Venoplasty for Cardiac Device Implantation

Sungkyunkwan University
School of Medicine

Samsung Medical Center
Electrophysiology Lab.

Seoul, Korea

Dr. Seung-Jung Park
Upgrade: No Venoplasty
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However,.....
Subclavian vein obstruction
Venous system (Subclavian, SVC, ...) stenosis/occlusion

• An important clinical problem. As indications for CIEDs expand and patients with existing CIED leads require the addition or replacement of leads, implanting physicians increasingly need to navigate these venous occlusions.

• The 2017 HRS Expert Consensus Statement recognizes Venoplasty (esp. SV) as a safe and effective lead management option when venous access becomes an issue due to occlusion of the desired access point.

• The technique of Venoplasty should thus become an integral part of the core armamentarium of the implanting physician.
Prevalence

- Varies widely, ranging from 30% to 50%.

- One group prospectively studied venography at 6 months postimplantation in 202 patients and identified > moderate stenosis in 51%.
Predisposing factors

- Previous use of transvenous temporary leads
- LV ejection fraction < 40%,
- Advanced age (>65 years)

were found to be independent risk factors for a higher incidence of venous occlusion.
Early and Late thrombosis

- Studies have described subclavian venous thrombosis of both an *early (within 6 months)* and *late (at 6 years)* progression. Late thrombosis is most often asymptomatic and is a result of chronic fibrosis around the device leads, which allows time for concurrent collateralization.
Subclavian vein obstruction
Dilator first → with sheath
Failure → Thicker dilator
Successful LV lead implantation
# Patterns of subclavian occlusion

<table>
<thead>
<tr>
<th>Location of Stenosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral</td>
<td>61%</td>
</tr>
<tr>
<td>Central only</td>
<td>17%</td>
</tr>
<tr>
<td>Central and peripheral</td>
<td>22%</td>
</tr>
</tbody>
</table>

## Severity of Stenosis

**based on a peripheral venogram**

<table>
<thead>
<tr>
<th>Severity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stenotic</td>
<td>15%</td>
</tr>
<tr>
<td>Stenotic with collaterals</td>
<td>20%</td>
</tr>
<tr>
<td>Total with collaterals</td>
<td>65%</td>
</tr>
</tbody>
</table>

## Severity of Stenosis

**based on contrast injection at occlusion site**

<table>
<thead>
<tr>
<th>Severity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stenotic</td>
<td>13%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>67%</td>
</tr>
<tr>
<td>Total</td>
<td>20%</td>
</tr>
</tbody>
</table>
Location of Stenosis

Figure 1  Location of chronic lead-related occlusions in the subclavian/innominate vein on the right; 61% are peripheral only, 22% are peripheral and central, and 17% are central only.
From smoke into smother
Wiring is first!
Overestimation of obstruction

• Peripheral vein venography, sonography, CT scan, and so forth **overestimate the severity of the obstruction.** Contrast injection at the site of occlusion (**local venogram**) frequently delineates a path to the central circulation.
Uninvited Guests
Contrast extravasation

- Contrast extravasation was common during crossing of total occlusions and was observed with balloon ruptures on 3 occasions, but none was clinically significant.
Unpredictable
Multiple projections
Another option
SVC obstruction
Serial dilatation
Balloon Angioplasty

• Compared with progressively larger dilators, Balloon angioplasty improves the quality of venous access, providing the unrestricted catheter manipulation critical to both His bundle pacing and left ventricular lead implantation.
Balloon type & Inflation

• a 6 ~ 9mm, 4-cm ultra-noncompliant balloon
  (lumen diameter .035-in) over the Amplatz Extra Stiff wire to just beyond the SVC innominate junction.

• Use a 9-mm balloon if the plan is to add 2 leads or there is elastic recoil after 6-mm balloon inflation

• Inflate the balloon to the rated burst pressure (RBP) indicated on the balloon package:
  → 26~30 atm for the peripheral balloons
  18~20 atm for the low-profile peripheral balloon
Damage to existing leads

- In 468 patients over 12 months after venoplasty.
- 2 preexisting atrial lead dislodgements (at 3, 5 mo)
- 1 preexisting atrial lead insulation defect (9mo)
- When compared with a cohort who had lead replacement without SV, there was no evidence to suggest that SV caused delayed lead damage.
- Additional safety data by an email survey → no adverse event.
Summary

- Obstruction looks more severe than real
- Wiring is First
- Serial Dilation, Balloon angioplasty, and Lead extraction
- Not so difficult and Safe
Thank you for your attention!!

Guard Your Heart above all else
For it determines the course of your life.

——Proverbs 4: 23——
BACKGROUND The need to add a lead(s) despite subclavian/innominate obstruction is increasing. Subclavian venoplasty may be a good alternative to the commonly employed options; however, there are few reports in the literature, and all are by interventional radiologists.

OBJECTIVE To describe the procedural details, results and safety of venoplasty by implanting physicians in a large group of consecutive patients.

METHODS Safety, lead function and success were established from review of the procedure reports and clinical complications in 373 consecutive venoplasty patients from 1999–2010. Procedural details were obtained by review of the angiograms (venograms) and procedural flow charts of 152 consecutive patients from 2004–2007.

RESULTS Venoplasty was successful in 371 of 373 patients without damage to the existing leads and without clinical complications. Total angiographic occlusion was demonstrated in 65% of cases by peripheral venogram, but in only 20% of cases by contrast injection at the site of obstruction; 86% were crossed with a hydrophilic wire. Microdissection and excimer laser were used to cross three of the four wire-refractory occlusions. Obstruction was both central and peripheral in 22.1% of cases and central only in 17%. The time required to cross the obstruction and perform venoplasty was 13–21 minutes. A noncompliant balloon was successful in most, but an ultranoncompliant balloon was required in 13% of cases. Contrast extravasation was common during crossing of a total obstruction and also was observed with balloon rupture on three occasions, but was not clinically significant.

CONCLUSIONS Subclavian venoplasty is a safe, practical lead management option that can be used by implanting physicians.
A. Persistent waist in ultra noncompliant balloon at 30 atmospheres

B. Ultra noncompliant balloon inflated against a stiff .035 inch guide wire