

May-Thurner syndrome

Introduction

- Most patients with iliac vein compression syndrome (IVCS) or May-Thurner syndrome are young to middle-aged women and are asymptomatic. Symptomatic patients often present with left lower limb edema, pain, varicosities, venous claudication, venous stasis and ulceration, and deep venous thrombosis.
- Chronic lower limb edema can be treated conservatively. However, patients with symptomatic IVCS are often failed by conservative treatment.
- Many patients with left iliofemoral venous thrombosis associated with IVCS have been overlooked. Multidetector CT scan and iliac venography may play important role in the diagnosis of IVCS.

The Patient

- **Case History**

A 15-year-old girl has suffered from right lower limb swelling since her eight months old. There was no pain and no itching. She has no systemic disease.

At vascular surgery clinic, physical examination revealed skin

thickening and mild lichenification of the swelling right lower limb.

- **Diagnosis**

May-Thurner syndrome or iliac vein compression syndrome

- **Findings**

1. MDCT scan of the whole abdomen was performed with routine injection of contrast medium via forearm superficial vein and administration of diluted contrast medium simultaneously via sheath in left external iliac vein and angiocatheter in right common femoral vein immediately after angiographic procedure. The total volume of contrast injection for the combined examinations was 120cc.
2. MDCT scan and reconstructed images show compression of the proximal portion of the left common iliac vein by the *right* common iliac artery. Finding of CT images was compatible to May-Thurner syndrome or IVCS.

- **Take-home message**

1. In symptomatic IVCS, endovascular venous stenting is helpful to achieve a high venous patent rate from 12 to 24 months.
2. Angiography and venography have been considered as a diagnostic imaging of choice for IVCS. A combined MDCT scan and reconstructed images maybe helpful to provide stereotactic anatomic details supplementing conventional angiography.

Protocols

● Scan Parameters

Scanner (no of Slices)	64
Scan Area	Abdomen and pelvis
Scan Direction	Feet First Supine
Scan Time (s)	4.75
Tube Voltage (kV)	120
Tube Current (eff.mAs, adap.to Pitch)	247-499
Dose Modulation	Yes
CTDIvol (mGy)	16.25
Rotation Time (s)	0.5
Pitch	0.984
Slice Collimation (mm)	64x0.625

● Reconstruction Parameters

Slice Width (mm)	2.5
Reconstruction Increment (mm)	2.5
Reconstruction Kernel	Text
Additional Row 1	Text
Additional Row 2	Text
Additional Row 3	Text
Additional Row 4	Text
Additional Row 5	Text
Additional Row 6	Text
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● Contrast Injection Protocol (I)

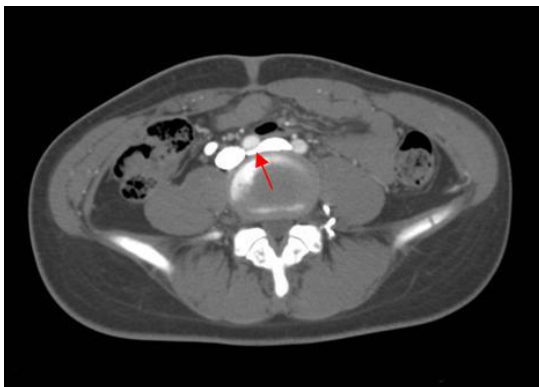
Contrast media conc. (mg I / ml)	370
CM Volume (ml)	90
CM injection rate (ml / s)	2.3(55 ml), 5.5(diluted CM 35 ml)
IDR (Iodine delivery rate) (g I / s)*	1.769, 1.41
Body weight adaption (yes/no)	Yes
Monophasic / Biphasic	Triphasic
Bolus tracking threshold ((HU) or na)	180
ROI position	Descending aorta
Scan delay ((s) or peak time)	29
Saline flush volume (ml)	20
Saline flush injection rate (ml/s)	5.5

- Contrast Injection Protocol (II)

Needle Size (G)	18G
Injection Site	Femoral vein
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Images

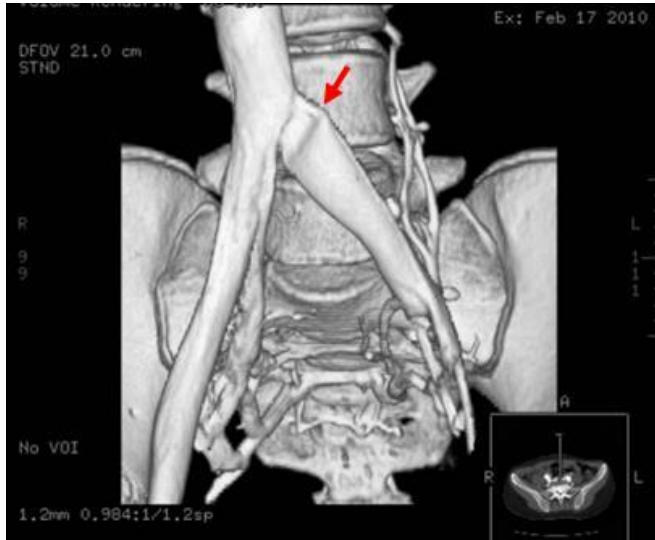
- MDCT angiogram and iliac venogram shows anterior compression of left common iliac vein (arrow) by the right common iliac artery.



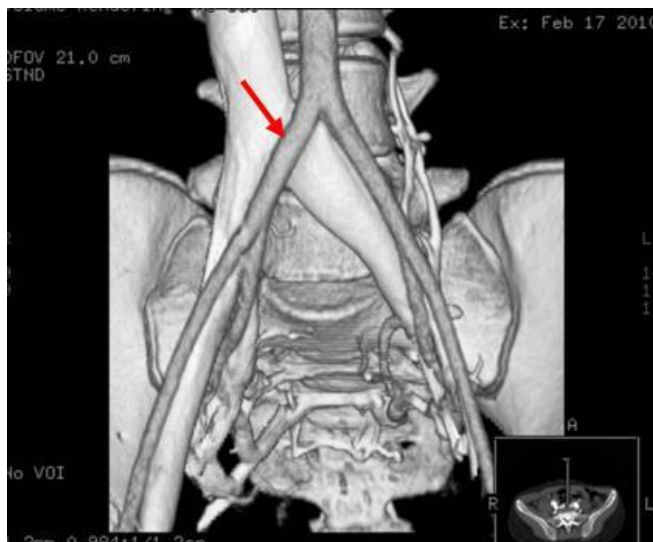
- Coronal CT angiogram shows right common iliac artery overriding left common iliac vein. a = abdominal aorta, v = inferior vena cava.

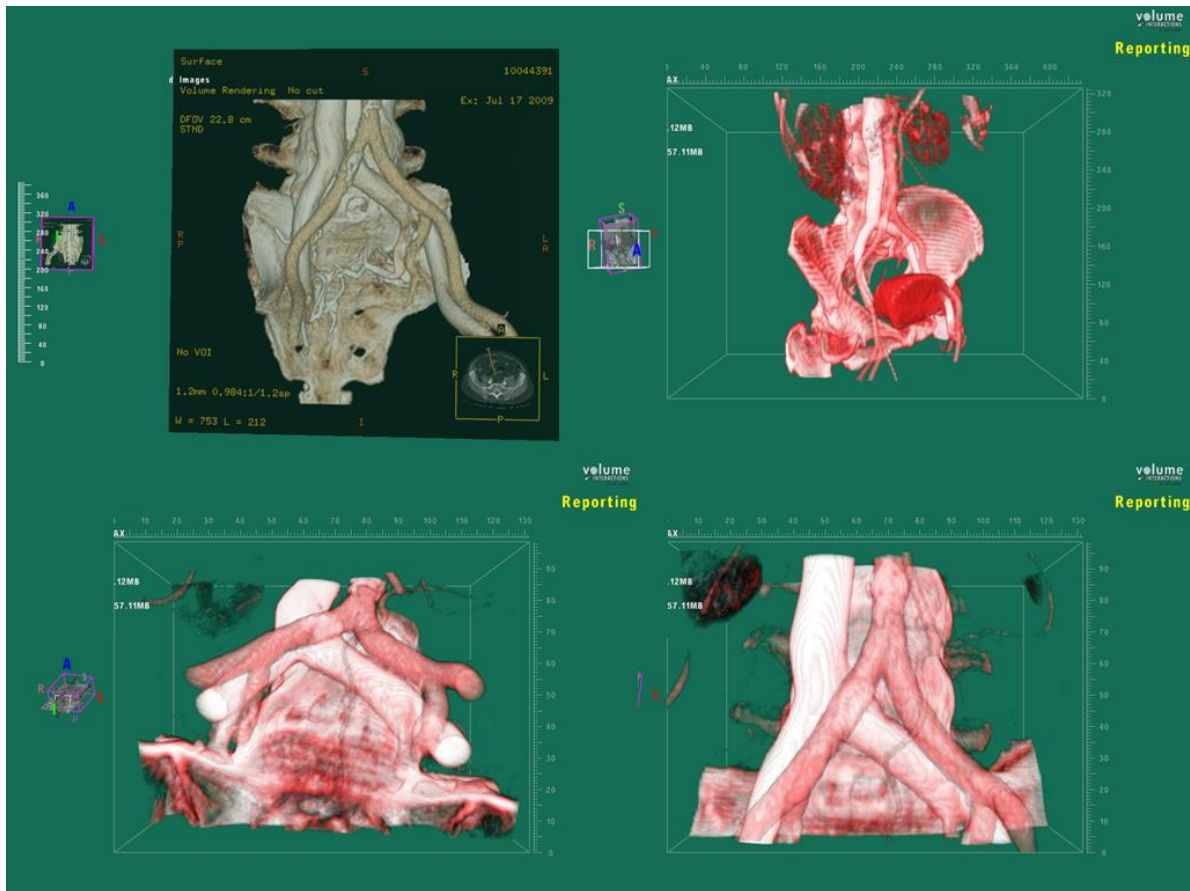


- Common iliac vein reconstructed image shows a clear profile of anterior indentation groove (arrow) at left common iliac vein.



- Combined common iliac artery and vein reconstructed image shows the right common iliac artery (arrow) overlying the left common iliac vein.





References

1. May R, Thurner J. The cause of the predominantly sinistral occurrence of thrombosis of the pelvic veins. *Angiology* 1957; 8: 419–48
2. Kasirajan K, Gray B, Ouriel K. Percutaneous AngioJet thrombectomy in the management of extensive deep vein thrombosis. *J Vasc Interv Radiol* 2001; 2: 179–85
3. Shebel ND, Whalen CC. Diagnosis and management of iliac vein compression syndrome. *J Vasc Nurs* 2005; 23: 10–7
4. Heijmen RH, Bollen TL, Duyndam DAC, Overtom TTC, Van Den Berg JC, Moll FL. Endovascular venous stenting in May-Thurner syndrome. *J Cardiovasc Surg* 2001; 42: 83–7
5. Oguzkurt L, Tercan F, Pourbagher MA, Kizilkilic O, Turkoz R, Boyvat F. Computed tomography findings in 10 cases of iliac vein compression (May-Thurner) syndrome. *Eur J Radiol* 2005; 55: 421-5

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Aortic dissection

Introduction

1. Acute aortic dissection is the most common aortic emergency and often has a fatal outcome. It occurs in approximately 2 out of every 10,000 people, predominately in men aged 40 to 70.
2. Acute aortic dissection causes sudden chest pain with cold sweat. Typically the pain moves as the dissection gets worse.
3. Acute proximal or distal dissection with complications should be critically treated by surgery or endovascular repair.
4. MDCT angiogram is an imaging of choice to screen and diagnose patients with aortic dissection for critical surgical planning.

The Patient

- **Case History**

A 35-year-old man suffered from sudden onset of severe chest pain, radiating to back and left arm. At the same time, he also felt cold sweating and mild shortness of breath. Nausea was also noted. At emergency department, high blood pressure (244/126 mmHg) was noted. Chest film showed widening of mediastinum.

- **Diagnosis**

Aortic dissection, Stanford type B.

● **Findings**

MDCT angiogram shows aneurysmal dilatation of the thoracic aorta with dissection from aortic arch to right common iliac artery. The perfusion of both kidneys are intact

● **Take-home message**

1. Chest pain is the most common presenting symptom in patients with aortic dissection.
2. Most patients are associated with high blood pressure, which is present in more than two thirds of people who have an aortic dissection.
3. MDCT allows early detection and characterization of aortic dissection, providing powerful imaging tool to optimize treatment and improve clinical outcomes.

Protocols

● **Scan Parameters**

Scanner (no of Slices)	64
Scan Area	Whole body
Scan Direction	Feet First Supine
Scan Time (s)	4.68
Tube Voltage (kV)	120
Tube Current (eff.mAs, adap.to Pitch)	499
Dose Modulation	Yes
CTDIvol (mGy)	15.02
Rotation Time (s)	0.5
Pitch	1.375
Slice Collimation (mm)	64x0.625

- Reconstruction Parameters

Slice Width (mm)	5
Reconstruction Increment (mm)	5
Reconstruction Kernel	Text
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Additional Row 5	Text
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Additional Row 7	Text

- Contrast Injection Protocol (II)

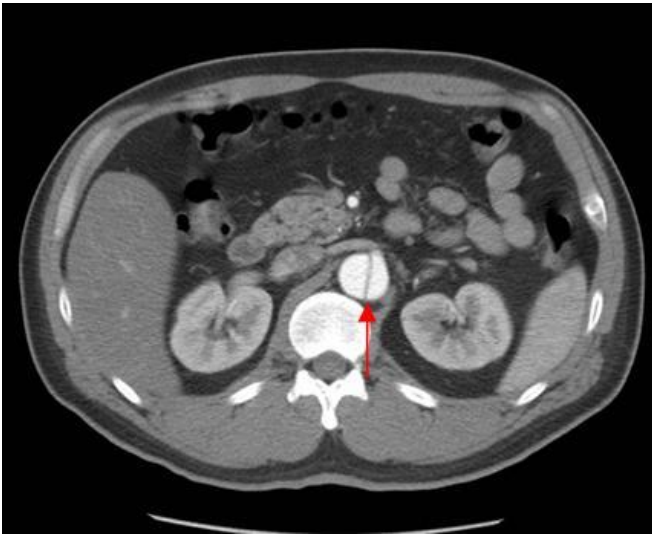
Needle Size (G)	20G
Injection Site	Forearm to elbow
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Images

- Axial MDCT angiogram shows aneurysmal dilatation of thoracic aorta with aortic dissection (arrow)



- Axial MDCT angiogram shows dissection (arrow) of the descending aorta.

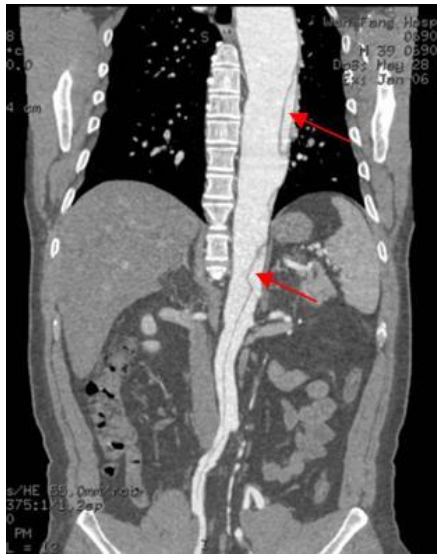


- Oblique reformatted image shows long segment of aneurysmal dilatation of the aorta, with dissection (arrow).



- Coronal reformatted image shows intimal flap of the descending aorta with aortic dissection (arrow), with involvement to the right common iliac artery.

Aortic dissection



References

1. <http://www.americanheart.org/presenter.jhtml?identifier=3005390>
2. <http://www.nlm.nih.gov/medlineplus/ency/article/000181.htm>
3. Guangqi C, Xiaoxi L, Wei C, Songqi L, Chen Y, Zilun L, Shenming W. Endovascular repair of Stanford type B aortic dissection: early and mid-term outcomes of 121 cases. *Eur J Vasc Endovasc Surg* 2009; 38: 422-6
4. McMahon MA, Squirrell CA. Multidetector CT of aortic dissection: a pictorial review. *Radiographics* 2010; 30: 445-60

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Duplicated inferior vena cava

Introduction

1. Duplicated inferior vena cava (IVC) is a rare congenital abnormality, accounting 0.2-0.3% in patients with congenital heart malformations. It is often asymptomatic but may be associated with various urogenital tract anomalies.
2. The left IVC typically ends at the level of the left renal vein. However, variations in the development of the suprarenal IVC are possible.
3. MDCT is helpful to recognize variety of anatomic and incidental anomalies relevant to preoperative planning.

The Patient

- **Case History**

A 51-year-old man suffered from pain, swelling and recurrent cellulitis at bilateral legs and discoloration over bilateral feet for four years. He had history of gout for 10 years and hypertension for 8 years. He also received surgery for bilateral varicose vein 30 years ago.

At vascular surgery clinic, physical examination revealed swelling with local heat over his bilateral lower limbs. An old ulceration on his left leg also was noted.

- **Diagnosis**

Infrarenal duplicated IVC.

- **Findings**

MDCT scan of the whole abdomen was performed with routine injection of contrast medium via forearm superficial vein and administration of diluted contrast medium simultaneously via sheath in left external iliac vein and angiocatheter in right common femoral vein immediately after angiographic procedure. The total volume of contrast injection for the combined examinations was 120cc. There was no communication between bilateral common iliac veins . At infrarenal level, two vascular structures was noted at para-aortic space. The left one joined to IVC at L1-2 level. Duplication of IVC was compatible. No other accompanying urogenital tract anomalies was identified.

- **Take-home message**

1. Duplicated IVC may associated with various urogenital tract anomalies such as horseshoe kidneys and circum-aortic renal collar.
2. MDCT angiography and urography allow confident detection and classification of a variety of anatomic and incidental anomalies relevant to the preoperative selection of potential laparoscopic renal donors and to surgical planning.

Protocols

- Scan Parameters

Scanner (no of Slices)	64
Scan Area	Abdomen and pelvis
Scan Direction	Foot first supine
Scan Time (s)	6.53
Tube Voltage (kV)	120
Tube Current (eff.mAs, adap. to Pitch)	499
Dose Modulation	Yes
CTDIvol (mGy)	20.97
Rotation Time (s)	0.5
Pitch	0.984
Slice Collimation (mm)	64x0.625

- Reconstruction Parameters

Slice Width (mm)	2.5
Reconstruction Increment (mm)	2.5
Reconstruction Kernel	Text
Additional Row 1	Text
Additional Row 2	Text
Additional Row 3	Text
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- Contrast Injection Protocol (I)

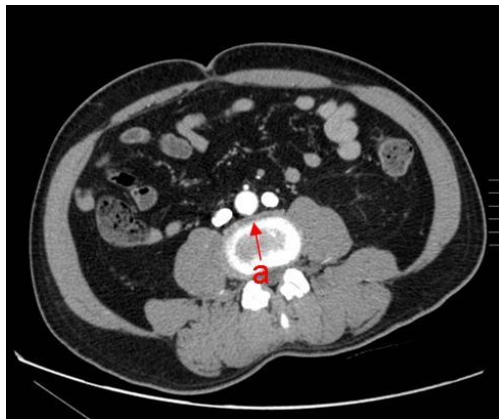
Contrast media conc. (mg I / ml)	370
CM Volume (ml)	90
CM injection rate (ml / s)	2.5(70ml), 5.5(diluted, 20ml CM)
IDR (Iodine delivery rate) (g I / s)*	1.692, 1.73
Body weight adaption (yes/no)	Yes
Monophasic / Biphasic	Triphasic
Bolus tracking threshold ((HU) or na)	180
ROI position	Descending aorta
Scan delay ((s) or peak time)	37
Saline flush volume (ml)	20
Saline flush injection rate (ml/s)	5.5

● Contrast Injection Protocol (II)

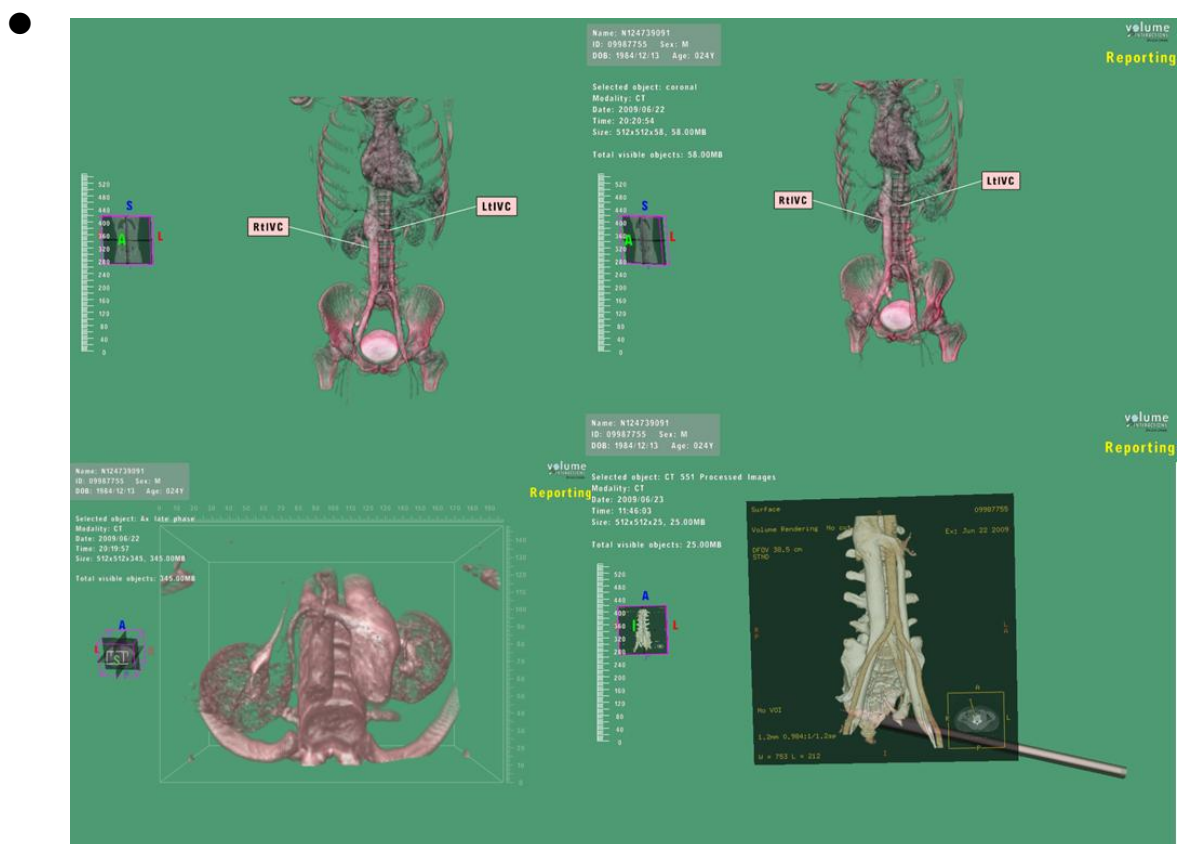
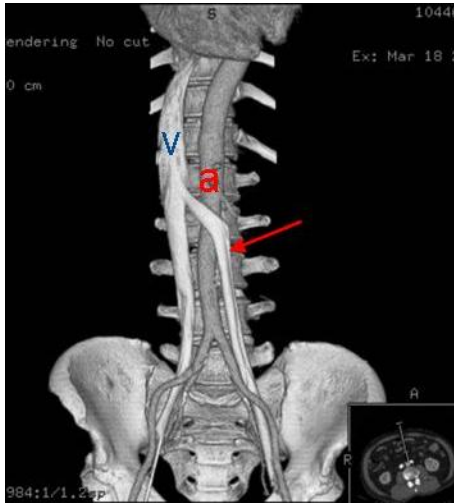
Needle Size (G)	18G
Injection Site	Bilateral femoral veins
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Images

- Combined MDCT angiogram and iliac venogram shows two vascular structures at bilateral paraaortic regions, compatible with duplicated IVC. a = abdominal aorta



- Combined aorta and IVC reconstructed image clearly shows the relationship of the aorta and the duplicated IVC. The left-side IVC (arrow) joins into its right side at infrarenal, L1-2 level. a = abdominal aorta, v = inferior vena cava



References

1. Brochert A, Reynolds T. Unusual duplication anomaly of the inferior vena cava with normal drainage of the right IVC and hemiazygous continuation of the left IVC. *J Vasc Interv Radiol* 2001; 12: 1453-5
2. Ng WT, Ng SS. Double inferior vena cava: a report of three cases. *Singapore Medical Journal* 2009; 50: 211-3
3. Simsek S, Berg FG, Nanayakkara PWB et al. Anomaly of the inferior vena cava causing recurrent deep vein thrombosis in a young male. *European Journal of Internal Medicine* 2004; 15: 251-4
4. Mani N, Venkataramu NK, Singh P, Suri S. Duplication of IVC and associated renal anomalies. *Indian J Radiol Imaging* 2000; 10: 157-8
5. Raman SS, Pojchamarnwiputh S, Muangsomboon K, Muangsomboon K, Suhulam PG, Gritsch HA, Lu DS. Surgically relevant normal and variant renal parenchymal and vascular anatomy in preoperative 16-MDCT evaluation of potential laparoscopic renal donors. *AJR Am J Roentgenol* 2007; 188: 105-14

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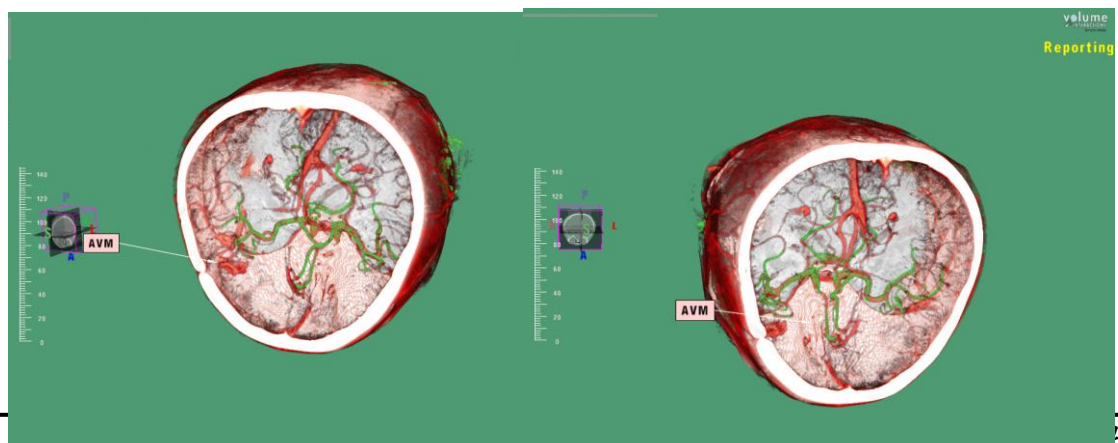
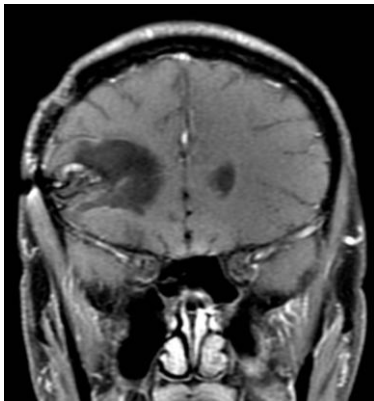
Case 1

Cerebral arteriovenous malformation (AVM)

Case History

- Male, 24 y/o
- Seizure attack and intracerebral hemorrhage at right sylvian fissure, s/p surgery at Chung-Hsin Hospital
- Repeat seizure attack many times, s/p cyberknife therapy at Hsin-Kong Hospital.
- In this admission, the patient suffered from palpitation and tachycardia after taking Dilantin and phenobarbital.
- Angiogram shows residual AVM at right frontal lobe, with arterial supply from branches of MCA and venous drainage via enlarged vein of Labbe into transverse sinus

Images



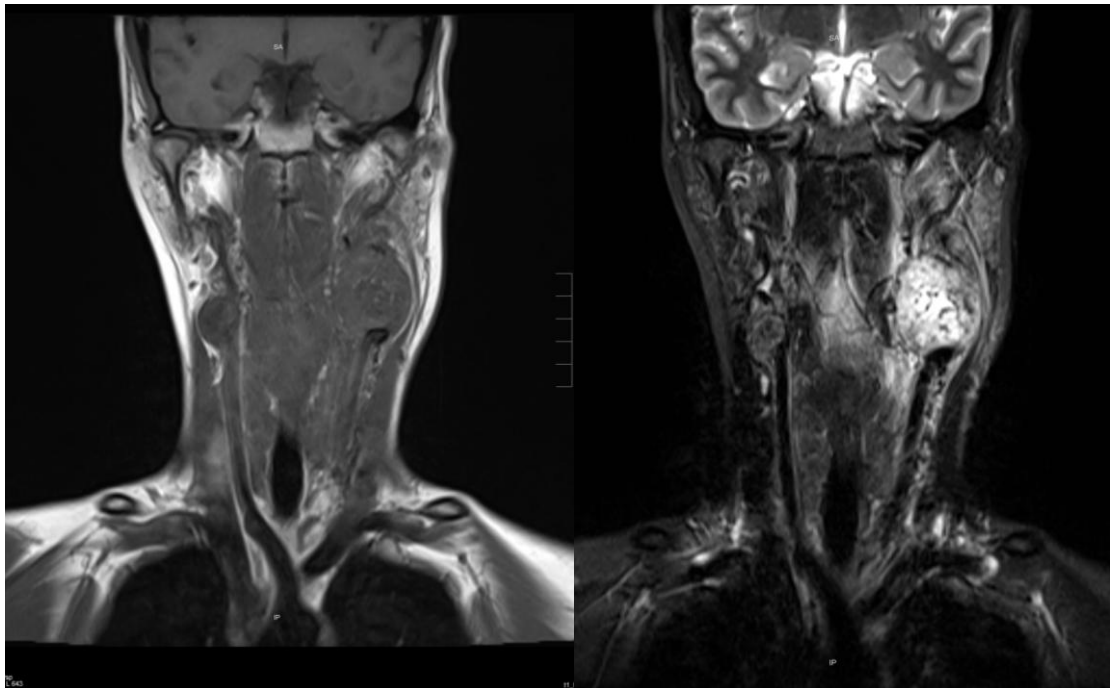
Case2

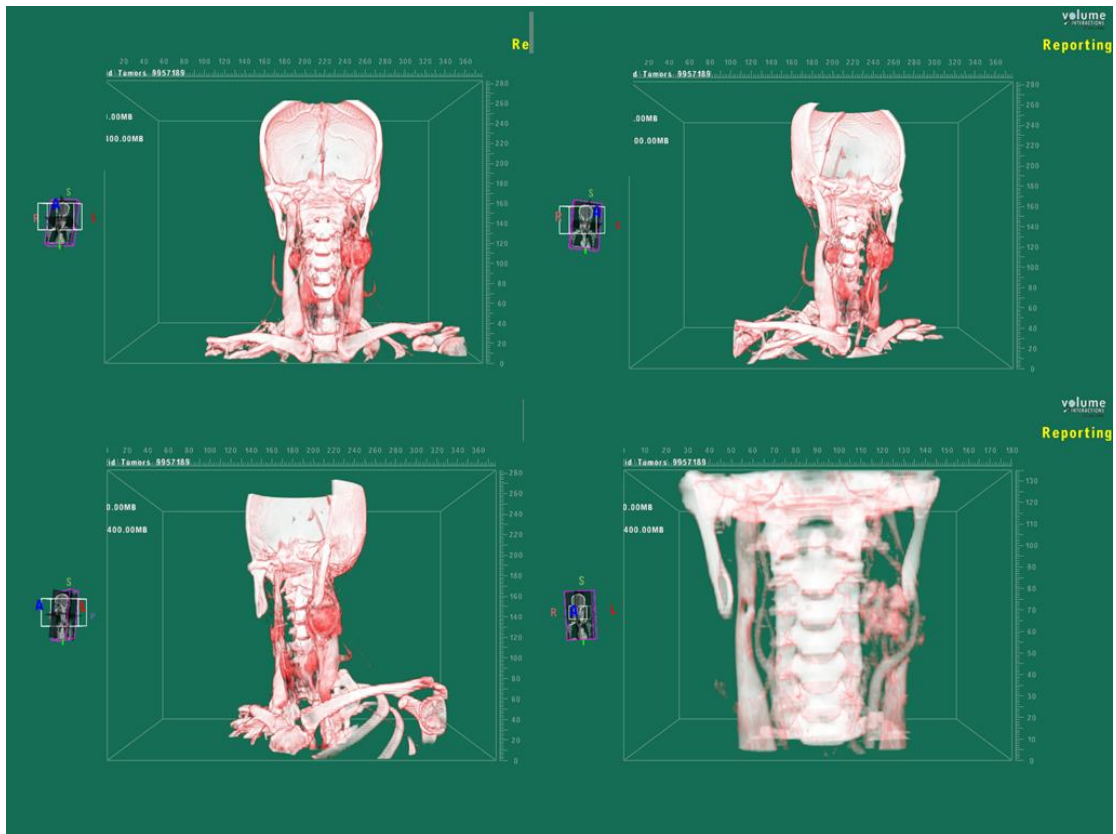
Bilateral carotid body tumors

Case History

- ID: 09XXX189, Female, 36 y/o
- A progressive enlarged protruding mass over left neck for many years
- MRI of neck shows a soft-tissue mass, 4.6x3.8x3.5cm, at left carotid body causing splaying of carotid bifurcation with 'salt and pepper' pattern, with obvious enhancement, consistent with carotid body tumor. Another mass, 2.0x1.9x1.8cm, with similar MRI appearance at right carotid body is noted.
- Received cyberknife radiosurgery

Images





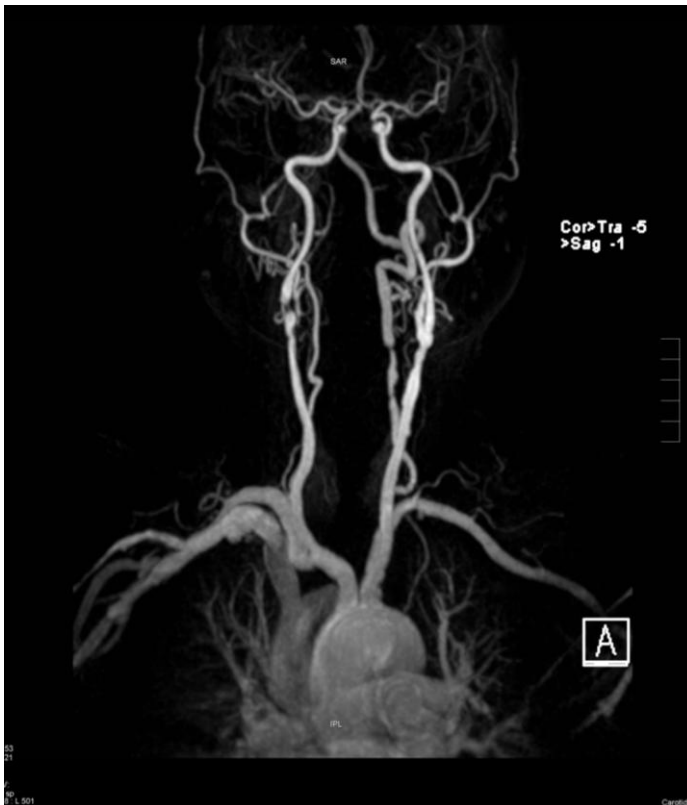
Case 3

Bilateral common carotid arterial stenoses

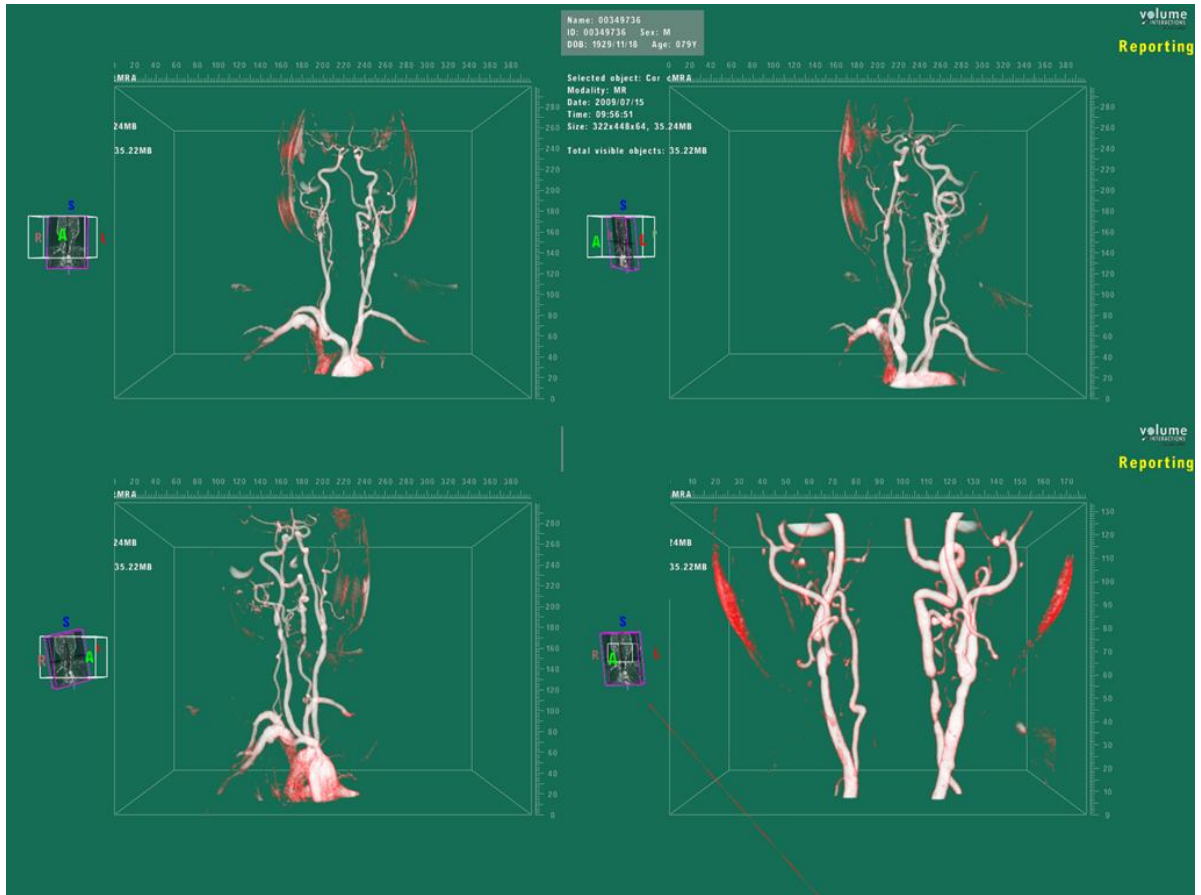
Case History

- Male, 79 y/o
- Intermittent dizziness with blurred vision of bilateral eyes, especially at left eye, for many years. Each episode of dizziness persisted 3 to 4 minutes and spontaneously improved after rest.
- MRI of neck shows high-grade stenosis of left internal carotid artery, with slow flow.
- Received angioplasty treatment
- Histology: blood vessel, artery, carotid, left, endarterectomy, calcified plaque (stenoses clinically)

Images



Case series



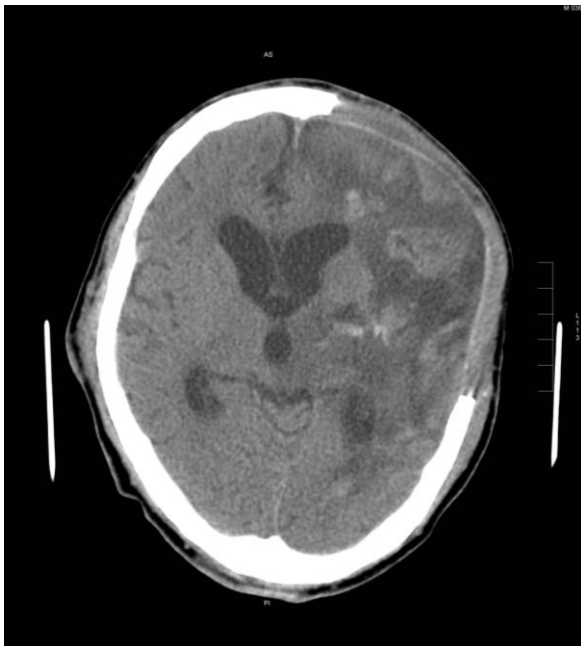
Case 4

Post-traumatic cerebral aneurysm

Case History

- ID: 00XXX511, Male, 36 y/o
- Fell down during vacation at Thailand, received craniotomy.
- Plain CT scan shows round-shape aneurysmal like mass attaching anterior horn of left lateral ventricle.
- Received cranioplasty.

Images





Case 5

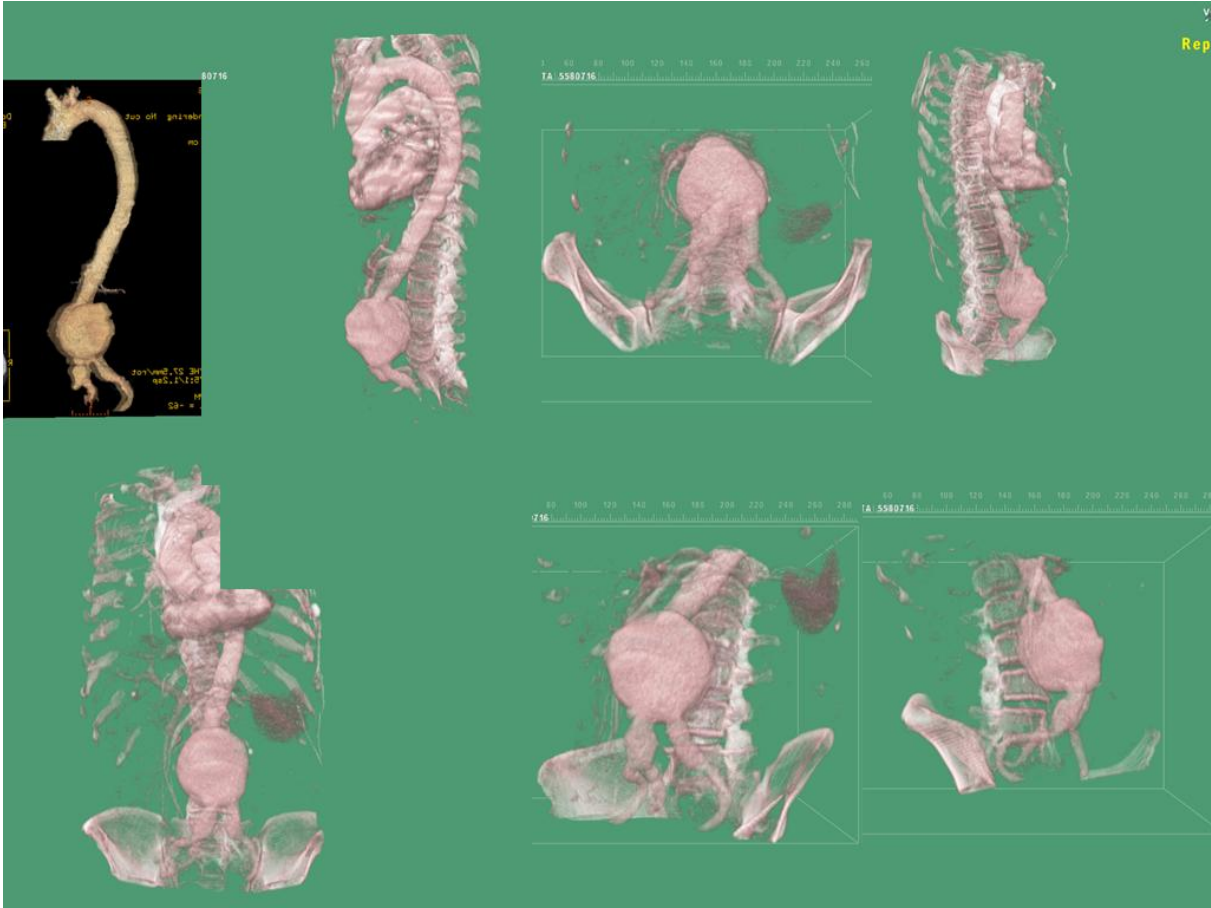
Huge abdominal aortic aneurysm

Case History

- ID: 05XXX716, Female, 82 y/o
- Sudden onset of conscious loss in the morning. She had low-back pain and lower limb weakness before noon yesterday.
- PE: 82/60mmHg; PR, 108bpm; RR, 35bpm; 34.4°C
- A huge pulsating mass over periumbilicus area.
- CT scan shows a huge infrarenal aneurysm, 9.8x8.5cm, at abdominal aorta just above bifurcation.
- Received emergent surgery.

Images





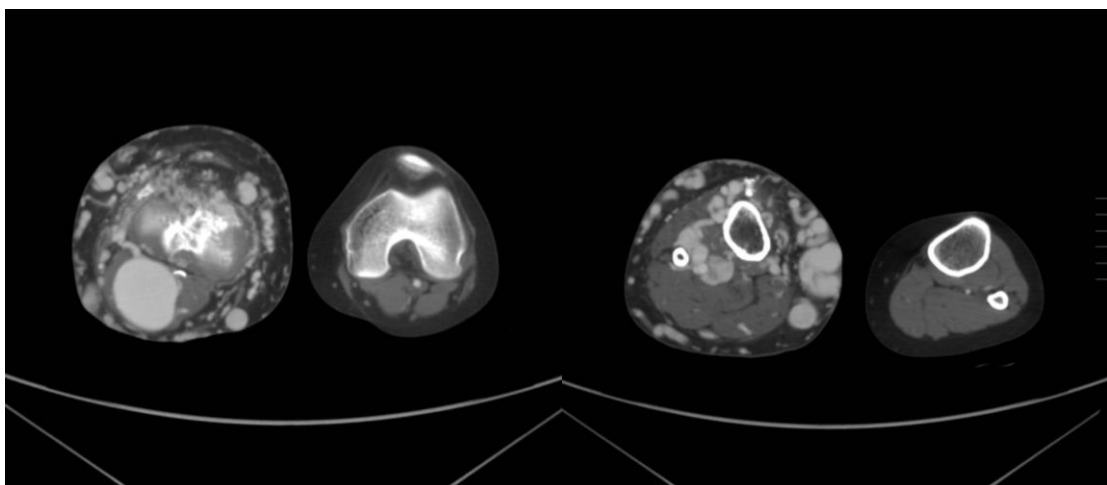
Case 6

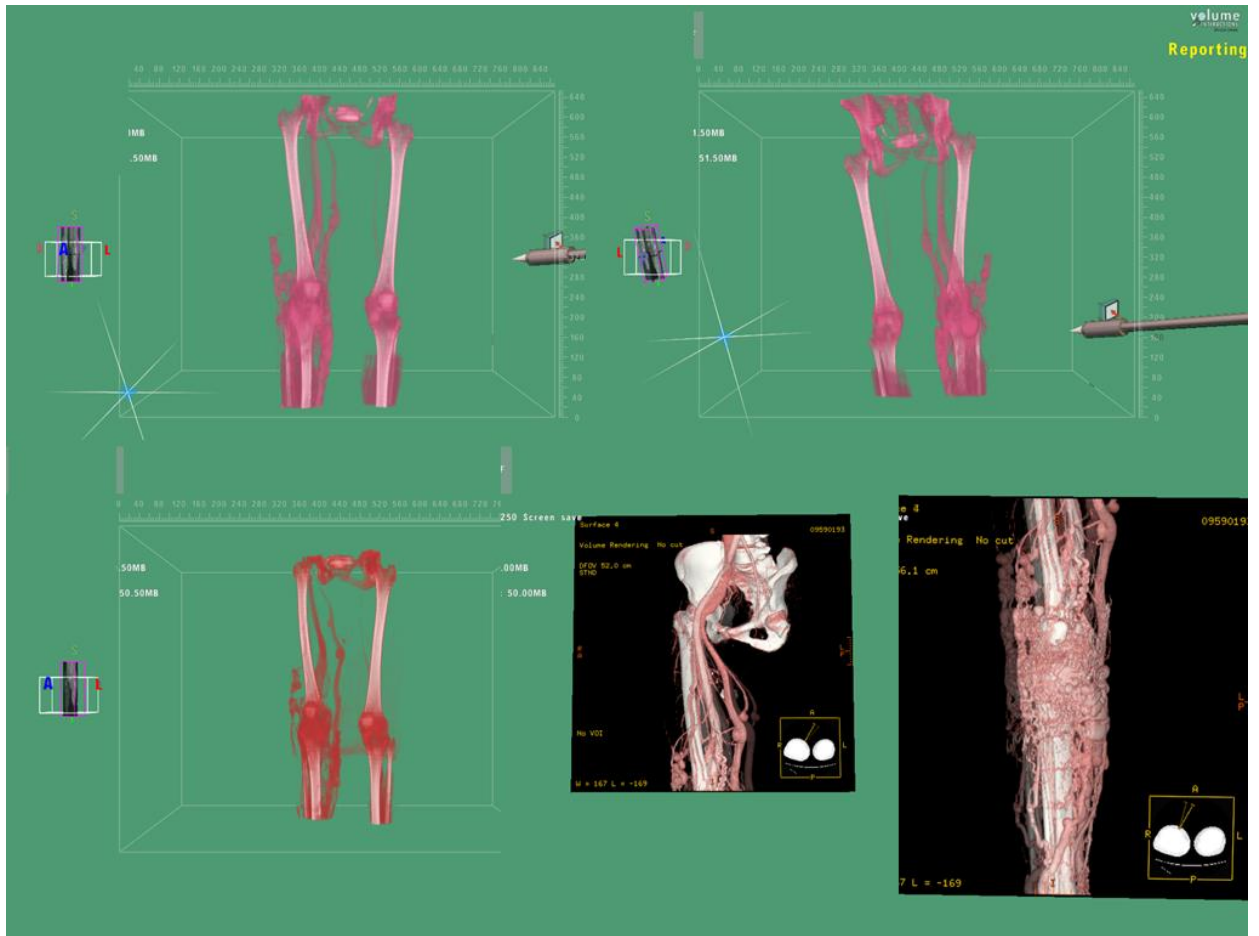
Right lower limb arteriovenous malformation (AVM)

Case History

- Female, 29 y/o
- Swelling of right lower limb since childhood. The symptom was aggravated by prolonged standing or walking. Discoloration of skin and swelling getting worse was noted.
- PE revealed venous dilatation and hemangioma over right foot. Audible bruit was noted over right lower abdomen.
- Arteriogram shows an aneurysm at distal popliteus artery associated with engorged surrounding veins at distal right lower extremity.
- Histology: blood vessel, thigh and knee, AVM.
- Received surgery.

Images





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