FRONTIER V Clinical Study of PerQseal®+
Large Hole Vascular Closure Device

Arne Schwindt, MD
on behalf of the Frontier V study investigators
Disclosure

Speaker name: **Arne Schwindt, MD**

I have the following potential conflicts of interest to report:

- [x] Consulting
- [ ] Employment in industry
- [ ] Stockholder of a healthcare company
- [ ] Owner of a healthcare company
- [ ] Other(s)

- [ ] I do not have any potential conflict of interest
Temporal Trends for Large Hole Access

![Graph showing temporal trends for large hole access procedural data.](image)
The Challenge

Major Bleeding Complication Rates

Adapted from: CARDIAC INTERVENTIONS TODAY JULY/AUGUST 2019 VOL. 13, NO. 4
Common Large Hole VCDs

<table>
<thead>
<tr>
<th>Perclose ProGlide</th>
<th>Prostar XL</th>
<th>Manta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suture-based</td>
<td>Suture-based</td>
<td>Biomechanical closure secured by suture and radiopaque lock</td>
</tr>
<tr>
<td>Single device: 5–8 F For sheath sizes &gt; 8 F, two devices and the preclose technique are required</td>
<td>8.5–10 F (Off-label: 10–24 F)</td>
<td>10–20-F devices/sheaths (12–25-F outer diameter)</td>
</tr>
</tbody>
</table>

**CENTRAL ILLUSTRATION** MANTA Versus Double ProGlide After TAVR

- **Vascular Complications (%):**
  - MANTA: 10% (Minor), 4% (Major)
  - ProGlide: 20% (Minor), 40% (Major)
- **Modified VCD Failure (%):**
  - MANTA: 20%
  - ProGlide: 40%


Vascular access site complications, modified vascular closure device (VCD) failure, and bailout options with MANTA versus ProGlide are shown.
PerQseal+ Delivery System

- Simple, Intuitive Device Operation
  - 3 steps for deployment
- One device per arteriotomy
- Safety wire access maintained
- No pre-procedure steps

- For sheaths sizes 14 – 22 F
- Blood signal and graduations
- Docks with PerQseal Delivery Device
**PerQseal+ Implant**

- Patch based, fully absorbable implant
  - Seals from the inside
  - Single material synthetic implant
  - Very low cross-sectional profile
  - Textured abluminal surface
- Up to 24 F arteriotomies
- No suture, collagen or metal components
- Absorbed within 180 days
Punktion AFC auf 12Uhr
Frontier V Clinical Study of PerQseal+

Safety and Performance Study of Large Hole Vascular Closure Device – FRONTIER V Study

Two Phase Study: 1st phase 25 Subjects; 2nd phase up to 65 Subjects
Commenced: March 2021
Follow-ups: Immediate post-op; Pre-discharge; 1 and 3 months.

Purpose:
The purpose of this Clinical Investigation Plan (CIP) is to:

1. Validate the safety and performance of the PerQseal+ when used in conjunction with the L PerQseal® Introducer in arteriotomies created with 14 – 22 F sheaths (arteriotomy up to 26 F) within the target population.

2. Provide clinical evidence to support the associated benefits of the PerQseal+ when used in conjunction with the L PerQseal® Introducer in arteriotomies created with 14 – 22 F sheaths within the target population.
Frontier V Clinical Study of PerQseal+

• Study Endpoints:
  This is a **non-inferiority study based on safety.**

• Primary Endpoint
  **Safety:** Incidence of major vascular access site complications related to the PerQseal+ Closure Device up to 1 month from implantation (inclusive), is non-inferior to the major device related complication rate associated with alternative large hole closure, derived from a recent focused literature review in an equivalent patient population.

• Secondary Endpoints
  – **Safety:** Incidence of minor vascular access site complications directly related to the PerQseal+ Closure Device up to 1 month from implantation (inclusive).
  – **Performance:** assessed by technical success rate for the PerQseal+ Closure Device at discharge or within 5 days of implantation, is non-inferior than the technical success rates associated with alternative large hole closure devices, derived from a recent focused literature review in an equivalent patient population.
## Contributors to PerQseal+ Study

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Enrolments</th>
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</thead>
<tbody>
<tr>
<td>University Hospital Schleswig-Holstein (UKSH) – Lübeck, Germany</td>
<td>16 TAVR Pts</td>
</tr>
<tr>
<td>Dr C Frerker - cPI, Dr T Schmidt, Prof. I Eitel</td>
<td></td>
</tr>
<tr>
<td>Saarland-Heilstätten GmbH, SHG-Kliniken – Völklingen, Germany</td>
<td>24 TAVR Pts</td>
</tr>
<tr>
<td>Dr F Gatto - PI</td>
<td></td>
</tr>
<tr>
<td>Erasmus Medical Center – Rotterdam, Netherlands</td>
<td>2 TAVR Pts</td>
</tr>
<tr>
<td>Dr N van Mieghem - PI</td>
<td></td>
</tr>
<tr>
<td>St. Franziskus-Hospital Münster – Münster, Germany</td>
<td>18 EVAR Pts (29 Closures)</td>
</tr>
<tr>
<td>Dr A Schwindt – PI, Dr M Austermann</td>
<td></td>
</tr>
<tr>
<td>Medical Faculty of the University of Leipzig – Leipzig, Germany</td>
<td>16 EVAR/TEVAR Pts (17 Closure)</td>
</tr>
<tr>
<td>Dr A Schmidt – PI, Dr D Branzan</td>
<td></td>
</tr>
<tr>
<td>Centre Hospitalier Universitaire (CHU) de Bordeaux Bordeaux, France</td>
<td>14 TAVR Pts</td>
</tr>
<tr>
<td>Dr L Leroux - PI</td>
<td></td>
</tr>
<tr>
<td>Hôpital Marie Lannelongue - Paris, France</td>
<td>1 TEVAR Pts</td>
</tr>
<tr>
<td>Prof. S Haulon - PI</td>
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## Baseline Demographics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Subjects n (TAVR/EVAR/TEVAR)</td>
<td>91 (56/33/2)</td>
</tr>
<tr>
<td>Males n (mean age)</td>
<td>63 (77 years)</td>
</tr>
<tr>
<td>Females n (mean age)</td>
<td>28 (81 years)</td>
</tr>
<tr>
<td>CFA Diameter Mean ± SD (Min-Max) [mm]</td>
<td>9.5 ± 1.8 (7 – 15.2)</td>
</tr>
<tr>
<td>Subjects with Calcification n/N (%)</td>
<td>24/103 (23.3%)</td>
</tr>
<tr>
<td>Right groin closure n/N (%)</td>
<td>66/103 (64%)</td>
</tr>
<tr>
<td>Sheath size range</td>
<td>12 – 24 F</td>
</tr>
<tr>
<td>ACT Mean ± SD (Min – Max)[seconds]</td>
<td>169.1 ± 45.1 (90 – 301)</td>
</tr>
<tr>
<td>Tissue tract depth Mean ± SD (Min – Max) [cm]</td>
<td>5.1 ± 1.7 (2 – 10)</td>
</tr>
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</table>
**Results**

**Safety** *(All subjects prior to or inclusive of 30 day FU*)

Study Enrolment Completed – 19-Jan-2023

- 103 Closures in 91 patients
- 56 TAVR subjects, 33 EVAR (12 bilateral closures), 2 TEVAR
- 4 Device related **minor** complication (3 x haematoma & 1 Pseudoaneurysm), 4% all resolved without sequelae* (PP-Population)
- 1 Device related **major** complication (bleeding with Hb drop >3 g/dL) 1% resolved without sequelae*
- No late major or minor device related vascular complications
- No clinically significant changes on Ultrasound or CT-Angiogram

*96% (87/91) Subjects with 30-day FU
Major complication not yet Adjudicated by independent CEC
## Results

### Effectiveness

- 96% technical success
- 99% Treatment Success Rate
- 77% TTH < 5 min

<table>
<thead>
<tr>
<th>PerQseal+ n = 100</th>
<th>TTDD</th>
<th>TTH</th>
<th>TCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.7</td>
<td>3.6</td>
<td>8.3</td>
</tr>
<tr>
<td>Median</td>
<td><strong>4.5</strong></td>
<td><strong>1</strong></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td>SD</td>
<td>2</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Min</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Max</td>
<td>14</td>
<td>26</td>
<td>32</td>
</tr>
</tbody>
</table>

**TTDD** total time for device deployment  
**TTH**  total time to hemostasis  
**TCT**  total closure time
Comparison of Vascular Complications Across Studies

Source: Manta IFU; Lanne et al. EuroIntervention; Moccetti et al. JACC Interventions 2019; Vol. 12, No. 17. 2019 Feb 8. 14 (15); Frontier IV&V and EFS data on file; Berlin data from Dr. Ioannis Passaloglou, Sankt Gertrauden Krankenhaus, Berlin, Germany, in publication. Abdel-Wahab et al. CIRCULATION AHA.121.057856.

*Note that the Manta IDE did NOT include hematomas in its definition of minor vascular complications.
Conclusions

• PerQseal+ device is Safe and Effective in closing arteriotomies up to 24 F
• Easy to use
• Excellent outcomes from discharge through 1-month follow-up
• PerQseal+ provides a compelling alternative for fully percutaneous large hole closure with reduced complexity