Arteriovenous Grafts: Are They as “Bad” as We Think?

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Arteriovenous Fistulas: Are They as “Good” as We Think?

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Disclosures

- None
Autogenous versus prosthetic vascular access for hemodialysis: A systematic review and meta-analysis

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Objectives: The autogenous arteriovenous access for chronic hemodialysis is recommended over the prosthetic access because of its longer lifespan. However, more than half of the United States dialysis patients receive a prosthetic access. We conducted a systematic review to summarize the best available evidence comparing the two accesses types in terms of patient-important outcomes.

Methods: We searched electronic databases (MEDLINE, EMBASE, Cochrane CENTRAL, Web of Science and SCOPUS) and included randomized controlled trials and controlled cohort studies. We pooled data for each outcome using a random effects model to estimate the relative risk (RR) and its associated 95% confidence interval (CI). We estimated inconsistency caused by true differences between studies using the I² statistic.

Results: Eighty-three studies, of which 80 were nonrandomized, met eligibility criteria. Compared with the prosthetic access, the autogenous access was associated with a significant reduction in the risk of death (RR, 0.76; 95% CI, 0.67-0.86; I² = 48%, 27 studies) and access infection (RR, 0.18; 95% CI, 0.11-0.31; I² = 93%, 43 studies), and a nonsignificant reduction in the risk of postoperative complications (hematoma, bleeding, pseudoaneurysm and steal syndrome, RR 0.73; 95% CI, 0.48-1.16; I² = 65%, 31 studies) and length of hospitalization (pooled weighted mean difference −3.8 days; 95% CI, −7.8 to 0.2; P = .06). The autogenous access also had better primary and secondary patency at 12 and 36 months.

Conclusion: Low-quality evidence from inconsistent studies with limited protection against bias shows that autogenous access for chronic hemodialysis is superior to prosthetic access. (J Vasc Surg 2008;48:348-478.)
RCTs and cohort studies that concurrently compared fistulas and grafts

83 studies included in the review

- 80 observational studies
- 3 open randomized trial

69,816 patients
Fistulas associated with:

- Decreased risk of death
- Decreased infection
- Increased primary patency
- Fewer access-related hospital days
- Fewer perioperative complications
- Reduced access-related hospital days
Huber et al, JVS 38:5,1005;2003
Conclusions

“Benefits of fistulas over grafts parallel that of previous literature, however this inference is derived from very low-quality evidence.”

“Selection bias has likely overestimated the benefit in patients who received the fistula”
Limitations of the Vascular Access Literature

- Few randomized controlled trials
- Strong treatment bias
  - Fistulas- young, males, good veins
  - Grafts- females, elderly, disadvantaged anatomy
- Conclusions based on small patient numbers
- Early failures or interventions excluded from analysis

Charmaine E. Lok, Jessica M. Sontrop, George Tomlinson, Dheeraj Rajan, Mark Cattral, George Oreopoulos, Jeremy Harris, and Louise Moïl

Summary
Background and objectives Comparisons of fistulas and grafts often overlook the high primary failure rate of fistulas. This study compared cumulative patency (time from access creation to permanent failure) of fistulas and grafts.

Design, setting, participants, & measurements Vascular accesses of 1140 hemodialysis patients from two centers (Toronto and London, Ontario, Canada, 2000–2010) were analyzed. Cumulative patency was compared between groups using Kaplan-Meier survival curves and log-rank tests. Hazard ratios (HRs) for fistula failure relative to grafts and 95% confidence intervals (95% CIs) are reported.

Results There were 1012 (88.8%) fistulas and 128 (11.2%) grafts. The primary failure rate was two times greater for fistulas than for grafts: 40% versus 19% (P<0.001). Cumulative patency did not differ between fistulas and grafts for the patients’ first access (median, 7.4 versus 15.0 months; respectively [HR, 0.99; 95% CI, 0.79–1.23; P=0.85]) or for 600 with a subsequent access (7.0 versus 9.0 months [HR, 0.93; 95% CI, 0.77–1.13; P=0.39]). However, when primary failures were excluded, cumulative patency became significantly longer for fistulas than for grafts for both first and subsequent accesses (61.9 versus 23.8 months [HR, 0.56; 95% CI, 0.43–0.74; P<0.001] and 42.8 versus 15.9 months [HR, 0.56; 95% CI, 0.44–0.72; P<0.001]). Results were similar for forearm and upper-arm accesses. Compared with functioning fistulas, grafts necessitated twice as many angioplasties (1.4 versus 3.2/1000 days, respectively; P<0.001) and significantly more thrombolysis interventions (0.06 versus 0.98/1000 days; P<0.001) to maintain patency once matured and successfully used for dialysis.

Conclusions Cumulative patency did not differ between fistulas and grafts; however, grafts necessitated more interventions to maintain functional patency.

Cumulative Patency
Early Failures Excluded
Cumulative Patency
Early Failures Included
Cumulative Patency: Forearm
Early Failures Excluded
Cumulative Patency: Forearm
Early Failures Included
Cumulative Patency: Upper Arm
Early Failures Excluded
Cumulative Patency: Upper Arm
Early Failures Included
Comparison of Arteriovenous Fistulas and Arteriovenous Grafts in Patients with Favorable Vascular Anatomy and Equivalent Access to Health Care: Is a Reappraisal of the Fistula First Initiative Indicated?

David E Disbrow, MD, David L Cull, MD, FACS, Christopher G Carsten III, MD, FACS, Seung Koo Yang, BA, Brent L Johnson, MS, Gail P Keahey, RN

**BACKGROUND:** Initiatives to increase arteriovenous fistula (AVF) use are based on studies that show that AVFs require fewer interventions and have better patency than arteriovenous grafts (AVGs). Because patients who receive AVFs typically have more favorable vascular anatomy and are referred earlier for access placement than those who receive AVGs, the advantages of AVF might be overestimated. We compared outcomes for AVFs and AVGs in patients with equivalent vascular anatomy who were on dialysis via catheter at the time of vascular access placement.

**STUDY DESIGN:** The study included patients who underwent placement of a first-time AVF or AVG between 2006 and 2009, who were on dialysis via catheter at the time of access placement, and who had favorable arterial and venous (>3 mm) anatomy. Outcomes for AVF and AVG were compared.

**RESULTS:** Eighty-nine AVF and 59 AVG patients met study inclusion criteria. Similar secondary patency was achieved by AVG and AVF at 12 (72% vs 71%) and 24 months (57% vs 62%), respectively (p = 0.96). The number of interventions required to maintain patency for AVF (n = 1; range 0 to 10) and AVG (n = 1; range 0 to 11) were not different (p = 0.36). However, the number of catheter days to first access use was more than doubled in the AVF group (median 81 days) compared with the AVG group (median 38 days; p < 0.001).

**CONCLUSIONS:** For patients who are receiving dialysis via catheter at the time of access placement, the maturation time, risk of nonmaturation, and interventions required to achieve a functional AVF can negate its benefits over AVG. A fistula first approach might not always apply to patients who are already on dialysis when referred for chronic access placement. (J Am Coll Surg 2013;216:679–686. © 2013 by the American College of Surgeons)
Results

Cumulative Patency

Proportion Maintaining Secondary Patency

Log-Rank
P-value: 0.968

AV Fistula (AVF)  
AV Graft (AVG)

Months from First Use
Results
Fistula Maturation

- 23/89 (26%) failed to mature

- 24/66 (29%) required at least one intervention to achieve maturity
## Results

### Interventions

<table>
<thead>
<tr>
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<th>AVF</th>
<th>AVG</th>
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<tr>
<td>Median</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>25&lt;sup&gt;th&lt;/sup&gt; quartile</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>3</td>
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<tr>
<td>Range</td>
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<td>0-11</td>
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</tbody>
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Results

Catheter Days to First Use

Days

AVF

AVG

P-value <0.001
## Forearm Fistula Patency Rates

<table>
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<tr>
<td>Primary failure risk</td>
<td>15%</td>
<td>28%</td>
</tr>
<tr>
<td>Primary patency 1 yr</td>
<td>62%</td>
<td>55%</td>
</tr>
<tr>
<td>Secondary patency 1 yr</td>
<td>66%</td>
<td>68%</td>
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</tbody>
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Rooijens P et al. 2004  Al-Jaishi AA et al. 2013
Once an AV fistula is successfully cannulated it provides the following advantages:

- Lower rate of thrombosis
- Fewer interventions to maintain patency
- Lower rate of infection
- Lower cost

Efforts to “maximize” AV fistula prevalence without regard for patient selection likely negates the benefits of AV fistulas.
Summary

- Surrogate Quality Measure
  - AV fistula prevalence

- Actual Quality Measures
  - Primary patency
  - Secondary patency
  - Access-related infection rate
  - # interventions required to maintain functionality
  - Accessibility
  - Access-related morbidity
  - Access-related mortality
Conclusions

- AV fistula prevalence is a “blunt instrument” for measuring vascular access quality

- FFBI efforts to further increase fistula prevalence may not result in improved patient outcomes

- Focus needs to shift from achieving AV fistula prevalence to placing the right access in the right patient at the right time
References

- Cull DL. The role of prosthetic hemodialysis access following the introduction of the dialysis outcome quality and Fistula First Breakthrough Initiatives. Semin Vasc Surg 2011;24:89-95.
