When to use a branch and when to use a fenestration

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Disclosure of Interest

Potential conflicts of interest

Cook Medical: Consulting
European proctor
Unrestricted educational grants
Aortic morphology

FENESTRATIONS

Short-necked infrarenal

Juxtarenal

Suprarenal

FENESTRATIONS or BRANCHES

Thoraco-abdominal aneurysm
Aortic morphology

FENESTRATIONS

Short-necked infrarenal

Juxtarenal

Suprarenal

FENESTRATIONS or BRANCHES

Thoraco-abdominal aneurysm
15 years of debate
Considerations

Lumen
(diameter, bridging distance, angulation, atheroma)

Access quality
(ilio-femoral, proximal, atheroma, prior surgery)

Aortic coverage
(durable repair, risk of SCI, staging)

Target vessel morphology
(take-off angulation, orientation, length, diameter)
LATERAL OBLIQUE
LAO 75°

Arch Replacement + Frozen Elephant Trunk

Rt. Renal Artery
O’clock = 9:15

Lt. Renal Artery
O’clock = 2:30

Estimated position of ZTE8 (implanted after this scan)
THEORETICALLY better co-axial alignment and improved tolerance to respiratory/cardiac movements

BUT downward angulation may be associated with high stress at the stent graft - distal target vessel transition causing endothelial damage and material fatigue

AND tortuosity and long bridging distance may be associated with increased flow resistance, risk of kinking and turbulence causing intimal hyperplasia

Short bridging length probably better than long
BEVAR-FEVAR and renal arteries

UCSF
Proponents of BEVAR for almost everything
Single centre experience
148 renal branches
RA occlusion 6% vs. 2.6% CA, 0% SMA (mean FU 21m)

Cleveland Clinic
Proponents of fenestrations for renal arteries
Single centre experience
1111 renal fenestrations
RA occlusion 2.2% (mean FU 3 yrs)
449 patients treated by BEVAR or FEVAR
348 Crawford extent I-III, 101 extent IV endograft coverage

BEVAR alone (%)
Royal Free 78, Malmo 63, St.Thomas’ 55, Nuremberg 30, Lille 16

30-day mortality – Branch 9%, Fen 4%

856 renal target vessels – 445 branch, 411 fenestrations
Failed cannulation – Branch 2%, Fen 0%

2-yr freedom from occlusion – Branch 90%, Fen 97% (SS)
2-yr freedom from occlusion + R/I – Branch 86%, Fen 95% (SS)

NS trend persisted for extent I-III repair alone
Tortuosity is the Significant Predictive Factor for Renal Branch Occlusion after Branched Endovascular Aortic Aneurysm Repair

EJVES 2016;51:350-7

Patency of 90 renal arteries in 49 patients

Pre-operative RA angulation

Morphology of renal branches

10 occlusions
2-yr 1º patency 84%

Tortuosity index = Bridging length (centreline reco) / Linear distance > 1.11; p=0.04

Length of bridging covered stents
Angulations of distal renal artery
Renal length covered

NS for occlusion
Post-dissection TAAA

October 2010 – October 2015, Nuremberg
32 patients

Fens = 16, Fens+Branches = 15, Branches = 1
30-day mortality = 6%
2-year TV patency 95% (mean FU 20m)

October 2011 – March 2015, Lille
16 patients

Fens = 15, Branches = 1
30-day mortality = 6%
TV patency 100% (mean FU 12m)
Birmingham experience

213 patients treated by BEVAR or FEVAR
All supracoeliac coverage, renal and visceral stent-grafting
Crawford extent II,III endograft coverage
BEVAR alone = 17%, Branches+fens = 13%, Fens = 70%

767 stent-grafted target vessels

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Branch</th>
<th>Fenestration</th>
<th>Failed</th>
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</thead>
<tbody>
<tr>
<td>CA</td>
<td>160</td>
<td>54</td>
<td>105</td>
<td>1</td>
</tr>
<tr>
<td>SMA</td>
<td>212</td>
<td>55</td>
<td>157</td>
<td>0</td>
</tr>
<tr>
<td>RA</td>
<td>405</td>
<td>76</td>
<td>324</td>
<td>5 (1.2%)</td>
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<tr>
<td></td>
<td>767</td>
<td>185</td>
<td>586</td>
<td>6 (0.7%)</td>
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</table>
Birmingham experience

30-day mortality
Elective = 0.5% (1 of 181); acute/rupture = 31% (10 of 32)
Permanent dialysis = 0.5% (1 of 202)

16 of 190 survivors (excl. 12 survivors with SM-FEVAR)
19 of 693 (2.7%) target vessel events @ 1 - 54m FU

CA (n=3; 1 BEVAR)
PTA for compression (2), redo stent-graft for EL (1)
SMA (n=2; 1 BEVAR)
Redo SG for EL (2)
RA (n=8; 2 BEVAR)
Redo SG for EL (7), redo SG for stenosis (1)
RA occlusion 6 of 405 (1.5%) (5 BEVAR, 1 FEVAR)

1-year freedom from TV re-intervention/occlusion = 91 (+3)%
Summary

Many factors to consider during planning

One approach does not fit every patient

Renal fenestrations more durable than branches

CA/SMA probably do well with either approach

Our preference

RA fens and CA/SMA fens or branches

More data required specifically for patients undergoing extent I-III endograft coverage