

Carotid and Neurovascular Disease and Intervention

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TCT-190

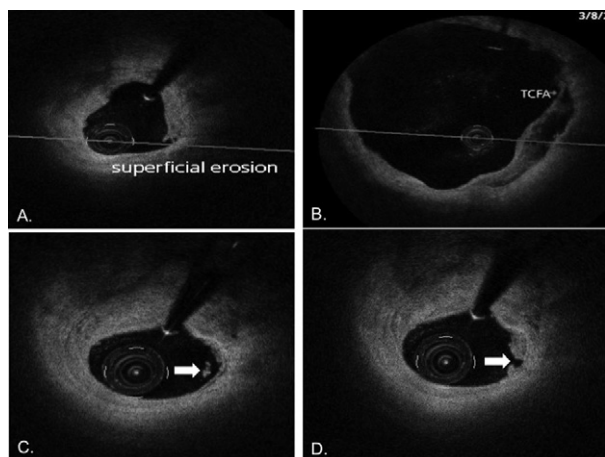
Use of Optical Coherence Tomography (OCT) for Characterization of Carotid Plaque In Patients with Severe Asymptomatic Carotid Stenosis

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Background: Carotid artery related stroke is mainly an embolic disease that has been associated with inflammation, plaque rupture, and thrombus formation in "vulnerable" atherosclerotic plaque. Almost, two-thirds of these strokes affect patients who are previously asymptomatic. Estimation of the degree of stenosis in a carotid lesion based on angiography is a poor predictor of clinical outcome. We propose that stroke risk may be best predicted by plaque morphology in these asymptomatic lesions using OCT with its unique fine imaging resolution.

Methods: We have performed OCT imaging of carotid plaques in 22 consecutive asymptomatic patients with severe carotid artery stenosis. Detailed analysis showed various features of high-risk vulnerable plaque such as thin-cap fibroatheroma, plaque rupture, intraluminal thrombus, calcifications in some (n=13) while the remaining had none of these features (n=9). Periprocedural events rates were compared between two groups.

Results: Patients with high-risk vulnerable plaque features had more periprocedural events, while the patients without these features had no events.



Conclusions: OCT can be used safely and effectively to identify high-risk vulnerable plaque features in asymptomatic patients with severe carotid artery stenosis for further risk stratification and optimal treatment strategy such as carotid artery stenting versus carotid endarterectomy.

TCT-191

Percutaneous Transluminal Angioplasty And Stenting Of Extracranial Vertebral Artery Stenoses

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Background: To evaluate the safety and efficiency of vertebral angioplasty and stenting (VAS) in symptomatic patients.

Methods: Material and Methods: 102 angioplasties in 96 pts (M:72) mean age 68,3 ± 6,7 years (22-84) left 58. All pts had multivascular diseases: carotid (CA):63, subclavian (SA): 26, coronary:64. ... Atheromatous lesions: 100, inflammatory: 2. Mean lesion length: 9,6 +/- 2,8 mm. Mean % stenosis 83,2 ± 7,7, mean arterial diameter : 4,8 ± 0,6 mm (4-6). 94 lesions at VO segment (ostium), 6 at V1 and 2 at V2 segments. Indications for angioplasty: dizziness (96), bilateral weakness (11), visual changes (11), diplopia (10), drop attacks (20), TIA (13), ataxia (5). A protection device (filter) used in 10 pts. 20 SA angioplasties performed at the same time of VAS, 8 CA. All angioplasties performed by

femoral approach, 4 by brachial approaches after failure of femoral approach. (2 successes).

Results: Technical success 100/102 (98%). 6 lesions treated by angioplasty alone: 3 VO (first 3 pts. 2 V1, 1 V2 lesion). 1 pt (inflammatory disease) treated by cutting balloon alone. 93 lesions treated with stents (direct stenting: 78). Peripheral balloon expandable stents (n=23), self expandable stents (n=4 for 3 V1 and one V2 lesions). 70 coronary stents (14 DES). 1 pt developed a TIA during the procedure. No neurological complications at 30 days Clinical success 94/96 (98%) Post-procedure arterial diameter: 4,55 ± 0,8 mm (4-6). Mean residual stenosis 2,2 ± 3,5 %. In 10 pts treated with protection devices, visible debris removed in 7 (5 Filterwire, 2 Fibernet) with the same amount of debris as during Carotid Stenting) 7 pts (8%) developed a symptomatic restenosis during the follow-up (mean: 31,4±28,9 months), 3 after PTA alone, 4 after PTA and stent (1 occlusion treated medically, 6 stenoses successfully treated with PTA). No restenosis after DES implantation at 1 year.

Conclusions: VAS can be performed safely and effectively with a high technical success rate, a low complication rate, a low restenosis rate and a durable clinical success in patients with symptomatic VA stenosis. Stents seem to improve immediate and long-term results. The role of protection devices and D.E.S has to be discussed.

TCT-192

Vertebral Angioplasty Stenting. Are Protection Devices Useful?

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Background: It is now clear that atheroemboli are the rule in any intervention in atherosclerotic disease and seems the root cause of many procedural complications. Embolic protection devices (EPD) reduce the number of cerebral emboli during carotid angioplasty stenting (CAS). Recent studies have shown a high incidence of emboli during Vertebral Angioplasty Stenting (V.A.S) and a comparable frequency and amount of captured emboli during V.A.S and CAS. Neurological complications after V.A.S are not frequent but could be devastating. So the use of EPD for VAS may be advisable and should reduce the neurological complications during V.A.S

Methods: We retrospectively determined rates of technical success and one month stroke and death associated with stent placement by using EPD (Filterwire and Fibernet filter in patients with symptomatic ostial VA stenoses. Technical success was defined as successful EPD deployment and stent placement, successful EPD retrieval and a residual stenosis < 30%. 30 day outcomes included any stroke and death. The new EPD (Fibernet) allows capture of debris of 40 microns without compromising the flow. Its retrieval catheter is an aspiration catheter allowing meticulous cleaning of the vessel and of the dilated area

Results: In a series of 102 VAS, 10 patients treated with EPD. Mean age 69 y. (63-80). Male: 8, left 6. Mean % stenosis 80,9±6,8. Mean arterial diameter: 4,8 ± 0,5mm. Femoral approach used in all cases. Filterwire :8 patients, Fibernet: 2. Technical success was achieved for the 10 patients. Postprocedure residual stenoses: 4±3%. Visible debris were removed in 70% of cases (Filterwire:5 and Fibernet:2). Filter deployment time: 10 mm (7-13 mm). No stroke or death observed at one month. With Fibernet mean debris area: 184 mm2. (aspirated debris : 114mm2, debris in the filter 70 mm2) Debris analysis will be reported. These results are comparable to the results obtained in CAS.

Conclusions: The present study demonstrates the feasibility and safety of VAS using EPD. Further studies are required to determine the exact role of EPD and their indications in VAS. It seems that the results obtained in VAS are comparable to those obtained after CAS.

TCT-193

Use Of Drug-Eluting Balloon For The Treatment Of In-stent Restenosis After Carotid Artery Stenting

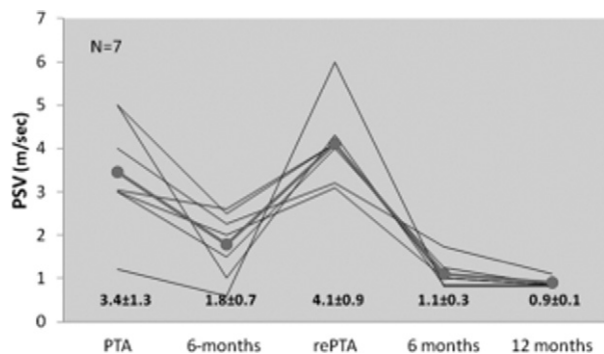
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Background: In-stent restenosis (ISR) after carotid artery stenting (CAS) is a rare event. Endovascular treatment is considered for significant ISR (>80% diameter stenosis by Doppler US). Despite favorable acute results, recurrent ISR ranges between 0 and 50%. Evidence of DEB effectiveness for coronary and peripheral ISR treatment is accumulating. We assessed the safety and efficacy of DEB in ISR after CAS.

Methods: Significant ISR occurred in 11/803 (1.3%) consecutive CAS procedures at a median F/U of 624±580 days. In 7 pts (6 internal and 1 common carotid arteries), DEB (In.Pact Admiral, Invatec-Medtronic, Italy) treatment (single 3-minute inflation) was performed after standard predilation with distal cerebral protection. DEB size was selected by IVUS (1:1 stent to DEB size ratio). Post-DEB, patients were treated with double antiplatelet therapy for 3 months. Acute and long-term clinical outcomes were obtained in all pts.

Results: Technical and procedural success was 100%. Angiographic stenosis decreased from 83±5% to 18±6%. Minimal lumen area by IVUS increased from 3.2±1.8 to 12.6±2.1mm2 (p<0.001), stent area was unchanged (from 17.5±4.7 to 17.3±4.7mm2) and restenosis area decreased from 13.6±5.8 to 4.6±3.3mm2 (p<0.001). At a F/U of 412±52 days (range 343-455), no clinical event occurred. Average Doppler Peak Systolic

Velocity (PSV) decreased from 4 ± 0.97 m/s to 0.90 ± 0.14 m/s. The 6- and 12-month PSV values after DEB were significantly lower as compared to those obtained after CAS at the same time intervals (Figure).



Conclusions: DEB treatment of ISR after CAS is feasible. Initial results show safety and effectiveness.

TCT-194

Impact of Asymptomatic new Cerebral Lesions in DW- MRI after Carotid Artery Stenting on Long Term Prognosis

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Background: After embolic protected CAS, new cerebral ischemic lesions have been reported in up to 70 % of patients. There impact on long-term prognosis after CAS is unknown. Aim of the study was to evaluate the impact of new asymptomatic cerebral ischemic lesions, found in diffusion weighted magnetic resonance imaging (DWMRI) after embolic protected carotid artery stenting (CAS), on long-term prognosis.

Methods: 837 consecutive patients who had an embolic protected CAS without peri-procedural complications and had a DWMRI before and 24 hours after the procedure were included. Cox Regression analyses were performed to identify independent risk factors for long-term major adverse cerebral and cardiovascular events (MACCE) including patient-, lesion-, and procedural characteristics as well as the result of the DWMRI.

Results: The follow-up rate was 91 %. At a mean follow up of 779.5 ± 535.8 days. MACCE occurred in 6.04 % of the patients. Diabetes was the only significant independent predictor for MACCE. Asymptomatic ischemic cerebral lesions after CAS were not associated with MACCE during long-term FU.

Conclusions: In patients who underwent uncomplicated embolic protected CAS, only diabetes was predictive for long-term MACCE, whereas asymptomatic ischemic embolic events during CAS had no impact on long-term outcome.

TCT-195

Novel Quantitative Virtual Histology Parameters in the Asymptomatic and Symptomatic Carotid Atherosclerotic Plaque Imaging: Data from the First 222 Patients in CRACK-VH Study

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Background: Internal carotid artery stenosis (CS) degree is a poor marker of symptom risk, and plaque morphology might play an important role. IVUS offers high-resolution (axial ≤ 0.12 mm for 20 MHz transducer) plaque imaging; nevertheless, phenotypic virtual histology (VH-IVUS) carotid plaque classification was shown to be prone to between-center and between-observer image interpretation variability.

Methods: We developed and implemented a novel Q-IVUS software-based algorithm for detailed quantitative CS plaque VH-IVUS analysis to supplement the conventional phenotypic plaque classification. Following inter-transducer and inter-observer reproducibility validation (n=21, separate communication), we employed the QVH-IVUS 'peak' algorithm (including standard - total component value per plaque cross-sectional area, PA; and novel parameters - eg, minimal fibrous cap thickness, confluent necrotic core area, thickness and arc) to evaluate 222 index CS lesions in 222 consecutive patients (age 47–83y, 62.6% men, 68.9% with h/o CS-attributable symptoms, S) presenting with CS >50% in the context of potential revascularization. Use of EPD for CS imaging (67%) was left to operator (filters $\approx 3/4$, proximal $\approx 1/4$).

Results: Table; values are peak \pm SEM per PA; abstract p values are for Total Asympt vs. Total Sympt CS lesions. MLA= minimal lumen area, AS=area stenosis, PB=plaque burden, FC=fibrous cap, NC=necrotic core, FF=fibro-fatty, Ca=dense calcium, FT=fibrotic).

Conclusions: QVH-IVUS 'peak' image analysis of the carotid atherosclerotic plaque revealed significant inter-group differences in novel QVH-IVUS plaque parameters, including lower minimal FC thickness and higher confluent NC-area, -thickness and -arc, and higher peak confluent Ca-area in S lesions. Further work will test the role of QVH-IVUS 'peak' image analysis algorithm in identifying the asymptomatic CS lesions at risk of symptomatic transformation.

	Asympt ICA control S	Asympt ICA + control S	Sympt ICA ≤6m	Sympt ICA >6m	Total Asympt ICA	Total Sympt ICA	p
n	69	38	88	27	107	115	
MLA (mm ²)	6.0 ± 0.3	7.8 ± 0.5	6.2 ± 0.3	6.5 ± 0.5	6.6 ± 0.3	6.3 ± 0.3	ns
AS (%)	72.4 ± 1.4	66.8 ± 2.3	71.4 ± 1.4	70.2 ± 2.6	70.4 ± 1.3	71.1 ± 1.2	ns
PB (%)	83.7 ± 0.9	78.8 ± 1.3	83.9 ± 0.9	83.5 ± 1.7	82 ± 0.8	83.8 ± 0.8	0.03
min FC thckn (mm)	0.41 ± 0.04	0.32 ± 0.05	0.16 ± 0.02	0.18 ± 0.03	0.37 ± 0.03	0.17 ± 0.01	<0.001
NC (mm ²)	5.5 ± 0.4	4.5 ± 0.4	6.9 ± 0.4	6.7 ± 0.7	5.2 ± 0.3	6.8 ± 0.37	0.01
NC (%PA)	22.2 ± 1.6	22.0 ± 2.2	27.5 ± 1.5	28.4 ± 2.9	22.2 ± 1.3	27.7 ± 1.35	0.03
confl NC area (mm ²)	2.9 ± 0.3	2.6 ± 0.3	4.2 ± 0.4	4.0 ± 0.6	2.8 ± 0.2	4.2 ± 0.29	0.001
confl NC (%PA)	10.9 ± 1	11.1 ± 1.5	14.3 ± 1.1	15.6 ± 2.3	11.0 ± 0.9	14.6 ± 1	0.007
confl NC arc (°)	83 ± 6	73 ± 7	119 ± 9	105 ± 11	79 ± 5	116 ± 7	<0.001
confl NC thckn (mm)	1.01 ± 0.06	1.02 ± 0.08	1.31 ± 0.06	1.27 ± 0.11	1.01 ± 0.05	1.30 ± 0.05	<0.001
FF (mm ²)	12.4 ± 0.8	11.2 ± 0.9	12.6 ± 0.5	12 ± 1.3	12 ± 0.6	12.5 ± 0.51	ns
FF (%PA)	39.8 ± 1.9	40.4 ± 2.4	40.3 ± 1.5	39.7 ± 3.7	40 ± 1.5	40.2 ± 1.4	ns
Ca (mm ²)	8.4 ± 0.8	6.8 ± 0.8	8.6 ± 0.7	11.9 ± 1.8	7.8 ± 0.6	9.3 ± 0.7	ns
Ca (%PA)	2.1 ± 0.2	2.1 ± 0.5	2.5 ± 0.3	3.1 ± 0.5	2.1 ± 0.2	2.7 ± 0.22	0.01
confl Ca area (mm ²)	1.3 ± 0.1	1.0 ± 0.1	1.6 ± 0.2	1.9 ± 0.3	1.2 ± 0.1	1.6 ± 0.14	0.02
confl Ca arc (°)	79 ± 7	57 ± 6	85 ± 7	105 ± 15	71 ± 5	90 ± 7	0.05
FT (mm ²)	18.1 ± 0.6	16 ± 0.7	19 ± 0.5	17.5 ± 0.9	17.4 ± 0.5	18.7 ± 0.5	ns
FT (%PA)	66 ± 1.2	65.1 ± 1.5	65.3 ± 0.9	63.3 ± 2	65.7 ± 0.9	64.8 ± 0.8	ns

TCT-196

Chronic Cerebrospinal Venous Insufficiency: The Association Between the Extent of Extracranial Venous Anomalies and Clinical Severity and Duration of Multiple Sclerosis.

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Background: Chronic cerebrospinal venous insufficiency (CCSVI) characterized by stenoses or obstructions of the internal jugular veins (IJV) and/or azygos vein (AZY), has been reported to be associated with multiple sclerosis (MS). However, such association is a matter of debate. The aim of our retrospective analysis was to determine the relationship between the extent of extracranial venous pathology and clinical severity of MS.

Methods: We analyzed 50 consecutive patients (pts) with relapsing-remitting (32 pts) and secondary progressive (18 pts) clinical course of MS (age 38 ± 10 years, M:F=15:35) scheduled for duplex ultrasound (DUS), invasive phlebography, and eventual endovascular procedure of IJV and/or AZY. The extent of stenotic/obstructive process of IJV, and AZY, or IJV reflux, were graded by combination of invasive phlebography and duplex ultrasound as negative (group A), unilateral/focal stenosis/regurgitation (group B), or bilateral/multifocal stenoses/regurgitation (group C). The clinical severity of MS was evaluated by expanded disability disease scoring (EDSS). The study was approved by the local scientific and ethical committee.

Results: Out of 50 analyzed pts (mean EDSS 3.7 ± 2.4) there were 10 pts with negative DUS and venous phlebography pathology (20%), 16 pts with unilateral/focal venous pathology (32%), and 24 pts with bilateral/multifocal pathology (48%). The 20 cases were treated by balloon angioplasty alone, whereas the stenting of at least one vein was required