Early septotomy MAY BE THE FUTURE OF MANY TYPE B AORTIC DISSECTION MANAGEMENT

Juan C. Parodi MD and Ramon Berguer MD
Buenos Aires and University of Michigan

TEVAR IS THE TREATMENT OF CHOICE OF COMPLICATED TYPE B DISSECTIONS
Late follow up when the dissection extends beyond the diaphragm often shows False Lumen dilation

Juan C. Parodi MD and Ramon Berguer
Buenos Aires and University of Michigan

Hypothesis: False lumen dilation in patients with type B aortic dissections is related to the diastolic pressure and not to the thickness of the outer wall

Development of false lumen dilation in aortic dissections

Potential Causes:
- Less resistance to dilation of thinner outer wall of the false lumen.
- Inflammation of the wall, degradation of collagen and elastin by MMPs
- Persistent high pressure in the false lumen, mainly diastolic.
In patients with acute dissection the diameter of the false lumen in the abdominal aorta increased after 24 months of treatment.
Chemelli-Steingruber * reported that after 60 months diameters of the false lumen in Type IIIb TBAD were almost equivalent comparing patients treated with endografts or with medical treatment.

They concluded that TEVAR delays but does not stop the natural course of the disease.


Chemelli-Steingruber IR MD, Chemelli A, MD, Alexander Strasak, MD, Beate Hugl, MD, Renate Hiemetzberger, MD, Benedikt V. Czermak, MD

1,129 consecutive patients with TBAAD enrolled in IRAD (International Registry of Acute Aortic Dissection) between 1995 and 2012 who received medical (n = 853, 75.6%) or TEVAR (n = 276, 24.4%) therapy. Adverse events during follow-up: aortic growth/new aneurysm: 73.3% of patients with medical therapy and in 62.7% of patients after TEVAR.

Aortic and visceral arteries endarterectomy

- 19 patients underwent aorto-visceral endarterectomy
- In most of the patients trap-door technique described by Wylie was used
- No dilatation of the aorta was found. Longest follow-up at the time of publication of the article was 8 years.

Innominate Artery Endarterectomy

- Included the trunk of the innominate artery and the plaque of the thoracic aorta at the ostium of the innominate artery in 34 patients
- Mean follow-up of 6 years (seven months to 16 years)
- No dilatation seen

Endarterectomy of the Aortic Arch

- Andre Thevenet did not encounter aneurysmal dilatation in any of the 14 patients in whom, under deep hypothermic arrest, he did an endarterectomy of the entire aortic arch through a longitudinal incision. He followed these patients for up to 25 years (Personal communication to Ramon Berguer MD April 2014)

Lack of secondary aneurysms after aorto-iliac endarterectomy (AIE)

- Areas of endarterectomy of the aorta and iliac arteries don’t dilate over time.
- In a meta-analysis of 1940 patients* who underwent aorto-iliac endarterectomy between 1963 and 1996, Minimum follow up was 10 years. Secondary aneurysm of the endarterectomy site did not occur in any patient in the 11 articles analyzed.

Lack of aortic dilation after surgical fenestration in patients with aortic dissections

Several series of surgical aortic fenestrations (septectomy) performed to treat chronic limb ischemia in the setting of acute aortic dissection showed no dilation of the segment of the aorta in which fenestration was performed. Mean follow-up was 11 years, with a range of 6 months to 14 years. Only two patients had true lumen dilatation: one with true lumen dilatation in a patient with Marfan syndrome and the other in a patient with type B aortic dissection.


Preliminary Conclusions

Arteries don’t dilate after endarterectomy or septectomy, including aorta and branches.

Deep femoral veins have been used by Clagett and others to replace infected aortic prosthesis and infected aorta with great success. No failures in the long term have been reported.

Of note, we have not encountered aneurysmal dilatation of an FV graft so far, a finding also made by Daenens and Alli (Journal of Vascular Surgery).

Thus, dilatation of the false lumen is unrelated to wall thickness.

Type B Aortic Dissection, refractory pain

Systolic pressure: True lumen 143 mm False lumen 110 mm
Diastolic pressure: True lumen 89 mm False lumen 98 mm
In patients with partial thrombosis of the false lumen, the risk of death is increased by a factor of 2.7 in comparison with patients with patent false lumen.

Study of patients with Type B aortic dissections. Evolution of the volume of the false lumen in relationship to the size of the entry and re-entry sites.

Collection of data in relation to diastolic and systolic pressures in the false and true lumen.
Maximum diastolic pressure in the false lumen was found in the model with a small proximal entry site and no re-entry site, less, but high diastolic pressure in the false lumen was found in the presence of a large entry site and a small re-entry site. The case in which the proximal entry site was small with a larger distal re-entry the diastolic pressure was lower than the former model.

The absence of a proximal tear in the presence of distal tear (C) correlated with a significant decrease in systolic pressure in the FL and an elevation of diastolic pressure. This is comparable with Type BIII ATBD after TEVAR.

Conclusions: In this model of chronic type B aortic dissection, diastolic false lumen pressure was the highest in the setting of smaller proximal tear size and the lack of a distal tear.

In the absence of proximal tear and a 3.2 cm distal tear the diastolic pressure was significantly higher in the FL compared with the TL (Situation similar than TEVAR in Type III B aortic dissection)

Elasticity Values and MMP-2 and MMP-9 Levels in Aortic Dissection

Table 1. Relationship between MMPs levels and the Elastic Modulus

<table>
<thead>
<tr>
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<th>Patient #1</th>
<th>Patient #2</th>
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<tbody>
<tr>
<td></td>
<td>Type B</td>
<td>Type B</td>
</tr>
<tr>
<td>MMP-2</td>
<td>0.89</td>
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<tr>
<td>MMP-3</td>
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<tr>
<td>MMP-7</td>
<td>6.97</td>
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</tr>
<tr>
<td>MMP-9</td>
<td>13.73</td>
<td>13.73</td>
</tr>
</tbody>
</table>

Inverse relationship between the maximum elastic modulus and the levels of MMP-2 and a direct correlation between this modulus and the levels of MMP-9.
Elasticity Values and MMP-2 and MMP-9 Levels in Aortic Dissection

MMPs upregulation after septectomy is similar to upregulation occurring after spontaneous dissection.

Methods to prevent dilatation of the false lumen in type IIIb dissections after TEVAR

- Petticoat technique
- Candy-Plug
- Knicher Blocker technique
- Coils in the false lumen
- Stabilize approach
- Occlusion of the re-entry/entry sites
- Endovascular septotomy and stenting.

Outcomes after false lumen embolization with covered stent devices in chronic dissection

Jahanzaib Idrees, Eric E. Roselli, Susan Shafii, Joshua Reside, Bruce W. Lytle
p1507-1513
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Covered stent devices included iliac plugs in 18, nitinol embolization plugs in two, and occluded stent graft in one. More than one device was used in 15 patients. Endoleaks around the plug occur in 29% of the cases.

Eric Roselli’s Technique developed at the Cleveland Clinic

Presence of back-flow to the false lumen due to incomplete aposition of the distal end of the endograft. Treatment of type A aortic dissection with replacement of the ascending aorta arch and placement of an elephant trunk graft, extended with an endograft.
Eric Roselli’s Technique developed at the Cleveland Clinic

Fenestration done at The level of the visceral segment of the aorta.

Fenestration allows aposition and sealing of the distal endograft.

Relamination

Potential advantages of Septotomy with percutaneous Cutter

- We have proven in an experimental model that an extensive percutaneous septotomy done in the distal aorta that opens at least 250 square millimeters equalizes pressures in true and false lumens.
- The procedure is simple and cheap

Pressure Difference between False and True Lumina vs. Total Area of the Tear Sizes

![Graph showing pressure difference between false and true lumina vs. total area of the tear sizes.]

Conclusions:

- Complementary treatment to TEVAR with extensive septotomy could be needed in most of IIIb TBAD to prevent long term dilatation of the false lumen.
- Chronic Dissections with aneurysms can be transformed in “one-lumen” aneurysm and treated with fenestrated or branched endografts.