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Laser in-situ Fenestration: An Increasingly Used Promising Technique of Physician Modified Endografts (PMEG) in Complex Aortic Emergencies

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INTRODUCTION

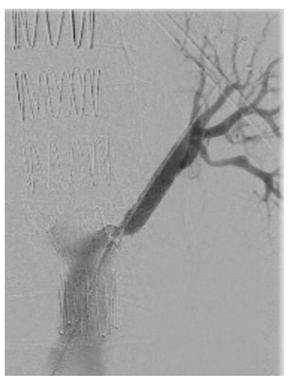
Complex endovascular aneurysm repair (EVAR) techniques are ideally done using custom-made devices (CMDs) excluding the aortic aneurysm sac and preserving side branches to organs (1). In urgent and emergent aortic presentations, off-the-shelf techniques are often used including branched devices, chimney, periscope, and physician-modified endografts (PMEGs). In situ laser fenestration is meant to producing side holes in the deployed stent graft fabric using laser light energy that could be dilated serially and used as fenestrations in situation when clinical urgency does not allow enough time for custom-made devices to be manufactured (2).

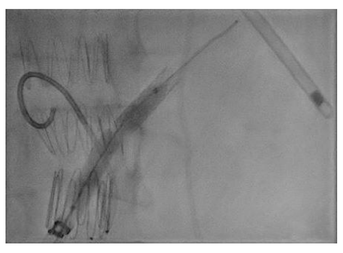
METHODS

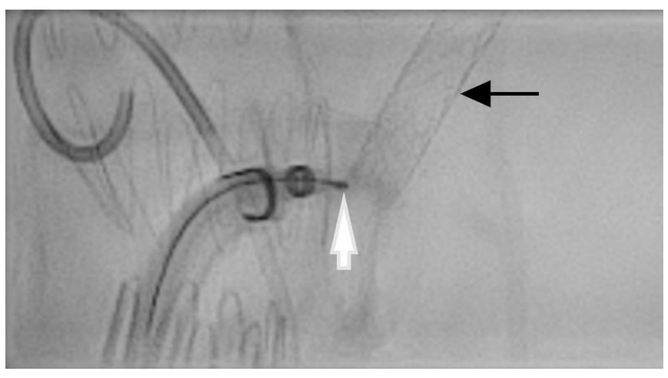
This study is retrospective, reporting 9 cases done using in situ laser fenestration either in antegrade or retrograde approach. We analysed operative techniques, equipment used, success rate and fenestration related complications including; endoleaks, dissections and distal organ perfusion, as well as in-hospital and short-term complications, and outcomes of postoperative 30-day CT scans..

CVX-300 Excimer laser

System specifications	
Power requirements	208-230 VAC single phase power
US wall outlet receptacle	NEMA L6-30R, Hubble Part # HBL2620, 250VAC, 30A, wall mount twist lock
Wavelength	308 nm
Class	Class IV laser system
Length	49 in / 125 cm
Height	35 in / 89 cm plus 6.9 in / 17.5 cm control panel
Width	24 in / 61.3 cm
Weight	650 lb / 295 kg







Antegrade access to left renal artery through the deployed stent graft

RESULTS

A total of 9 cases have been recorded utilising in-situ laser fenestration. Indication of interventions varied from contained descending thoracic aneurysm rupture, type b aortic dissection complicated with degenerative descending aortic aneurysm and symptomatic mycotic thoracoabdominal aortic aneurysm. The technique was successful in 8 cases establishing a patent single vessel fenestration within a reasonable operative time with no endoleaks at the procedure completion angiogram. No in-hospital morbidity or mortality has been recorded. Clinical and 30-day CT angiogram follow-up scans both showed in-place stent grafts with patent endoleak-free fenestration, well perfused target vessels and end organs. Moreover the technique was used in crossing the dissection septum in a case of type 2 aortic dissection complicated with malperfused left kidney, the false lumen was crossed using laser energy and flow was restored to the left kidney through the true lumen after deploying a stent graft.

Retrograde technique for laser fenestration of left subclavian artery with TEVAR

CONCLUSIONS

In situ laser fenestration has been used with an increasing rate providing promising results over short-term follow-up. High quality evidence with long term follow-up is still not available and requires further research. The technique requires a multidisciplinary team approach to ensure appropriate patient selection, advanced complex endovascular expertise with bailout options, and tertiary centres with available hybrid facilities.

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