris) and the additional features (dermal stalk and inner echogenic rim) of all epidermal cysts.

RESULTS: Study population consisted of 39 male patients (mean age, 51 years) and 27 female patients (mean age, 49 years) with an overall mean age of 50 years (age range, 3-84). 56 patients showed well-circumscribed boundary (85%), 52 patients showed oval shape (77%), 54 patients showed heterogeneously hypoechoogenicity (82%), and 47 patients showed internal rod-like hypoechoic foci (65%). Patients with unruptured epidermal cysts had higher rates of characteristic features than those with ruptured epidermal cysts (unruptured vs. ruptured, well-circumscribed boundary: 95% vs. 30%, oval shape: 84% vs. 40%, and internal rod-like hypoechoic foci: 73% vs. 20%). 14 patients showed dermal stalk (21%) and 5 patients showed inner echogenic rim (8%). Inner echogenic rim were detected only in patients with ruptured epidermal cysts.

CONCLUSION: Our results correlated with results of
many previous studies about characteristic features. About one-fifth of all cases showed dermal stalk. It can be thought to be remnant opening as formation of epidermal cysts through obstruction of hair follicles. Therefore, dermal stalk may be helpful additional feature to differentiate epidermal cysts from other superficial soft tissue lesions. Inner echogenic rim had been detected only in patients with ruptured epidermal cysts. It can be thought to be increased reflection of US, because rupture of epidermal cysts cause shrinking and irregularity of the wall which is lined with stratified squamous epithelium. Therefore, inner echogenic rim may be helpful to diagnose the ruptured epidermal cysts. In conclusion, dermal stalk and inner echogenic rim may be helpful features on US for accurate diagnosis of the epidermal cysts.

SE 07 MS-55
MRI evaluation of the ankle joint: normal anatomy and trauma evaluation: a pictorial essay
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INTRODUCTION: MRI is a non-invasive technique which has become the gold standard for evaluating the ankle pathologies. High soft tissue contrast resolution coupled with multi-planar capabilities helps in evaluating the ankle tendons, ligaments, nerves, fascia and occult bone injuries.

AIMS AND OBJECTIVES:
1. To optimize the MRI protocol for adequate evaluation of the ankle soft tissues.
2. To study the normal ankle anatomy.
3. To study the imaging features of traumatic ankle pathologies and appearances.

MATERIALS AND METHODS: A retrospective analysis of images of ankle MRI done at Prima Diagnostics, Bengaluru was done. The cases had been scanned on Siemens’s AMIRA 1.5 tesla scanner using a dedicated ankle coil.

RESULTS:
1. Optimization of MRI protocol for study of ankle anatomy.
2. Normal MRI anatomy of the ankle ligaments and appearance of ankle ligament injuries.
3. Normal MRI anatomy of the ankle tendons and appearance of ankle tendon injuries.

SE 07 MS-56
Total hip arthroplasty: what is happening at follow-up?
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Total hip replacement (THR) has become the standard treatment for end-stage hip joint disease. Implants have four main combinations of head and acetabular materials: metal-on-polyethylene (MoP), metal-on-metal (MoM), ceramic-on-ceramic (CoC), and ceramic-on-polyethylene (CoP). Each of implant combination has a different imaging appearance and different associated risk complications. A particular disadvantage of the MoM bearing in hip arthroplasty is the release of small wear particles and metal ions into local tissue and the general circulation. Systemic metal intoxication is common and extensively reported in MoM bearings. Periprosthetic osteolysis is a well-known phenomenon caused by wear particle-induced bone resorption, particularly common in MoP bearing. CoC bearing shows lowest wear rate whereas vulnerable to fracture and breaking. In addition, complication such as dislocation or infection can occurs regardless of the combination of implant materials. The purpose of this article is 1) to illustrate types of total hip replacement with a focus on composition of ball and socket combination using schemata and different imaging modalities and to 2) present the imaging features of various specific and general complications which occur more commonly depending on the total hip implants options, along with clinical presentation. Here, we present component-specific complications such as heart failure due to cobalt intoxication followed by the revision of fractured ceramic-on-ceramic THR to MoP bearing, metallosis with adverse local tissue reaction in MoM and MoP bearings, ceramic fracture on CoC bearing, and other common complications such as dislocation and infection.

SE 07 MS-57
Accessory ossicles and sesamoid bones in musculoskeletal system: a pictorial review
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Accessory ossicles and sesamoid bones are normal variants of bone development. They are frequent findings in routine radiographs of musculoskeletal system. They are commonly considered fortuitous and
unrelated to the patient's symptom; however, they may sometimes cause painful syndromes or degenerative changes. They may also simulate fractures. Our aim of this educational exhibition is to review, illustrate the imaging findings of some of the more frequent accessory ossicles and sesamoid bones of the musculoskeletal system. Moreover it also provides a brief description of the management of the patients with painful accessory ossicles and sesamoid bones.

**SE 07 MS-58**

**US in evaluation of painful shoulder: a pictorial review**

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**PURPOSE:** Painful shoulder is a common condition associated with substantial functional limitation. It has multiple etiologies, most of which have overlapping clinical features and pinpointing the cause is often not possible on history and physical examination alone. MRI is the gold standard for evaluation of joint and soft tissue pathology, however it is expensive, has limited availability and prolonged scan time. Sonography (US), in experienced hands, can provide high resolution real time images of the shoulder and its capability to perform focused and dynamic assessment serves as a distinct advantage over MRI. This modality currently appears to be underutilized for the shoulder evaluation. This review discusses the technique and pitfalls of shoulder US and illustrates the US appearances of the various etiologies of painful shoulder, along with MRI correlation.

**CONTENTS ORGANISATION:**

1. Technique of shoulder evaluation
2. Potential pitfalls and their remedies
3. Imaging spectrum of the various etiologies:
   1) Rotator cuff pathologies
      (1) Tendon tears - partial and complete
      (2) Tendinosis and tenosynovitis
      (3) Tendon dislocations
      (4) Bursal effusion
      (5) Impingement syndrome
   2) Non Rotator cuff pathologies
      (1) Adhesive capsulitis
      (2) Joint infections - Tubercular and pyogenic
      (3) Inflammatory joint conditions - rheumatoid arthritis, osteoarthritis

**CONCLUSION:** US can diagnose most causes of painful shoulder with good accuracy, however, it is limited by lack of visualization of deeper joint structures where MRI is superior. Despite this limitation US merits to be used as the first line modality for evaluation of painful shoulder.

![]()

Ultrasound image showing Partial Supraspinatus Tear

**SE 07 MS-59**

**Extraosseous Ewing’s sarcoma: a case report**

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Extraosseous Ewing’s sarcoma (EES) is a rare type of tumor that originates from soft tissues. It is part of the Ewing’s sarcoma family of tumors along with Ewing’s sarcoma of the bone, primitive neuroectodermal tumor and askin tumor, all of which arise from the same type of primitive stem cells.

The purpose of this case report is to familiarize readers with the clinical features and imaging of EES to allow early diagnosis and prompt management of the disease. Here, we report a case of a 21-year-old gentleman, who presented with progressive bilateral lower limb weakness and numbness associated with urinary and bowel incontinence, a week after experiencing neck and shoulder pain whilst playing badminton. The patient’s pertinent clinical history, computed tomography (CT) and magnetic resonance imaging (MRI) findings will be presented, followed by literature review and a brief discussion on this disease.

The initial cervicothoracic MRI scan showed an extradural lesion at the level of T1 until T5 with significant spinal cord compression and multivertebral focal abnormal signal intensity, whereas, the ‘staging’ CT scan showed multiple liver and bony metastases. The extradural lesion was subsequently confirmed histologically to be EES.

Familiarization with rare diseases such as EES is important because although a definitive diagnosis will only be obtained with tissue confirmation, imaging
allows early diagnosis which is essential in treatment planning and assessing complications, thus, give a better prognosis for the patient.

SE 07 MS-60
Focused US in patients with trauma to extremities
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PURPOSE: To determine the utility of ultrasound (US) in detection of fractures in patients presented to the emergency department. To correlate US findings with the plain radiograph.

MATERIALS AND METHODS: A total 153 patients between age group of 5-70 years were taken in the study; presented to the emergency department with history of trauma. Patients were then subjected to US examination by high frequency linear probe (14L5 probe Siemens Acuson S2000) for any cortical breaks in both parallel and perpendicular plane to the limb at the point of pain and tenderness. After this plain radiograph of the affected part was taken and the results were recorded and compared.

RESULTS: Of the 153 patients, 105 males and 48 females. Mean age was 37 years. 92 of them had fracture as detected on plain radiograph and all of them showed cortical breaks on US. In 15 patients with fracture the cortical breaks were not visualized as the probe was in parallel plane to the fracture line but when the orientation of the probe was altered, cortical breaks were easily visualized.

SE 07 MS-61
Do they follow rules and regulations? Association of soft tissue injury and bone edema patterns in acute knee injuries
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PURPOSE: To evaluate the association of bone contusion patterns and stabilizing structures around knee joint.

MATERIALS AND METHODS: 630 patients who had presented to a tertiary center from January 2013 to January 2017 with acute trauma were evaluated with 1.5T MRI GE HDX machine. Contusion, fracture patterns and soft tissues were characterized and evaluated with PD weighted images and STIR images by two radiologists.

RESULTS: Most of the injuries could be organized into 5 specific patterns of pivot shift pattern (48%), clip injury (15%), hyperextension pattern (12%), lateral subluxation (9%) and dashboard pattern of injuries (12%). Few injuries (4%) because of their complex mechanism and background degenerative and other arthritis, limited their characterization.

CONCLUSION: Systemic evaluation of contusion patterns which are obvious to identify, aids in diagnosing injury of stabilizing structures which can be subtle sometimes.

SE 07 MS-62
MRI evaluation of ligamentous knee joint injuries and its arthroscopic correlation
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INTRODUCTION: The knee joint is a common site of injury, mainly due to trauma, repetitive activities and sports activities. A detailed clinical examination with the numerous stability tests provide an almost 70% accuracy in diagnosing the pathology. However, they may not be appropriate due to pain. MRI has emerged as a primary tool in diagnosis and to guide the management of traumatic knee pain. Arthroscopy is invasive and expensive but still considered as “the gold standard” for the diagnosis of traumatic intraarticular knee lesions. However, the high NPV and high specificity confirm the use of MRI as a screening tool highly predictive in avoiding unnecessary arthroscopies.

AIMS AND OBJECTIVES: The present study involves study of MRI findings and grading of various ligamentous and meniscal injuries in cases of knee joint injuries and correlation of various MRI findings with arthroscopic findings.

MATERIALS AND METHODS: 50 patients with history of traumatic knee joint injury with suspected internal derangement of knee joint underwent MRI and were studied prospectively for duration of 2 years and correlated with arthroscopic findings. General contraindication to MRI, patient under 10 years of age and patients with knee joint neoplasm, inflammatory, infectious and degenerative conditions of knee joint were excluded from the study. MRI was performed on PHILIPS ACHIEVA 1.5 TESLA using sense knee coil. Arthroscopic follow-up of the patients was taken from the orthopedic surgeon.

RESULTS: 50 patients were studied between the age group 21-30 years (48%). The commonest observed pathology was ACL tears (90%) followed by medial...
meniscal (MM) tears (60%). Statistically significant association was observed between ACL tear and grade 3 meniscal tears as well as between ACL tear and MCL injury. MRI has high sensitivity, specificity and accuracy in diagnosing posterior cruciate ligament and complete anterior cruciate ligament tears.

CONCLUSION: MRI has been proven to be effective in defining the internal knee structures and has proved to be an imaging modality of choice thus providing an aid in planning the treatment if needed. MRI should be done in all patients suspected of ligamentous injury, thus preventing unwanted arthroscopies.

SE 07 MS-63
Sonoelastography features in evaluation of various benign soft tissue lesions in musculoskeletal imaging
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PURPOSE: To evaluate usefulness of sonoelastography for characterizing benign soft tissue lesions.

MATERIALS AND METHODS: We evaluated 32 soft tissue lesions of 32 patients using conventional B-mode US and compression type sonoelastography, from January to October 2016. The color code grading system as qualitative measurement and relative tissue-elasticity ratio by semi-automatic range of interest (ROI) at least 3 times as quantitative grading were done for each examination. The color pattern was graded into three major patterns: blue, green and red. According to the B-mode ultrasound feature, diagnoses were divided into 3 categories as follow: solid, semi-solid and cystic.

RESULTS: There were 20 lesions of blue, 1 green, 4 reds, 2 blue/green, 2 green/red, 3 blue/red and the range of tissue-elasticity ratio was from 0.35 to 6.13. There were 12 lesions of solid group, including lymph node (1), fibromatosis coli (2), benign fibrous histiocytoma (2), lipoma (1), nodular fasciitis (3), neurogenic tumor (2) and vascular leiomyoma (1). They tended to show blue color with high value of relative tissue elasticity, ranging from 1.14 to 5.17. The semi-solid category included 16 cases, including hemangioma (2) and epidermal inclusion cyst (14) with predominant green color and medium value of relative tissue elasticity, ranging from 1.55-1.82. The cystic lesions included TGDC (1), abscess (2) and ganglion cyst (1) with red color and lowest value of relative tissue elasticity, ranging from 0.59-0.98.

CONCLUSION: Compression type sonoelastography may serve as a useful diagnostic tool for evaluation of various benign soft tissue lesions and help to guide treatment.

SE 07 MS-64
Role of CT and MRI in diagnostic and prognostic evaluation of thoracolumbar spinal injury using TLICS (thoracolumbar injury classification and scoring) system
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INTRODUCTION: The radiologist has a pivotal role in evaluation of thoracolumbar “spinal trauma” with objective not only to eliminate the possibility of further damage and to identify the lesions which can be corrected, but also to evaluate the prognosis. The thoracolumbar injury classification and scoring (TLICS) provides a spine injury severity score based on three components: injury morphology (compression, burst, translation/rotation, distraction), integrity of the posterior ligamentous complex (PLC), and neurologic status of the patient. A numerical score is calculated for each category, with a lower point value assigned to a less severe or less urgent injury and a higher point value assigned to a more severe injury requiring urgent management. The total score helps guide decision making about surgical versus nonsurgical management. Familiarity with the TLICS will help radiologists who interpret spine trauma imaging studies to effectively communicate findings to spine trauma surgeons.

AIMS AND OBJECTIVES: To evaluate the common modes and site of injury in thoracolumbar spinal trauma. Classification of the thoracolumbar spinal injury using TLICS (thoracolumbar injury classification and scoring) system, and its correlation with surgeon’s choice of therapy.

MATERIALS AND METHODS:

Machines:
CT - Philips Brilliance I-256 Slice CT
MRI - 1.5 Tesla MR Achieva
Study Duration: 1 YR
Sample Size: 60
Observation:
L1 (28.5%) was the commonest vertebra involved. Burst compression was the commonest injury morphology-57.1%. Majority of the patients had intact posterior ligamentous complex- 85%.
Disc disruption was present in 11% of the patients. 0.7% of the patients had cord changes.
Amongst patients with TLICS score < 4, all of them showed neurological improvement. 26.3% of the patients with score ≥ 4 did not show neurological improvement despite surgery.
CONCLUSION: CT and MRI have a pivotal role in evaluation of thoracolumbar ‘spinal trauma’ with objective not only to eliminate the possibility of further damage and to identify the lesions which can be corrected, but also to evaluate the prognosis. The TLICS provides an accurate spine injury severity score based on three components: injury morphology, integrity of the PLC, and neurologic status. Familiarity with the TLICS will help radiologists who interpret spine trauma imaging studies to effectively communicate findings to spine trauma surgeons.

SE 07 MS-65
MRI analysis of extraarticular gastrocnemius ganglion cyst: prevalence, clinical relevance, and associated abnormalities
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PURPOSE: To describe the prevalence and radiologic features of extraarticular ganglion cysts at the gastrocnemius origin and its association with clinical relevance and internal derangement of the knee.

MATERIALS AND METHODS: Eighty consecutive patients with MRI knee were included. Images were retrospectively reviewed by two musculoskeletal radiologists for evaluation of cystic lesion around proximal medial and lateral gastrocnemius tendon as following: 1) prevalence and location (subcapsular, pericapsular, extraarticular) of cystic lesion, 2) morphology of cystic lesion and associated findings including size, shape (diffuse crescent, uni- or multilocular round) and presence of internal septation of cystic lesion, and adjacent gastrocnemius tendon abnormality, 3) presence of internal derangement of knee including high grade cartilage lesion (ICRS grade ≥ 2), pivot ligament (ACL, PCL) injury, meniscal tear, corner (posterolateral or posteromedial) injury on MRI, and high grade osteoarthritis (KL grade ≥ 3) on radiograph. Each radiologic finding was compared among the three types of cystic lesion according to the location by using the Mann Whitney U-test and Fisher's exact test. Inter-observer reliability was assessed using ICC and kappa statistics.

RESULTS: Cystic lesion around proximal gastrocnemius tendon was present at 128 sites on 80 MRI exams (subcapsular [n = 61], pericapsular [n = 39], and extraarticular [n = 28] location). Extraarticular location was noted 16 sites (20%) around medial and 12 site (15%) around lateral gastrocnemius tendon. Uni or multilocular shape (p = 0.00 and 0.01) and internal septation (p = 0.00 and 0.04) were significantly more frequent in cystic lesions with extraarticular location than in those with subcapsular or pericapsular location, respectively. High grade cartilage lesion (p = 0.12), meniscal tear (p = 0.00) and high grade osteoarthritis (p = 0.00) were significantly more frequent in cystic lesions with extraarticular location than in those with subcapsular location.

CONCLUSION: Extraarticular cystic lesions around proximal gastrocnemius was observed in 15-20% of MRI and showed to be consistent with typical features seen in ganglion cyst at other sites. High grade cartilage lesion, meniscal tear, and high grade osteoarthritis were frequently identified in patients with extraarticular cystic lesion than those with subcapsular location.

SE 07 MS-66
Imaging analysis of superficial soft tissue lymphomas
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PURPOSE: To describe imaging findings in superficial soft tissue lymphomas, especially those located in the skin and subcutaneous fat layer.

MATERIALS AND METHODS: This retrospective study included 44 pathologically confirmed superficial lymphoma lesions in 36 patients. All patients underwent imaging by at least one of MRI, CT, and US. Imaging analysis included the size, margin, location, morphology (nodular, reticular, or diffuse), homogeneity, multiplicity, and extent of the lesion. The enhancement patterns and vascularity of the masses were also assessed.

RESULTS: A nodular or mass form was the most common (21/44, 47.7%) morphology, and of the mass-forming lesions, 18 showed thin curvilinear opacity, extending from the peripheral margin of the mass to the skin or fascia, with a streaky appearance. Seventeen (38.6%) lesions were ‘mixed type’ (combination of diffuse and nodular or mass forms). Most of the lesions showed ill-defined or partially ill-defined margins; only three had truly well-defined margins. Regarding homogeneity, 35 (80%) lesions showed homogeneous patterns, and the remaining nine heterogeneous lesions showed necrosis or cystic components within the masses.

CONCLUSION: The imaging findings of superficial soft tissue lymphomas were non-specific in confirming the diagnosis. However, if images show more than two masses or nodular lesions with a fatty, streaky appearance and ill-defined margins in the cutaneous or subcutaneous layers, we should consider the possibility of a superficial soft tissue lymphoma.
Quantitative T2 relaxation analysis of articular cartilage of knee joint in patients with knee pain and healthy individuals at 1.5T MRI

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PURPOSE: To quantitatively evaluate the knee joint articular cartilage in patients with knee pain by T2 relaxation measurements in comparison to healthy individuals.

MATERIALS AND METHODS: Using 1.5T MRI 30 knee joints of patients with knee pain and 30 healthy individuals were investigated. After resting in supine for 30 minutes, all the individuals were examined by multiplanar T1w and PDw sequences. For quantitative measurements T2 mapping was performed using dedicated software (HDx.T2 Map CartiGram.GE). An eight-echo multiecho spin echo pulse sequences were used in axial and coronal sections to acquire the data with 16 × 16 cm FOV, matrix of 256 × 192 and slice thickness of 3 mm with 0.6 mm spacing. Using a dedicated software tool, data were post processed and T2 maps were generated. The articular cartilage was subdivided into eight areas and regions-of-interest (ROI) were manually placed in all zones of the articular cartilage. For statistical workup correlation coefficients and confidence intervals were calculated.

RESULTS: In patients with knee pain T2 relaxation values were significantly higher in all the compartments of the cartilage than those in healthy individuals (mean, 44.8 ms vs. 37.9 ms; p < 0.001). This difference was most evident in the medial and anterior compartments of the articular cartilage.

CONCLUSION: Based on these initial results, T2 relaxation values of the knee joint seem to be elevated in patients with knee pain compared to control group. Thus T2 mapping of knee articular cartilage might potentially serve as quantitative non-invasive tool for the detection of articular cartilage lesion at an early stage.

<table>
<thead>
<tr>
<th>Study</th>
<th>T2 value in controls</th>
<th>T2 value in patients</th>
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<tbody>
<tr>
<td>Timothy C. Dunn et al.</td>
<td>34.9 +/- 1.0</td>
<td>41.0 +/- 0.7</td>
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<tr>
<td>Fang Liu et al.</td>
<td>36.0 +/- 2.1</td>
<td>44.4 +/- 3.7</td>
</tr>
<tr>
<td>Our study</td>
<td>37.9 +/- 1.4</td>
<td>44.8 +/- 3.1</td>
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