Endovascular Thrombolysis of Dialysis Access Conduits

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Vascular Access for Hemodialysis

Basic facts - the need for Access

- Hemodialysis is a life-sustaining treatment that must be provided on a regular basis
- Vascular access is essential for the provision of dialysis - no blood flow, no hemodialysis
- Disruptive and life-threatening loss of access occurs frequently in the dialysis population
- Problems with dialysis access is the leading cause of morbidity and dissatisfaction
Maintaining vascular access

“As dialysis therapy continues to be refined, providing increased life span and quality of life, patients require more maintenance and repair procedures than creation of new access. The skillful management of access over time may have the greatest impact on long term patient outcomes”

Robert McClelland, Univ of Texas, Dallas
Endovascular thrombectomy at Henry Ford - 2002

- 837 I-basement endovascular cases in 2002
- 371 cases involved percutaneous thrombolysis - 44% percent of total
- Our success rate for thrombolysis was 85%
- In failures, enough information about the anatomy may be gathered to plan operative revision, or additional studies are ordered
Venoplasty balloons
Flowmeter
Manometer for intra-access pressure monitoring
Steps in endovascular dialysis access thrombectomy

- Cannulation of graft directed toward venous end
- Passing venous anastomosis with wire
- Mechanical, sometimes chemical thrombectomy
- Venoplasty of venous anastomosis and graft
- Retrograde cannulation via second sheath
- Fogartization of arterial plug
- Arterial dilation if needed
- Central and pullback venograms, pressures, flows
Visualization of the dialysis conduit
Central vessels
Left subclavian and axillary
Axillary vein and occlusion
Venoplasty of outflow
Venous outflow
Clean out graft
Arterial dilation
Arterialization
Thrombectomy of left forearm loop graft and cephalic vein
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Special situations

• Freshly placed grafts
• Chronically occluded grafts
• Central stenosis
• Arterial problems
• Complications
Thrombectomy of freshly placed grafts

- Conventional wisdom is to explore the venous end of the graft through the original incision for Fogerty thrombectomy, patch venoplasty or a new venous anastomosis.
- Endovascular treatment usually avoided by most for the first 2-4 weeks.
- But reoperative trauma is rarely beneficial.
Thrombectomy of new left arm loop graft
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Thrombectomy of new left arm loop graft
Thrombectomy of new thigh graft
Thrombectomy of new thigh graft
Thrombectomy of new thigh graft
Thrombectomy of new thigh graft
Thrombectomy of new thigh graft - 2 month follow-up
Thrombectomy of new thigh graft - 2 month follow-up
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Thrombectomy of new thigh graft - 2 month follow-up
Thrombectomy of chronically clotted grafts

• “Dialysis grafts may be declotted up to three months”, W. Perry Arnold, in Davidson’s “Access for Dialysis”
• In our experience, grafts clotted for up to 15 months can be revitalized endovascularly
• In other cases, operative venous or arterial revision may be necessary
Thrombectomy of chronically occluded left arm graft

- Referred from outside institution for “Lifesites”
- Multiple failed access procedures, including left arm graft clotted for several months
- No history of left-sided catheters or pacer
- Agreed to 50-50 proposition to reopen left arm graft
Thrombolysis of left arm graft - 1
Thrombolysis of left arm graft - 2
Thrombolysis of left arm graft - 3
Thrombolysis of left arm graft - 4
Thrombolysis of left arm graft - 5
Thrombolysis of left arm graft - 6
Thrombolysis of left arm graft - 7
Thrombolysis of left arm graft - 8
Thrombolysis of left arm graft - 10 2 month follow-up
Thrombolysis of left arm graft - 11 2 month follow-up
Thrombolysis of left arm graft - 12 month follow-up
Thrombolysis of left arm graft - 13 10-month follow-up
Thrombolysis of left arm graft - 14 10-month follow-up
Thrombolysis of left arm graft - 15 10-month follow-up
Thrombolysis of left arm graft - 16 10-month follow-up after venoplasty
Thrombolysis of chronically occluded left thigh graft

- Totally occluded upper body central veins
- Left thigh graft placed 15 months ago with early post-operative thrombosis
- Endovascular attempt at declotting fails and graft is abandoned
- Right femoral tunneled catheter is progressively dysfunctional - clot in IVC
Thrombolysis of chronically occluded left thigh graft - 1
Thrombolysis of chronically occluded left thigh graft - 2
Thrombolysis of chronically occluded left thigh graft - 3
Thrombolysis of chronically occluded left thigh graft - 4
Thrombolysis of chronically occluded left thigh graft - 5
Thrombolysis of chronically occluded left thigh graft - 6
Thrombolyis of chronically occluded left thigh graft - 7
Thrombolysis of chronically occluded left thigh graft - 8
Thrombolysis of chronically occluded left thigh graft - 9
Thrombolysis of chronically occluded left thigh graft - 10
Thrombolysis of chronically occluded left thigh graft - 11
Thrombolysis of chronically occluded left thigh graft - 12
Central stenosis and occlusion
Right subclavian occlusion
Right subclavian occlusion
Thrombectomy device boring through an occlusion
Right subclavian occlusion
Stented central veins - the results and the program for maintenance

- Stenotic central veins can be kept open, preserving options for upper extremity vascular access, and avoiding catheters
- 16% primary, 84% secondary patency at 1 yr
- With current methods, re-intervention is required frequently - every three months
- Better stents and high pressure balloons show promise for more durable interventions
Retrograde brachial angio
High brachial stenosis
High brachial stenosis
High brachial stenosis
High brachial stenosis stented
Complications of endovascular treatment of dialysis access
Complications of endovascular examination and treatment

- Pulmonary or arterial embolism of clot
- Embolized foreign bodies (eg, stents)
- Rupture of conduit
- Contrast or medical reaction
- Oversedation and respiratory arrest
- Cardiac arrhythmyinia
Contraindications to endovascular procedures

- Medical instability (SOB, AMS, hypotension)
- Pulmonary hypertension or right heart failure
- Dye allergy with anaphylaxis
- Right to left cardiac shunt
- Personality disorders, history of frontal lobotomy
Axillary-subclavian clot
Axillary-subclavian clot
Axillary-subclavian clot
Axillary-subclavian clot
Reflux exam patent graft
Reflux exam during thrombectomy
Ruptured outflow vein - 1
Ruptured outflow vein - 2
Ruptured outflow vein - 3
Ruptured outflow vein - 4
Ruptured outflow vein - 5
Graft ulcerated to skin
DOQI benchmarks for dialysis graft thrombectomy

• 95% one-time usability and 40% three month unassisted patency for successful percutaneous thrombectomy
• 95% one-time usability and 50% six-month unassisted patency for surgical thrombectomy
• Fistulograms for all thrombosed accesses
Conclusions
Endovascular examination
and treatment of dialysis access

The power to see
The power to act
“No-touch”, minimal access”
vascular surgery
Conclusions

Maintenance and rescue of Access

• In treatment of thrombosis try endovascular intervention first - DOQI calls for a fistulogram in all cases of clotted access
• Catheters should be avoided by prompt restoration of access whenever possible
• Old clotted grafts can be restored
• Newly placed grafts can be declotted safely
• Clotted fistulas can be restored
Conclusions

* Maintenance and rescue of Access

- Communication and coordination between providers is essential - consider a nurse coordinator or a dedicated access service
- Lost access is an emergency for the patient
- Create a realistic set of expectations in patient and family, referring physicians, dialysis nurses, nephrologists, and nurses
What to do when a patient clots

• Call Access center immediately
• Ascertain need for dialysis
• Ascertain NPO status
• Ascertain consent status
• Ascertain responsible party
The final conclusions

“It’s easier to rescue something that was done right the first time”