Issues in Dialysis Access Management:

**Buttonhole Technique**

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**CONFLICT of INTEREST DECLARATION**

I have no financial arrangements, interests/affiliations with any commercial company supporting this research or related to its content.

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**Importance of Successful Cannulation**

Each puncture → vessel injury

- 3x/week treatments → 312 punctures/annum

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**Objectives**

- To review the technique of buttonhole (BH) creation
- To report the 10 year experience of St. Michael's Hospital
- To define the role of buttonhole cannulation in HD access

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**What is BH Cannulation?**

- Is cannulating the fistula in the *exact same spot*, at the *exact same angle and depth* every time the needles are inserted.
- AKA "Constant Site Technique"
- Development of a scar tissue tunnel track → eventual use of a BH fistula needle (blunt, dull)
- Technique used worldwide for native AV fistulas for over 25 years.

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**Creation of the Buttonhole 4 Methods**

1. Traditional sharp needles (single cannulator / modified multiple cannulators)
2. BioHole® method
3. Angiocath method
4. VWING method

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1. Sharp Needle BH Creation
- Same site cannulation with sharp needle
- 6-8 cannulations

2. BioHole™ (Peg) BH Creation
- Needle removal, hemostasis
- Insert peg
- Exchange each HD over 14 days

3. Angiocath* BH Creation
- Secure, dress
- Lock with citrate 4%
- Protector bandage
- Each dialysis
  - Dressing change
  - Position and integrity verified with US
- Indwelling for 10-14 days
  * Off label use

3. Angiocath* BH creation
- Aseptic insertion
- Hold with firm grip
- Insert angiocath
- Advance catheter
- Withdraw steel introducer needle

4. VWING
- Use ultrasound to map the AVF and determine implant location
- Determine VWING size
- Create incision and expose ~ 3cm of the fistula.
- Align and attach the VWING
- The VWING should be just below the skin surface to ensure maximum palpability

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The SMH Experience

Ontario Experience

- 13 centres across Ontario initiated BH before 2011
  - Currently 3 are still ongoing
  - 8 programs discontinued use of BH due to infections
  - 2 programs discontinued use due to logistics

SMH Experience: Infection Rates

<table>
<thead>
<tr>
<th>Infection Type</th>
<th>Home</th>
<th>In-Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>0.28</td>
<td>0.31</td>
</tr>
<tr>
<td>SMH</td>
<td>0.08</td>
<td></td>
</tr>
</tbody>
</table>

BioHole™ Resulted in Significantly Lower Pain Compared to Modified BH

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Buttonhole vs Rope Ladder

- Pain
- Infections
- Hemostasis
- Complications
  - Procedures
  - Longevity

Inconsistent Evidence on BH Cannulation

- Four RCTs showed BH vs. rope-ladder (RL)
  - Increased AVF survival
  - Decreased need for access interventions
  - No increased infection rates or prolonged bleeding times.
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  - No increased infection rates or prolonged bleeding times.

- MacRae et al., 2012:
  - Fewer hematomas
  - Increased risk of bacteremia
  - Increased localized signs of infection.

- Vaux et al., 2013:
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- Chow et al., 2011:
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  - More haematoma formation
  - More site pain during dialysis.

- Struthers et al., 2010:
  - No difference in bleeding times
  - BH needling is preferred by both patients and staff
  - Reduced discomfort during needling
  - Fewer complications.

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**Infection Rates May Depend on Method of BH Creation and Site Care Protocols**

**Guidelines to select patients**

**Inclusion**
- Limited cannulation sites
- Difficult cannulation
- Self cannulators/ home HD
- Aneurysm development
- Patient preference and MD informed consent

**Exclusion**
- Valvular disease (mechanical valves, rheumatic heart disease, hx endocarditis
- Other implants (pacemaker)
- Poor hygiene
- Immune suppression (failed Tx), Lupus

**Summary**
- Suggested Benefits
  - Less cannulation pain
  - Rescue of AVF with restricted cannulation sites
  - Rescue of AVF with aneurysmal areas
  - Promotion to independent modality with self-cannulation

  **AND**

- Acknowledged risks of increase infection: BH vs techniques
- Inconsistent results of RCT: type/quality of BH

**Conclusions**
- All BH are not created equal
- BH may be highly valuable in select patients with rigid protocols:
  - May preserve use of problematic AVF
  - Promote self-cannulation (+/- transitioning to home HD)
  - Decrease cannulation pain
- Informed consent re: infection risks and off label use

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**VWING ~3.5 years experience by Jan 2014**

<table>
<thead>
<tr>
<th>IMPLANT HISTORY</th>
<th>Patients</th>
<th>Devices</th>
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<tbody>
<tr>
<td>VWING Patient Total / Implanted VWING Total</td>
<td>141</td>
<td>216</td>
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<tr>
<td>Patient Implant Days / Device Implant Days</td>
<td>46,700</td>
<td>72,500</td>
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<tr>
<td>Cannulations</td>
<td>N/A</td>
<td>23,800</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPLICATION RATES (per patient year)</th>
<th>Catheter (USRDS)</th>
<th>AV Fistula (USRDS)</th>
<th>VWING SAVE Study Rate</th>
<th>VWING Overall Reported Rate</th>
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</thead>
<tbody>
<tr>
<td>Infection of Access</td>
<td>1.45</td>
<td>0.18</td>
<td>0.038</td>
<td>0.016</td>
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<tr>
<td>Sepsis</td>
<td>2.32</td>
<td>0.52</td>
<td>0.038</td>
<td>0.008</td>
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</tbody>
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1. / Hospital-treated events
2. Rates estimated from clinical trial reports and post-market surveillance