



CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES IN VASCULAR SURGERY

JANUARY 25-27 2018 

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER, PARIS, FRANCE

Embolized hardware: take it or leave it?

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Disclosure

Speaker name: Richard Shoenfeld, MD

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- I have the following potential conflicts of interest to report:
- Consulting
- Employment in industry
- Shareholder in a healthcare company
- Owner of a healthcare company
- Other(s)
- I do not have any potential conflict of interest



The 12 Commandments and 4 Rules

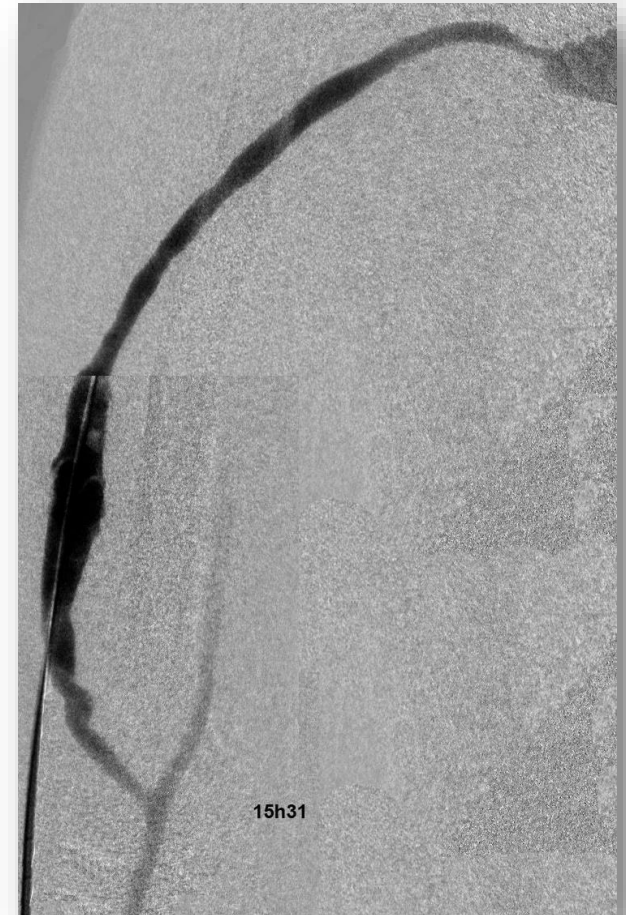
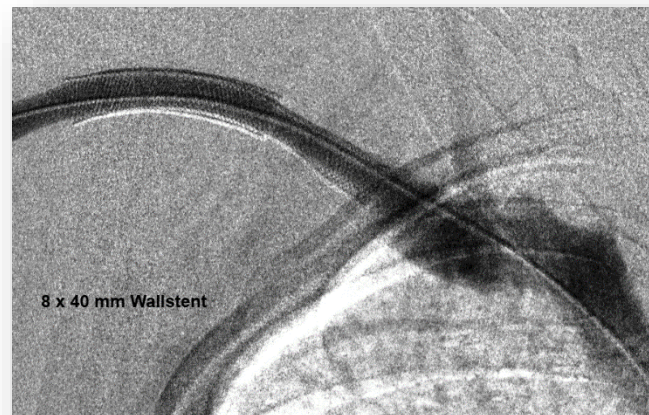
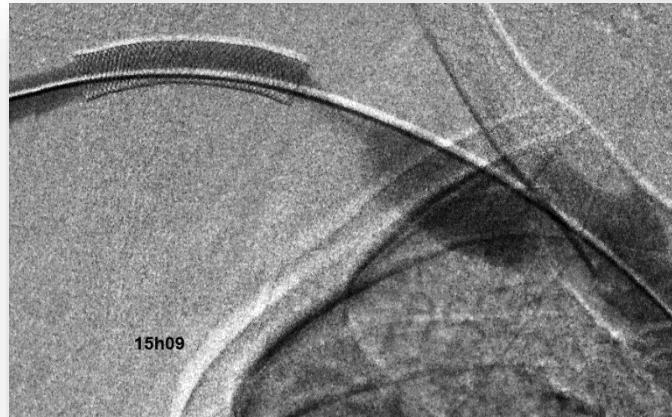
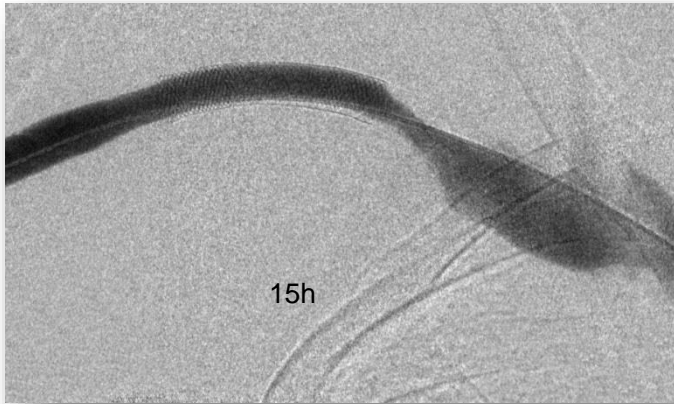
(with interpretive statements)

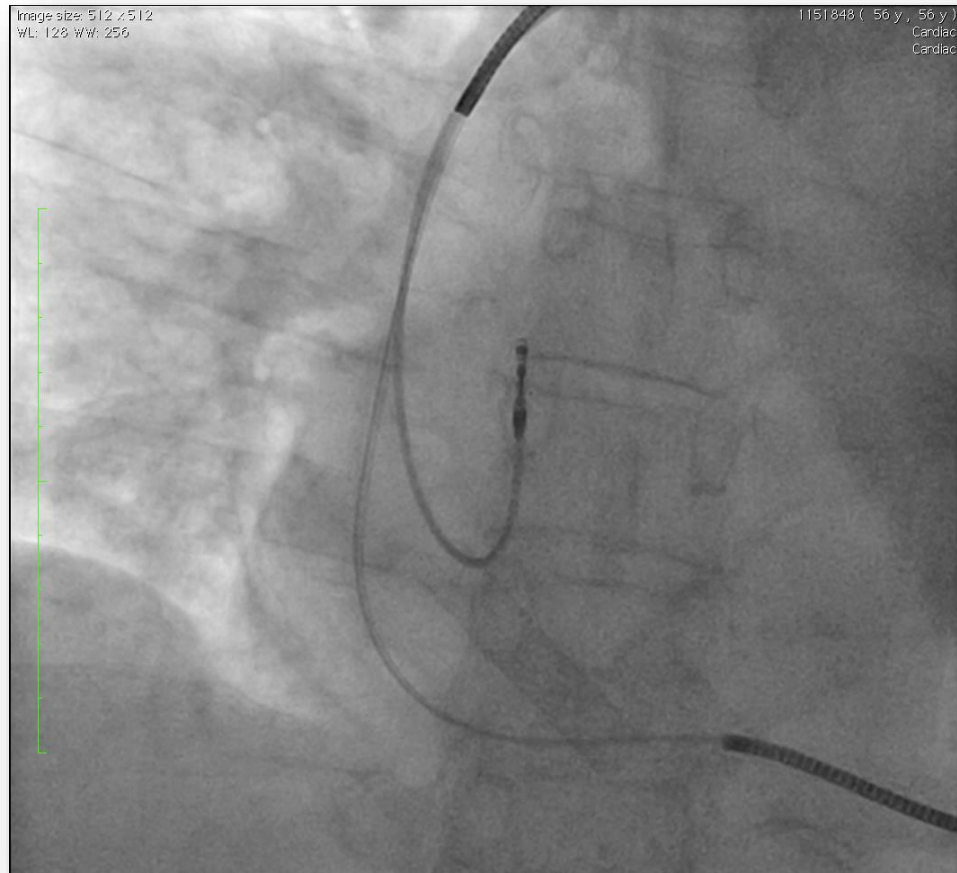
- # 12 “Shit happens”
- # 3 You shall not take the name of the LORD your God in vain
- # 6 You shall not murder (see commandment # 11)
- # 11 The patient shall not die on your table



Rule # 1

Things meant to stay put should stay where you put them





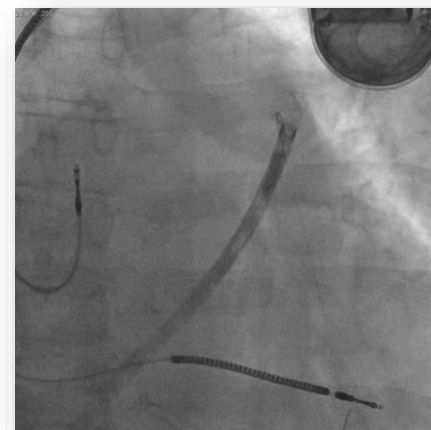
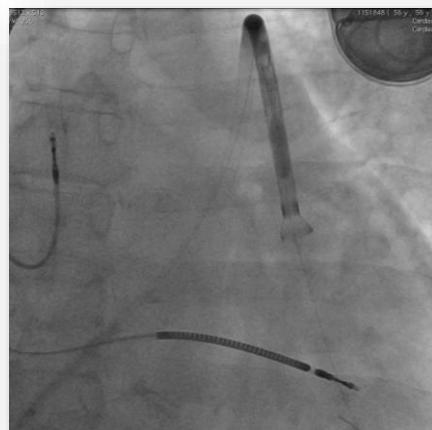
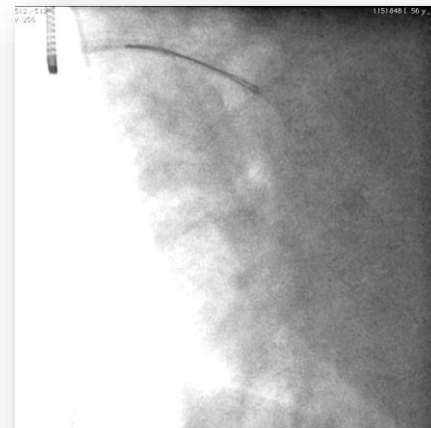
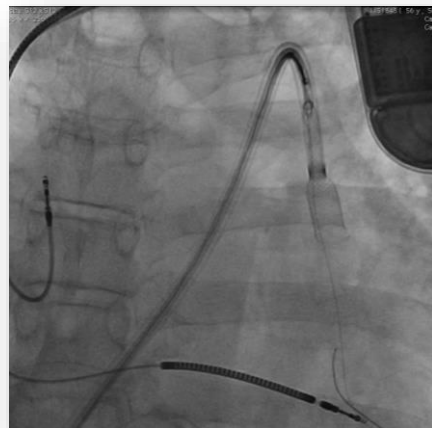
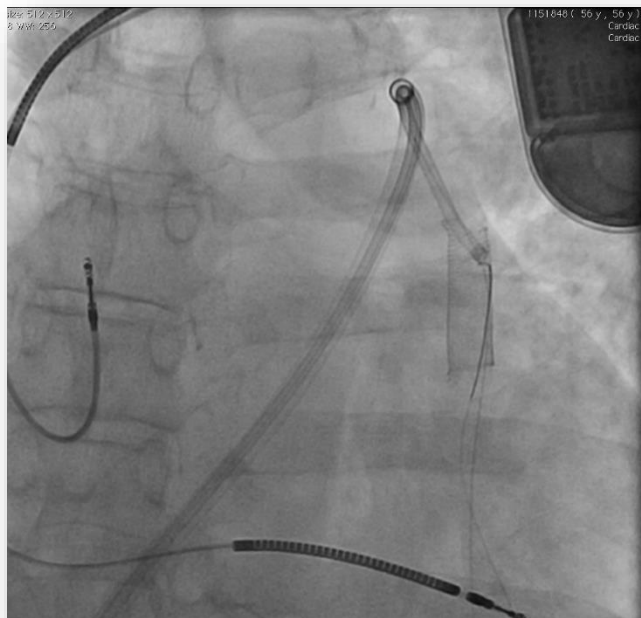
Rule # 2

Embolized material meant to stay put should probably come out

... Or parked where it will safely stay put!

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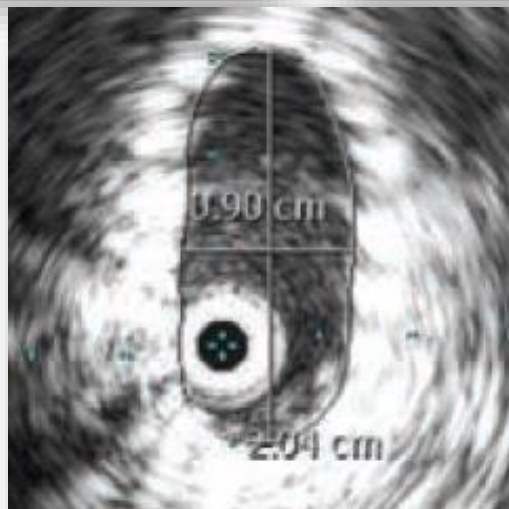
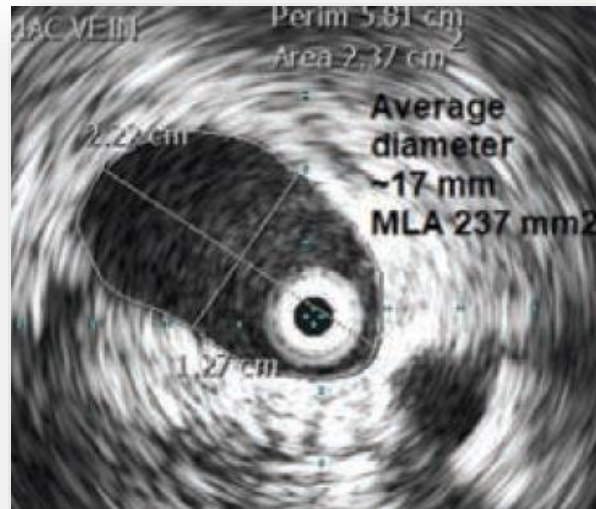
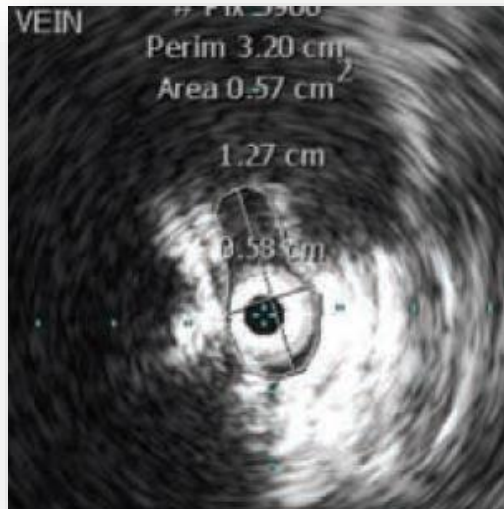
- Stent migration: causes
 - Iatrogenic
 - Stent too small +++
 - Inaccurate estimation of true vessel caliber
 - Least accurate method:
 - “Eyeballing” it
 - Semi-quantitative method:
 - PTA balloon
 - Quantitative methods:
 - Measurement from calibrated angio software
 - CT, MR, US, IVUS



Quantitative methods: which is most accurate?

Imaging Common Iliac Vein Compression: Differences between CT Angiography, Intravascular Ultrasound and Venography

- Compared with IVUS,
 - venography underestimates stenosis by 14%.
 - CTA overestimates stenosis by 4.9%.
- CTA % stenosis = useful to predict IVUS % stenosis
- In absence of CTA, IVUS, not venography should be used to evaluate % stenosis



Area of Reference Common Iliac Vein, Corresponding to Theoretical Diameter and Matching Choice of Stent Size

Measured Reference Vessel Area (mm ²)	theoretical Reference Vessel Diameter (mm)	Selected Stent Diameter (mm)
50.27	8	8-10
78.54	10	10-12
113.1	12	12-14
153.94	14	14-16
201.06	16	16-18
254.47	18	18-20
314.16	20	20-22
380.13	22	22-24



Stent migration: other causes

- Zones of instability
 - Abrupt difference in caliber between 2 contiguous zones
 - Stent extrusion
- High blood flow
- Rapid device deployment
- No long guidewire in the IVC (SVC) +++
- Unfamiliar equipment
- Inadequate experience, imaging



Rule # 3

Some material can't safely come out
and should be repositioned in a safe zone



Clinical and Technical Aspects of Cases in which Misplaced or Migrated Endovascular Stents were Managed Percutaneously

Patient/Sex/ Age (y)	Intended Stent Location	Lost Stent Location	Reason for Misplacement or Migration	Stent Type and Size	Retrieval Technique	Largest Sheath (F)	Outcome/Stent Location
1/M/46	SVC	L PA	Too small	PS30	Reposition with balloon	9	R EIV
2/F/67	L CIV	IVC	Ruptured balloon	P308	Remove with balloon	10	Removed percutaneously
3/F/76	L CCA	Aorta	Dislodged from balloon	P294	Reposition with balloon	8	R CIA
4/M/62	SVC	R CIV	Too small	P308	Reposition with balloon	10	R CIV
	SVC	R CIV	Too small	P394	Reposition with balloon	10	L EIV, with WS2445
5/M/67	R renal artery	Aorta	Dislodged from balloon	P154	Reposition with balloon	8	L EIA
6/M/77	R renal artery	Aorta	Dislodged from balloon	P204	Reposition with balloon	14	L SCA
7/M/60	Hepatic IVC	Renal IVC	Ruptured balloon	P308	Reposition with balloon	12	IVC
8/F/43	Axillary vein	RV	Too small	P154	Unsuccessful	14	Surgically removed from heart
9/F/53	R renal artery	Aorta	Dislodged from balloon	P154	Reposition with balloon	8	L EIA
10/M/25	UE vein	R PA	Too small	P294	Reposition with balloon	8	L EIV
11/M/67	R UE vein	RV	Too small	WS	Snare	8	Removed percutaneously
12/M/58	L SCA	Aorta	Caught on catheter	P204	Reposition with balloon	8	L CIA
13/M/57	TIPS	IVC	Too small	WS1260	Snare/balloon	10	Removed percutaneously
14/F/70	R SCV	SVC	Too small	WS1455	Forceps, snare	12	Surgically removed from femoral vein
15/M/63	IVC	RA	Too small	WS1890	Guidewire snare	24	Removed percutaneously
16/M/44	TIPS	SMV	Too long	WS1260	Forceps, snare	24	Removed percutaneously
	TIPS	TIPS IVC	Too small	WS1690	Forceps, guidewire snare	24	Removed percutaneously
17/F/40	L renal artery	R EIA	Too small	P104	Reposition with balloon	9	R EIA
18/M/36	TIPS	RA	Too small	WS1068	Snare	12	Removed percutaneously
19/F/64	L CIV	L CIV IVC	Too small	WS1260	Guidewire snare, snare	16	Removed percutaneously
20/F/52	TIPS	TIPS IVC	Too long	WS1094	Snare	12	Removed percutaneously
21/M/54	Aorta	Aorta	Too small	WS1260	Snare	16	Surgically removed from femoral artery
22/M/53	L renal artery	Aorta	Caught on catheter	P154	Reposition with balloon	8	R CIA
23/M/40	TIPS	RA	Too long	WS1068	Guidewire snare, snare	14	Removed percutaneously
24/M/69	R CIA	Aorta	Dislodged from balloon	P154	Reposition with balloon	7	L CIA
25/F/40	R renal artery	Aorta	Too small	P104	Remove with balloon	20	Removed percutaneously

Note.—SVC = superior vena cava, L = left, CIV = common iliac vein, CCA = common carotid artery, R = right, IVC = inferior vena cava, UE = upper extremity, SCA = subclavian artery, SCV = subclavian vein, CIA = common iliac artery, PA = pulmonary artery, RV = right ventricle, RA = right atrium, SMV = superior mesenteric vein, EIA = external iliac artery, PS = Palmaz-Schatz, P = Palmaz, WS = Wallstent, EIV = external iliac vein. The size listed for each Wallstent is a combination of the stent diameter and the stent length when fully self-expanded. If stent size is not given, it is unknown.

Misplaced, migrated stents
 20/801 or 2.5%
 in 5 years

Cardiopulmonary migration
 3: RA } Perc treatment
 2: PA }

RV migration
 2: RV :1 rigid; surgery
 1 WS; extraction

Which treatment?
 Rigid stent → repo, surgery
 Flexible stent → extraction




Rule # 4

When things go wrong....call for help



Symptomatic stent in RV

- Brutal onset of chest pain
- ± syncope
- Arrhythmias
- Acute decompensation, hemodynamic collapse
-  Cardiac insufficiency (TR), perforation, tamponnade
- Imaging
 - CXR, CT
 - Echocardiography +++



Complications related to stent migration, manipulation

- Intimal damage, dissection
- Arrhythmias, cardiac perforation, tamponnade
- Valvular damage, risk of acute decompensation
- Stent migration to a more dangerous or difficult place for percutaneous extraction or surgery
- Echocardiography to verify valvular function before and after any attempt to recuperate a stent from the RV

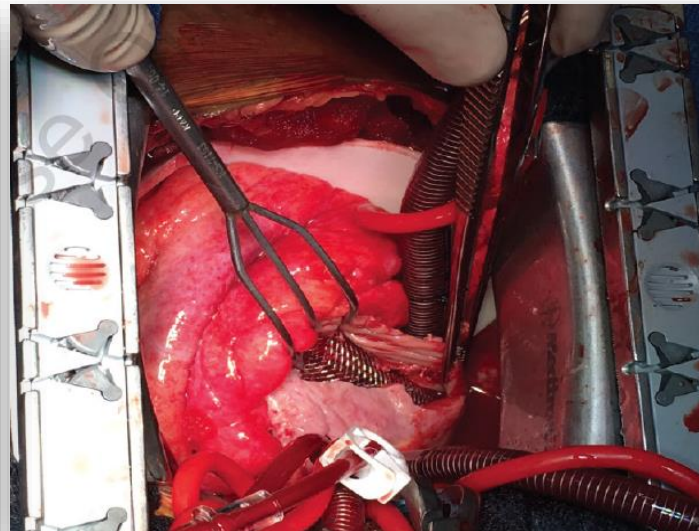
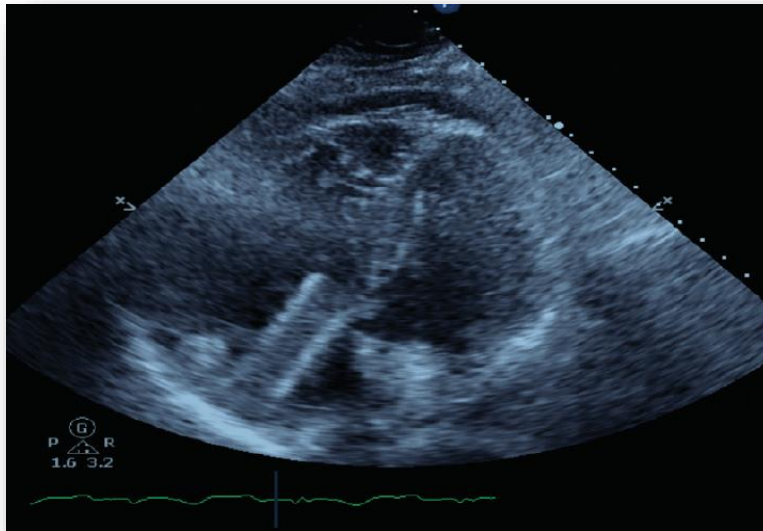




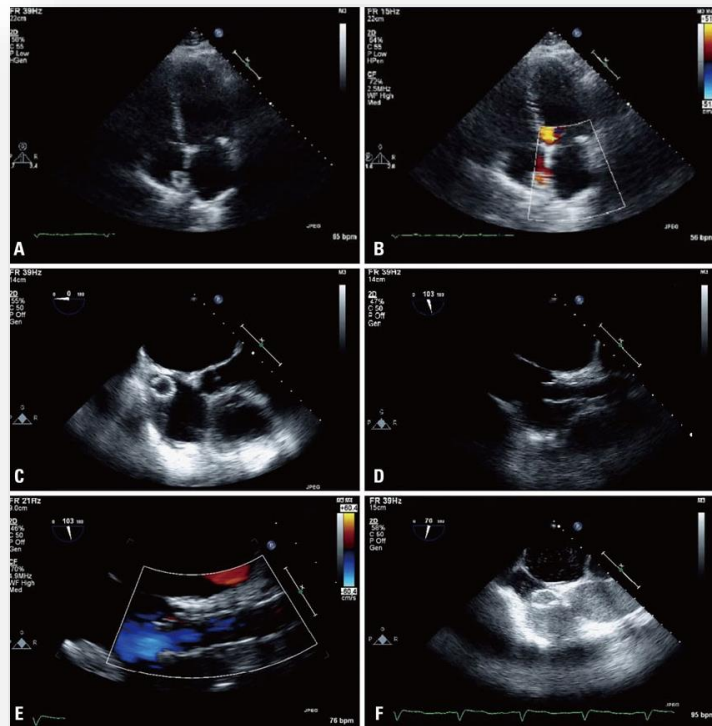
Table 1. Demographics on Reported Cases of Stent Migration in Chronic Venous Insufficiency and Clinical Outcome.

Author	Indication-Presentation	Migration to	Surgical vs Endovascular Removal	Outcome	Heart Injury	ECG Changes	Sex	Age	CEAP Score
Toyoda N et al ¹⁷	Chronic venous insufficiency Lower extremity edema, venous stasis dermatitis, and ulceration	Right ventricle	Surgical removal	Survived	None	Premature atrial contraction	M	33	5
Ashar RM et al ²⁰	Right iliac vein stenosis, DVT Right lower extremity edema	Right ventricle and pulmonary artery	Endovascular removal	Survived	Not reported	Ventricular arrhythmia	M	32	3
El Feghaly M et al ¹⁸	May-Thurner syndrome Vulvar varicosities	Right ventricle	Endovascular removal	Survived	Moderate regurgitation of the tricuspid valve	Unknown	F	33	2
Ibrahim M et al ²¹	May-Thurner syndrome Left lower extremity edema	Right ventricle	Surgical removal	Survived	Tricuspid regurgitation, constrictive pericarditis, heart failure	Unknown	M	27	3
Hoffer E et al ²²	Iliac vein stenosis secondary to radiation therapy Unknown presentation	Right ventricle	Surgical removal	Survived	Moderate regurgitation of the tricuspid valve	Nonsustained ventricular tachycardia	F	53	Unknown
Mullens W et al ²³	May-Thurner syndrome Left lower extremity edema	Tricuspid valve, right ventricle	Surgical removal	Survived	Tricuspid regurgitation	Atrial fibrillation	F	55	3

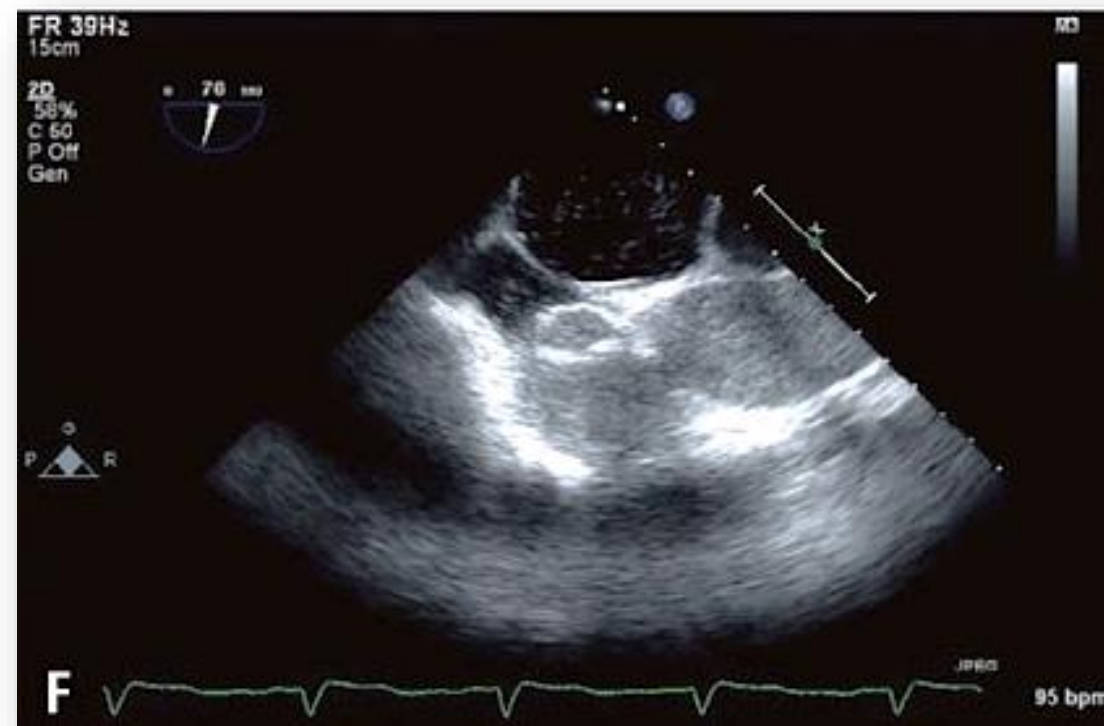


Must we always remove a poorly-positioned or migrated stent?

Presentation



3 months





Take-away points

- Size does matter!
- Location, location, location!
 - Don't redeploy in same location implicated in stent migration
 - Rigid stents → reposition in stable location
 - Flexible stents → percutaneous removal, if safe
 - Bare stent, permeable, non-occlusive, in stable zone with high flow in asymptomatic patient → probably safe. »Let it be. «
 - Covered stent in same circumstances: may be safe?
 - Covered stent in other circumstances: redeploy to safe zone or remove



- Catheters, guidewires, temporary endovascular material, coils:
 - remove if possible.
- Use plugs instead of coils to occlude high flow vessels
- Stent trapped in RV
 - Symptomatic patient: arrhythmias, decompensation
 - Echocardiography: assess valvular function, effusion before and after any attempt to recuperate a stent from the RV to R/O TV damage, perforation, tamponnade
 - Surgical removal + valve repair, as needed