**Can Interventional Programs (IN) Help Popularize Home Dialysis Therapies?**

**Gerald Beathard State of the Art Lecture**
**ASDIN**
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**Stephen R. Ash, MD, FACP**

*Indiana University Health Arnett and WellBound, Inc.*
*Ash Access Technology and HemoCleanse, Inc.*

Lafayette, Indiana

Clinical Associate Professor, Indiana University Medical School
Adjunct Associate Professor, Purdue University
Past President of ASAIO, ASDIN and Secretary/Treasurer of IFAO

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**Promoting Home Dialysis Therapy is Important Because These Patients are Healthier and Happier**

- The therapy is more nearly continuous and less physiologically stressful
- Blood and peritoneal fluid access is a challenge for patients, but met with increasing experience
- The support by the dialysis center is much more one-on-one providing more continuity of care
- Access placement and maintenance is done by a staff familiar to the patient and center
- Peritoneal dialysis is a successful therapy that provides greater satisfaction to the patients

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**Decreasing UFR Diminishes CV Mortality, Even On 3/week Treatment Schedule**

**In-Center Hemodialysis Six Times per Week versus Three Times per Week**

**The Pitt Trial Group**

**Conclusions**—Frequent hemodialysis, as compared with conventional hemodialysis, was associated with favorable results with respect to the composite outcome of death or change in left ventricular mass and death or change in a physical-health composite score but prompted more frequent interventions related to vascular access.
Placement of PD Catheters by IN Grows the Home Dialysis Population

1. Dissection (surgical)
2. Peritoneoscopic (local procedure, with 2.2 mm diameter scope), with ultrasound examination
3. Seldinger technique (further developed to fluoroscopic technique)
4. Laparoscopic (general anesthesia with 5 or 10 mm diameter scopes)
Surgical Implantation

Methods of placing PD Catheters:
Surgical (dissection)

Pertoneoscopic Implantation

Peritoneoscopic Placement with 2.2 mm diameter scope, Single Puncture Technique

Steps of Implantation
Y-Tac Pertoneoscopic System
Purpose of viewing peritoneum through the peritoneoscope:

- Confirm intraperitoneal position of cannula after first puncture.
- After air inflation, assure Quill® guide is adjacent to the parietal peritoneum.
- Find direction for Quill® guide that avoids adhesions and large loops of bowel.
- Direct catheter through Quill® along previously inspected course.
- Observe previously placed catheters to determine if there were mechanical problems.
- Photograph unusual findings using high intensity light source.

Deep cuff in rectus

Fluoroscopic Placement

Blind (needle, guidewire and split sheath)
In a randomized study, fluoroscopic placement gave equal long-term PD catheter survival as laparoscopic placement but with fewer complications (e.g., peritonitis).

Early catheter success rate is 98% or above in published series. At one RMS center beginning placements just after training with fluoroscopic placement mostly, early success was 99%.

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<thead>
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<td>n</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>method</td>
<td>P, P</td>
<td>84</td>
<td>384</td>
<td>164</td>
<td>62</td>
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<tr>
<td>PDS</td>
<td>O</td>
<td>0</td>
<td>O</td>
<td>O</td>
<td>L</td>
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<tr>
<td>success rate</td>
<td>99%</td>
<td>98%</td>
<td>88%</td>
<td>99%</td>
<td>100%</td>
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<tr>
<td>leakage</td>
<td>3.6%</td>
<td>3.1%</td>
<td>38%</td>
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<td>1.3%</td>
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<tr>
<td>cellulitis</td>
<td>12%</td>
<td>5.7%</td>
<td>24%</td>
<td>16%</td>
<td>12.9%</td>
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<tr>
<td>exit site</td>
<td>1.2%</td>
<td>6.3%</td>
<td>11%</td>
<td>37%</td>
<td>-</td>
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<tr>
<td>peritonitis</td>
<td>3.6%</td>
<td>2.9%</td>
<td>6%</td>
<td>6%</td>
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Laparoscopic Placement with Omentopexy, Downward Tunnel and Adhesiolysis Also Gives Excellent Results

Laparoscopic Placement

Laparoscopic Placement with Omentopexy, Downward Tunnel and Adhesiolysis Also Gives Excellent Results

Laparoscopic Placement with Omentopexy, Downward Tunnel and Adhesiolysis Also Gives Excellent Results

Laparoscopic Placement with Omentopexy, Downward Tunnel and Adhesiolysis Also Gives Excellent Results
Urgent start dialysis eases transition from uremia to chronic dialysis

**Table 2**

<table>
<thead>
<tr>
<th>Deimplantation method</th>
<th>Author (year) (Ref.)</th>
<th>Catheter (iy)</th>
<th>Preebdominal surgery (%)</th>
<th>Mechanical catheter complication (%)</th>
<th>Raw dysfunction (%)</th>
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<tbody>
<tr>
<td>Percutaneous guidewire</td>
<td>Ganev et al. (2001)</td>
<td>150</td>
<td>0</td>
<td>1.3</td>
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<tr>
<td></td>
<td>Mean et al. (2003)</td>
<td>134</td>
<td>0</td>
<td>10.7</td>
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<tr>
<td></td>
<td>Norrell et al. (2006) 27</td>
<td>94</td>
<td>0</td>
<td>1.7</td>
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<tr>
<td>Open surgery</td>
<td>Ganev et al. (1995/20)</td>
<td>122</td>
<td>0</td>
<td>10.1</td>
<td>15.3</td>
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<tr>
<td></td>
<td>Oostwegel et al. (2006) 31</td>
<td>292</td>
<td>0</td>
<td>10.5</td>
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<td></td>
<td>Tisch et al. (2006) 45</td>
<td>186</td>
<td>0</td>
<td>1.2</td>
<td>15.4</td>
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<td></td>
<td>Chiu et al. (2017) 65</td>
<td>122</td>
<td>0</td>
<td>10.8</td>
<td>15.3</td>
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<tr>
<td>V-HEP laparoscope</td>
<td>Ganev et al. (1999/2004)</td>
<td>90</td>
<td>0</td>
<td>10.4</td>
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<td>292</td>
<td>0</td>
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<td>Chiu et al. (2017) 65</td>
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<td>10.8</td>
<td>15.3</td>
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</tbody>
</table>

* Published reports (2005-2017) that describe at least 10 catheters within 12 months of follow-up, and provide complete data for mechanical catheter complications.

**Advantages:**

- Placement performed when the patient and physician decide that dialysis is inevitable but in the future
- Allows the cuffs of the PD catheter to seal for weeks to months before use
- Avoids need for care of the exit site and catheter flushes before dialysis is implemented
- Makes initiation of dialysis an easier decision, involving only a procedure done under local anesthesia to provide a workable catheter.

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**Table 3. Infectious and Mechanical Complications**

<table>
<thead>
<tr>
<th>Complications</th>
<th>Urgent Start PD (p &lt; 0.1)</th>
<th>Non-urgent PD (p &lt; 0.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endo-infection (77%)</td>
<td>1.05 (1)</td>
<td>0.01 (0.0)</td>
</tr>
<tr>
<td>Bacteraemia (15%)</td>
<td>1.05 (1)</td>
<td>0.01 (0.0)</td>
</tr>
<tr>
<td>Septicemia (15%)</td>
<td>1.05 (1)</td>
<td>0.01 (0.0)</td>
</tr>
<tr>
<td>Sepsis (15%)</td>
<td>1.05 (1)</td>
<td>0.01 (0.0)</td>
</tr>
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**Implantation Tools**

- **Catheter Burying Procedure**
  - Also called “Moncrief-Popovich Technique” for burying catheters
  - The external limb of the catheter is buried under the skin at the time of the implantation procedure.
  - The external limb is exteriorized weeks to months later when dialysis is needed.

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**Embedding the External Portion of the PD Catheter Makes Planning for Dialysis Therapy Easier**

- **Advantages:**
  - Placement performed when the patient and physician decide that dialysis is inevitable but in the future
  - Allows the cuffs of the PD catheter to seal for weeks to months before use
  - Avoids need for care of the exit site and catheter flushes before dialysis is implemented
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**Drawings courtesy of Dr. J.H. Crabtree.**

**Slide Courtesy of MediGroup, Inc.**
Alternate approach: after peritoneoscopy, reassemble the Quill®, Cannula and Trocar; embed the catheter through the single exit site.

NOTE: not an FDA approved use of the YOTec components, and catheter must be shortened, filled with heparin and plugged.

**Why Nephrologists Place Peritoneal Catheters**

- Improved or at Least Equal Outcomes to Other Techniques
- Improved Diagnosis: Doing it Adds Understanding
- Continuity of Care: Procedure Room to Ward to Dialysis Unit to Procedure Room
- Availability to Perform Procedures in Timely Manner
- Improved Treatment Options for Every Patient
- Motivation for Continued Improvement of Performance and Procedure and Devices
- Satisfaction in Training and Career
- An Economically Neutral to Positive Step
- Peritoneal Dialysis Program will grow

**Nephrology PD Catheter Placement Leads to Growth of the PD Population**

Vascular Mapping by IN Promotes Creation of Fistulas and Grafts in Appropriate Patients
Physical Examination and Early Intervention Promotes Greater Fistula Success, Especially When the Same Physician Does Both

Surveillance of Fistula and Graft Function Promotes Timely Use of Intervention to Prolong Access Function
Declotting Fistulas Often Provides a Workable Access for Many Months

Improvements in Vascular Access Technology Come Mostly from Nephrologists and Nephrology Nurses… and Vascular Access is the “Achilles Heel” of Dialysis
Achilles' heel gave him no problem until people started sticking things into it...

Innovations in Vascular Access Come Principally From Nephrologists and Vascular Access Nurses

- AV Fistula
- AV grafts
- Buttonhole technique
- De-clotting fistulas
- Acute central venous catheters for dialysis
- Tunneled central venous catheters for dialysis, new designs
- Tunneled and Cuffed PD catheters
- Embedding PD catheters
- Suture-less end-to-side anastomosis for creating fistulas
- New options for dialysis access

Role of Buttonhole Cannulation in Access Preservation
The buttonhole technique is the use of a single needle tunnel track and a single vessel wall puncture site for the arterial needle and a separate site for the venous needle. Unlike one-site-iris, in which a limited area is punctured over and over again, the buttonhole needs to be a single tunnel track (like a pierced earring tunnel track) and a single vessel flap that mates perfectly with the AVF needle. Like a pierced earring, the tunnel track is created with a sharp cutting AVF.

Optimizing Hemodialysis Catheter Insertion

My own current projects in vascular access...

Fig 1. Technical Aspects of the AVF: Note the Dacron tubing and felt grooves that we used in our initial proof of concept experiment. An important goal (specific Aim 1) of this project is to improve upon the technical and engineering aspects of the AVF.

And we still have time for what matters most...