MagicTouch use at the graft-vein junction in thrombosed AVG

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Introduction

• A functioning dialysis access (AVF/AVG) is critical to the delivery of life saving hemodialysis therapy in patients with End Stage Renal Failure

• Neo-intimal hyperplasia occurs frequently within the dialysis access circuit
  – Poor flow
  – Obstruction
  – Thrombosis

Background

• In arteriovenous graft (AVG), the primary cause of failure is venous stenosis of the graft-vein junction from neointimal hyperplasia

• Thrombosed AVG is known to have poor patency even after successful salvage intervention
Hypothesis

- Sirolimus-coated balloon (SCB) is effective in the inhibition of neo-intimal hyperplasia in the dialysis access circuit
  - Prolong the patency of access after successful intervention
Aims and methods

• Single centre, prospective pilot study of patients (n = 20) presenting with thrombosed AVG

• Application of the sirolimus coated balloon at the graft vein junction following successful endovascular salvage of AVG

• **Primary endpoint**: Primary patency rate of the AVG at 3-month

• **Secondary endpoints**:  
  – Primary patency rate of the AVG at 6-month and 12 month

  Tan Ru Yu et al. CVIR Endovasc. 2020 Jul 5;3(1):34
Study Population

37 patients with thrombosed AVG

20 patients recruited

3-month follow-up (n = 17)
- Patent without additional intervention (n = 13)
- New re-thrombosis (n = 3)
- Angioplasty (n = 1)

6-month follow-up (n = 17)
- Patent without additional intervention (n = 11)
- New re-thrombosis (n = 2)
- Prior intervention (n = 4)

Excluded:
- Pre-existing anticoagulation (n=1)
- Withdrawal of consent (n=1)
- Medically unfit for procedure (n=2)
- Patent AVG (n=1)
- Co-existing central vein stenosis (n=5)
- Adherent clot resistant to treatment (n=3)
- Stenting (n=1)
- Failed thrombectomy (n=3)

12-month follow up (n=17)
- Patient without additional intervention (n = 6)
- New re-thrombosis (n=3)
- Prior intervention (n= 2)

Excluded:
- Death (n = 1)
- AVG explanted (n = 1)
- AVG revision (n = 1)

Tan CW at al. J Vasc Interv Radiol 2020
# Baseline demographics

<table>
<thead>
<tr>
<th></th>
<th>n = 20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median age, years (range)</strong></td>
<td>68 (49, 80)</td>
</tr>
<tr>
<td><strong>Male gender, n (%)</strong></td>
<td>7 (35)</td>
</tr>
<tr>
<td><strong>Etiology of ESRD, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>8 (40)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>7 (35)</td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>4 (20)</td>
</tr>
<tr>
<td>Polycystic Kidney Disease</td>
<td>1 (5)</td>
</tr>
<tr>
<td><strong>Median vintage of AVG, months (range)</strong></td>
<td>14.5 (4.7, 102.4)</td>
</tr>
<tr>
<td><strong>Types of AVG, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Upper arm brachioaxillary</td>
<td>15 (75)</td>
</tr>
<tr>
<td>Upper arm brachiobasilic</td>
<td>3 (15)</td>
</tr>
<tr>
<td>Forearm brachiobasilic</td>
<td>2 (10)</td>
</tr>
</tbody>
</table>
### Procedural characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thrombolytic agent, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Tissue Plasminogen Activator</td>
<td>13 (65)</td>
</tr>
<tr>
<td>Urokinase</td>
<td>7 (35)</td>
</tr>
<tr>
<td><strong>Size of high-pressure angioplasty balloon used, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>6mm</td>
<td>2 (10)</td>
</tr>
<tr>
<td>7mm</td>
<td>16 (80)</td>
</tr>
<tr>
<td>8mm</td>
<td>1 (5)</td>
</tr>
<tr>
<td>9mm</td>
<td>1 (5)</td>
</tr>
<tr>
<td><strong>Cutting balloon usage, n (%)</strong></td>
<td>4 (20)</td>
</tr>
<tr>
<td><strong>Size of Sirolimus balloon used, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>7mm</td>
<td>13 (65)</td>
</tr>
<tr>
<td>8mm</td>
<td>7 (35)</td>
</tr>
<tr>
<td><strong>Number of patients with residual stenosis, n (%)</strong></td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>Number of patients with residual clots, n (%)</strong></td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
Results: 3-month patency rates

• Primary patency at 3 months: 13/17 (76%)*
  - Reasons:
    • Recurrent thrombosis: 3
    • Angioplasty for low flow: 1

• Primary assisted patency at 3 months: 14/17 (82%)

*One patient had surgical revision of A limb for pseudoaneurysm (day 8),
*One died (day 40)
*One had AVG explanted due to infection (day 88),
*All AVG were functioning at time of event
Results: 6 month patency rates

- Primary patency at 6 month: 11/17 (65%)
  - 2 additional patients reached end point at 134 and 157 days post intervention respectively

- Primary assisted patency rate: 65%
Results: Kaplan-meier analysis

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## Results 12-month patency rates

<table>
<thead>
<tr>
<th>N=17</th>
<th>3-month</th>
<th>6-month</th>
<th>12-month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Patency, %</td>
<td>76</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>Primary Assisted Patency, %</td>
<td>82</td>
<td>65</td>
<td>47</td>
</tr>
</tbody>
</table>

Number of AVG abandoned at the end of 12 month = 5
## Comparison with other studies for thrombosed AVG

<table>
<thead>
<tr>
<th></th>
<th>3-month</th>
<th>6-month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average reported rates (%)</strong></td>
<td>49</td>
<td>38</td>
</tr>
<tr>
<td><strong>Suggested threshold (%)</strong></td>
<td>44</td>
<td>31</td>
</tr>
<tr>
<td><strong>Our reported rates (%)</strong></td>
<td>55.5</td>
<td>35.8</td>
</tr>
<tr>
<td><strong>Rates with Paclitaxel-coated balloon (%)</strong></td>
<td>43.6</td>
<td>23.1</td>
</tr>
<tr>
<td><strong>Sirolimus Pilot study (%) n= 17 [n=20]</strong></td>
<td>76.4 [65]</td>
<td>64.7 [55]</td>
</tr>
</tbody>
</table>

3. Nephrology 2019; 24(12): 1290-1295
## Comparison with other studies for thrombosed AVG

<table>
<thead>
<tr>
<th>Study Description</th>
<th>6-month Circuit patency</th>
<th>12-month Circuit patency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting balloon vs plain balloon (%) (^1) (n = 145)</td>
<td>37.5 vs 29.3</td>
<td>Not reported</td>
</tr>
<tr>
<td>Stent graft vs plain balloon (%) (^2) (n=129)</td>
<td>34.2 vs 21.8</td>
<td>Not reported</td>
</tr>
<tr>
<td>Sirolimus Pilot study (%) n= 17</td>
<td>65</td>
<td>35</td>
</tr>
</tbody>
</table>

Case example
Case example
Hypothesis

• Sirolimus-coated balloon (SCB) is effective in the inhibition of neo-intimal hyperplasia in the dialysis access circuit
  – Prolong the patency of access after successful intervention
Hypothesis and Objective

• Hypothesis
  – Sirolimus coated balloon is superior to plain balloon angioplasty in maintaining access circuit patency

• Objective
  – Primary circuit patency rate 6-month post angioplasty
    • Freedom from clinically driven indication for re-intervention or
    • Access circuit thrombosis
Sirolimus coated balloon vs plain balloon in AVF

- Prospective
- Multi-center
- Double blinded RCT
- N = 170 patients with dysfunctional AVF
- Parallel assignment, 1:1 allocation into either group:
  - SCB – treatment arm
  - PB – control arm
Inclusion criteria

1. Age 21-85 years
2. Patient who requires balloon angioplasty for dysfunction arteriovenous fistula
3. Matured AVF, defined as being in use for at least 1 month prior to angioplasty
4. Successful angioplasty of the underlying stenosis, defined as less than 30% residual stenosis on Digital Subtraction Angiography (DSA) and restoration of thrill in the AVF on clinical examination

First 3 criteria = preliminary eligibility criteria

The last criteria can only be determined during procedure
Recruitment process

Patient has matured AVF (in use for >1 month) and is scheduled to undergo balloon angioplasty

The patient
- fulfills preliminary eligibility criteria **AND**
- does not meet any exclusion criteria **AND**
- consents to join study

Surgeon verifies treatment of stenosis with balloon angioplasty

Patient has <30% residual stenosis
- **Continue on next slide**

Patient has ≥30% residual stenosis
- Screen failure. To replace with new patient

The patient
- does not fulfill preliminary eligibility criteria **AND/OR**
- meets any exclusion criteria **AND/OR**
- does not consent to join study

Patient is not enrolled

Continue on next slide
Recruitment process

Patient has <30% residual stenosis

Patient is randomized 1:1

Treatment with sirolimus-coated balloon (SCB)

Treatment with placebo plain balloon (PB)

Control arm

Treatment arm

Before discharge, patient receives post-procedure ultrasound scan

Post-procedure ultrasound scans at 3, 6 and 12 months after the intervention

Secure web-based randomization

Program developed by Singapore Clinical Research Institute

Double-blinded: patients and the study team will not know the treatment allocation

Only study coordinators remain un-blinded throughout the study

Each site has received the emergency code break envelopes. Only Site-PIs can break the blind.
Recruitment update

- First patient recruited 11 Jan 2021
- Total of 6 patients in 2 sites have been recruited as of 22 Jan 2021
Conclusions

• Application of sirolimus coated balloon in dialysis access circuit appears to be safe and effective

• Larger randomised controlled studies are on-going to verify our findings.
Thank You

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