METHODS Intra-procedural ultrasound assessment of both the radial (RA) and ulnar arteries (UA) was performed in a consecutive series of patients undergoing cardiac catheterization and/or intervention at a tertiary referral center. The diameters of the RA and UA were defined as the mean of two perpendicular measurements. The RA or UA was defined as larger if the difference in diameter was >20%. In the case of a dual artery, measurements of the dual arteries and the proximal confluent were obtained. Prior to ultrasound assessment, all patients were pre-treated with 0.4mg of sublingual nitroglycerin.

RESULTS A total of 566 RA/UA measurements were analyzed in 565 patients (female: n=201 [35.5%], mean age: 66.5 years). The mean diameters of the RA and UA were 3.03 ± 0.57 mm and 2.70 ± 0.57 mm (P< 0.01), respectively. Comparing gender, the mean diameter of the RA was 3.2 ± 0.56 mm in male and 2.7 ± 0.45 mm in female patients (P< 0.001) as well as 2.8 ± 0.57 mm and 2.4 ± 0.47 mm for the UA (P< 0.001). The RA was larger (>20%) than the UA in 210 (37.1%) and the UA was larger (<20%) than the RA in 37 (6.5%) measurements. In 15 patients, the RA diameter was <2.0 mm with a mean RA diameter of 1.6 ± 0.5 mm. The corresponding ipsilateral UAs were significantly larger in these 15 patients with a mean diameter of 2.6 ± 1.02mm (P= 0.0012). A dual RA was present in 25 (4.4%) measurements. Of these, the smaller dual RA had a mean diameter of 1.82 ± 0.37 and the larger dual RA of 2.59 ± 0.36 mm (P< 0.01). The corresponding proximal confluent of the dual RA measured 2.10 ± 0.40 mm. No dual UA was observed.

CONCLUSIONS The present study showed that systematic ultrasound assessment of both the RA and UA revealed anatomical particularities in 10.9% of patients, which is not assessable by palpation. In 10.9% of patients, an UA significantly larger than the RA or a dual RA with a more accessible confluent was observed. This information can only be obtained by ultrasound-guided arterial access, and may improve access rates from the wrist by allowing the operator to choose the UA when the RA is significantly smaller, thereby possibly preventing impossible to place too large of sheath in a small RA, and access the confluent of a dual RA, rather than a smaller dual RA branch.

CATEGORIES OTHER: Vascular Access: Transradial

KEYWORDS Radial artery, Ulnar Artery, Ultrasound guided

TCT-425
Rotterdam Radial Access Research: Radial Artery Access Evaluation After Coronary Procedures With Very High Resolution Ultrasound; The Puncture’s Footprint

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BACKGROUND The radial artery is a common access site for coronary diagnostics and intervention. Despite the advantages, low risk of radial pulse and arterial occlusions are known complications (0.6-12%). The Rotterdam Radial Access Research (R-RADAR) study aims to determine patterns of radial healing and the impact on occlusion and loss of pulsation by visualizing the radial artery non-invasively with very high resolution ultrasound.

METHODS The radial artery was assessed by a 40 MHz linear external ultrasound prior to the procedure, at 3 hours follow up and 30 days follow up. Study endpoints were safety and feasibility of imaging the radial artery with a 40 MHz probe, incidence of loss of radial pulse, radial artery occlusion, pain or discomfort at the hand or wrist and procedure related functional compromise at 3 hours and 30 days follow up.

RESULTS A total of 90 patients were enrolled in this prospective study. All showed acute wall injuries after cannulation 3 hours and at 30 days follow up. Observed injuries were dissections, hematoma, pseudo-aneurysm, thrombus and spasm often resulting in lumen compromise. Persisting occlusion occurred in 3.9% of the patients, loss of pulsation in 9.7%. One patient showed a fistula of the radial artery and vein. 44 patients experienced pain/discomfort of the hand at 3 hours follow up (29.5%) and at 30 days (31.2%). Nineteen patients had function compromise at 3 hours (13.6%) and at 30 days follow up (11.7%). 14 patients experienced both pain and function compromise. Multiple puncture attempts correlated with loss of pulsation (OR 2.64 vs 0.37 and the larger RA had a mean diameter of 1.82 ± 0.37 and the larger dual RA of 2.59 ± 0.36 mm (P< 0.01). The corresponding proximal confluent of the dual RA measured 2.10 ± 0.40 mm. No dual UA was observed.

CONCLUSIONS Ultrasound acquisition of the radial artery with a 40MHz linear external probe is safe and feasible. Structural radial artery wall are omnipresent Acute wall injuries did not correlate with pulsation loss, occlusions and symptoms at follow up, however there was a significant correlation of multiple puncture attempts with loss of pulsation, occlusion and symptoms.

CATEGORIES OTHER: Vascular Access: Transradial

KEYWORDS Percutaneous coronary procedure, Radial access, Vascular ultrasound

TCT-426
The Impact Of Operator Experience During Institutional Adoption Of Transradial Cardiac Catheterization

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BACKGROUND Trans-radial (TR) cardiac catheterization offers numerous benefits over trans-femoral (TF) cardiac catheterization, but the TR approach has been slowly adopted in the United States. The purpose of this study is to examine trends in TR cardiac catheterization and the impact of institutional operator experience on TR outcomes in contemporary practice.

METHODS We reviewed all cases of attempted TR catheterization at a single tertiary care academic medical center from the initial adoption of the TR approach in May, 2008 until April, 2015. TR cannulation failure was defined as inability to cannulate the radial artery, and TF cross-over was defined as conversion from a TR to TF approach after successful radial artery cannulation. We assessed trends over time by a non-parametric test of trend. We used generalized estimating equations for categorical variables and linear mixed models for continuous variables, and we adjusted models for performance of percutaneous coronary interventions (PCI) and differences between individual operators.

RESULTS Over the study period, 4177 attempted TR cardiac catheterization cases were performed by 12 operators. Operator experience at the study institution ranged from 13 to 935 TR cases. Overall, PCI was performed in 859 (20.5%) TR cases, and the percentage of TR cases performed with PCI increased from 9.7% in 2009 to 26.3% in 2014 (P-trend <0.001). The overall TR cannulation failure rate was 2.8%, and the overall TF cross-over rate was 2.9%. Over the study interval, the rate of TR cannulation failure decreased from 4.3% in 2009 to 2.5% in 2014 (P-trend = 0.05), and the rate of TF cross-over decreased from 4.3% in 2009 to 2.2% in 2014 (P-trend = 0.03). Increasing operator experience was associated with lower rates of TR cannulation failure and TF cross-over (table). Operators with over 100 cases had the lowest odds of TR cannulation failure, while operators with over 200 cases had the lowest odds of TF cross-over. Increasing operator experience was also predictive of shorter mean fluoroscopy time and lower mean contrast dye dosing (table). Performance of PCI was not a significant predictor of TR cannulation failure, but was a predictor of TF cross-over (odds ratio 1.99, 95% confidence interval 1.56 to 2.54, P<0.001), higher mean contrast dye...
dose (mean increase 105.4 mL for PCI cases, P<0.001), and longer mean fluoroscopy time (mean increase 14.4 min for PCI cases, P<0.001).

**CONCLUSIONS** Increasing operator experience improves TR cannulation failure and TF cross-over rates, reduces contrast dye dosing, and shortens fluoroscopy time. These data support an operator learning curve of at least 200 cases to achieve optimal TR performance.

**CATEGORIES OTHER:** Vascular Access: Transradial

**KEYWORDS** Coronary angiography, Percutaneous coronary intervention, transradial, Transradial

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**TCT-427**

Safety and Efficacy of The ProStar XL Percutaneous Vascular Closure System for Transfemoral Transcatheter Aortic Valve Replacement (TAVR): A Single Center Six-year Experience

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**BACKGROUND** Vascular complications are frequent following transcatheter aortic valve replacement (TAVR) and are associated with increased mortality and prolonged hospital stay. This study investigated the vascular complications and clinical outcomes associated with the use of the Prostar XL vascular closure system.

**METHODS** Between October 2008 and February 2015, 481 consecutive patients underwent TAVR. A true percutaneous femoral approach was performed in 323 patients (67.2%). The femoral artery diameter, tortuosity and calcification were measured using CT. All complications were defined according to VARC-2 standardized endpoints. Successful closure with Prostar XL was defined as adequate hemostasis without Prostar-related vascular complications. The incidence of vascular complications in the early (2008-2011) and late (2012-2015) experience of the TAVR program were compared.

**RESULTS** The mean age of the cohort was 79.14±8.77 years, 51.1% were female, and mean logistic EuroScore was 21.2±12.7. The vast majority of cases used an 18F sheath (91.9%) and Medtronic CoreValve device (92.9%). The mean minimal luminal diameter of the femoral artery was 8.11±1.20 mm, the mean sheath diameter was 7.20±0.17 mm, and the mean SFAR was 0.90±0.12. Vascular complications occurred in 13.3% of the cohort overall (15.2% vs. 12.0%, P=0.467). Major vascular complications were decreased in the late experience (7.9% vs. 3.3%, p<0.079). Prostar XL failure was more common in the early experience (10.8% vs. 4.9%, P=0.09). There was no significant difference in life-threatening/disabling bleeding (0.6% vs. 1.1%, P=0.779), BARC major bleeding (4.3% vs. 2.2%, P=0.280), or BARC minor bleeding (8.6% vs. 2.8%, P=0.200) in the latter group, despite higher rates of moderate and severe tortuosity (P=0.001), more cases with SFAR>1.05 (P=0.04), and a trend towards more calcified vessels (P=0.09). Overall Prostar XL failure was 7.1% and was more frequently seen in patients with SFAR>1.05 (P=0.001). On multivariable analysis, calcium score 2 or 3 (OR 1.62, 95% CI 1.20 to 2.19, P=0.000), minimal CI lumen diameter (OR 0.60-95% CI: 0.40 to 0.87, P<0.009), and NYHA class III/IV (OR 0.20, 95% CI: 0.06 to 0.62, P=0.006) were independent predictors of vascular complications. Cardiovascular 30 day-mortality was similar in both early and late groups (1.4% vs. 0.5%, P=0.585).

**CONCLUSIONS** The experience of the ProStar XL device for femoral artery closure reduced major vascular complications despite patients referred for TAVI since 2012 have tended to have anatomically more challenging femoral access when compared to cases referred previously. The ProStar XL device provides consistent, safe vascular closure following TAVI.

**CATEGORIES OTHER:** Vascular Access: Femoral and Closure Devices

**KEYWORDS** Aortic valve, Closure device, Vascular complications

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**TCT-428**

The Long-term Effect of Transradial Coronary Catheterization on Upper Limb Function

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**BACKGROUND** Anatomical and physiological changes that are induced by radial access may lead to a decrease of upper limb function. This is the first study that investigated the effect of transradial (TR) access on upper extremity function at long-term follow-up.

**METHODS** Between January 2013 and April 2014, upper limb function was assessed in a total of 349 patients with complete 1-year follow-up after coronary catheterization. Upper limb function was assessed with the self-reported Cold Intolerance Symptom Severity questionnaire. Both questionnaires were completed before the catheterization and at 1 year follow-up. Higher scores represent worse upper limb functionality or symptoms.

**RESULTS** The mean age of the study population was 64 years, and 72% of the population was male. Radial approach was performed in 300 patients. Box plots of QuickDASH scores at baseline and 1-year follow-up for TR- and TF-treated patients can be appreciated in Figure 1. Whiskers represent 5th to 95th percentiles. Upper limb function at long-term follow-up did not change significantly over time when catheterization was performed through the radial artery (baseline 2.39 [IQR 0.00-13.64]; f-up 0.00 [IQR 0.00-11.02]) or femoral artery (5.68 [IQR 0.00-15.91]; f-up 4.55 [IQR 0.00-17.05]). If we applied a Clinically Important Difference of 1.1% of the TR patients would have a clinically-relevant increase of the QuickDASH, which was similar to the TF treated patients (12.5%, p=0.76). Similarly, upper extremity was not affected by cold intolerance after TR access (baseline 0.00 [IQR 0.00-13.75]; f-up 0.00 [IQR 0.00-0.00], p=0.09) or TF access (baseline 0.00 [IQR 0.00-31.25]; f-up 0.00 [IQR 0.00-33.00], p=0.29). The development of pathological cold intolerance (defined as C2SS > 30) was not associated with the applied access route (p=0.22).

**CONCLUSIONS** At long-term follow-up upper limb function was not affected when coronary catheterizations and interventions were performed through the radial artery. The results of our study are of importance to all patients undergoing TR access, especially when optimal upper extremity function is essential.

**CATEGORIES OTHER:** Vascular Access: Transradial