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Abstract

Background: Fibromuscular Dysplasia (FMD) is an arteriopathy which may lead to stenosis, aneurysm, and dissection. Pulsatile tinnitus (PT) is a common, debilitating symptom of FMD.

Methods: Data were queried from the United States Registry for FMD from 11 clinical centers.

Results: Of the 873 patients (pts) enrolled, data regarding PT as a presenting symptom was available for 720 (82.5%). 231 pts reported PT (32.1%). Pts with PT were more often female. There was no difference in age at symptom onset; however there was a trend toward earlier age at diagnosis. Patients with PT were more likely to have frequent headaches, neck pain, and dizziness but less likely to have hypertension. Patients with PT were more likely to have had a TIA, cervical bruit, Horner's syndrome, and cervical artery dissection. Extracranial carotid and/or vertebral artery involvement was more common among patients with PT while renal and mesenteric involvement was less common. Pts with PT were more likely to have multi-vessel FMD.

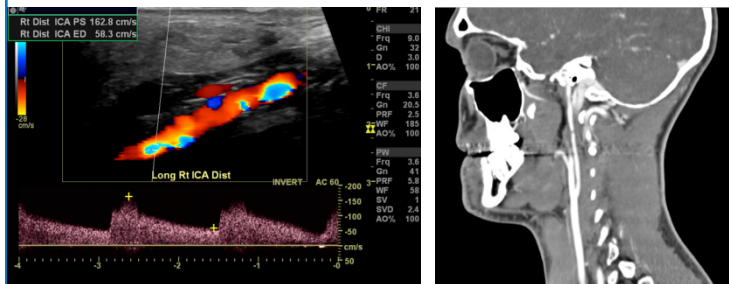
Conclusions: PT is an important presenting symptom of FMD in approximately one-third of pts and is associated with a pattern of multi-vessel involvement, increased involvement of the carotid and/or vertebral arteries, and cervical artery dissection. Pts presenting with PT should be evaluated for cerebrovascular FMD.

Fibromuscular Dysplasia (FMD)

- Uncommon non-inflammatory arteriopathy that may lead to stenosis, aneurysm, and dissection
- Can affect various arterial beds, most commonly the renal, carotid, and vertebral arteries
- Patients often undiagnosed or misdiagnosed for years
- Pulsatile tinnitus (PT) is a common and debilitating symptom of FMD
- We sought to study incidence, predictors, and pattern of arterial involvement among FMD patients with PT

Carotid Duplex Ultrasound (CDU): elevated velocities and turbulence in distal ICA

CTA: distal ICA focal (intimal) FMD



Methods

- United States Registry for FMD formed in 2008
- Study IRB approved at all participating clinical centers
- Standardized data collection form completed at enrollment and for each subsequent follow-up visit
- Online database maintained by Michigan Cardiovascular Outcomes Research and Reporting Program (MCORRP)
- Data for 873 patients enrolled as of 10/30/2013 at 11 clinical centers presented
- Data on PT variable available on 720/873 patients (82.5%)
- 231/720 patients (32.1%) reported PT
- Differences in characteristics between patients with and without PT evaluated using Student's t-tests, Wilcoxon rank-sum and Fisher's exact tests

Demographics / Medications

	All FMD patients	Patients with Pulsatile Tinnitus	Patients without Pulsatile Tinnitus	p-value
N (%)	720	231/720 (32.1)	489/720 (67.9)	<0.0001
Female	658/720 (91.4)	226/231 (97.8)	432/489 (88.3)	<0.0001
Age at Symptom Onset	48.8±14.1	48.3±11.5	49.1±15.2	0.49
Age at Diagnosis	53.0±13.3	51.7±10.7	53.6±14.4	0.065
PAST MEDICAL HISTORY				
Contraceptive/ Hormone Use	333/505 (65.9)	148/177 (83.6)	185/328 (56.4)	<0.0001
History of Smoking	244/700 (34.9)	65/222 (29.3)	179/478 (37.4)	0.041
Anxiety Disorder	58/273 (21.2)	26/82 (31.7)	32/191 (16.8)	0.0093
Depression	57/278 (20.5)	22/81 (27.2)	35/197 (17.8)	0.100
MEDICATIONS				
ACEIs/ARBs	282/690 (40.9)	75/219 (34.2)	207/471 (43.9)	0.016
Beta-Blockers	265/690 (38.4)	70/222 (31.5)	195/468 (41.7)	0.012
ASA	477/703 (67.9)	168/226 (74.3)	309/477 (64.8)	0.012
Clopidogrel	105/674 (15.6)	45/222 (20.3)	60/452 (13.3)	0.024
FAMILY HISTORY				
FMD	32/664 (4.8)	13/215 (6.0)	19/449 (4.2)	0.33
Aneurysm	139/654 (21.3)	59/212 (27.8)	80/442 (18.1)	0.0057
Dissection	18/632 (2.9)	7/211 (3.3)	11/421 (2.6)	0.62
Sudden Death	95/638 (14.9)	42/212 (19.8)	53/426 (12.4)	0.018
Stroke	294/649 (45.3)	121/215 (56.3)	173/434 (39.9)	<0.0001

Presenting Signs/Symptoms

PRESENTING SYMPTOMS/SIGNS	All FMD Patients	Patients with PT	Patients without PT	p-value
Hypertension	445/714 (62.3)	120/226 (53.1)	325/488 (66.6)	0.00065
Headache	390/717 (54.4)	164/231 (71.0)	226/486 (46.5)	<0.0001
Dizziness	203/686 (29.6)	92/213 (43.2)	111/473 (23.5)	<0.0001
Neck Pain	187/694 (27.0)	98/215 (45.6)	89/476 (18.6)	<0.0001
Cervical Bruit	157/685 (22.9)	94/213 (44.1)	63/472 (13.3)	<0.0001
Aneurysms	125/707 (17.7)	25/226 (11.1)	100/481 (20.8)	0.0015
Carotid Artery Dissection	112/704 (15.9)	45/227 (19.8)	67/477 (14.0)	0.061
TIA	64/708 (9.0)	33/227 (14.5)	31/481 (6.4)	0.0007
Stroke	54/713 (7.6)	20/228 (8.8)	34/485 (7.0)	0.45
Horner's Syndrome	33/687 (4.8)	16/213 (7.5)	17/474 (3.6)	0.033
Post-Prandial Abdominal Pain	49/704 (7.0)	25/221 (11.3)	24/483 (5.0)	0.0036
Renal Infarction	14/325 (4.3)	1/103 (1.0)	13/222 (5.9)	0.044
Renal Artery Dissection	16/702 (2.3)	2/228 (0.9)	14/474 (3.0)	0.11
FMD Type*				
Medial Fibroplasia	453/696 (65.1)	175/224 (78.1)	278/472 (58.9)	<0.0001
Intimal	21/696 (3.0)	5/224(2.2)	16/472 (3.4)	0.48
Medial and Intimal	11/696 (1.6)	3/224 (1.3)	8/472 (1.7)	1.0

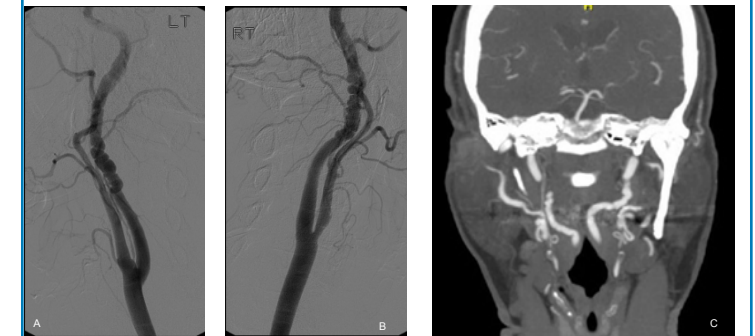
*divided by number of pts assessed for at least one bed

Vascular Bed Involvement

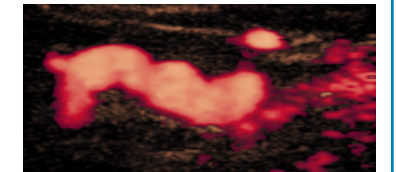
VASCULAR BED INVOLVEMENT*	All FMD Patients	Patients with PT	Patients without PT	p-value
Extracranial carotid	453/619 (73.2)	187/218 (85.8)	266/401 (66.3)	<0.0001
Vertebral	155/477 (32.5)	71/176 (40.3)	84/301 (27.9)	0.0062
Renal	432/621 (69.6)	120/199 (60.3)	312/422 (73.9)	0.00075
Mesenteric	77/407 (18.9)	18/141 (12.8)	59/266 (22.2)	0.024
Intracranial	66/432 (15.3)	29/173 (16.8)	37/259 (14.3)	0.50
Lower Extremity	59/181 (32.6)	20/43 (46.5)	39/138 (28.3)	0.039
≥2 Vascular Beds Involved	352/720 (50.6)	139/231 (62.1)	213/489 (45.1)	<0.0001

*Denominator shown represents number of patients imaged for the specific arterial bed.

FMD Findings



Multifocal FMD (medial fibroplasia) of the internal carotid arteries.
Panel A/B: Digital subtraction angiography
Panel C: CTA
Panel D: CDU with classical beading demonstrated using color power angiography



Discussion and Conclusions

- PT is an important clinical manifestation of FMD and is a presenting symptom in approximately 1/3 of FMD patients.
- FMD patients with PT were more often female and had medial fibroplasia (multifocal FMD)
- Patients with PT more frequently presented with H/A, dizziness, neck pain, cervical bruit, TIA, and Horner's syndrome
- There was no difference in frequency of stroke among FMD patients with and without PT
- Patients with PT had more frequent extracranial carotid, vertebral, and multi-vessel involvement and less frequent renal and mesenteric involvement
- The complaint of PT in a female middle aged patient should prompt investigation for cerebrovascular FMD

Conflict of Interest Disclosure

Sponsor: Fibromuscular Dysplasia Study of America, a non-profit organization.

Disclosure: Drs. Gornik and Olin are volunteer members of the medical advisory board of the FMDSA. Ms. Pamela Mace is a paid employee of FMDSA.