Aortic Dissection

Joseph BK Kim

05/25/2021

RAD4001: General Radiology

Manickam Kumaravel, MD and Pritish Bawa, MD

UTHealth®
The University of Texas
Health Science Center at Houston | McGovern
Medical School

Clinical History

Mr. J is a 59 yo white/Caucasian male w no PMH who presented with acute onset bilateral upper extremity weakness and chest pain w SOB. Patient became agitated and combative and was intubated.

Clinical Information

Physical Exam: Intubated and Sedated, Afebrile, Vital Signs within normal (HR 96, RR 17, SpO2% 93, BP 105/57), palpable pulses in all 4 extremities, no murmurs, rubs, or gallops

Lab tests show elevated lactic acid (12.7 mMol/L) and elevated WBC (13.5), ECG shows sinus tachycardia with no ST segment elevations, bedside ultrasound showing aortic dissection flap

Example of Aortic dissection flap
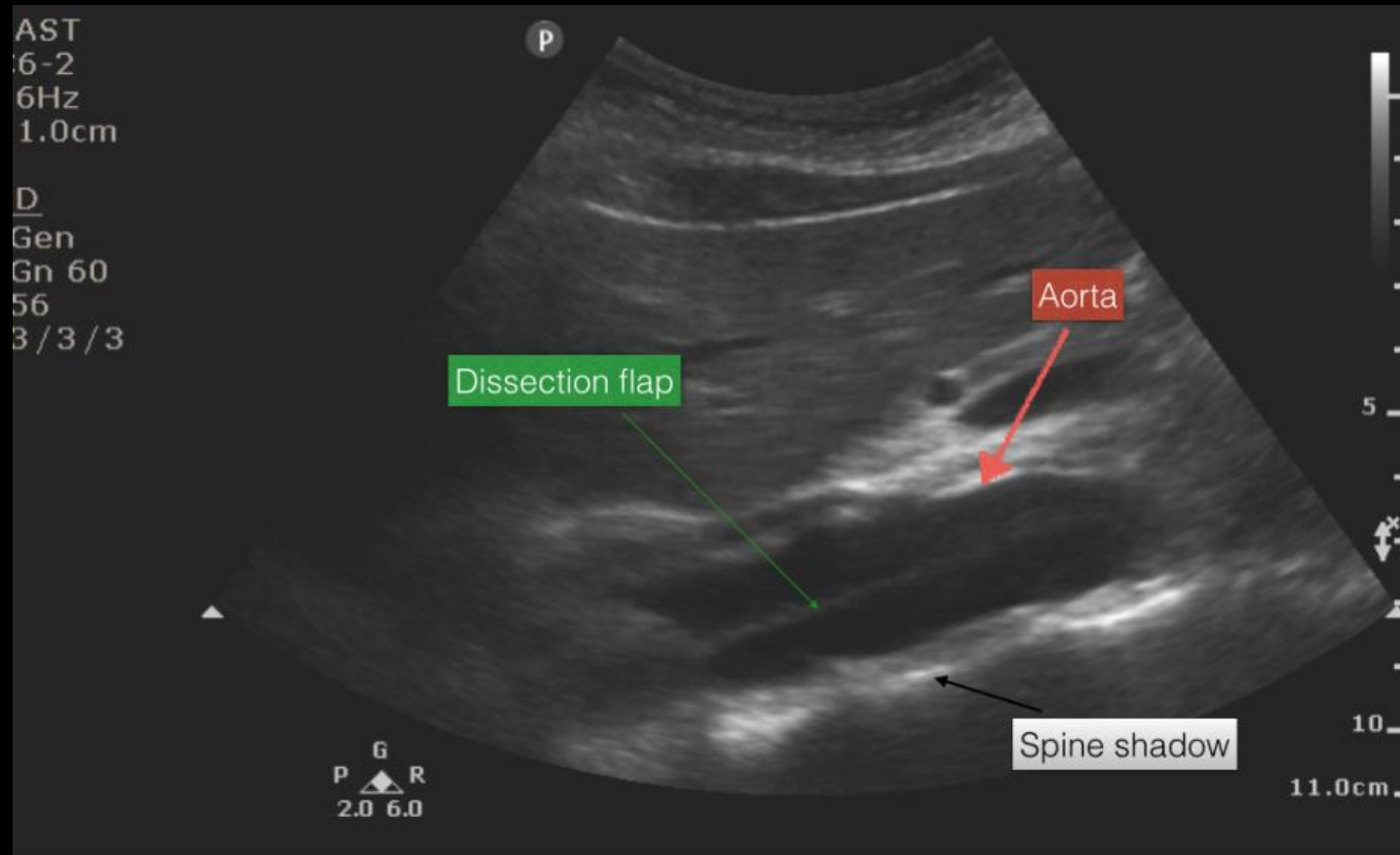
MCGOVERN MEDICAL SCHOOL

Relevant Imaging

- The following imaging studies were obtained:
  - Chest X-ray
  - CT chest with contrast
  - CT abdomen and pelvis with contrast
  - CT brain without contrast
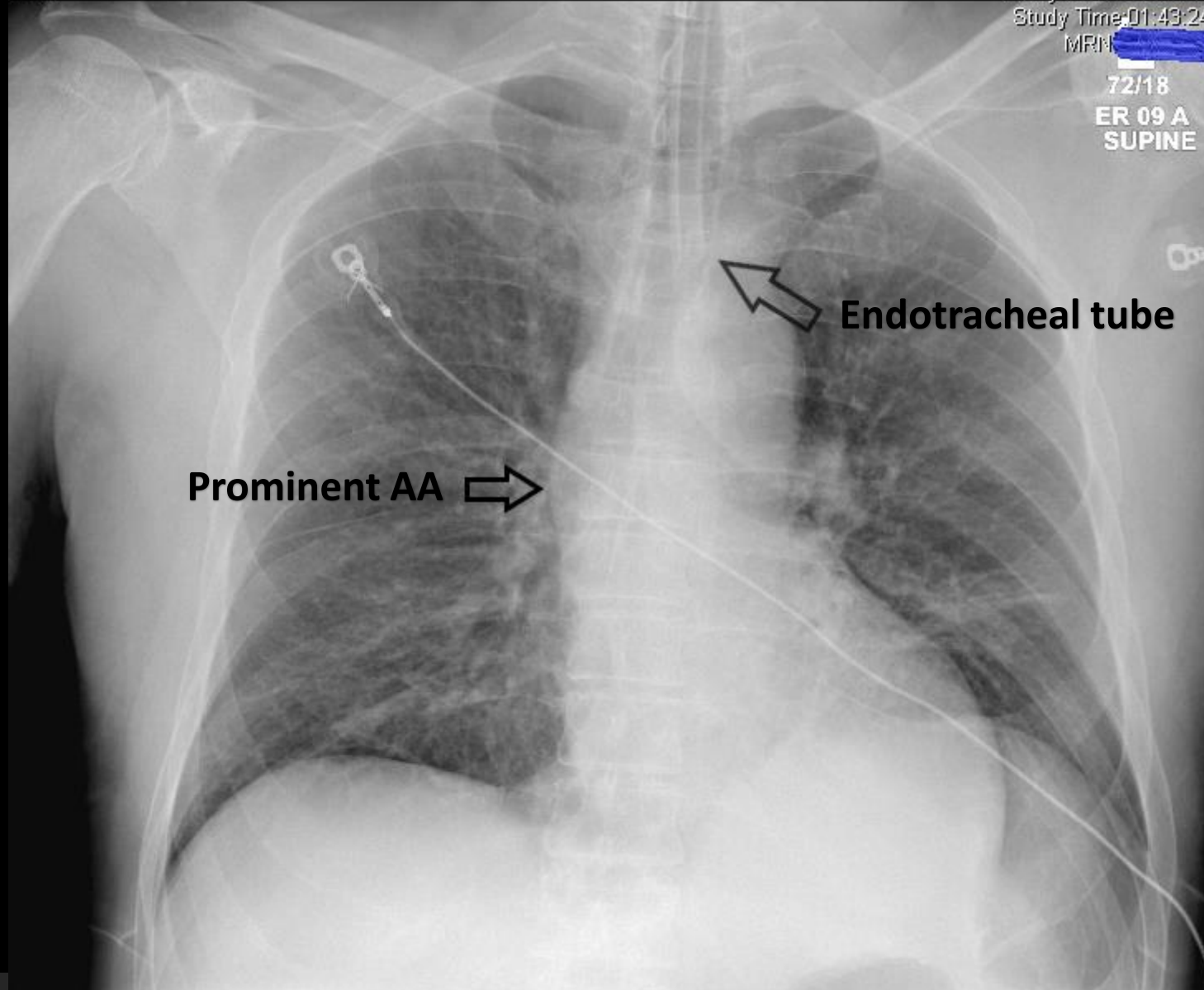 - CT angiogram of the neck

Chest X-ray (AP)

05/20/2021

CT brain without contrast

05/20/2021

CTA Neck

05/20/2021

CT chest abdomen and pelvis with contrast

05/20/2021
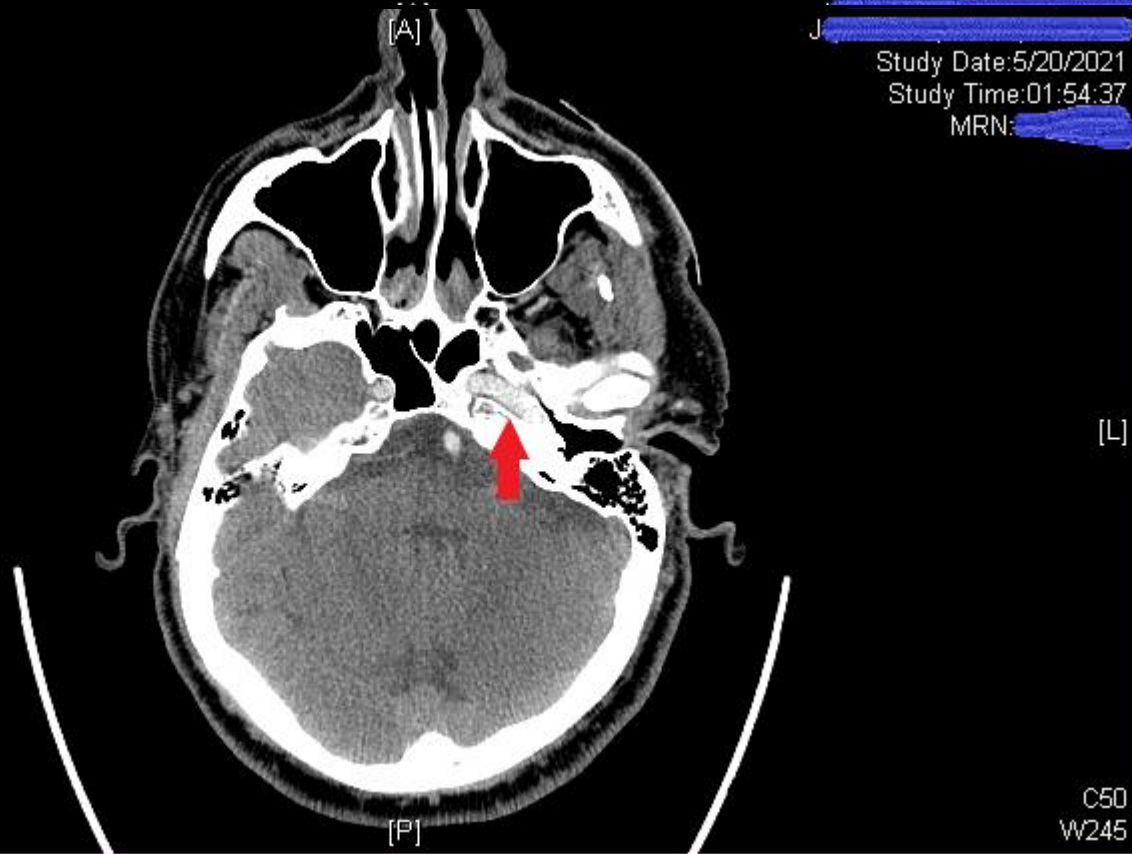
CT chest, abdomen and pelvis with contrast

Differential Diagnosis

- Vascular
  - Aortic dissection
  - Aortic aneurysm
  - Pseudodissection (due to motion artifact due to pulsation or contrast streaks)
  - Mural thrombus
  - Aortic intramural hematoma without dissection
- Nonvascular
  - Acute coronary syndrome
  - Pulmonary embolus
 - Spontaneous pneumothorax
  - Esophageal rupture

Key CT Findings, final diagnosis and clinical correlation

- Type A aortic dissection involving the aortic root extending through the aorta to left external iliac artery. False lumen extends towards left vertebral artery. Aneurysmal dilation of the ascending aorta measuring up to 5 cm.

- Compromised blood supply due to the false lumen compressing on the true lumen most likely the cause of clinical findings
    - Chest pain
    - Bilateral upper extremity weakness
    - Altered mental status
    - Increased lactic acid and WBC

Discussion

- Pathophysiology
  - Continuously high pulsatile and shear stress
  - Connective tissue disorders – degenerative changes in collagen, elastin, SM
  - Intimal tear develops -> blood flows into media -> formation of false lumen (larger lumen, slower flow, elevated mean pressure)
  - Dissections can extend proximally or distally

- Mr J had typical findings of Type A aortic dissection

https://www.lecturio.com/concepts/aortic-dissection/

NORMAL
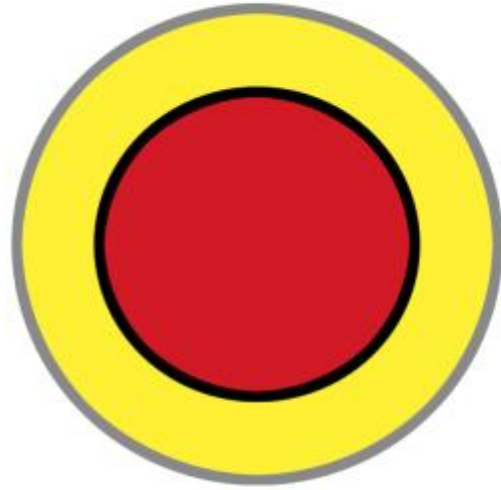
DISSECTION

Blood

Intima

Media

Adventitia

Note the intimal tear with blood dissecting into the aortic media.

This may extend proximally and/or distally (into and/or out of the plane of the figure).

https://www.saem.org/about-saem/academies-interest-groups-affiliates2/cdem/for-students/online-education/m4-curriculum/group-m4-cardiovascular/thoracic-aortic-dissection

Aortic Dissection Classification

https://www.lecturio.com/concepts/aortic-dissection/
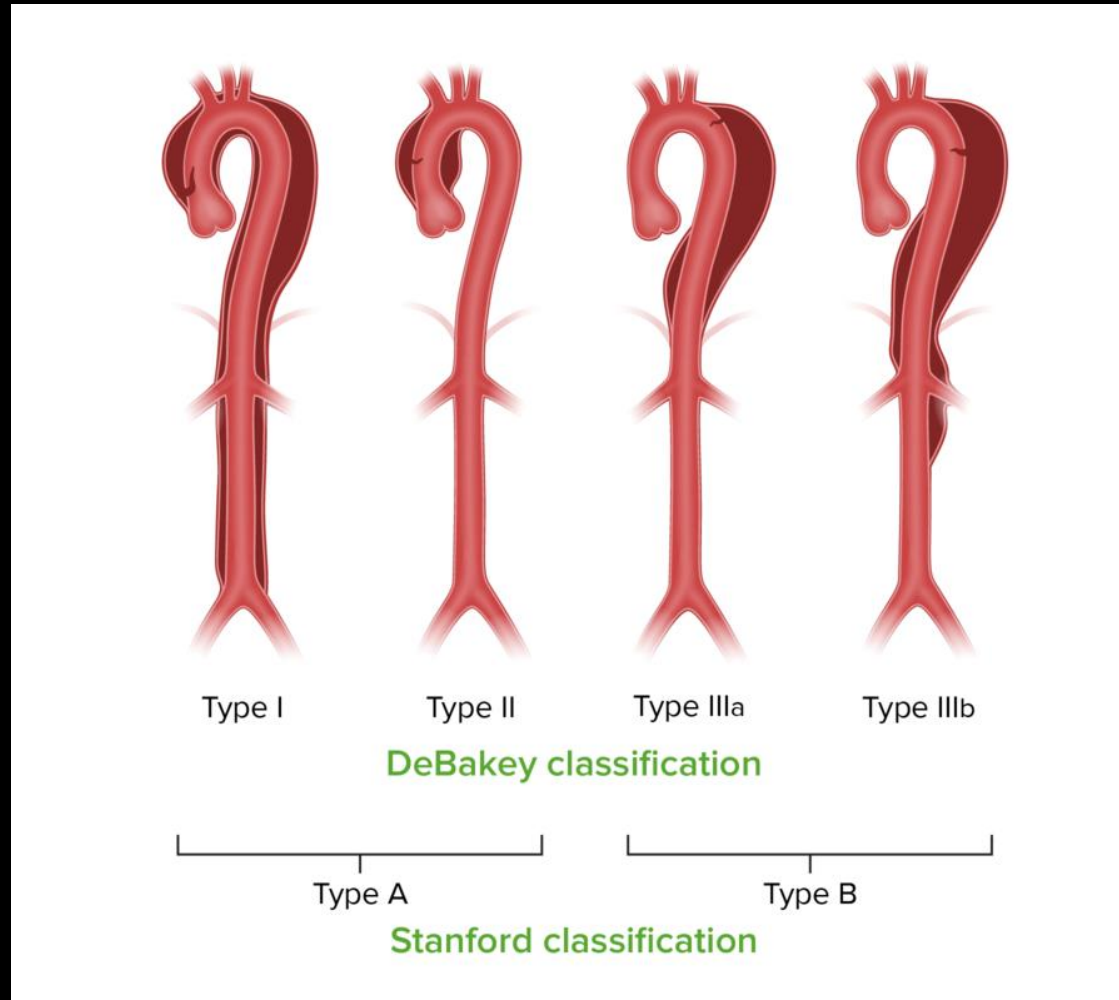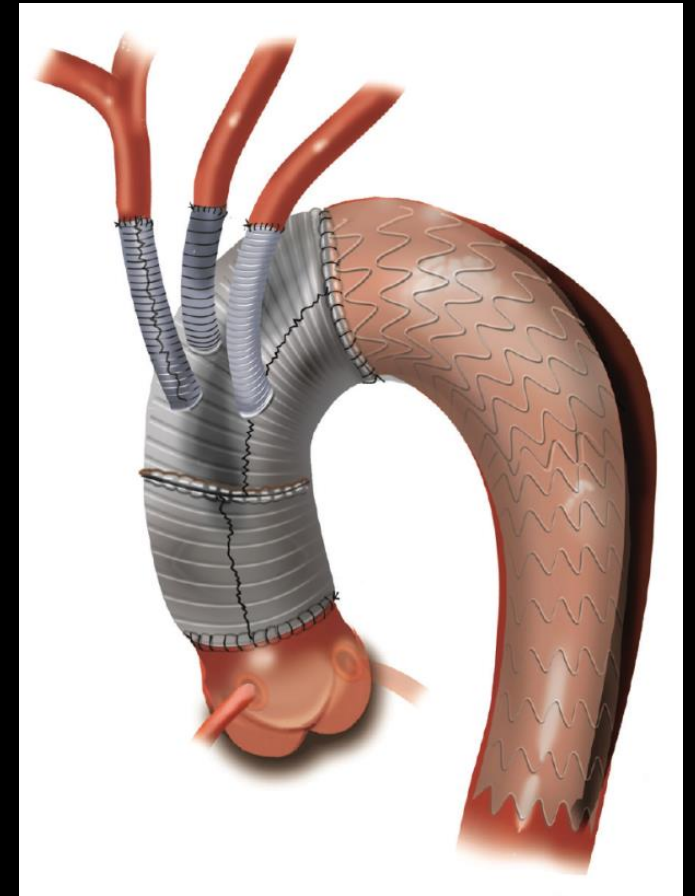
Hospital Course

- Emergent resection and graft replacement of the ascending aorta with proximal aortic arch and reconstruction of the aortic root

- Afib with RVR started on amiodarone

- Recovering well

https://evtoday.com/articles/2018-nov/hybrid-techniques-for-surgical-repair-of-acute-type-a-aortic-dissection

ACR appropriateness criteria

Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Chest/back pain, aortic dissection suspected	Radiography chest	<0.1 mSv ☢	<0.03 mSv [ped] ☢	Usually appropriate	🟢
	CTA chest and abdomen with IV contrast	10-30 mSv ☢☢☢☢	Null	Usually appropriate	🟢
	US echocardiography transesophageal	0 mSv O	0 mSv [ped] O	Usually appropriate	🟢
	MRA chest and abdomen without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	🟢
	MRA chest and abdomen without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	🟢
	Aortography chest and abdomen	10-30 mSv ☢☢☢☢	Null	May be appropriate	🟡
	US echocardiography transthoracic resting	0 mSv O	0 mSv [ped] O	May be appropriate	🟡
	FDG-PET/CT skull base to mid-thigh	10-30 mSv ☢☢☢☢	10-30 mSv [ped] ☢☢☢☢☢	Usually not appropriate	🔴

Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Head trauma, moderate to severe, acute, blunt, GCS<=13, not abuse, initial imaging	CT head without IV contrast	1-10 mSv ☢☢☢	0.3-3 mSv [ped] ☢☢☢	Usually appropriate	🟢
	MRI head without IV contrast	0 mSv O	0 mSv [ped] O	Usually not appropriate	🔴

Cost for radiographs

- CT chest with contrast: $276.00 - $414.00
- CXR (1 view): $57.60 - $86.40
- CT abd and pelvis with contrast: $307.20 - $460.80
- CT brain without contrast: $178.40 - $267.60
- Total for imaging: $1000-1500

https://onlinepatientestimation.com/PatientPortal/patient/selfservice

Take home points

- Presence of an intimal flap and double-lumen aorta – key features of aortic dissection
- Chest radiograph may be normal but may contain widened mediastinum or irregular aortic contour
- CTA is the investigation of choice
- True lumen will be often be smaller than the false lumen due to the high pressure false lumen

https://radiopaedia.org/articles/aortic-dissection?lang=us

References

- ACR Appropriateness Criteria®. Acr.org. Published 2016. Accessed May 25, 2021. https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

- Aortic Dissection | Concise Medical Knowledge. Lecturio. Published January 28, 2021. Accessed May 25, 2021. https://www.lecturio.com/concepts/aortic-dissection/

- Gaillard, Frank. "Aortic Dissection | Radiology Reference Article | Radiopaedia.org." *Radiopaedia.org*, 2017, radiopaedia.org/articles/aortic-dissection?lang=us. Accessed 25 May 2021.

- Hybrid Techniques for Surgical Repair of Acute Type A Aortic Dissection - Endovascular Today. Hybrid Techniques for Surgical Repair of Acute Type A Aortic Dissection - Endovascular Today. Endovascular Today. Published 2018. Accessed May 25, 2021. https://evtoday.com/articles/2018-nov/hybrid-techniques-for-surgical-repair-of-acute-type-a-aortic-dissection

- https://onlinepatientestimation.com/PatientPortal/patient/selfservice

- Thoracic Aortic Dissection. Default. Published 2019. Accessed May 25, 2021. https://www.saem.org/about-saem/academies-interest-groups-affiliates2/cdem/for-students/online-education/m4-curriculum/group-m4-cardiovascular/thoracic-aortic-dissection

Questions?