Diagnosis Of ICA String Sign, Pseudo-Occlusion Or True Occlusion: Is Duplex Ultrasound Sufficient To Determine Accurately Patency And Operability

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Nothing to disclose

ICA Pseudo-Occlusion

Definition:
- 95 – 99 % Stenosis
- < 2mm Lumen diameter
- Low PSV ( < 40 cm/sec )

Pseudonyms:
- Slim sign *
- String sign **
- Hypoplasia
- Nearly occluded

* Littman & Wiley 1970
** Ehrenfeld 1976

ICA Pseudo-Occlusion

“ Gold Standard “

Contrast Arteriography

MRA ? *

Duplex Scan?

* Flow velocities over 15 cm/sec

ICA Pseudo-Occlusion

Advantages of Duplex Scan vs CA:
- External diameter (not only lumen)
- Wall thickness
- Hemodynamics
- Thrombus presence
- Low flows ?

29 Pseudo-Occluded ICA

- 28 Patients: 9 female & 19 male
- Age range 53 years to 80 years (mean 73 ± 7)
- Anticoagulation 23 patients (80 %)
- Hypertension 81 %
- Diabetes 44 %
- Smoking 38 %
- CAD 25 %
Pseudo-Occluded ICA

Diagnosis of ICA Occlusion
- MRA alone: 4
- MRA & Duplex: 13
- Duplex alone: 12

Indications
- CVA: 7
- TIA: 5
- Asymptomatic: 17

Modified Carotid Duplex Scan Protocol

Doppler
- Wall filter: minimal
- Pulse repetition frequency: (1250 Hz)
- Spectral analysis of ECA & branches for exclusion of false positive diagnosis

< 5 cm/sec

Modified Carotid Duplex Scan Protocol

Color / CPA
- Pulse repetition frequency: (150 - 350 Hz)
- Wall filter: minimal
- Sensitivity: maximal
- Persistence: maximal

Modified Duplex Protocol

Curved Probes for Extended Field of View
- 8 – 5 MHz
- 5 – 2 MHz

Modified Carotid Duplex Scan Protocol

High-Definition Magnification for Distal ICA
- Lumen
- Wall thickness

Modified Duplex Protocol

Motion Artifacts: Doppler Spectral Analysis

Occluded

Patent?
**Range Mean**

- **PSV**: 5 – 30 cm / sec 17 ± 9 cm / sec
- **EDV**: 0 - 12 cm / sec 3.3 ± 3 cm / sec
- **RI**: 0.44 - 1 0.75 ± 0.23

**Surgical Management**
- Endarterectomy 10
- Ligation 6

**Conservative Management**
- 13

**Endarterectomy (10 cases)**

**OR Findings**
- Shunt 1 case
- Pulsatile back-bleeding 9 cases
- Floating clot 2 cases
- Patches 10 cases

**Range (mm) Mean (mm)**

- **Outer Diameter**: 3.2 – 3.8 3.5 ± 0.2
- **Lumen (↑)**: 0.7 – 0.9 0.82 ± 0.07
- **Wall Thickness (↓)**: 1.1 – 1.5 1.3 ± 0.1

*P < .001

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**Conclusion**

- The proposed modified duplex protocol helps detect extremely low-flows in the ICA and increases detection of patent arteries previously thought to be occluded.
- We suggest ICA endarterectomy for all patients with ICA lumen diameter > 2mm and wall thickness < 1mm.
- We suggest a non-operative approach for neurologically asymptomatic patients with ICA lumen diameter < 2mm and wall thickness over 1mm.