Stent Selection for Peripheral Procedures-
Drug Eluting, Standard Nitinol, or Woven Nitinol?

Venita Chandra, MD
Clinical Associate Professor of Surgery
Division of Vascular Surgery
Stanford University

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DISCLOSURE

Venita Chandra, MD

• Consulting Fee: Abbott Vascular, Medtronic, Cook Medical, Gore
Disclosures

• Clinical Consultant:
  • Medtronic, Cook, Gore, Abbott
Why stents?

- Balloon-only angioplasty is fraught with:
  - Elastic recoil
  - Flow-limiting dissection
  - Constrictive remodeling
  - Neointimal hyperplasia

- Stents may address these issues
Stresses/Forces on Femoropopliteal Vessels

- 8° bending
- 3 lbs compression
- 60° twisting
- 25% shortening
Available Stent Platforms

- Self Expanding
  - Nitinol
  - Interwoven Nitinol
  - Drug Eluting Nitinol
  - Dual Component Design
- Stent grafts
- Balloon Expandable
- Bio-absorbable

“I’m making a decision! Stop confusing me with facts!”
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Explosion of Data
Standard Nitinol Stents (SNS)

- Laser cut Nitinol Tubes with open cell geometry
- Traditionally has been most commonly used stent in SFA

Smart Stent (Cordis)  Luminexx (Bard)  Xpert (Abbott)
Protégé Everflex (Ev3)  Absolute (Abbott)  Misago (Terumo)
LifeStent (Bard)  Complete (Medtronic)
SNS - Advantages

- Relatively simple deployment
- Relatively inexpensive
- Come in long lengths
SNS - Disadvantages

• Limited flexibility, thus prone to kinking/fracture
• Chronic outward force on vessel
• Restenosis
One of several RCTs

Mean 13 cm lesions

6 months:
24% vs. 43% restenosis on angio (p=0.05)

12 months:
37% vs. 64% restenosis on duplex (p=0.01)

Significantly farther walking distance

Results not Sustained Long Term *

* Chowdhury et. al. Cochrane Database: Angioplasty versus bare metal stenting for superficial femoral artery lesions. 2014
Interwoven Nitinol

- 6 pairs of super-elastic nitinol wires interwoven in a helical pattern with a closed cell geometry
- Allows for increased flexibility, and compression resistance
  - “vascular-mimetic”
Interwoven Stent - Advantages

- High radial strength (>4X SNS)
- Kink and crush resistant
- Fracture resistant
- Lower chronic outward force
Interwoven Stent- Disadvantages

• Significant length variability depending on how compressed/elongated
  • More difficult to deliver accurately
• Cost
Average Lesion Length 6.78 cm
Midterm Patency After Femoropopliteal Interventions: A Comparison of Standard and Interwoven Nitinol Stents and Drug-Coated Balloons in a Single-Center, Propensity Score-Matched Analysis

Sabine Steiner, MD, MSc, Andrej Schmidt, MD, Yvonne Bauback, MD, Michael Piorokowski, MD, Martin Werner, MD, Maryam Yahiaou-Doktor, MSc, Ursula Banning-Eichenseer, PhD, and Dierk Scheinert, MD

Abstract

Purpose: To describe and compare primary patency rates in patients undergoing endovascular femoropopliteal interventions with standard or interwoven nitinol stents or drug-coated balloons. Methods: A cohort of 197 patients was treated for symptomatic femoropopliteal occlusive disease classified as Rutherford category 2–3 at a large vascular center between June 2006 and August 2013 using either standard nitinol stents (PNS; n=37), interwoven nitinol stents (INS; n=47), or drug-coated balloons (DCB; n=39). Primary patency rates were assessed by ultrasound or angiographic reading for over 3 years of follow-up. Propensity score–matched pairs were formed to compare each treatment with another using survival analysis. Results: Survival curves of primary patency favored INS compared with SNS in 368 propensity score–matched pairs (p<0.001). Kaplan–Meier estimates at 1, 2, and 3 years were 86.6%, 76.4%, and 66.9%, respectively, in the INS group vs. 60.5%, 46.1%, and 42.1%, respectively, in the SNS group. No significant difference (p=0.232) was seen for the comparison of SNS vs DCB in 284 matched pairs over long-term follow-up (primary patency estimates at 1, 2, and 3 years were 79.8%, 53.8%, and 32.9%, respectively, in the DCB group vs 60.5%, 44.4%, and 40.7%, respectively, in the SNS group. Survival curves of primary patency favored INS over DCB in 254 matched pairs (p<0.001). Kaplan–Meier estimates at 1, 2, and 3 years were 79.0%, 51.2%, and 30.1%, respectively, in the DCB group vs 89.1%, 76.2%, and 66.2%, respectively, in the INS group. Conclusion: Propensity score–based analysis of primary patency suggests profound differences in restenosis rates between various treatment modalities for femoropopliteal disease for over 3 years of follow-up.

Keywords: drug-coated balloon, drug-eluting balloon, femoropopliteal segment, nitinol stent, patency, popliteal artery, propensity score matching, superficial femoral artery, restenosis

- Propensity matched outcomes at a single institution
- Improved primary patency in INS as compared to SNS
- 3 year patency of 68.9% vs. 40.3%
Drug Eluting Stents

- Standard nitinol stent coated with an antiproliferative drug
  - Paclitaxel, Sirolimus, Everolimus
- Zilver
  - Paclitaxel coating
    - Lipophilic avidly binds to intracellular target proteins
    - Inhibits smooth muscle migration and proliferation
Drug Eluting Stents - Advantages

• Impact of drug decreases intimal hyperplasia and thus decreases re-stenosis
• Simple accurate deployment
Drug Eluting Stents - Disadvantages

- Cost
- Shorter shelf life (<1 year)
- Can fracture (although flex design is supposed to decreased this)
  - 1 year rates of 0-1.6%
- Chronic outward force on artery
- ? Of mortality effect of drug
DES Data

- Previous trials of drug-eluting stents (Sirolimus and Everolimus)
  - No more effective long term than BMS
- Zilver PTX pivotal trial
  - Average lesion length: 6.3cm
Average Lesion Length 6.3 cm
In Conclusion

- In general self-expanding stents:
  - Improved acute success compared to PTA
  - Effective treatment for femoropopliteal disease
- Individualized approach matching unique characteristics and proper deployment of different stents to vessel anatomy, and physician experience needed to optimize clinical outcomes
Some Suggestions/Advice

• Try to stay current on data, and understand what is unique about various stents

• Long lesions/CTOs:
  • Viabahn, Supera or DES > STNS

• Adductor canal/popliteal lesions
  • Supera/Viabahn or DCB

• In stent restenosis:
  • DES/DCB or Viabahn
Thank You!

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