10:30 - 12:00 **Room K**

Radiographers

SS 1014

Quality issues in ultrasound and CT

Moderators:
O.P. Bansal; New Delhi/IN
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Reduction of contrast agent using virtual monochrome image in haemodynamics aortic phantom

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Purpose: It is possible to reduce the contrast agent in the fixed type phantom using virtual monochrome images (VMI). Consider whether reduction of the amount of contrast agent is possible even using haemodynamic aortic phantom.
Methods and Materials: Using the CT scanner (Somatom Definition Flash; Siemens Healthcare), haemodynamic phantom was scanned in the dual energy scan (80-Sn140kV). The kernel used for image reconstruction is "B30". Injection condition was 24mgI/kg/s (assuming a weight of 60 kg, 370mgI/ml syringe, and 10-second injection). After that the contrast agent was reduced by 10% and scanned. The reconstructed images are 54 keV, 57 keV, 60 keV, 63 keV, 66 keV, 69 keV, and 72 keV and MIX images. Contrast to noise ratio (CNR) and shape reproducibility was calculated, and visual evaluation was performed.
Results: The CNR was highest at around 66 keV, and CT value was increased at lower keV. Using VMI (66keV), if the CNR is made equivalent, the contrast agent can be reduced by 20% and equivalent images can be obtained. Considering the noise of the background and using further low keV, the CT value increases, it is possible to reduce 40% of the contrast agent.
Conclusion: Using VMI in not only fixed phantom but also haemodynamic phantom, we could reduce contrast agent by up to 40%.

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Development and reliability of an ultrasound protocol to evaluate quadriceps muscle mass and diaphragm structure: a pilot study

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Purpose: This study aimed to evaluate the intra and inter-operator reliability of an ultrasound (US) protocol, to assess quadriceps muscle mass and diaphragm structure in healthy people, for future monitoring of patients with respiratory disease.
Methods and Materials: Twelve volunteers (6♀, 31.8±10.6 years; BMI=23.4±3.7 kg/m2) participated. An US equipment (Logiq P6 PRO, GE) with a multifrequency linear probe (11L) was used. Three measures of Quadriceps (Q_{TK}) and Rectus Femoris thickness (RF_{TK}), RF cross sectional area (RF_{Area}), bilateral diaphragmatic thickness at maximal inspiration ($D_{TK}I$) and at end expiration ($D_{TK}E$) were obtained by one operator. Six volunteers were randomly evaluated by two operators. Mann Whitney test was used to assess differences between inspiration and expiration and the right and left hemi-diaphragm. The Intraclass Correlation Coefficient ($ICC_{2,1}$) was used to explore reliability.
Results: Mean RF_{TK} were 1.72cm, 8.19cm^2 for RF_{Area} and 3.23cm for Q_{TK}. Significant differences were found between $D_{TK}I$ and $D_{TK}E$ both at right (0.31±0,17cm vs 0.23±0.19cm, p=0.01) and left hemi-diaphragm (0.37±0.18cm vs 0.24±0.14cm, p=0.01). No significant differences between the right and left hemi-diaphragms were observed during inspiration or expiration. Intra and inter-operator reliability were all Excellent: $D_{TK}E$ (intra: $ICC_{2,1}$=0.977; inter: $ICC_{2,1}$=0.822), $D_{TK}I$ (intra: $ICC_{2,1}$=,0.903; inter: $ICC_{2,1}$=0.805), Q_{TK} (intra: $ICC_{2,1}$=0.976; inter: $ICC_{2,1}$=0,940), RF_{Area} (intra: $ICC_{2,1}$=0.973; inter: $ICC_{2,1}$=0.981) and RF_{TK} (intra: $ICC_{2,1}$=0.998 ; inter: $ICC_{2,1}$=0.762).
Conclusion: Results showed the feasibility and reliability of this US protocol in healthy people. One single measurement by one operator seems to be adequate. Bilateral diaphragmatic measurements might not be necessary in respiratory patient's evaluation

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Orbital ultrasound evaluation of the optic nerve sheath diameter

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Purpose: The human eye is one of the most complex organs in our body. The fact that the eye is a liquid-filled superficial structure allows an optimal appreciation of the ocular structures on ultrasound. There has been an increase in the use of this modality in the evaluation of the diameter of the optic nerve sheath (ONSD). To purpose of the study is to analyse the reproducibility of the ONSD diameter measures, to characterise the ONSD by ultrasound, to verify the existence of correlation with body mass index (BMI), blood pressure (BP) and glucose values.
Methods and Materials: 370 ultrasound images of ONSD were collected from 84 individuals, divided into 2 groups. The ICC was obtained to evaluate the reproducibility of the ultrasound measurements. The BMI, BP and glucose values were also collected from all subjects. The correlation of data was also evaluated with the Pearson test and the Student's T test for independent samples.
Results: The ONSD ICC values showed satisfactory reproducibility (0.73). BMI and age showed a positive correlation with BP ($p<0.05$). No significant differences were found between the group with pathology (myopia, astigmatism or hypermetropia) and without.
Conclusion: Ultrasonography showed a satisfactory reproducibility to assess the ONSD and could help with new ocular disease evaluation.

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Effects of smoking on carotid artery structures and haemodynamics: role of the radiographer in ultrasound assessment

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Purpose: Currently, tobacco is a behaviour associated with the appearance of several pathologies, such as atherosclerosis or stroke and qualified radiographers in sonography field should be able do detect premature vascular changes due to smoking. The goal of this study was to assess and compare structural and haemodynamic parameters on carotid arteries in smokers and non-smokers by ultrasound.
Methods and Materials: Several parameters on the carotid artery were evaluated by a trained radiographer: intima-media thickness (IMT), peak systolic velocity (PSV) and end-diastolic velocity (EDV). Measurements were performed using a sample of 103 volunteer participants (52 non-smokers and 51 smokers) aged between 20 and 40 years. B-mode images were acquired in longitudinal and transverse sections of the common carotid arteries. Inclusion criteria contains healthy participants with unknown diseases. The smokers group was divided into four different categories depending on the number of cigarettes smoked by day.
Results: It were observed higher mean values for all of the structural and haemodynamic parameters in the smokers group (IMT=0,706mm; PSV=104,94cm/s and DV=30,20cm/s) comparing with non-smokers (IMT=0,512mm; PSV=72,47cm/s and DV=19,29cm/s). Also, the female smokers group presents higher values when compared with the male smokers group (x=0,758 vs x=0,652, respectively).
Conclusion: The data from this study suggest that smoking has negative effects on carotid artery structure and haemodynamics. Therefore, smoking is a risk factor for alterations in carotid artery haemodynamics and female smokers are more likely to develop vasculares changes. Radiographers can play a key role in the detection of pathophysiological changes in a preventive perspective.

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Abdominal and lumbar muscle evaluation by ultrasound

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Purpose: The aim of this study is to characterize the muscular ultrasound of two postural muscles (rectus abdominis and lumbar multifidus) in healthy individuals and in individuals with postural alterations (namely hyperlordosis).
Methods and Materials: 30 young adults were submitted to an ultrasound evaluation of the rectus abdominis and multifidus lumbar muscles in rest and contraction and an angle measurement of the lumbar spine through a photometry equipment. They were divided into groups: one of control and other with non-congenital posture. The sample was composed of 11 participants with postural deviations and 19 without. 360 images were analysed with Image J software to obtain muscle thickness and echo-intensity values from the two muscles in two conditions and the angle of the lumbar spine was calculated also for all participants.
Results: There were significant differences between rest and contraction on muscle thickness and echo intensity of both muscles. There were no significant differences between the two groups of participants and there was no correlation between the angle and the ultrasound measurements.
Conclusion: The postural deviations do not influence the ultrasound characteristics of the studied muscles. However, more studies must be performed to analyse the relation between the lumbar and abdominal muscles and the postural changes.