940-55 Cutting Into the Sonolucent Zone After Coronary Atherectomy: Correlation Between Intravascular Ultrasound Images and Histological Findings

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To maximize the debulking volume is a major principle in directional coronary atherectomy (DCA), however an over-incision may cause a coronary rupture or a vascular injury. It is important to know the precise depth of DCA. Although sonolucent zone (SLZ) has been thought of as media, it is not evaluated what SLZ exactly represents after DCA in vivo. We compared intravascular ultrasound (IVUS) and histological examination in interpreting the cutting depth of DCA. Twenty-eight lesions in 26 patients were examined with 3.5Fr 30 MHz catheter after DCA. When the blood cell's halo faced directly to the SLZ, we defined it as SLZ-cutting. All retrieved tissues were examined histologically. The relationship between IVUS findings and histological examinations was as follows. In one case, IVUS underestimated the cutting depth. In 10 cases, IVUS interpreted SLZ cutting, but media was identified in only half of them. In another 5 cases, tissue contained intima and flakes of internal elastic lamina (IEL) only. Retrieved tissue of SLZ contained IEL without exception. The sensitivity of IEL cutting by IVUS was 94%, the specificity was 100%.

		Contents of retrieved tissue		
		intima	intima + IEL	media + IEL
Cutting depth by IVUS	intima	17	0	1
	SLZ	0	5	5

Conclusion: At the endpoint of atherectomy, SLZ cutting did not always mean the incision into media, but it meant the incision of internal elastic lamina.

940-56 Detailed Intravascular Ultrasound Analysis After Routine High Pressure Assisted Intracoronary Stent Implantation

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Previous studies have shown that following intravascular ultrasound(IVUS) guided stenting it is safe to withhold anticoagulation when stent expansion has been optimal with high pressure balloon inflation. To assess IVUS findings after routine high pressure inflation we studied 100 patients in our institution.

Results: The maximal mean inflation pressure was 16 ± 2.5 ATM. Optimal angiographic result was seen in all patients and quantitative angiography revealed a 8 ± 4% residual stenosis.

IVUS revealed the following findings: Stents were expanded *symmetrically* in 75% and *asymmetrically* in 25%. *Incomplete stent struts apposition* was observed in 55%, i.e., 1, 2, 3, 4 stent struts in the lumen were found in 13%, 17%, 3%, and 5%, respectively. *Mobile debris* in the stent lumen was found in 4% and plaque protusion at the *articulations site* in 2%. Proximal stent dissections and inflow stent obstructions were found in 3.5% and 2.8%., respectively. After IVUS assessment additional treatment was needed in 24 PTS, 26 lesions. Additional 5 and one half stents were implanted and 0.25 mm larger balloon and higher pressures were needed. Repeat IVUS revealed: *Complete stent expansion* was observed in all PTS; *asymmetric stent expansion* remained the same after higher pressures. *Complete stent struts appositions* was attained in 96% and *incomplete stent struts appositions* in 4% (one stent strut in the lumen). Furthermore, lumen CSA at the tightest point within the stent increased by 23%, minor diameter increased by 13%, and major diameter increased by 6%.

Conclusion: This study demonstrates that using routine high pressure balloon inflation and having attained an optimal visual angiographic result, IVUS evaluation revealed that in 24 patients further treatment was needed.

940-57 IVUS Assessment of High Pressure Stent Implantation

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Previous IVUS studies have suggested the routine use of high pressure balloon inflation to implant stents as *nominal* balloon infation pressures yield a high number of stents suboptimally expanded. To evaluate the effect of routine high pressure inflation on stent implantation 48 lesions (45 native coronary arteries, 3 SVG) in 43 patients were studied. Stents (19 Wiktor, 18 PS, 10 Wallstents, 1 Cordis) were implanted at 14.5 ± 2 atm, with a balloon/artery ratio of 1.15 ± 0.18. No major acute complication or subacute thrombosis occurred. QCA (automated edge detection, CMS) and IVUS analyses were performed blinded to the results of the other technique. Angio reference diameter was 3.3 ± 0.6 mm, % DS pre 69 ± 18, and % DS post 11 ± 11. Minimal Balloon Diameter at maximum inflation pressure was measured and cross-sectional area (CSA) calculated. IVUS measurements included minimal CSA within stent and proximal (distal if ostial) and distal (within 15 mm; proximal to any major branch) lumen CSA. Stent apposition on vessel wall (Appo), symmetry (Sym, minor/major axis) and expansion (Expan, minimal CSA within stent/reference CSA) were calculated. Mean stent Expan was 82 ± 20% (average proximal and distal reference) with a range of 45–124%. No differences in stent Expan were found among different stent types. The % of stents that satisfied four different, previously reported, IVUS optimal Expan criteria (*A:* 90% of average reference CSA, *B:* 60% of average reference CSA, *C:* 90% of distal reference CSA, *D:* 70% of balloon area) were as follow:

Appo 360^0	Sym > 0.7	Expan *A*	Expan *B*	Expan *C*	Expan *D*
96%	85%	29%	90%	43%	62%

Conclusions: Routine use of slightly oversized balloons at high pressures does not guarantee optimal stent expansion. The strictness of different IVUS criteria of optimal stent expansion vary widely, emphasizing the need to further define clinically relevant IVUS endpoints.

940-58 Intravascular Ultrasound (IVUS) for Accurate Guidance in Renal Artery Stent Placement

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Percutaneous renal angioplasty (PTRA) and stent deployment are conventionally guided by angiography. We performed PTRA with placement of Palmaz stents in 61 renal arteries in 49 pts. Pre- and post-procedure results were assessed by quantitative angiography and IVUS. IVUS catheter (3.5F, 20/30 MHz) was introduced via an 8F guiding catheter before and after each PTRA/stent deployment. 78% of pts. had six-month clinical, angiographic, IVUS, and hemodynamic follow-up. *Results:* 1. IVUS was employed to select balloon size (mean = 5.9 ± 0.9 mm), based upon measurement of normal "reference" vessel size (mean diameter = 5.2 ± 1.0 mm). 2. In 24/61 (39%) lesions, IVUS led to selection of longer stent since lesion length exceeded that judged by angiography. 3. IVUS revealed suboptimal residual lumen diameter with the presence of free stent struts within the lumen in 33/61 (54%) lesions. These lesions were redilated at a higher pressure or with a larger balloon. In all cases, underexpansion of stents could not be judged by angiography. 4. At six months only 5/61 (8%) vessels had significant (≥ 50%) restenosis. *Conclusion:* IVUS provides important information in renal artery stenting by accurately identifying the dimensions of the vessel, longitudinal extent of lesion, and presence of stent underexpansion, all of which may be ambiguous by conventional angiography. Six-month restenosis rate is very low in this series, indicating that guidance by IVUS may optimize outcome.

940-59 Can Ultrasound Texture Analysis Distinguish Between Red and White Thrombi: A Comparative Study of Intravascular Videodensitometric and Radiofrequency Data

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Visual assessment of intravascular ultrasound (IVUS) video images cannot reliably identify thrombus. However the application of statistical methods using texture analysis could potentially discriminate different thrombus types. To study this different types of clots (*n = 6 in each group*) were *induced* in vitro by adding thrombin (20 units/ml) in whole blood (red clot = RC, red blood cell count 4.3 × 10^{12}/l, Hb128 g/dl, platelets 208 × 10^9/l) and platelet rich plasma (white clot = WC, platelets 314 × 10^9/l). Clots were imaged at 4 hours with 30 MHz transducers and the following parameters were analysed from both the video and RF data after demodulation: mode, mean pixel grey level (MPV), standard deviation (SD), min and max brightness, kurtosis, and skewness. Results showed that red and white thrombus can be identified by mode (video RC 139.3 ± 19.1 and WC 98.2 ± 32.2, RF RC 8.9 ± 3.6 and WC 4.6 ± 2.9) and skewness (video RC −0.234 ± 0.23 and WC 0.35 ± 0.52; RF RC 1.3 ± 0.5 and WC 1.8 ± 0.7) from both data sets ($p < 0.001$). Mean (RC 134.8 ± 18.0 and WC 105.3 ± 17.4) and minimum brightness (RC 50.3 ± 10.3 and WC 31.4 ± 8.6) and SD (RC 26.4 ± 2.5 and WC 33.9 ± 7.8) were also significantly different between the two thrombus types when analysed from the video image.

We conclude that the heterogeneous structure of white thrombus can be identified and distinguished from red thrombus using texture analysis from either video image or RF data.