Controversies of revisional surgery in management of steal syndrome due to haemodialysis access

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Introduction

≈ 5% of patients with upper limb AVF develop ipsilateral hand ischemia, recently termed “Hand Access Induced Distal Ischemia” (HAIDI). Acute, sub-acute or chronic patterns may occur with time of onset <24 h, 1-30 days or > 1 month after construction respectively. Pathophysiology is incompletely understood and may include: Atherosclerosis, Recurrent Intradialytic Hypotension, Ongoing AVF Maturation and steal “flow reversal”

Different Revisonal Surgeries were developed:
- Distal revascularization interval ligation (DRIL)
- Revision using distal inflow (DRAL)
- Proximalization of arterial inflow (PAI)
- Distal radial artery ligation (DRAL)
- Side Branch Ligation (SBL) and Banding

Methods

Patients attending to Vascular Clinic of Mansoura University Hospital suffering from hand manifestations after creation of an ipsilateral AVF were examined for the presence or absence of ischemic manifestations related to previously created access.

Demographic data and Co-morbidities were collected. Clinical data were collected as regard:
- Type of access and onset creation.
- Onset, course and duration of ischemic manifestations.
- Presence or absence of upper limb PAOD.

All cases underwent duplex assessment on AVF stressing on:
- Patency of the anastomosis,
- Patency of the venous side of the access,
- Arterial tree patency proximal and distal to the AVF,
- Proximal and distal Peak systolic velocity (PSV),
- Venous Flow velocity (VFV) and
- Presence or absence of Flow Reversal (Steal)

Inclusion Criteria:
- All Patients with Brachial artery and Distal artery based AVF; suffering from chronic HAIDI-IIb, HAIDI-III and HAIDI-IVa were considered in this study.
- Acute and sub-acute non-thrombotic HAIDI cases were also considered in this study.

Exclusion Criteria:
- Chronic HAIDI-I and HAIDI-IIa were excluded from this study.
- Acute and Sub-acute thrombotic HAIDI were excluded from this study.

Side Branch Ligation (SBL)

Case (1): Multiple SBLs (7 SBs) including basilic vein for patient with HAIDI-III.

Proximalization of Arterial Inflow (PAI)

Case (2): DRIL in HAIDI-IVa patient using upper limb vein graft.

Distal Revascularization Interval Ligation

Case (3): DRIL for HAIDI-IVa using PTFE graft. (A; dry gangrene of right middle finger, B; dissecting vein, brachial, radial and ulnar arteries).

Results

Operative Techniques

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total no = 30</th>
<th>N = 30</th>
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<tbody>
<tr>
<td>DRIL</td>
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<tr>
<td>DRAL</td>
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</tr>
<tr>
<td>RUDI</td>
<td>4</td>
<td>13.3</td>
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<tr>
<td>PAI</td>
<td>2</td>
<td>6.7</td>
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<tr>
<td>Banding</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>SBLs</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Ligation</td>
<td>2</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Case (4): PAI using PTFE graft for HAIDI-III.

Case (5): Banding procedure for HAIDI grade III.

Revison Using Distal Inflow (RUDI)

Case (6): RUDI for HAIDI-IVa using reversed GSV. (A; cutaneous dry gangrene left index finger tip. B and C; distal arterial target anastomosis and the venous anastomosis before (B) and after (C) ligating the previous inflow.

Primary Indication of Surgery

Life Table Analysis of graft patency shows:
- 93% - 6 MONTH
- 88% - 12 MONTHS
- 59% - 24 MONTHS

Conclusion

RUDI, PAI, DRIL, Banding and SBL have resulted in similar patency and ischemic symptom resolution rates for the management of BA based HAIDI. Also, DRAL have accepted patency and symptom resolution rates for the management of RA based HAIDI.

- The ultimate decision in choosing re-intervention for HAIDI treatment depends on; Surgeon experience, Understanding the hemodynamics of the present fistula, Anatomic considerations and Present comorbidities.
- Banding procedure is considered the first choice as it is; Simple and Least invasive. Suitable with large diameter venous side. No arterial interference. Equal short term results to other more difficult procedures.
- RUDI have demonstrated advantages over DRIL as; Greater reductions in VFV thus it is more preferred in high flow AVF (over 2000 mL/min). Avoiding arterial ligation.
- In contrast, DRIL is preferred in; Low flow rates (800 mL/min). Severe peripheral occlusive disease.
- Also, low flow AVFs could be treated by PAI especially in the absence of significant PAOD.
- Its only limitation is the use of PTFE graft which makes DRIL preferred than PAI in this condition.
- SBL procedure has a specific indication; Presence of one or more significant SB within 3-5 cm from the AVF. Intraoperative pulse ex. or intraoperative duplex determine whether patient needs another simultaneous procedure or SBL alone is enough.