THE ROLE OF EXOGENOUS NITRATES IN ARTERIOVENOUS FISTULA MATURATION

John Yerxa
MS4
Duke University School of Medicine
Disclosure

• I have no relevant financial conflicts
Background

- Functional arteriovenous fistulae (AVF) are the most reliable form of dialysis access, but there is a significant stenosis and failure rate ¹
- The mode of stenosis, intimal hyperplasia (IH), is incompletely understood ²
- Multiple factors have been suggested to play a role including size, wall stress, physiologic properties and individual patient biology. ³
Methods

• Retrospective review of 712 patients undergoing AVF creation by the PI from 2006-2012
• Exclusion criteria for this study included:
  1. Access other than radiocephalic or brachiocephalic AVF
  2. Lost to follow up within 3 months
  3. Unclear outcome
• 481 surgeries on 419 patients were included in the analysis, and outcomes were classified into 8 outcome groups
Classification

Incident AVF

Biological Failure

- Patent not mature
  - 2. Abandoned
  - 3. Intraluminal Procedure with Success

1. Full Failure not patent

5. Maturation no intervention

Biological Maturation

Mature not usable

6. Abandoned

7. Procedure Success

8. Procedure; fails to function
Results

- 55.7% Male, 69.0% African American, 31.0% white
- Average age was 58.17±14.74
- 72.5% had long term patency (groups 2-8)
- 49.6% were functional (groups 3,5,7)
- 39.6% were biologically mature (groups 5-8)
Results

- 92 patients required 121 total angioplasties prior to AVF use, and the angioplasty success rate was 60.9%.
- Multiple comorbid diseases decreased the success rate of AVF, especially clinically significant PVD with a function rate of 27.9% and a maturation rate of 19.6%.
- Isosorbide nitrates showed a trend towards better functionality, maturation, and especially success of intervention in a more comorbid cohort.
The multivariate model was determined by logistic regression (SPSS) and included those factors that had a statistically significant difference (P≤0.05) either within the ISN group or within the particular outcome group. No multivariate analysis was done for the angioplasty success group because of the limited N.
Results

- ISN showed a trend towards increased maturation, functionality, and procedure success
- Controlling for those variables significantly different between the population on ISN and those not on the drug these trends were enhanced.
- Other drugs correlated with ISN use, none showed the same results tested independently.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>On ISN (N=56)</th>
<th>No ISN (N=425)</th>
<th>Significance (P)</th>
<th>Multivariate OR [95 CI] (P)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Maturation % (N)</td>
<td>42.9% (24)</td>
<td>39.2% (166)</td>
<td>0.594</td>
<td>1.87 [0.964-3.655] (0.064)</td>
</tr>
<tr>
<td>Functionality % (N)</td>
<td>57.1% (32)</td>
<td>48.9% (208)</td>
<td>0.289</td>
<td>1.816 [0.933-3.537] (0.079)</td>
</tr>
<tr>
<td>Angioplasty Success % (N)</td>
<td>90% (9)</td>
<td>58.5% (48)</td>
<td>0.083*</td>
<td>Φ</td>
</tr>
</tbody>
</table>

*Fisher's Exact Test

The multivariate model was determined by logistic regression (SPSS) and included those factors that had a statistically significant difference (P≤0.05) either within the ISN group or within the particular outcome group. No multivariate analysis was done angioplasty success group because of the limited N.
Supporting Evidence

- Nitrates have been shown to increase flow in AVF previously, and there is additional limited data which also suggests improved angioplasty success. \(^4,5\)
- An inhibitor of endogenous nitrate production has previously been shown to predict restenosis after intervention, and is elevated in patients with ESRD. \(^4\)
- Animal models have also shown that increased exogenous nitrate has improved restenosis after angioplasty. \(^6\)
Conclusions

• Exogenous nitrate medications are likely to decrease intimal hyperplasia and AVF failure, especially restenosis.
• Prospective studies of exogenous nitrate medications are needed
• Studies of mechanism of action may also be beneficial.


Thank You!

I would like to thank my collaborators and coworkers for their expertise, support, and encouragement on this project!

Dr. Jeffrey Lawson
Dr. Mostafa Gabr
Dr. Aamna Ali
Dr. James Otto
Dr. Roberto Manson
Shawn Gage
Dana Giangiacomo
Mindy Guzman
Whitney Lane
Questions?