Non Atheromatous Lesions Fibromuscular Dysplasia Rod Samuelson, MD Babak Jahromi, MD Elad Levy, MD Adnan Siddiqui, PhD, MD Nick Hopkins, MD







Presenter Disclosure Information

L. Nelson Hopkins MD

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Fibromuscular Dysplasia "String of Beads"



Intimal symmetric narrowing with post stenotic dilatation

Occurrence

- Incidence <1%
- Most commonly occurs in young females
- Presents with:
 - Asymptomatic Carotid Bruit
 - Hypertension(renal ds)
 - Headache
 - Transient Ischemic Attacks
 - Stroke
 - Tinnitus, Vertigo, Arrhythmia, Carotodynia, hearing impairment, Angina ...

Olin JW. Cleveland Clinical Journal of Medicine, April 2007.

Pathophysiology

- True etiology remains unknown
 - Congenital defects in media and internal elastic layers may predispose to pathologic change
 - ?? Autosomal Dominant with reduced penetrance in males ??
- Medial fibrodysplasia or intimal fibrodysplasia
 - Non-atherosclerotic
 - Non-inflamatory
- Most often affects the renal and carotid arteries
 - Renal: 85% of cases
 - Carotid: when present, bilateral in 80%
 - Both renal and carotid: 50% of cases

Stahlfeld KR. American Journal of Surgery, January 2007. Olin JW. Cleveland Clinical Journal of Medicine, April 2007.

Classification

- Type 1:Medial Fibroplasia

 80+% of cases
 Multiple, irregular concentric narrowings (dilitations > normal artery)
- Type 2: Intimal Fibroplasia
 ~7% of cases
 - Focal tubular stenosis
- Type 3: Adventitial Fibroplasia – Rare
 - Focal diverticular outpouchings

Associated Conditions

- Patients with FMD have increased risk for:
 - Intracranial aneurysms (20-50%)
 - Intracranial neoplasms
 - Carotid dissection
 - A-V Fistula

Irritable vessels

-Vasospasm common

Greenberg 2006.

Fibromuscular Dysplasia (FMD) Brachiocephalic Location

Carotid

- C2: common
- Proximal ICA: rare
- Vertebral
- Intracranial vessels: rare

Diagnosis Angiography – Gold Standard – High-grade stenosis with "string of beads" pattern

Indications for Treatment -Symptomatic FMD -Severe flow restriction -Dissection/ pseudoaneurysm -Anticoagulation contraindicated

Treatment

- Carotids... "string of beads" (Medial FMD)
 - Asymptomatic: antiplatelet medication and sequential imaging
 - Symptomatic: graduated low pressure endoluminal dilation (with EP)
 - <u>Stent RARELY</u> necessary
- Renals
 - If renal artery stenosis, hypertension or renal impairment, then transluminal angioplasty without stent

Stahlfeld KR. American Journal of Surgery, January 2007. Olin JW. Cleveland Clinical Journal of Medicine, April 2007.

FMD: Treatment

Medial and adventitial

Low pressure angioplasty
Success rate 80-90%
Recurrence 8%

Tubular FMD segmental tubular narrowing

High pressure angioplasty
Success rate variable
Self-expanding stent

"String Sign"

May be tubular FMD

What is this?



Pseudospasm

What is this?



Stroke in Evolution String Sign

Progressive, Fluctuating Hemiparesis

ICA & MCA Open Above





CAS *Percusurge & Wallstent*



Symptoms Resolved



Pseudoocclusion... String Sign Recurrent Symptoms...





Normal Vessel Above....Consider Reopening

Carotid Angioplasty and Stent When to Consider Stent or Stent Graft

Carotid dissection/ pseudoaneurysm with FMD when symptomatic or flow limiting

- Often track high into cervical segment
- May not be possible to use DEP

-alternative = flow reversal

Stent

Xpert – soft, trackable, self-expanding

• Fibromuscular dysplasia

Fig legend...2A

FMD is a nonatherosclerotic, noninflammatory arteriopathy of small and medium size arteries that often affects the renal and carotid arteries (22). Angiographically, it is diagnosed by a distinct beading of the artery with alternating areas of dilatation and stenosis. Most often, this finding is of little clinical significance. However, patients can develop secondary dissections and symptomatic stenosis requiring treatment; often tracking high in the cervical segment of the carotid artery where filters are not easily used, but flow reversal might be possible. Soft, trackable selfexpanding stents like the Xpert (Abbott Vascular Inc., Redwood City, CA; off-label for this indication) can produce excellent results, and balloon angioplasty alone can often be effective without stenting for pure FMD. Patients with Ehlers-Danlos syndrome, especially type IV, as the underlying condition are a high-risk group for treatmentrelated morbidity and long-term failure, and the decision to treat such patients should be carefully weighed against the risks of further vessel dissection. One patient treated recently at the University at Buffalo had bilateral, chronic, symptomatic dissections of the carotid artery secondary to FMD (Fig. 2a, left). The left-sided lesion was treated with an Xpert stent without DEP due to the high location and low risk for embolic phenomena; the right side was similarly treated with an Xpert stent (Fig. 2a, *middle*). Proximal to the stented region, the artery developed significant pseudospasm overlying the preexisting FMD (Fig. 2a, right). Angioplasty of this region was performed with a fair result, and a follow-up angiogram performed the next day showed a remarkably normal artery (Fig. 2b).

Tubular FMD

ID: 49 yo f

<u>RFR</u>: Bilateral sx upper cervical carotid stenosis

PMH: smoker

HPI: L hemisphere stroke (R paresis, dysphasia, mild cognitive deficit, R eye patchy loss of vision), bilateral transient monocular blindness.

Imaging MRI:Multiple bilateral MRI DWI changes in carotid watershed distribution.

Angio: bilateral severe distal cervical ICA narrowing associated with FMD-type changes.

<u>Tx:</u>

LICA:5x30 Xpert 4x20 postdil
 RICA: 4x40 Xpert, 3x30 postdil
 Outcome: Good clinical outcome



JPEG12 Q=90 11.12.1

JPEG12 G=90 11.12:1





Abbott Expert Stent



Xpert Nitenol Stent

A stent specifically designed for small vessels

Low profile

- High flexibility/conformability
- High radial force



Designed to optimize hemodynamics (low porosity)

Xpert stent system

Technical details

Stent Ø [mm]	Design	Sheath compatibility [F]	Strut thickness [mm]	Strut width [mm]
3	9 cells	4	0.09	0.11
4	9 cells	4	0.09	0.14
5	9 cells	4	0.11	0.16
6	9 cells	4*	0.11	0.16
*0000000000000000000000000000000000000	12 cells	5	0.14	0.16 n file AV in Beringen





LICA – crossing lesion

LICA – stent deployment



LICA – final





TOSHIBA STROKE RESEARCH CENTER

University at Buffalo State University of New York







- Intimal fibroplasia (tubular FMD)
- Medial fibroplasia (80%)
 Fibromuscular hyperplasia
 (Dilated diameter > normal diameter)
- Subadventitial fibroplasia
 Dilated diameter = normal diameter

FMD: Angiography

String of beads (80%)

Dilated areas wider than normal artery

Tubular FMD (intimal dysplasia)

Long segment = uniform narrowing

"String of Beads"

Intimal symmetric narrowing with post stenotic dilatation