TCT-317

Implementation of a Real-Time Skin Dose Tracking System in a Cardiac Catheterization Laboratory

Neil Dashkoff[1], Daniel Bednarek[1], Vijay Rana[1], Stephen Rudin[1]
[1]University at Buffalo, Buffalo, NY

Background: Radiation exposure levels to the skin during long fluoroscopic interventional procedures can exceed the threshold for deterministic effects such as erythema, epilation, desquamation and even necrosis. The interventionalist generally has little information during the procedure to accurately assess the level of skin dose and risk of these effects. We have developed a skin dose tracking system (DTS) that provides a real-time display of the cumulative dose distribution as well as the dose rate.
Methods: The DTS automatically calculates the skin dose and dose rate to the patient in real time using a computer model of the patient and imaging system. Geometric and exposure information is captured from the digital bus on a Toshiba Infinix fluoroscopic C-Arm unit (TAMS, Tustin, CA). This information allows a color-coded display of the dose distribution to be provided on a 3D patient graphic model as well as a color-bar representation of the dose rate and numerical presentation of peak skin dose and current dose rate. A prototype version of the DTS has been installed in a cardiac catheterization laboratory and diagnostic and percutaneous coronary interventional procedures have been monitored. The DTS can provide a display in the procedure room for real-time feedback so the cardiologist can recognize the impact on dose of imaging techniques used such as C-Arm angulation, pulse rate, source-to-skin distance, source-to-receptor distance, image-receptor magnification mode and imaging mode.
Results: Ionization chamber and radiochromic film verification show the dose representation of the DTS to be accurate to within 10%. Our results show that other parameters such as fluoroscopic time, dose-area-product and reference air kerma have little correlation to the actual peak skin dose. Visualization of the dose distribution with the DTS graphic representation facilitates dose spreading during the procedure to minimize hot spots on the patient's skin.
Conclusions: Feedback such as provided by the DTS during a fluoroscopic procedure can help the cardiologist to manage the dose given to the patient to avoid serious skin effects and to make an informed decision on the risk versus benefit tradeoffs of radiation use.

TCT-318

Contrast Agent and Radiation Exposure in Revascularisation of Chronic Coronary Total Occlusions: Magnetic Navigation versus Conventional Percutaneous Coronary Intervention

Sabine Scherzer[1], Berger Rudolf[1], Lisa Krenn[1], Clemens Gangl[1], Christian Roth[1], Natalija Lajic[1], Georg Delle Karth[1], Thomas Neunteufl[1]
[1]AKH Vienna Austria, Vienna, Vienna

Background: Aim of this trial was to compare magnetic navigation system (MNS) and conventional approach in revascularisation of coronary chronic total occlusions (CTO).
Methods: Forty symptomatic patients with CTO were randomized to MNS or conventional approach for antegrad crossing of the occluded vessel. Crossing success, crossing time, radiation exposure, and contrast media usage were directly compared using intention-to-treat and per protocol analysis. In the per protocol analysis each study group included patients with cross over after failing wire-crossing in the original group.
Results: In the intention-to-treat analysis wire-crossing and revascularisation were successful in a comparable number of CTOs using MNS (n=9/9) and the conventional approach (n=13/12). Crossing time was significantly shorter in the MNS group (415.5sec; IQR 211.5-497.5sec) than in the conventional group (1131sec; IQR 275.5-2630sec; p=0.03). Also radiation exposure was significantly lower in the MNS group (513.5mGy; IQR 313-837mGy) than in the conventional group (1346.5mGy; IQR 520.5-4053.5mGy; p=0.02). Usage of contrast agent was in trend lower in the MNS group (42.4ml; IQR 28.55-56.3ml) than in the conventional group (116ml; IQR 21.25-313.6ml). However, four previously failed MNS cases were successfully crossed with a wire and revascularized using the conventional approach. Accordingly, in the per-protocol the wire-crossing rate was in trend higher using the conventional approach (17 of 31) compared to the MNS (9 of 28; p=0.08).
Conclusions: The use of MNS for wire-crossing and revascularisation is feasible and can reduce crossing-time, radiation exposure, and the use of contrast agent. However, due to a better selection of crossing wires the conventional approach enables wire-crossing in cases failed by MNS and seems to be the more successful choice.

TCT-319

Improvement of coronary lesions quantification with rotational angiography "XperSwing"

Leire Unzue[1], Leire UnzueE[1], Juan Luis Delcan[2], Jose Luis Rodriguez-Lopez[3]
[1]H. MONTEPRíNCIPE, MADRID, NY, [2]H. MONTEPRINCIPE, BOADILLA DEL MONTE MADRID, SC, [3]PHILIPS, MADRID, SC

Background: Coronary angiography (CA) has been the gold standard technique for study of coronary artery disease. Is based on the analysis of bidimensional orthogonal projections that may not be optimal to estimate determinate coronary segments. Rotational angiography "Xperswing" (RA) is a new technique that allows the visualization of the coronary arteries from multiple views, with a single contrast injection. The aim of this study is to evaluate the coronary lesions quantification with RA compared to CA.
Methods: Quantitative coronary analysis of significant coronary stenosis (>50%) was performed. Every lesion was measured in two different projections: the "optimal projection", obtained by RA and defined by the operator as the one with a better lesion qualification, and the "standard projection", corresponding to the usual projection closer to the optimal one in obliquity and angulation. Measures were performed twice and by two independent operators. Intra- and inter-observator correlation was estimated by Kappa index and variables were compared with t Student test (SPSS 14.0).
Results: 205 lesions in 147 patients were analyzed. Kappa coefficient intra-observator was 0.80 and 0.86 respectively with an inter-observator correlation index of 0.72. Lesions length and maximal diameter of the vessel were significantly greater in the group of RA. In the segments analysis, calculated length was longer for the first diagonal branch, first marginal obtuse artery, middle circumflex, middle and distal RCA and posterior descending artery, with greater reference diameters for proximal LAD and distal RCA. There were not significant differences for coronary stenosis grade.
Conclusions: RA XperSwing provides a better visualization of coronary arteries improving lesions characterization, with longer measured lesions length and greater vessel diameters, especially in coronary segments with more angulation.

	Optimal projection	Standard projection	
Lesion diameter	1.13±0.39	1.17±0.47	0.33
Lesion length	**9.74±2.55**	**7.83±2.81**	**0.01**
Maximal diameter	**3.39±0.49**	**3.21±0.58**	**0.00**
%Diameter	50.97±10.70	49.05±11.58	0.11
%Stenosis	82.29±9.07	91.58±7.67	0.46

TCT-320

Rotational angiography with "Xperswing" technique: comparative analysis of radiation dose compared to conventional angiography

Leire Unsue[1], Juan Luis Delcan[2], Jose Luis Rodriguez-Lopez[3]
[1]H. MONTEPRíNCIPE, MADRID, NY, [2]H. MONTEPRINCIPE, BOADILLA DEL MONTE MADRID, SC, [3]PHILIPS, MADRID, SC

Background: Rotational angiography (RA) XperSwing is a new technique of coronary angiography, which involves pre-programmed rotation of the X-Ray tube around the patient allowing the acquisition of multiple coronary images with a single contrast injection. The benefits of the RA decreasing contrast dose and radiation exposure have been properly demonstrated, although the use of this technique involves some particularities such as the need of an enough distance between the X-Ray tube and the patient, and the inability to use collimating systems during the images acquisition. The aim of this study is to compare the radiation doses with RA and conventional angiography (CA).
Methods: 60 consecutive procedures were analyzed, 30 performed with CC and 30 with CA. The total radiation was estimated with the analysis of the dose area product (DAP) for fluoroscopy and exposition. The absorbed dose in air was expressed with the Kerma (Kinetic Energy Released per unit MAss). For a uniformly exposed area, the DAP is just the product of the aireKerma and the exposed area in cm2, so that a linear relationship between both variables is established.
Results: DAP values were significantly inferior for the group of RA, without differences in Kerma dose. The group with RA presented smaller fluoroscopy time with less number of acquired images.

	RA (30)	CA (30)	p
Diagnostic procedures	16 (53)	19 (63)	0.43
DAP fluoroscopy (mGy/cm^2)	**46709.587 ± 31030.67**	**78031.75 ± 57320.99**	**0.01**
DAP exposition (mGy/cm^2)	**21252.71 ± 13255.37**	**34642.75 ± 16591.05**	**0.00**
Total DAP (mGy/cm^2)	**67962.29 ± 44131.31**	**112674.50 ± 70133.99**	**0.01**
Kerma in air (mGy)	922.57 ± 641.95	1258.50 ± 868.27	0.12
Fluoroscopy time (min)	7,28 ± 3.3	11.5 ± 6.46	0.00
Total number of acquired sequences	8.14 ± 7.31	10.67 ± 3.21	0.23
Total number of acquired images	**429.71 ± 243.54**	**720.33 ± 233.26**	**0.00**

Conclusions: RA XperSwing reduces total dose of radiation compared to CA. Nevertheless, given a DAP value, RA increases the expected air kerma, probably due to a greater dispersion of the radiation during images acquisition. The use of distance injection systems could solve the limitation of this technique. Further studies are required to contrast these results, due to the small sample size and the combination of diagnostic and therapeutic procedures in the analysis.