Eur J Vasc Endovasc Surg (2018) ■, 1–7

Mid-term Outcomes of Stent Assisted Balloon Induced Intimal Disruption and Relamination in Aortic Dissection Repair (STABILISE) in Acute Type B Aortic Dissection

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WHAT THIS PAPER ADDS

This article reported the operative technique of stent assisted balloon induced intimal disruption and relamination in aortic dissection repair and reports the results on the first 41 patients with acute type B aortic dissection. This is the second and the largest report of the STABILISE technique. The findings of this study confirmed that the STABILISE technique is a simple, safe, and reproducible technique for treating persistent false lumen patency distal to the stent graft in acute aortic dissection.

Objectives: This article reports mid-term results of 41 patients treated by the stent assisted balloon induced intimal disruption and relamination (STABILISE) technique for acute type B aortic dissection.

Methods: Between November 2011 and November 2017, 41 patients (10 male; median age 50 years) underwent proximal descending aortic stent grafting plus stent assisted balloon induced intimal disruption of the thoraco-abdominal aorta for acute type B aortic dissection. Serial computed tomography angiography was used to assess aortic remodelling.

Results: There were no intra-procedural complications. Fifteen branch arteries supplied by the false lumen were stented (9% of the visceral branch arteries). The thirty day incidence of death, stroke, and paralysis/visceral ischaemia was 2% ($n = 1$), 0%, 5% ($n = 2$), and 2% ($n = 1$) respectively. During a median follow up of 12 months (range 1–168) eight patients (20%) required re-intervention. Primary visceral stent patency was 93% ($n = 14$). No aortic related deaths occurred. On the most recent computed tomography angiogram, complete false lumen obliteration and aortic remodelling was obtained in all patients at the thoraco-abdominal level, and in 39% ($n = 16$) at the unstented infrarenal aorto-iliac level. The maximum aortic diameter increased in only two patients (5%) at the unstented infrarenal level.

Conclusion: To obtain immediate and durable thoraco-abdominal aortic remodelling in acute type B dissections, the STABILISE technique is safe and reproducible while not compromising the patency of collateral branches.

Article history: Received 11 January 2018, Accepted 13 April 2018, Available online XXX

Keywords: Aortic dissection, Bare stent, Endovascular, TEVAR, STABILISE

INTRODUCTION

Over the past decade, thoracic endovascular aortic repair (TEVAR) has replaced open surgery as the preferred treatment for complicated acute type B aortic dissection.[1,2] However, TEVAR is associated with up to a 40% re-intervention rate most often due to aneurysmal evolution of the distal dissected aorta with increased risk from the persistent patent false lumen due to distal re-entry tear.[3,4]

The STABILISE concept was first described in 2014 by Hofferberth et al.[5] as "Sent assisted Balloon induced intimal Disruption and relamination in aortic dissection repair". This technique has been developed as an adjunct of the staged total aortic and branch vessel endovascular (STABLE) reconstruction technique (or PETTICOAT technique) which consists of bare stent deployment distal to the stent graft to induce remodelling of the distal dissected aorta while preserving the visceral branch arteries and the Adamkiewicz artery.[6] Where the STABLE technique mid-term results showed a 75% false lumen perfusion rate despite extensive distal aortic repair,[6–8] STABILISE aimed to achieve false lumen elimination and immediate restoration of uni-luminal thoraco-abdominal aortic flow by balloon inflation of the bare aortic stent.[5] Although the first report of this

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1078-5884/

https://doi.org/10.1016/j.ejvs.2018.04.008

Please cite this article in press as: Faure EM, et al., Mid-term Outcomes of Stent Assisted Balloon Induced Intimal Disruption and Relamination in Aortic Dissection Repair (STABILISE) in Acute Type B Aortic Dissection, European Journal of Vascular and Endovascular Surgery (2018), https://doi.org/10.1016/j.ejvs.2018.04.008

technique with 11 cases (7 acute type A, 4 acute type B) was promising,[5] there has been no other report since, and the technique was only described briefly. The aim of this article was to describe the operative technique of the STABILISE approach in this centre, and to report mid-term results of the first 41 patients treated by this technique for an acute type B aortic dissection.

METHODS

The Georges Pompidou European Hospital Ethics Committee approved this retrospective study and waived the need for individual patient consent. All patients gave informed consent to each procedure.

A retrospective review of a prospectively maintained database of acute aortic dissections in the "SOS Aorta" program at Georges Pompidou European Hospital, Paris, was performed from 2011 (first stent assisted balloon induced intimal disruption and relamination in aortic dissection repair performed in this department) to 2017. The medical records of all consecutive patients treated by the STABILISE technique for a complicated acute type B aortic dissection were reviewed for pre-operative patient characteristics, dissection morphology, details of operative strategy, intra-operative events, and post-operative course.

Patients

From November 2011 to November 2017, TEVAR was performed in all patients presenting to the tertiary referral centre with acute type B aortic dissection (ABAD), if complicated according to the 2017 ESVS Guidelines on the Diagnosis and Management of Descending Aorta Diseases,[9] or if associated with poor prognostic factors involving maximum aortic diameter of the dissected aorta $>$ 40 mm. The STABILISE technique was performed concomitant with proximal entry tear stent grafting for extension of dissection cases to the level of the abdominal aorta, and residual flow in the false lumen of the abdominal aorta distal to the stent graft on per-operative angiography. It was also performed as a second stage procedure for cases of secondary false lumen reperfusion distal to the proximal stent graft on post-operative computed tomography (CT) scan. Conversely, exclusion criteria for STABILISE techniques included dissection limited to the thoracic descending aorta and complete false lumen thrombosis after stent graft closure of the primary entry tear on per-operative angiogram.

Pre-operative management

Baseline CT scan with multiplanar reconstruction was performed in all patients to assess the dissection characteristics such as location of the primary entry tear, extension of the dissection, patency and origin (true or false lumen) of visceral vessels, in order to select the peripheral access site, and to perform sizing of aortic devices.

All patients had a second CT scan 2–3 days before discharge from the Intensive Care Unit, and a third between 7 and 10 days before hospital discharge.

Proximal stent graft choice: adequate proximal and distal sealing

The aim of the proximal stent grafting is both to close the primary entry tear to obtain proximal sealing, and to exclude the dilated proximal half of the descending thoracic aorta. The diameter of the stent graft was sized on the basis of its proximal sealing zone in the arch, and also in order to obtain a distal sealing of both the true and the false lumen at the level of the descending thoracic aorta. Since "off the shelf" stent grafts allow sealing on a maximum aortic diameter of 42 mm with their larger designs (45–46 mm), the distal part of the stent graft should land in an area where the global diameter of the aorta does not exceed 42 mm over at least a 20 mm length. The length of the stent graft should therefore be adapted to fulfill this condition. If no adequate distal landing zone $\leq$ 42 mm can be reached above the coeliac trunk, the STABILISE technique should not be recommended.

Stent graft implantation

All procedures were performed in a hybrid operating suite under general anaesthesia. The femoral artery access side depended on the extent of the dissection within the aortic bifurcation and the iliac arteries on pre-operative CT scan, with the easier access to the true lumen selected. After puncture of the common femoral artery, an angiogram was performed at visceral level through a 5F 120 cm Pigtail catheter to confirm its correct position in the true lumen. The pigtail was then advanced to the ascending aorta, and a Lunderquist Extra Stiff Double Curved Exchange Guide Wire (Cook Medical, Bloomington, IN, USA) placed over the pigtail catheter up to the aortic valve. The proximal stent graft was then advanced and deployed as usual on the landmark of an aortic arch angiogram in order to ensure proximal sealing.

Distal aortic bare stent deployment

An angiogram at the level of the thoraco-abdominal aorta, including the distal part of the stent graft, all visceral arteries, and the distal marker of the 24F Dryseal sheath in the infrarenal aorta was performed to serve as a road map. The delivery system of the Zenith Dissection Endovascular Stent (ZDES) (Cook Medical) was then exchanged and advanced through the 24F Dryseal sheath, on the true lumen extra stiff wire. Its optimal proximal deployment was aimed to provide a one stent body overlap in the stent graft. Distally, the extent of bare stenting was determined by the distal extension of the dissection up to 2–4 cm below the renal arteries. The entire infrarenal aorta was not stented even if the dissection extended to the iliac arteries, to preserve flow in them. A 185 mm length of aortic bare stent usually allowed its deployment from the distal extremity of the stent graft to the infrarenal aorta. Regarding diameter, the 36 mm ZDES was chosen for a maximum external aortic diameter up to 30 mm, and the 46 mm ZDES for a maximum external aortic diameter between 30 and 42 mm. Angiography of the visceral aorta confirmed

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