Scientific letters

Excimer Laser Coronary Atherectomy During Percutaneous Coronary Intervention

Uso de aterectomía coronaria con LASER Excimer como terapia coadyuvante en intervencionismo coronario percutáneo

To the Editor,

We present excimer laser coronary atherectomy (ELCA) as an adjuvant therapy in percutaneous coronary intervention (PCI) when standard techniques fail (when crossing or expanding the lesion is impossible): the application of high-energy light provides a photochemical, photothermal, and photomechanical triple effect.[1]

Given that this technique is not widely used in our setting, there is a relative lack of data on its applications, effectiveness, and safety. We present our experience with ELCA over a 4-year period in the treatment of 31 lesions that underwent PCI (Table 1). We included lesions with specific indications for ELCA use as the first and only procedure (treatment of saphenous lesions and in-stent restenosis), as well as lesions with previous failed PCI attempts (52%).

The lesions treated included 22 chronic total coronary occlusions (CTO), 5 in-stent restenoses (with underexpansion), 2 lesions that were "uncrossable" either with a guidewire or with any dilatation device after the guidewire was passed, 1 severely calcified lesion, and 1 saphenous bypass lesion. A 0.9 mm catheter was used in 87.1% of the cases. The procedure was begun with the lowest energy level and frequency for each catheter, increasing progressively from 30 to 80 mJ/mm^2 and from 25 to 80 Hz, respectively, until successful (the laser catheter crossing the lesion to the distal zone and/or dilatation of the lesion that was previously unexpandable with a balloon). The number of pulses used at each energy level was determined by the response. The catheter was advanced anterogradely from the proximal zone toward the lesion, with a maximum velocity of 0.5 to 1 mm/s and a maximum pulse application time of 10 seconds. Before each pulse, continuous perfusion was started with normal saline at 1 mL/s for 10 seconds as the laser was applied.

The mean fluence and frequency used were 66.43 ± 7.76 mJ/mm^2 and 67.16 ± 8.77 Hz, respectively, with a mean number of pulses of 3.9 ± 1.47 (Table 2). The laser success rate at the first attempt was 93.5%. Independently of the type of lesion treated, the overall success rate of the procedure was 96.8%, with a final lumen diameter of 3.18 ± 0.28 mm and final residual stenosis of 0.5% (Table 1).

This is the largest published report to date on the use of ELCA as an adjuvant therapy in PCI of CTOs: 22 lesions were treated (71% of the total), compared with only 11 CTOs in the LEONARDO study[2] (the largest series of ELCA-treated lesions) and 18 CTOs in the study by Fernandez et al.[3] Due to its photothermal and photochemical effects, ELCA use in CTO allows molecular modification and changes in the physical structure of the fibrous capsule of the occlusion, allowing the device to be advanced to the distal bed. The success rate in this CTO subgroup was 95.45% (higher than that reported in previous literature, where it varied between 77% and 100%[2,3]). There was just one case of technique failure because it was impossible to pass the guidewire.

We must highlight the 100% success rate in the treatment of in-stent restenosis (16% of the total) without subsequent complications. These results are consistent with those of previous studies, such as the ELLEMENT registry.[4]

From a safety perspective, it should be noted that the first devices had a complication rate that was not insignificant, with a mean coronary perforation rate of 0.5% to 8%[5] and a dissection rate of 7%.[6] However, design improvements, such as the use of a flushing technique with normal saline to remove any residual blood or contrast, and the use of small diameter catheters (0.9 mm), have enabled a reduction in the complication rate. In our study the complication rate was 3.2%, due to a single case of coronary artery perforation by the guidewire before the laser was used.

Table 1
Clinical and Angiographic Characteristics

Patients	n = 31
Age, y	68 ± 8.40
Male sex, n (%)	22 (71)
Initial smoker, n (%)	13 (41.9)
Hypertension, n (%)	16 (51.6)
Diabetes mellitus, n (%)	9 (29)
Dyslipidemia, n (%)	14 (45.2)
Previous viability study, n (%)	22 (71.0)
Stress echo	14 (45.2)
SPECT	8 (25.8)
Pre-PCI LVEF, %	51.45 ± 8.84
Lesions	n = 31
CTO, n (%)	22 (71)
In-stent restenosis, n (%)	5 (16.1)
Uncrossable lesions, n (%)	2 (6.5)
Severely calcified lesion, n (%)	1 (3.2)
Saphenous bypass, n (%)	1 (3.2)
Lesion type, n (%)	
B	2 (6.5)
C	29 (93.5)
Treated vessel, n (%)	
Anterior descending	19 (61.3)
Circumflex	3 (9.7)
Right coronary	9 (29)
Mean reference vessel diameter, mm	3.18 ± 0.34
Prelaser MLD, mm	0.27 ± 0.38
Prelaser stenosis, %	98.19 ± 3.45
Postlaser MLD, mm	1.35 ± 0.79
Postlaser stenosis, %	81.45 ± 7.18
Final MLD, mm	3.18 ± 0.28
Final stenosis, %	0.5

CTO, chronic total occlusion; LVEF, left ventricular ejection fraction; MLD, mean lumen diameter; PCI, percutaneous coronary intervention; SPECT, single-photon emission computed tomography.

Table 2
Technical Aspects of the Procedure

Lesions with previous failed PCI, n (%)	16 (52)
Arterial access, n (%)	
Radial	11 (35.5)
Femoral	1 (3.2)
Two arterial sites	19 (61.3)
Type of laser catheter by diameter, n (%)	
0.9 mm	27 (87.1)
1.4 mm	2 (6.5)
1.7 mm	1 (3.7)
No catheter (failure to pass guidewire)	1 (3.7)
Mean laser fluence, mJ/mm²	66.43 ± 7.76
Mean laser frequency, Hz	67.16 ± 8.77
Mean number of pulses	3.9 ± 1.47
Laser success at first attempt, n (%)	29 (93.5)
Combined use of other atherectomy therapies, n (%)	
Rotablation	0
Cutting balloon	0
Scoreflex	3 (9.7)
Mean contrast used, cc	211.74 ± 87.33
Mean fluoroscopy time, min	33.69 ± 14.31
Guide catheter used, n (%)	
XB or EBU 3.5	5 (16.1)
XB or EBU 4	14 (45.2)
Amplatz	10 (32.2)
JR	2 (6.5)
Mean number of guidewires used	2.10 ± 1.04
Microcatheter use, n (%)	
Finecross	13 (41.9)
Corsair	5 (16.1)
Other	3 (9.7)
Not used	10 (32.26)
Mean number of stents placed	2.22 ± 1.20
Percentage DES, %	100
Final length treated, mm	42.40 ± 26.05

DES, drug-eluting stent; PCI, percutaneous coronary intervention.

The results presented here allow us to recommend ELCA as a safe adjuvant therapy in complex PCI, when there is failure to cross or dilate the lesion as it significantly increases the success rate of the procedure.

Raymundo Ocaranza-Sánchez,[a,*] Rosa Alba Abellás-Sequeiros,[a] Carlos Galvão-Braga,[b] Ramiro Trillo-Nouche,[a] and José Ramón González-Juanatey[a]

[a]*Unidad de Cardiología Intervencionista, Complejo Hospitalario Universitario de Santiago de Compostela, Santiago de Compostela, A Coruña, Spain*
[b]*Unidad de Cardiología Intervencionista, Hospital de Braga, Braga, Portugal*

*Corresponding author:
E-mail address: raymundoocaranza@yahoo.com
(R. Ocaranza-Sánchez).

Available online 19 July 2016

REFERENCES

1. Oraevsky AA, Jacques SL, Pettit GH, Saidi IS, Tittel FK, Henry PD. XeCl laser ablation of atherosclerotic aorta: optical properties and energy pathways. Lasers Surg Med. 1992;12:585–97.
2. Ambrosini V, Sorropago G, Laurenzano E, Golino L, Casafina A, Schiano V, et al. Early outcome of high energy Laser (Excimer) facilitated coronary angioplasty ON hARD and complex calcified and balloOn-resistant coronary lesions: LEONARDO Study. Cardiovasc Revasc Med. 2015;16:141–6.
3. Fernandez JP, Hobson AR, McKenzie D, Shah N, Sinha MK, Wells TA, et al. Beyond the balloon: excimer coronary laser atherectomy used alone or in combination with rotational atherectomy in the treatment of chronic total occlusions, non-crossable and non-expansible coronary lesions. EuroIntervention. 2013;22:243–50.
4. Latib A, Takagi K, Chizzola G, Tobis J, Ambrosini V, Niccoli G, et al. Excimer Laser LEsion modification to expand non-dilatable stents: the ELLEMENT registry. Cardiovasc Revasc Med. 2014;15:8–12.
5. Bittl JA, Ryan Jr TJ, Keaney Jr JF, Tcheng JE, Ellis SG, Isner JM, et al. Coronary artery perforation during excimer laser coronary angioplasty. The percutaneous Excimer Laser Coronary Angioplasty Registry. J Am Coll Cardiol. 1993;21:1158–65.
6. Deckelbaum LI, Natarajan MK, Bittl JA, Rohlfs K, Scott J, Chisholm R, et al. Effect of intracoronary saline infusion on dissection during excimer laser coronary angioplasty: a randomized trial. The Percutaneous Excimer Laser Coronary Angioplasty (PELCA) Investigators. J Am Coll Cardiol. 1995;26:1264–9.

http://dx.doi.org/10.1016/j.rec.2016.04.039

Late Phrenic Nerve Stimulation in a Super-responder to Cardiac Resynchronization Therapy. The Toll of Success?

Estimulación frénica de aparición tardía en paciente superrespondedor a la terapia de resincronización. ¿El precio del éxito?

To the Editor,

We report an unusual case of late-onset phrenic nerve stimulation (PNS) in a super-responder to cardiac resynchronization therapy (CRT).

The patient was a 58-year-old woman with a history of hypertension and bronchial hyperreactivity. Four years earlier, she had been diagnosed with nonischemic dilated cardiomyopathy and left bundle-branch block (Figure 1A). She remained stable while receiving optimal medical treatment, with 40% left ventricular ejection fraction (LVEF) in New York Heart Association (NYHA) functional class II until her status worsened to NYHA III. An echocardiogram (video 1 of the supplementary material) revealed a spherical left ventricle (LV) with pronounced asynchrony, end-systolic volume of 128 mL, and LVEF (by Simpson method) of 26%. Consequently, a CRT device with defibrillator was implanted in June 2012. At that time, a bipolar lead was placed in a position with a long electrical delay (LV QRS interval of 180 ms). The LV capture threshold in bipolar pacing was 0.75 V at 0.4 ms, whereas impedance pacing was 460 Ω and R wave was 7 mV, without PNS (10 V output at 0.5 ms). Electrocardiogram showed simultaneous biventricular pacing, atrioventricular interval of 130 ms, and bipolar LV pacing with a QRS complex of 120 ms (baseline, 188 ms) and evident fusion between biventricular pacing and native conduction through the right branches (Figure 1B). Figure 2A shows the lead position on radiography in a posterolateral branch of the coronary sinus.

The patient's clinical and echocardiographic progress was excellent. At 9 months postimplantation, the patient was in NYHA I and the echocardiogram showed disappearance of the spherical LV shape, noticeably decreased volumes (end-systolic volume, 32 mL), and normal LVEF (59%) (video 2 of the supplementary material). However, shortly thereafter, she consulted for PNS in