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P1004 Saline flush during excimer laser pulse delivery in the rabbit femoral artery: an unexpected photodynamic therapy effect

Ton G. van Leeuwen, Evelyn Velema, Gerard Pasterkamp, Mark J. Post, Cornelius Borst. *Heart Lung Institute, Utrecht University Hospital, Utrecht, The Netherlands*

Background: To reduce the size of explosive water vapor bubbles formed during intra-luminal delivery of laser pulses, blood must be displaced by saline. In a previous study, we demonstrated that saline flush during excimer laser light delivery drastically reduced the number of medial dissections in the rabbit femoral artery. However, the transparent saline solution in front of the catheter tip provided direct irradiation of the arterial wall, which resulted in increased medial and adventitial necrosis. In this study, we evaluated the effect of flushing saline on intimal hyperplasia (IH) and arterial remodeling. **Methods:** In the femoral artery of the rabbit, 600 excimer laser pulses (308 nm, 55 mJ/mm², 20 Hz) were delivered coaxially in 10 bursts of 3 seconds each. During laser pulse delivery, the 4.5 F multifiber catheter (0.67 mm/s) was pulled back over a length of 20 mm. In 12/24 procedures, saline was flushed (0.2 ml/s) via the guide wire channel. At 4 locations in the lesion, angiographic measurements were performed before and after the procedure and at follow-up. After termination, the arteries were pressure perfusion fixed. In 4 cross-sections of each lesion, the intimal hyperplasia thickness was morphometrically analyzed with a computer-based system. Arterial shrinkage was defined as the lumen loss diameter which was not explained by IH.

Results:

Patent arteries dimensions: [mm, mean ± sd]

Occlusions	Lumen loss	IH thickness *2	Shrinkage
Blood 7/12	0.43 ± 0.30	0.15 ± 0.10	0.26 ± 0.26
Saline 4/12	0.37 ± 0.27	0.15 ± 0.13	0.22 ± 0.22

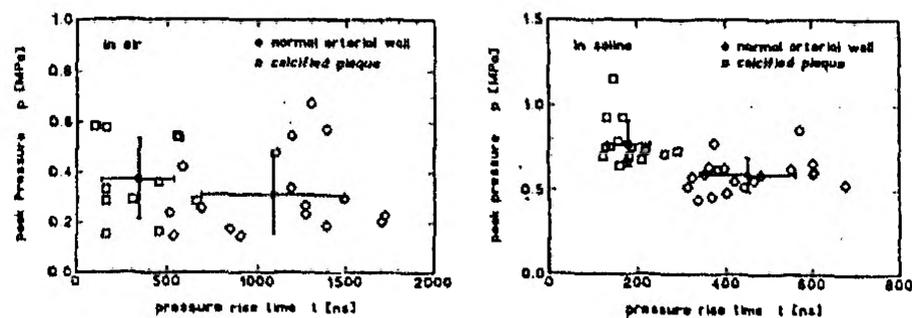
In the middle segments of the saline group no IH and no shrinkage was present. Furthermore, parts of the media were acellular, a histopathology that also is observed after photodynamic therapy of arteries. However, at both edges of the lesion, IH and arterial shrinkage reduced the lumen. In the blood group, the lesion was distinct with the maximal IH in the middle of the lesion.

Conclusion: Flushing saline during coaxial excimer laser pulse delivery facilitated direct irradiation of the arterial wall, which prevented, in the middle of the lesion, restoration of the media and formation of intimal hyperplasia, resembling the effect of photodynamic therapy. In both groups, lumen reduction, either in the middle of the lesion or at the edges, is due to intimal hyperplasia and arterial shrinkage.

P1005 Alternative energy source for intra-coronary laser interventions: the Er:YAG laser

K.K. Haase, C. Rose, A. Athanasiadis, A. Baumbach, K.R. Karsch. *Department of Cardiology, University of Tübingen, Germany*

Coronary excimer laser ablation is limited by the induction of pressure waves and vapor bubbles which have been identified to be a major cause of vessel wall trauma during tissue ablation. Er:YAG lasers – as opposed to excimer lasers – offer significantly higher ablation rates with only minimal thermal injury. To identify the extent of pressure waves during Er:YAG laser ablation, normal and atherosclerotic vessel segments were irradiated *in vitro* using a pulsed Er:YAG laser system ($\lambda = 2.94 \mu\text{m}$). In a first series, the laser spikes (macropulse duration: 250 μs) were focused in air onto the tissue. In a second series, the pulses were delivered via a ZrF fibre and a quartz fibre onto the vessel wall samples being immersed in a saline solution. The pressure pulses were detected by needle type hydrophones at the back side of the samples in the first series and lateral to the ablating fibre tip in the second series.



Although Er:YAG laser ablation is associated with the induction of pressure waves, the maximum intensity of the stress waves is significantly reduced as compared to excimer laser ablation. In concordance with previous experiments, these results support the assumption that minimal thermal injury, low peak pressures and high ablation rates will lead to new clinical perspectives of treatment of coronary artery disease.

CORONARY ARTERY DISEASE SEVERITY AND LEFT VENTRICULAR FUNCTION

P1006 The impact of the severity of coronary artery stenosis and the collateral circulation on the functional outcome of dyssynergic myocardium after revascularization in patients with chronic left ventricular dysfunction

Abdou Elhendy, Guiseppe Trocino, Jos R.T.C. Roelandt, Jan H. Cornel, Galal M. El-Said, Mohsen M. Ibrahim, Medhat El-Refae, Paolo M. Fioretti. *Thoraxcenter, Erasmus University Rotterdam, The Netherlands*

Background. Collateral circulation and patency of the infarct related artery have been associated with more myocardial preservation after acute myocardial infarction. However, the relation between these parameters and functional recovery after revascularization in patients with chronic left ventricular dysfunction has not been evaluated.

Methods. We studied 40 patients with old myocardial infarction by low-dose dobutamine (up to 10 $\mu\text{g/kg/min}$) echocardiography (LDDE) before coronary artery bypass grafting. A 16 segments-5 grade score model was used to assess left ventricular function. Viability and functional recovery were respectively defined as a reduction of wall motion score ≥ 1 at LDDE 14 \pm 8 days before surgery and at follow up resting echocardiography 3 months after surgery.

Results. There were 56 stenotic coronary arteries subtending severely dyssynergic regions, of which 38 were occluded. Among 186 severely dyssynergic segments postoperative functional recovery occurred in 42 (23%). There was no significant difference between regions with patent or occluded arteries with respect to prevalence or extent of viability and functional recovery. In patients with total occlusion, parameters of viability and functional recovery were not related to the collateral grade. Sensitivity, specificity and accuracy of LDDE for prediction of regional functional recovery were 71% (CI 65–78), 90% (CI 86–95) and 86% (CI 81–91) respectively.

Conclusion. In patients with chronic left ventricular dysfunction, the presence of total occlusion of coronary arteries supplying severely dyssynergic regions does not imply a lower prevalence or extent of myocardial viability regardless of the grade of visualised collaterals. Independent on the severity of coronary stenosis, noninvasive evaluation of myocardial viability using techniques like LDDE is required to identify segments with high probability of improvement after revascularization.

P1007 Does the change in quantitatively assessed coronary artery disease after lipid-lowering therapy relate to functional status of the patient? A substudy of the Regression Growth Evaluation Statin Study (REGRESS)

W.R.M. Aengevaeren, G.J.H. Uijen, A.V.G. Brusckhe¹, J.W. Jukema¹, T. van der Werf. *Department of Cardiology, University Hospital Nijmegen;*
¹ *Interuniversity Cardiology Institute the Netherlands (ICIN), Utrecht, The Netherlands*

In general the effects of lipid-lowering therapy are evaluated by clinical events or anatomical parameters. Assessment of functional parameters is an alternative approach, that may provide relevant additional information. Therefore we assessed regional myocardial blood flow and exercise parameters and related the changes in these measurements to the results of the quantitative coronary angiography (QCA).

Methods: In this substudy 69 patients were randomised to pravastatin (prav.) 40 mg o.d. or placebo (plac.) according to the REGRESS protocol. Before and after 2 years of therapy the following measurements were performed: 1) Mean segment diameter (MSD) and minimal obstruction diameter (MOD) assessed by QCA. 2) Assessment of the regional myocardial blood flow by digital subtraction angiography after i.c. papaverine with video-densitometric calculation of the hyperemic mean transit time (HMTT). 3) Exercise time (EXT) and maximal ST-segment depression (MST), assessed during a standardised bicycle test.

Results: Complete follow-up after 2 years was available in 26 patients in the medical management (M), 10 in the PTCA (P) and 14 in the CABG (C) stratum, respectively. Effect analysis of prav. versus plac. was based on 36 patients (M and P strata, PTCA vessels excluded). The change in MOD was correlated to the change in MST ($r = 0.52$, $p = 0.009$), not to EXT or HMTT. The change in MSD was not correlated with change in exercise parameters or change in HMTT. The change in HMTT was correlated with the change in EXT ($r = 0.65$, $p = 0.002$).

In conclusion: Change in MOD is moderately related to maximal ST-segment depression during the exercise test. Myocardial perfusion better correlates with the functional status of the patient, presumably because HMTT also reflects changes at the microcirculatory level.