

B

Scientific Sessions and Late-Breaking Clinical Trials (B)

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Lower limbs low voltage (80 kV) CTA: lower radiation dose delivered and less contrast medium with preservation of image quality

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Purpose: To compare the intravascular enhancement in low dose (80 kV) CT-angiography of lower limbs performed with a reduced dose of high concentration contrast medium (CM) (75 ml of iopromide 370) in comparison with standard protocol at 100 kV performed injecting a full dose of CM (100 ml).

Methods and Materials: 120 patients (84 males; mean age 71.4 years) were randomly directed in two different protocols of CT-angiography of lower limbs, performed with standard tube parameters (100 kV) and administration of 100 ml of CM at 4 ml/s or with low voltage protocol (80 kV) with injection of 75 ml of CM at 3 ml/s. In each patient density values of 4 region of interest (ROI) at the level of the abdominal aorta, popliteal artery, of a vessel of the leg and in a psoas muscle were measured. Risk factors, serum creatinine, the signal to noise ratio and x-ray dose (DLP) were also registered.

Results: The density values of aorta were significantly higher in 80 kV protocol in comparison with the standard protocol ($P=0.001$); no statistically significant differences were noted in the vascular enhancement of popliteal or leg artery. There was no statistically significant difference ($P = 0.152$) in image quality measured with SNR. The DLP in the 80 kV protocol was significantly lower than the standard approach ($P < 0.05$).

Conclusion: 80 kV CT angiography of lower limbs allows to significantly reducing the amount of administered contrast medium preserving the image quality and lowering the radiation dose of about 30%.

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Low-dose runoff CTA in overweight and obese patients: effect of hybrid iterative reconstruction technique on image quality

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Purpose: To investigate the effect of low tube voltage and iterative reconstruction on image quality and the radiation dose of the peripheral CTA in overweight and obese patients.

Methods and Materials: 60 overweight or obese patients were enrolled. First group (n=20) was examined under 120 kV/200 mAs, second group (n=20) - 100 kV/200 mAs and third group (n=20) - 80 kV/200 mAs. We compared quantitative and qualitative parameters among three groups and among four reconstructions (FBP, HIR3,4,5) in second and third group. Student's t-test, Friedman test and Mann-Whitney U-test were performed for statistical analysis.

Results: Mean BMI was 29.7 ± 2.7 kg/m², 29.2 ± 2.94 kg/m², 29.3 ± 2.34 kg/m², respectively ($p > 0.05$). Effective dose was 26.9 ± 5.94 mZv, 16.3 ± 1.4 mZv, 8 ± 1.7 mZv, respectively ($p < 0.0001$). Mean arterial attenuation was about 17% higher in second group (120 kV vs 100 kV: 303 ± 61 vs. 364 ± 57 HU; $p < 0.0001$), and 32% in third group (120 kV vs. 80 kV: 303 ± 61 HU vs. 445 ± 103 HU). Image noise at the level of aortoiliac segment was 33.2 ± 11.3 in 120 kV group vs. 58.5 ± 12.5 in 100 kV, and 66.4 ± 11.3 in 80 kV. Average noise decreased when using 3 levels of HIR up to 25%, 37%, 44%, respectively both in 100 kV and 80 kV group ($p=0.00001$), but the level of the image noise was relatively high and the subjective image quality was significantly decreased, especially in 80 kV group despite the use of iterative reconstruction (120 kV vs. 80 kV+HIR $p < 0.001$; 120 kV vs. 100 kV+HIR $p=0.09$).

Conclusion: Low dose CT angiography using 100 kV and HIR results in significant decrease of radiation dose, maintaining a sufficient image quality in overweight and obese patients. Application of 80 kV protocol fails to achieve sufficient image quality in this patients, even when using IR.

B-0631 14:40

Location and severity of aortic valve calcium in patients undergoing transcatheter aortic valve implantation

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Purpose: Recent studies from the German transcatheter aortic valve registry have revealed that patients with paravalvular leaks are prone to considerably higher in-hospital mortality. Thus, location and aortic valve calcium scoring prior to Transcatheter-Aortic-Valve-Implantation (TAVI) might be important with regards to outcome and paravalvular leaks.

Methods and Materials: 152 patients (64 men, 82±5 years) with symptomatic aortic stenosis were included in this study. Prior to TAVI all patients underwent a thoracic-pelvine ECG-gated-CT-angiography for therapy planning. The total aortic-valve calcifications, leaflet aortic-valve calcifications, and outflow tract calcifications were assessed.

Results: The mean aortic valve calcification score was 1,966 mm³, with a range from 164.3 mm³ to 22,857.4 mm³. No patient had an aortic valve calcium score of 0. The median calcium score was 1212.7 mm³ (718.4-2059.1 mm³). There was no significant difference of the calcium distribution between the leaflets; the mean calcium score of the non-coronary leaflet was 675 mm³ and 516 mm³, and 645 mm³ for the left- and right-coronary leaflet ($p > 0.05$). This was also true for the median calcium leaflet scores 514.4 mm³ (258.7-769.6 mm³) vs. 343.6 (164.1-543.2 mm³) vs. 428.0 mm³ (237.9-766.9 mm³), respectively. The outflow tract had a mean calcification score of 509 mm³, with a range from 0-9,320 mm³, while the median score was 127.9 mm³ (37.8 - 576.7 mm³).

Conclusion: Predictions for TAVI regurgitation and persistence of paravalvular leaks are still not explored. Both, the amount of calcium and its exact location on the aortic valve and outflow tract may be important in determining the development of paravalvular aortic regurgitation and post procedural outcome after TAVI.

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Accuracy and time-efficiency of multi-path curved planar reformations in the evaluation of low-dose CT angiography of the peripheral arteries

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Purpose: CT angiography (CTA) is an accurate modality for the assessment of peripheral arterial occlusive disease (PAOD). However, time-consuming reading of axial images is necessary due to the lower accuracy of available reformations such as maximum intensity projections (MIP). This study aimed to evaluate the accuracy and time-efficiency of multi-path curved planar reformations (MP-CPR) for the detection of significant stenosis (> 70%) in comparison to axial images, using digital subtraction angiography (DSA) as reference.

Methods and Materials: Forty consecutive patients with PAOD referred to CTA prior to endovascular treatment were prospectively included. A dual-source CT scanner with 80 kV tube voltage, tube current modulation (120-150 ref. mAs) and iterative image reconstruction was used. 20 arterial segments were defined in each leg; for each segment, the degree of stenosis was assessed on MP-CPR and axial images independent of each other and compared to DSA.

Results: Regarding detection of significant stenoses, MP-CPRs yielded a lower sensitivity (84% vs. 89%, $p = 0.01$) and accuracy (93% vs. 92%, $p = 0.73$) but higher specificity (94% vs. 93%, $p = 0.04$) than axial images. The largest sensitivity discrepancy between MPCPRs and axial images was in the iliac segments (83% vs. 100%). The evaluation of MPCPRs was significantly faster than that of axial images (mean per patient: 4:41 min vs. 6:57 min, $p < 0.01$).

Conclusion: While providing similar accuracy, MP-CPR evaluation is significantly faster than evaluation based on axial images. However, for stenosis detection in the iliac segments, additional review of axial images is still recommended.

Author Disclosures:

M.M. Schreiner: Research/Grant Support; This work was supported by Fonds zur Förderung der wissenschaftlichen Forschung (FWF, Austria) under the contract number TRP 67.

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3D DCE-MRA in evaluation of blood-flow in diabetic foot

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Purpose: To identify and evaluate pedal vascularisation in diabetic patients of using contrast MR-angiography.

Methods and Materials: 31 diabetic foot of 31 patients (14 male (45.2%), 17 female (54.8%); mean age 54.65 ± 15.1) underwent 3D DCE-MRA (Gadovist, 15 ml) at 1.5 T. Imaging analysis included blood-flow's speed, vascular architectonic's condition and character of contrast's accumulation. Osteomyelitis was verified according to operations in 15 cases (48.4%).

Results: All patients were divided in 3 groups: I - ischaemic (n=5, 16.1%), II - neuropathic (n=12, 38.7%), III - neuroischaemic (n=14, 45.2%) forms of DF. First-pass MRA detected significantly ($p = 0.03$) delay in contrast's arrival in I group by comparison with II group. MR-angiography showed absence of pedal vessels patens in I group: arcus plantaris n=3 (60.0%), a.digitales n=5 (100%); and in III group: arcus plantaris n=2 (14.0%), a.digitales n=5 (35.7%). There was uniform (group III 2/5, 40.0%), increase (group.I. 5/5, 100%; group II 10/12, 83.3%; group III 11/14, 78.6%) and absence (group III 1/14, 7.1%) Gadovist's distribution in soft tissues. It wasn't significant difference in long-term contrast extravascular accumulation in all group of diabetic foot. Osteomyelitis associated with diffuse enhanced contrast accumulation in all cases (n=15, 100%).