Introdução à AngioTC de coronárias e RM cardíaca

1702104 - Sistema Cardiocirculatório

1

Anatomia coronariana

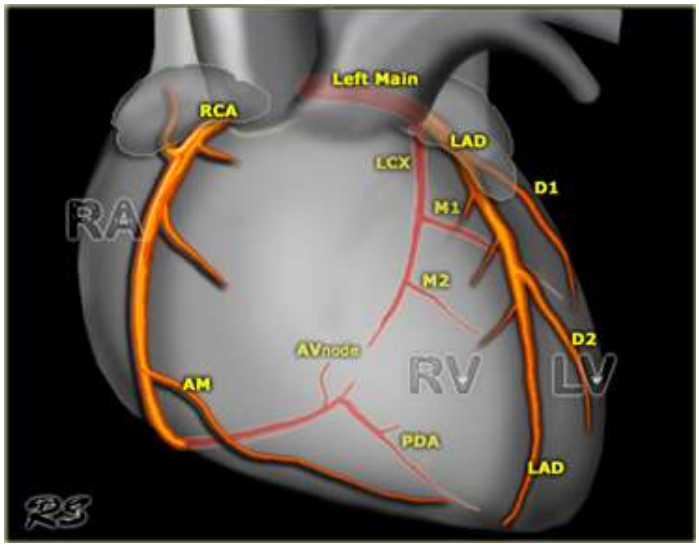
2

Anatomia coronariana

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

3

Anatomia coronariana



Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/anatomy/coronary-anatomy-and-anomalies (acesso em 18/02/2024)

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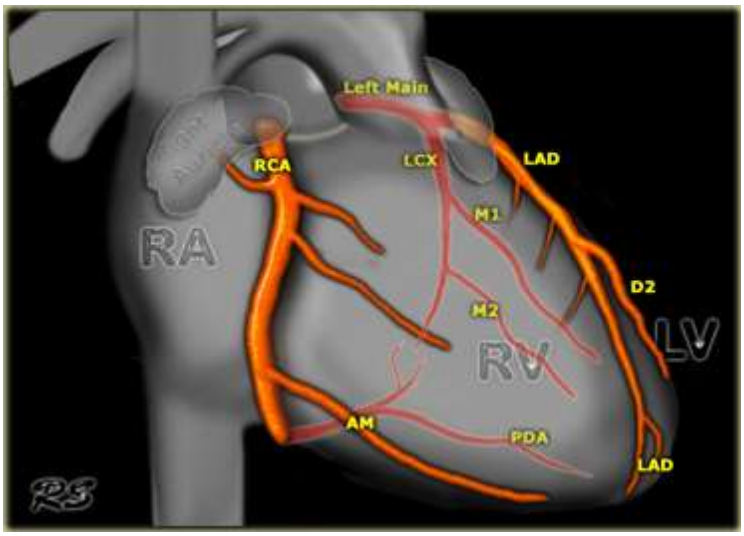

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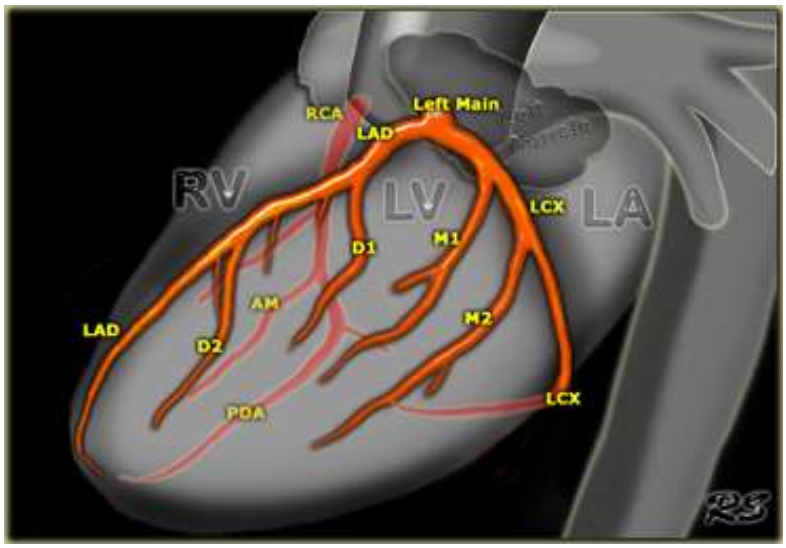

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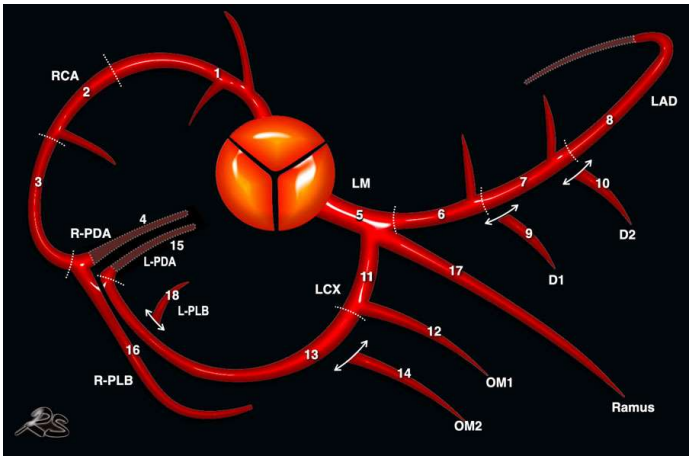
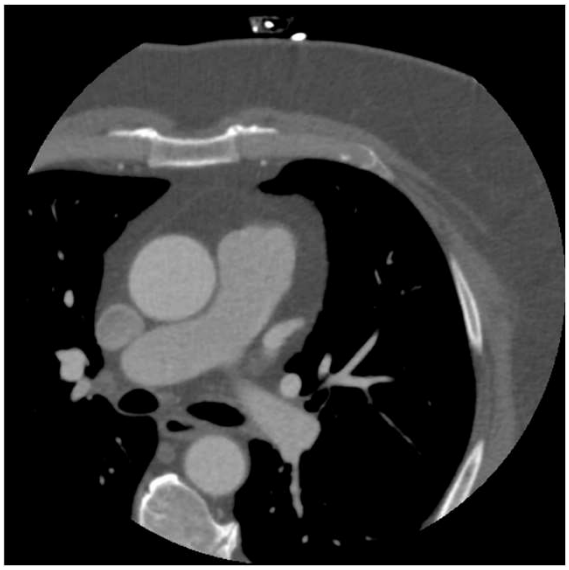
Anatomia coronariana





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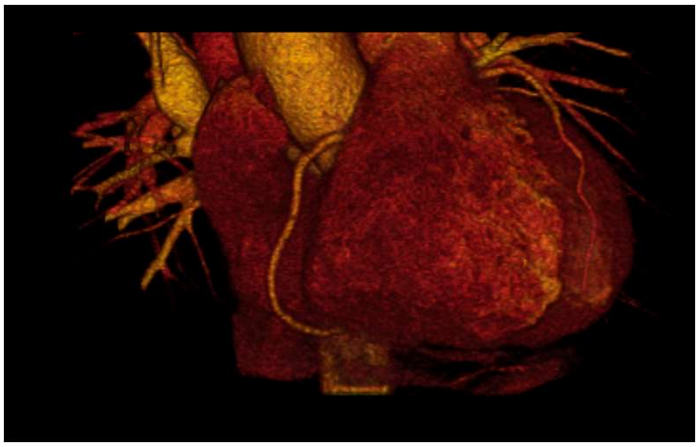
Anatomia coronariana

Segment	Abbreviation	Description
Proximal RCA	pRCA	Ostium of the RCA (right coronary artery) to one-half the distance to the acute margin of heart
Mid RCA	mRCA	End of proximal RCA to the acute margin of heart
Distal RCA	dRCA	End of mid RCA to origin of the PDA (posterior descending artery)
PDA-RCA	R-PDA	PDA from RCA
PLB-RCA	R-PLB	PLB (posterior-lateral branch) from RCA
LM	LM	Ostium of LM (left main) to bifurcation of LAD (left anterior descending artery) and LCx (left circumflex artery)
Proximal LAD	pLAD	End of LM to the first large septal or D1(first diagonal), whichever is most proximal
Mid LAD	mLAD	End of proximal LAD to one-half the distance to the apex
Distal LAD	dLAD	End of mid LAD to end of LAD
Diagonal 1	D1	First diagonal branch D1
Diagonal 2	D2	Second diagonal branch D2
Proximal LCx	pCx	End of LM to the origin of the OM1 (first obtuse marginal)
OM1	OM1	First OM1 traversing the lateral wall of the left ventricle
Mid and distal LCx	LCx	Traveling in the AV groove, distal to the first obtuse marginal branch to the end of the vessel or origin of the L-PDA (left posterior descending artery)
OM2	OM2	Second marginal OM2
PDA-LCx	L-PDA	PDA from LCx
Ramus intermedius	RI	Vessel originating from the left main between the LAD and LCx in case of a trifurcation
PLB-L	L-PLB	PLB from LCx
		Dashed lines represent division between RCA, LAD, and LCx and the end of the LMPLB = PLV (posterior left ventricular branch) Additional nomenclature may be added for example: D3, R-PDA2, SVG (saphenous vein graft) mLAD

Raff GL, Abidov A, Achenbach S, Berman DS, Boxt LM, Budoff MJ, Cheng V, DeFrance T, Hellinger JC, Karlsberg RP; Society of Cardiovascular Computed Tomography. SCCT guidelines for the interpretation and reporting of coronary computed tomographic angiography. J Cardiovasc Comput Tomogr. 2009 Mar-Apr;3(2):122-36. doi: 10.1016/j.jcct.2009.01.001. Epub 2009 Jan 29. PMID: 19272853.

Anatomia coronariana



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Anatomia coronariana

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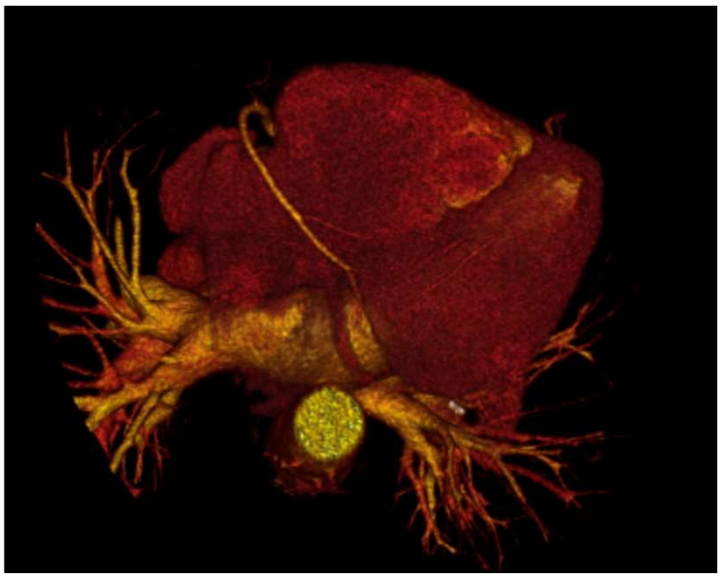
Anatomia coronariana



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Escore de cálcio coronariano

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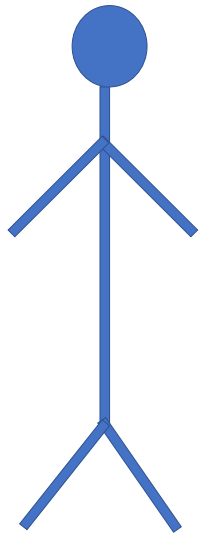

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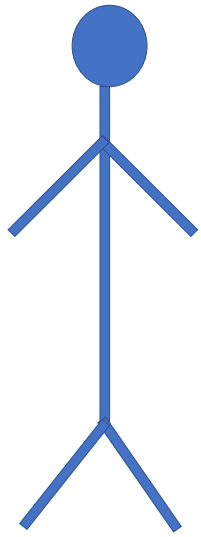
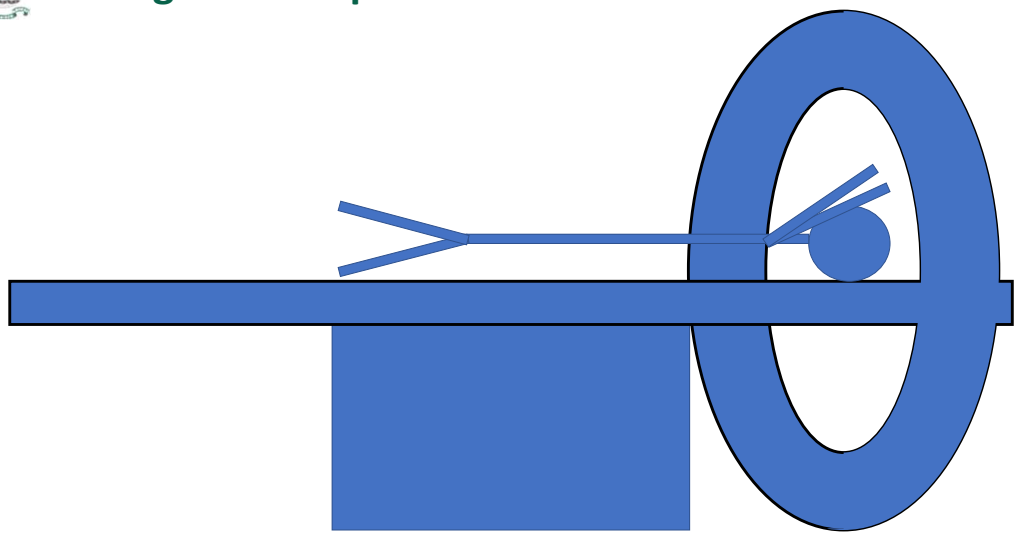


Frequência cardíaca: <100 bpm (evitar café, chocolate, energéticos, etc...)

Sem exames com contraste EV nas últimas 48hs

14

Tomografia computadorizada



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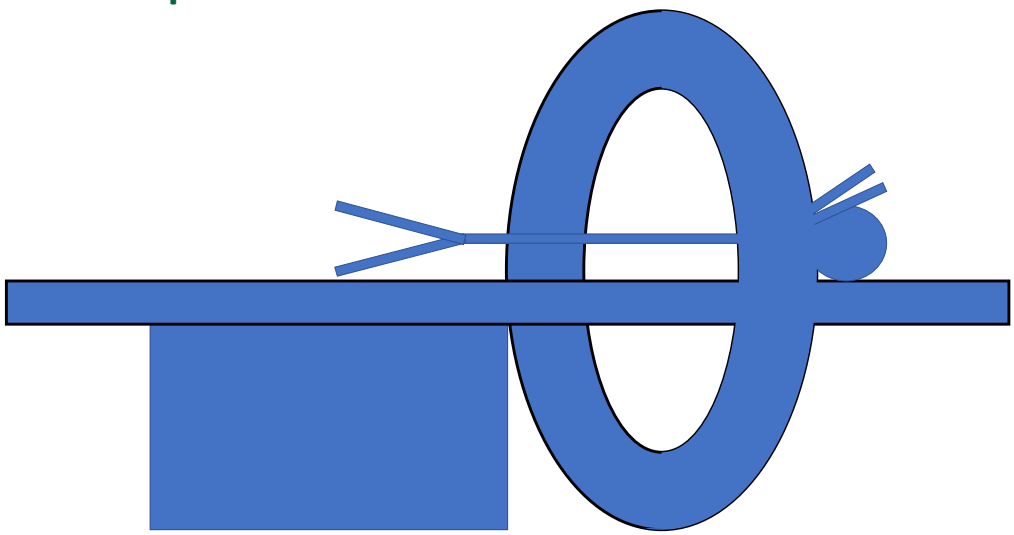

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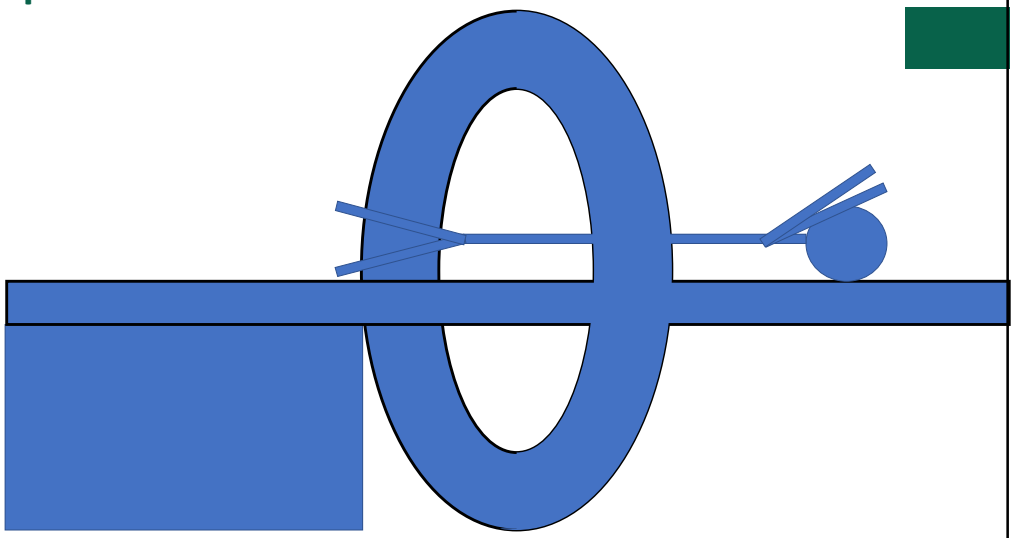

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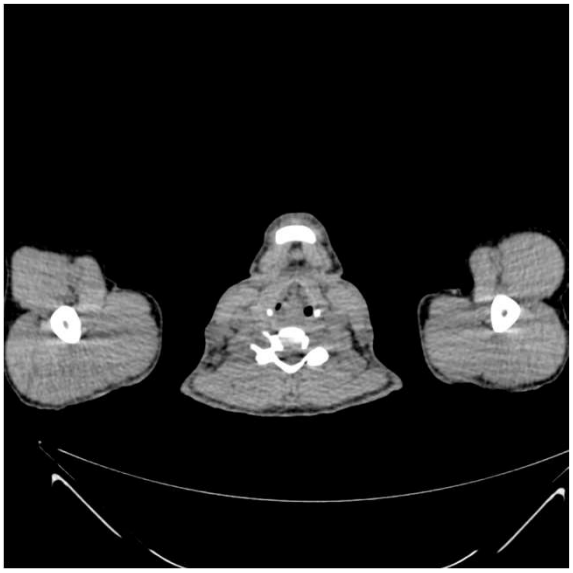

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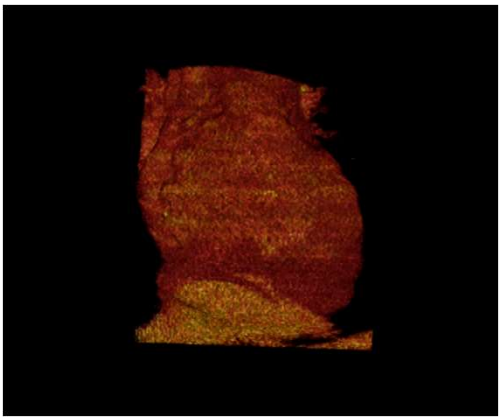

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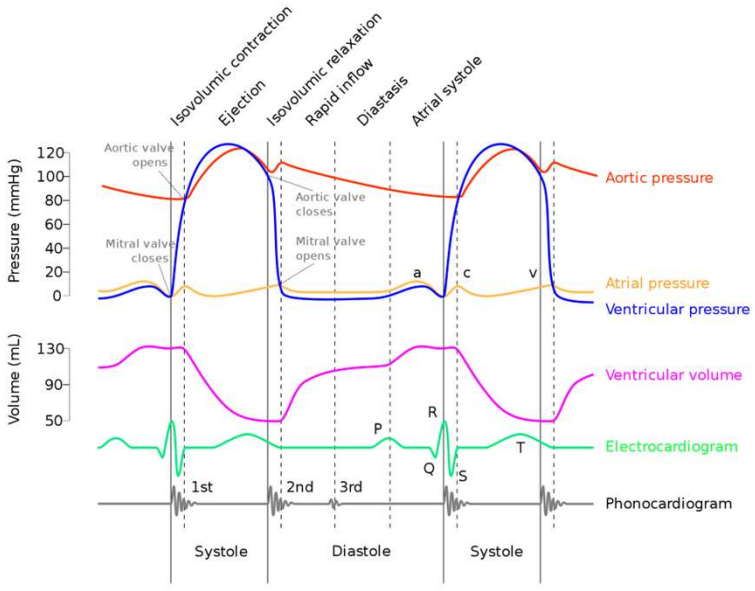
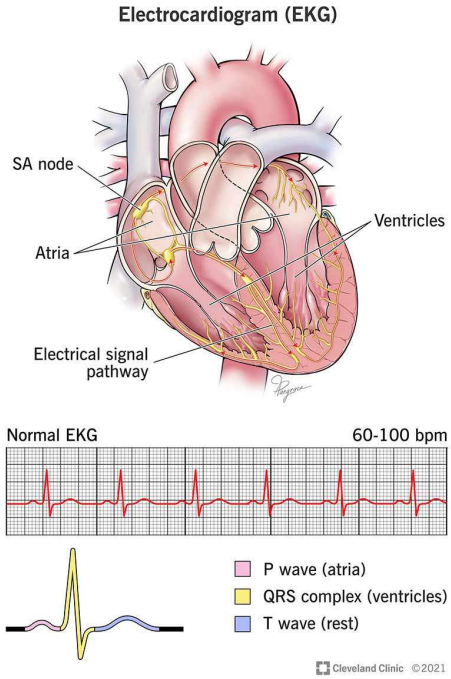
ECG





Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).
By adh30 revised work by DanielChangMD who revised original work of DestinyQx; Redrawn as SVG by xavax - Wikimedia Commons: Wiggers Diagram.svg, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=50317988

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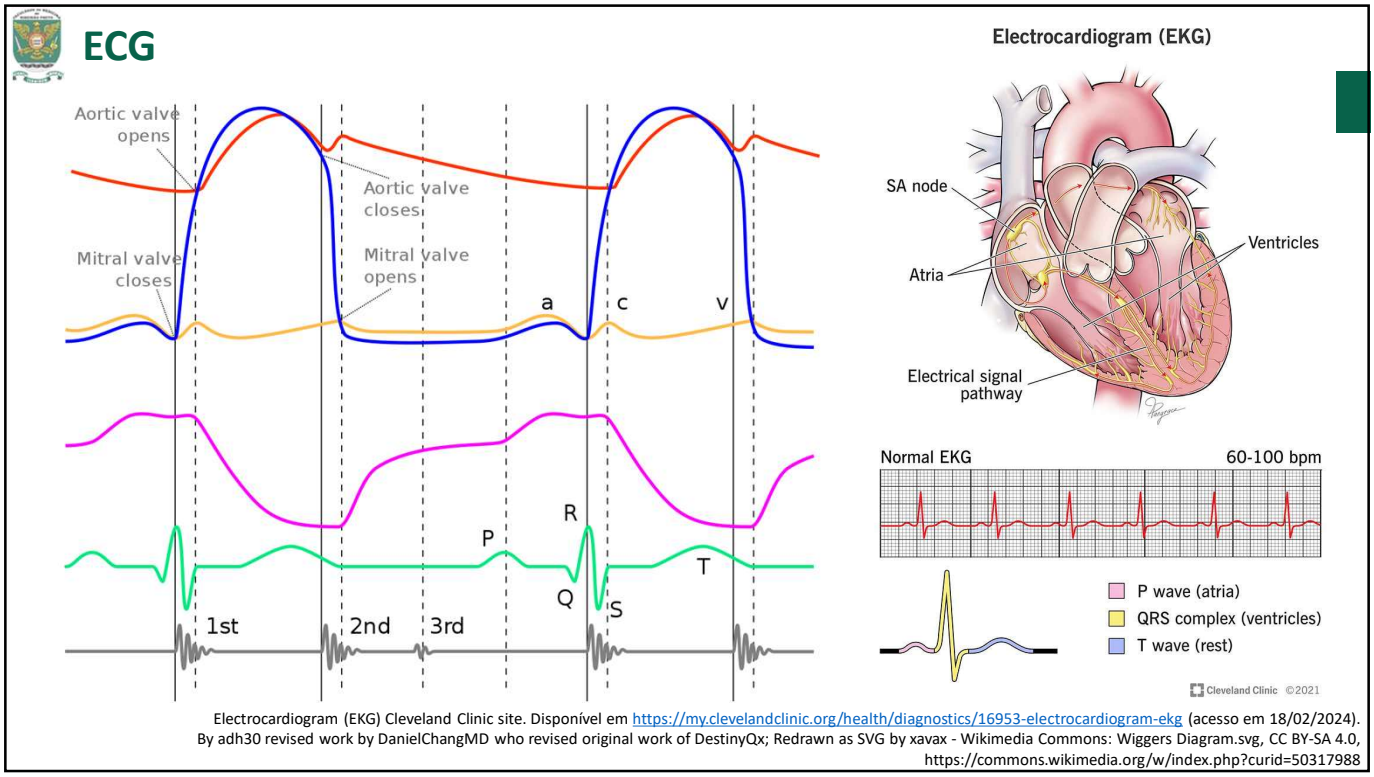

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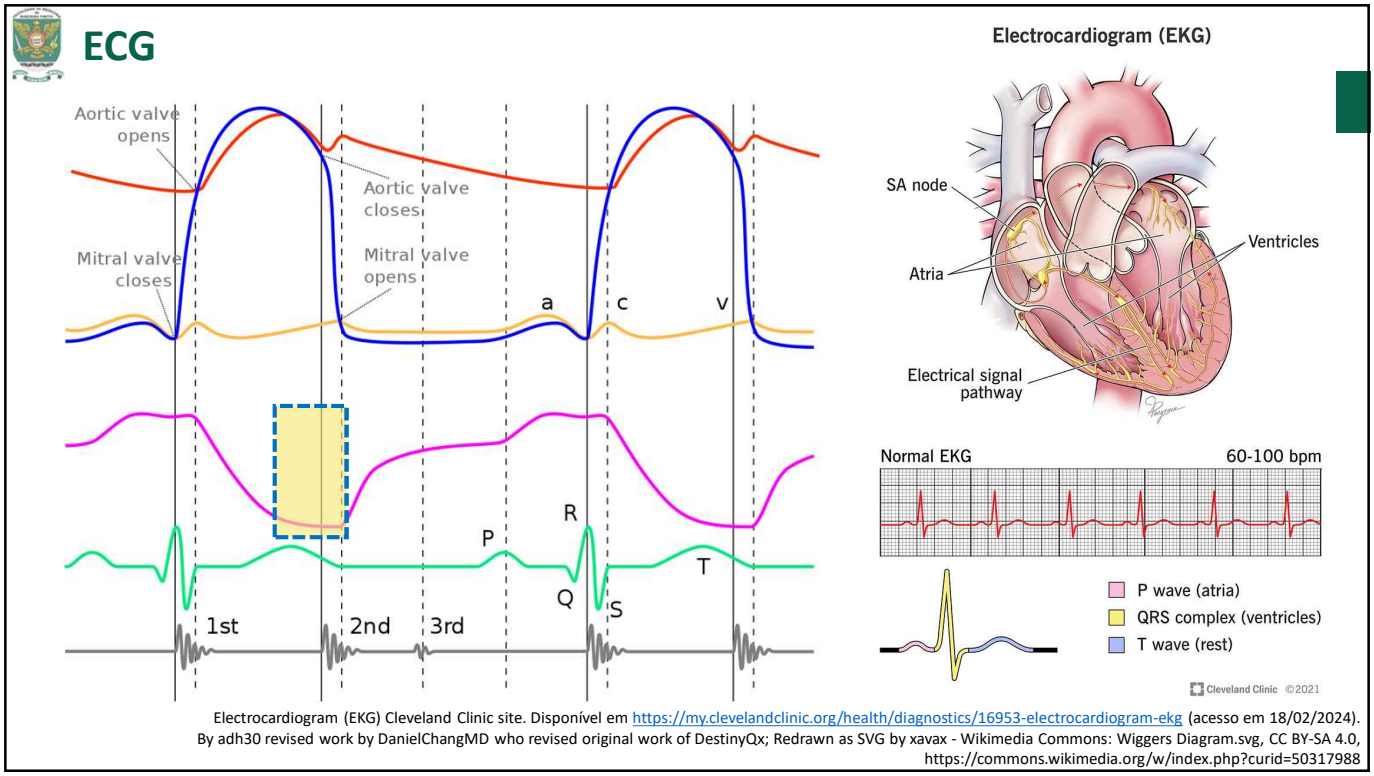

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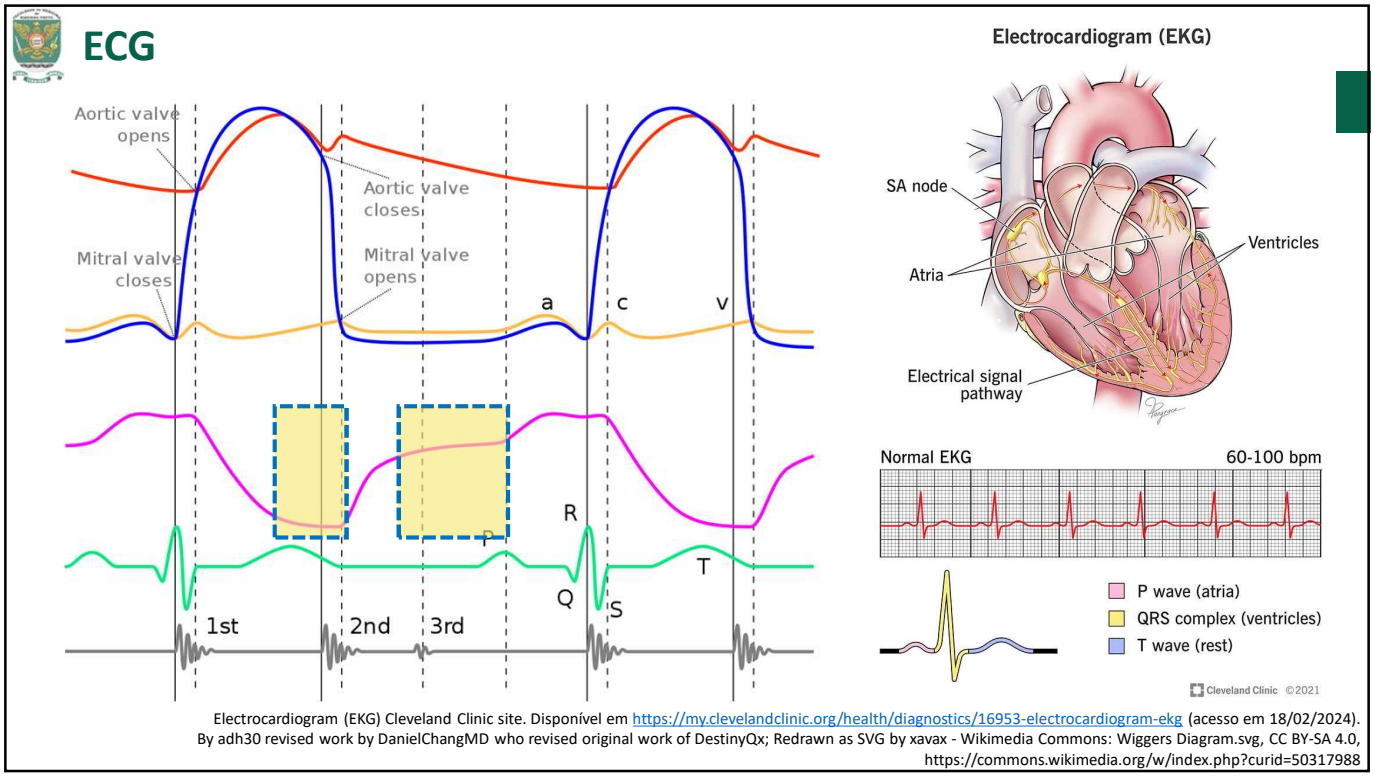

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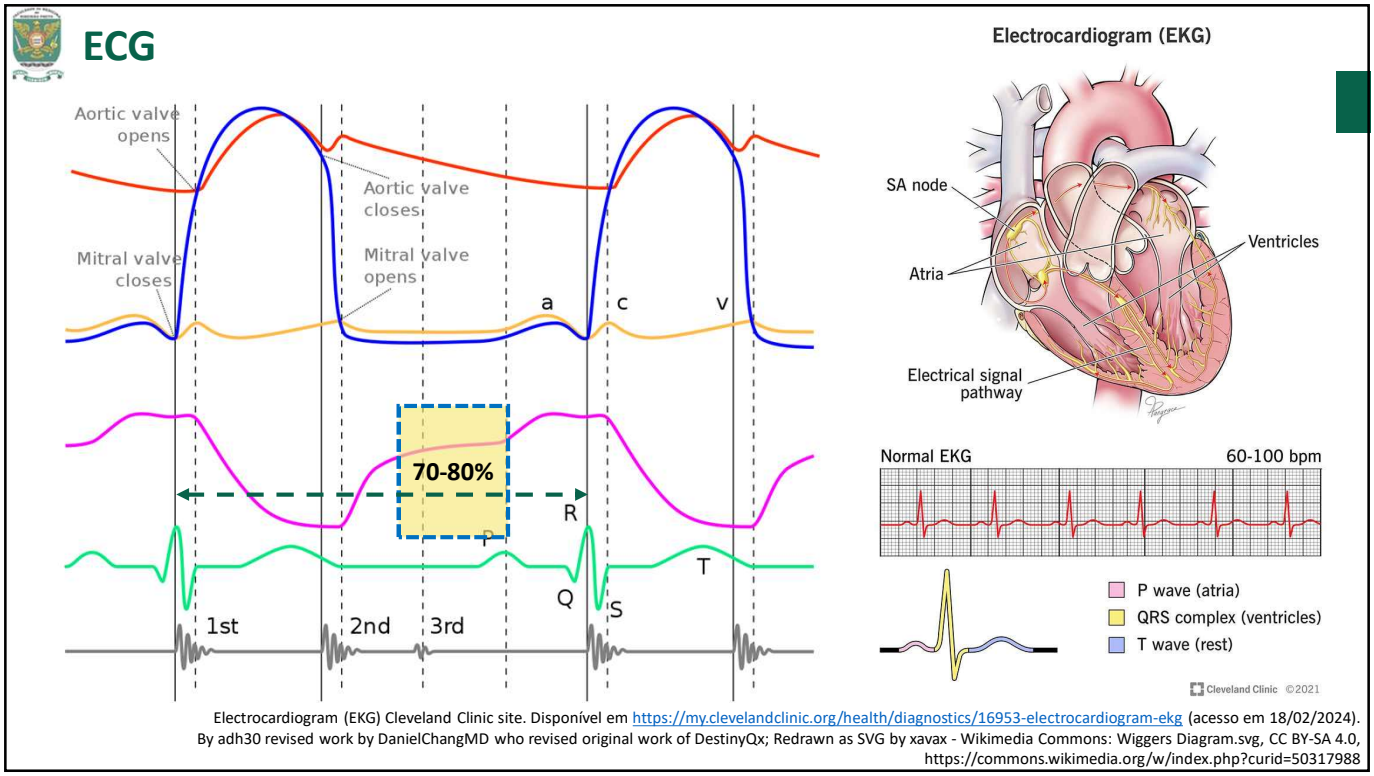

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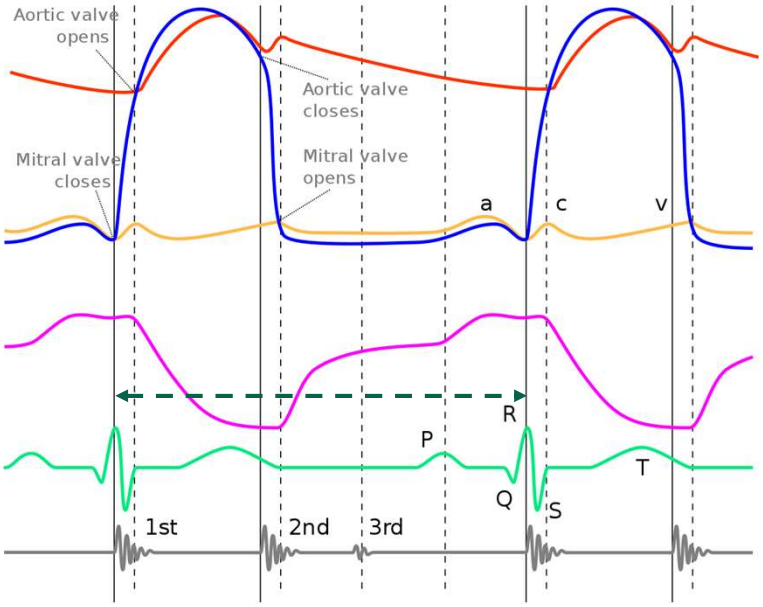
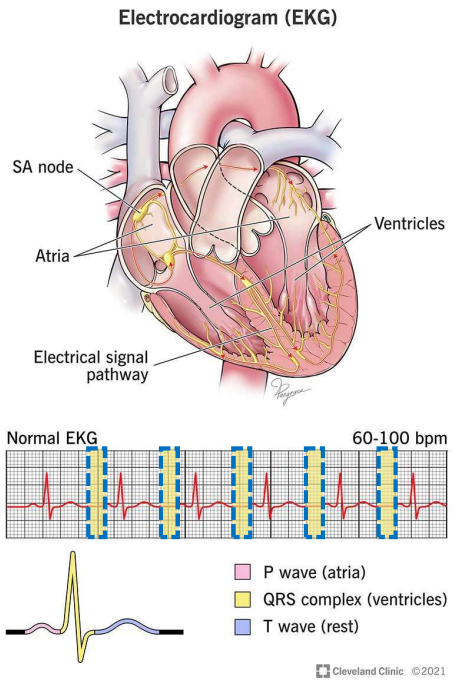
24

ECG





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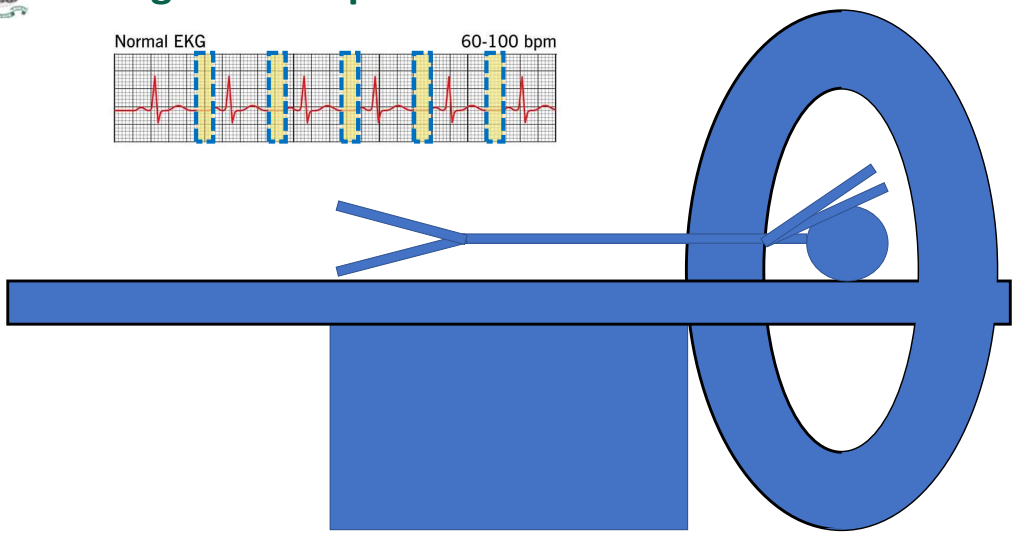
25

Tomografia computadorizada com ECG



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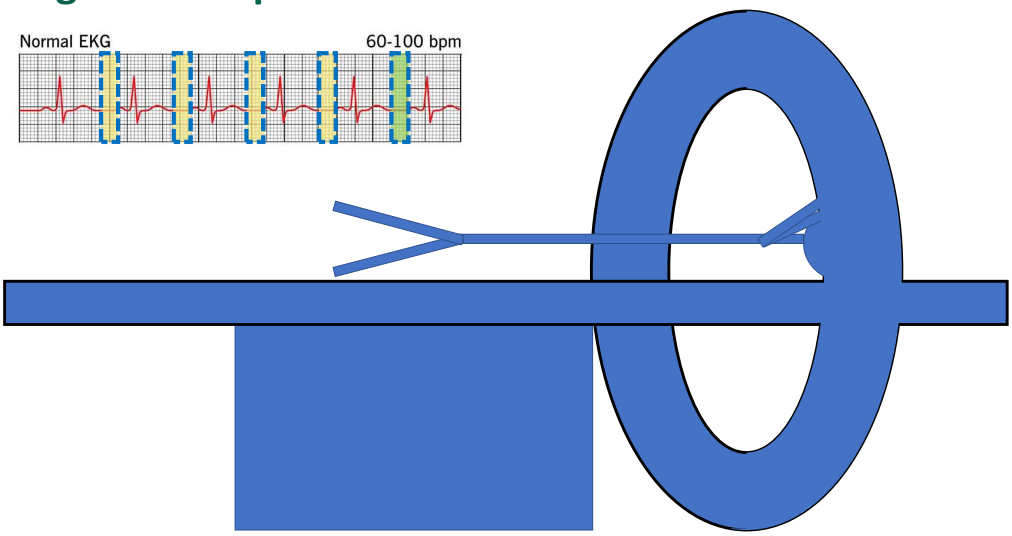
Tomografia computadorizada com ECG



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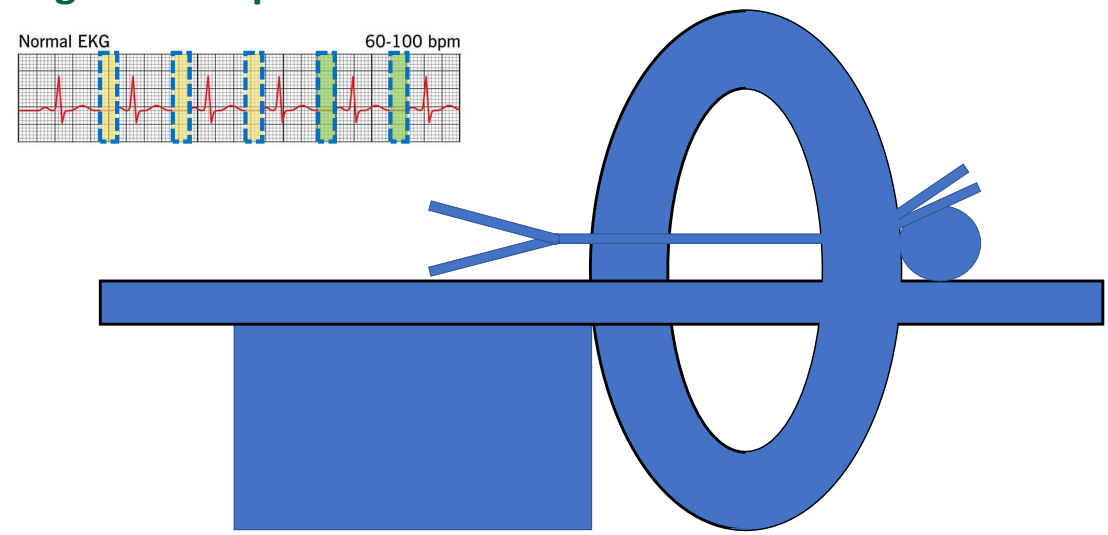

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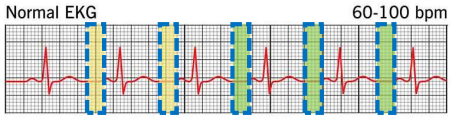

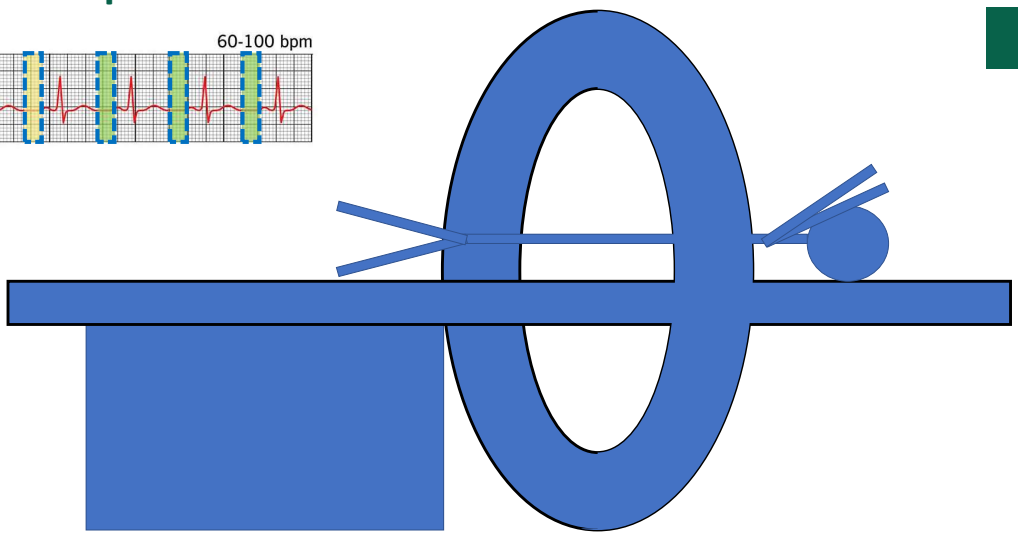

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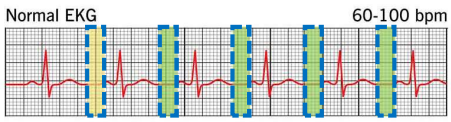

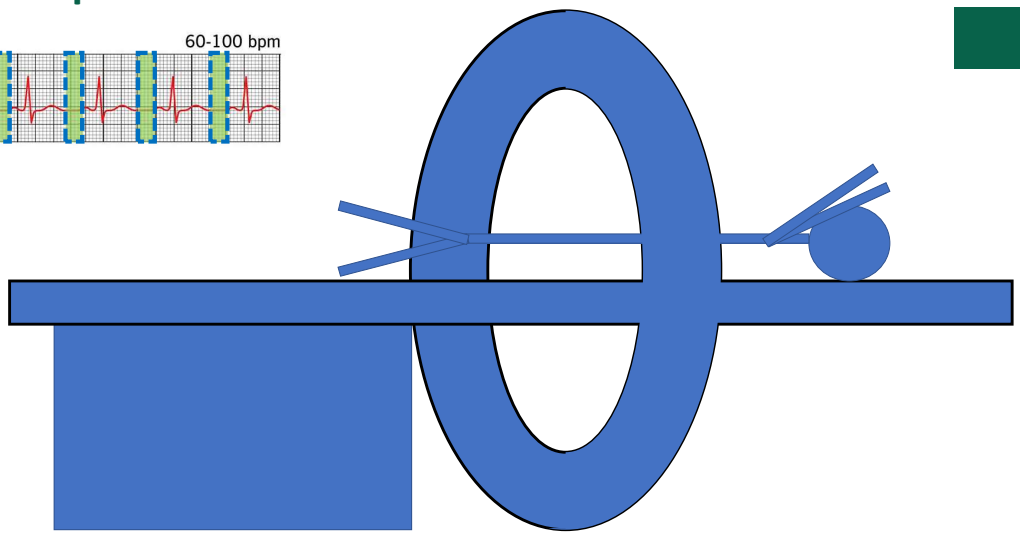

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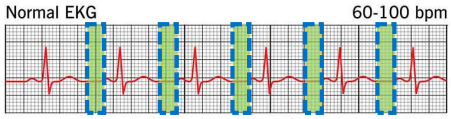

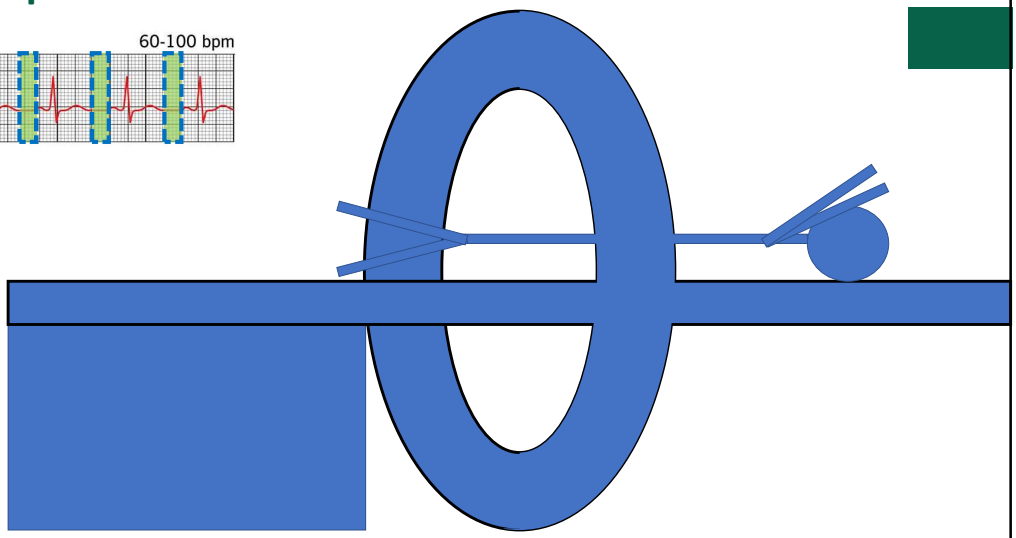

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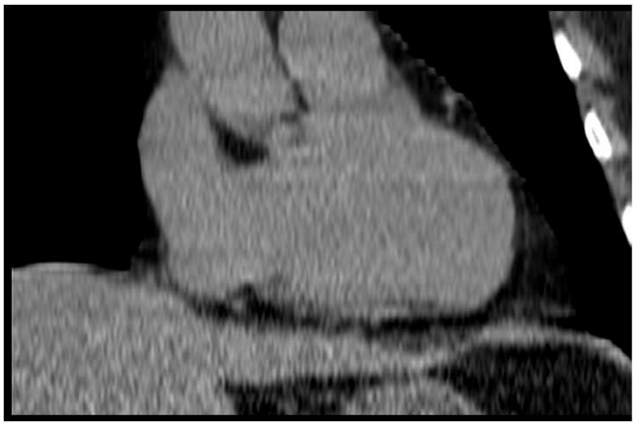
Escore de cálcio



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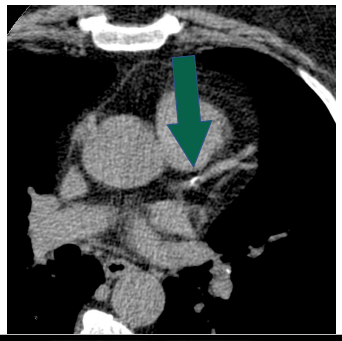

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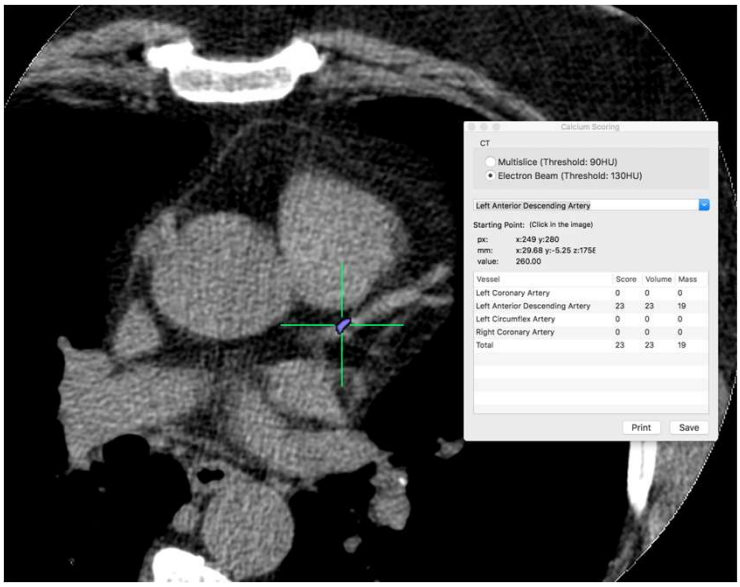
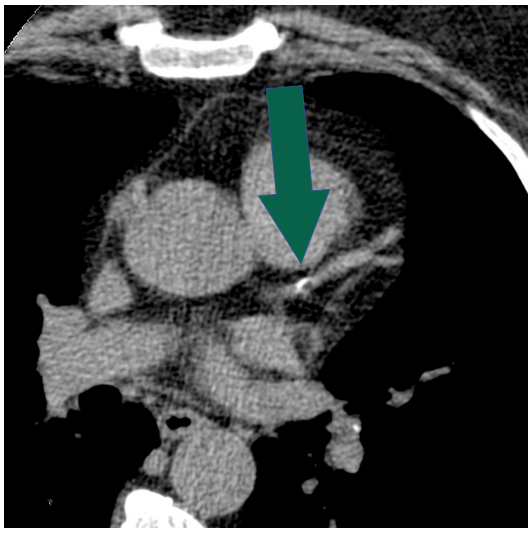
Escore de cálcio





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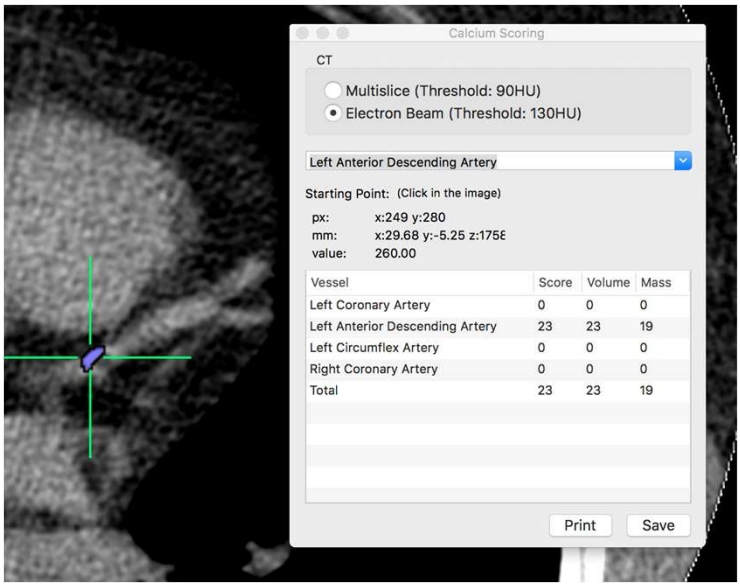
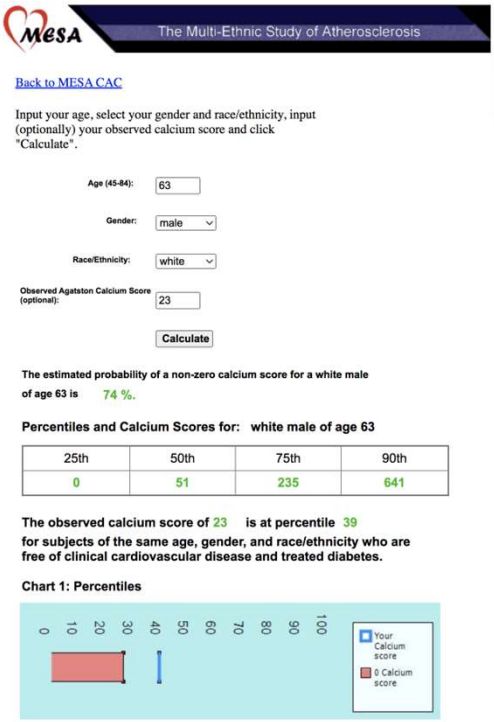
Escore de cálcio





McClelland RL et al. Distribution of coronary artery calcium by race, gender, and age: results from the Multi-Ethnic Study of Atherosclerosis (MESA). Circulation. 2006;113(1):30-37.
Disponível em https://www.mesa-nhlbi.org/Calcium/input.aspx (acesso 28/02/2024).

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Técnica

Posicionamento: decúbito dorsal com braços acima da cabeça

Voltagem do tubo: fixo em 120 kVp

mAs: variável pelo IMC

-IMC <30: 40mAs

-IMC 30-34: 50 mAs

-IMC >34: 60 mAs

Aquisição em inspiração

Reconstruções de 2,5 mm com FOV de 25 cm

Gupta A et al. Coronary Artery Calcium Scoring: Current Status and Future Directions. Radiographics. 2022 Jul-Aug;42(4):947-967. doi: 10.1148/rg.210122.

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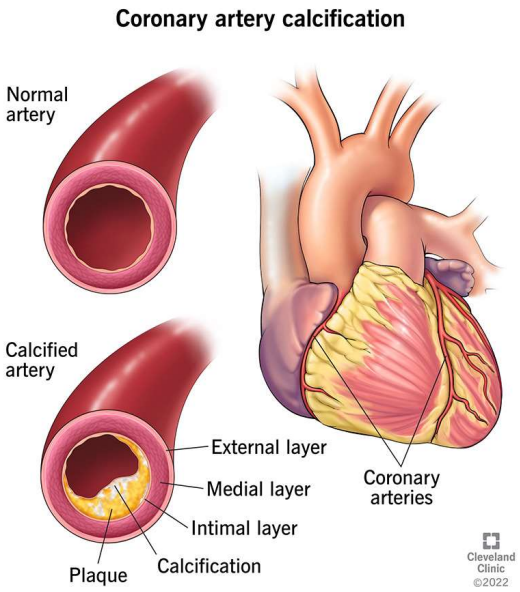
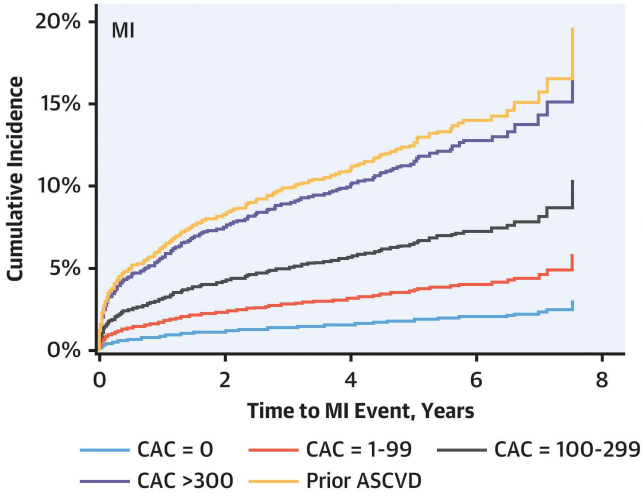
Para que serve?

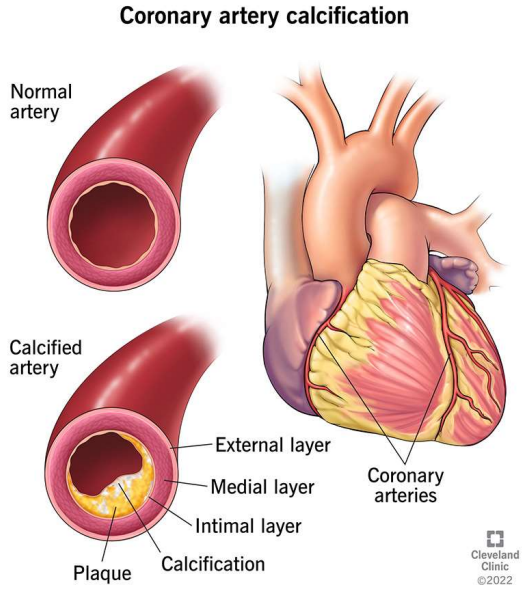
Escore de cálcio

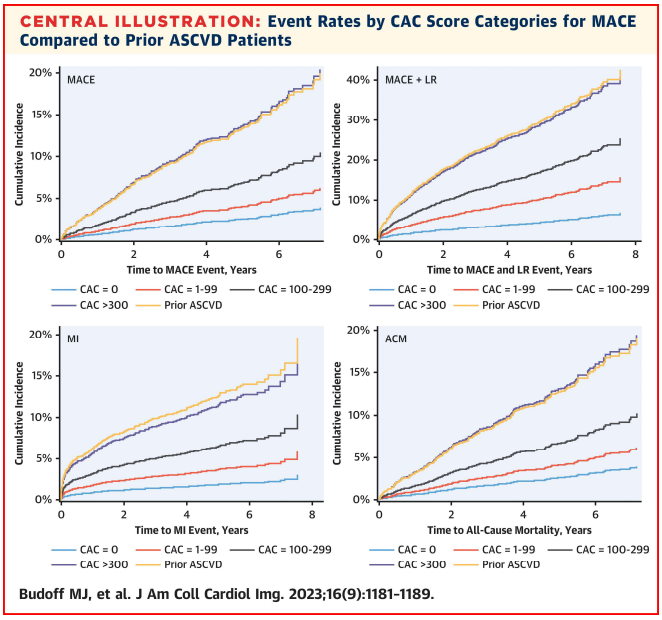




Budoff MJ et al. CONFIRM Investigators. When Does a Calcium Score Equate to Secondary Prevention?: Insights From the Multinational CONFIRM Registry. JACC Cardiovasc Imaging. 2023 Sep;16(9):1181-1189. doi: 10.1016/j.jcmg.2023.03.008.
Coronary Artery Calcification. Cleveland Clinic web site. Disponível em https://my.clevelandclinic.org/health/diseases/22953-coronary-artery-calcification (acesso em 18/02/2024).

Escore de cálcio

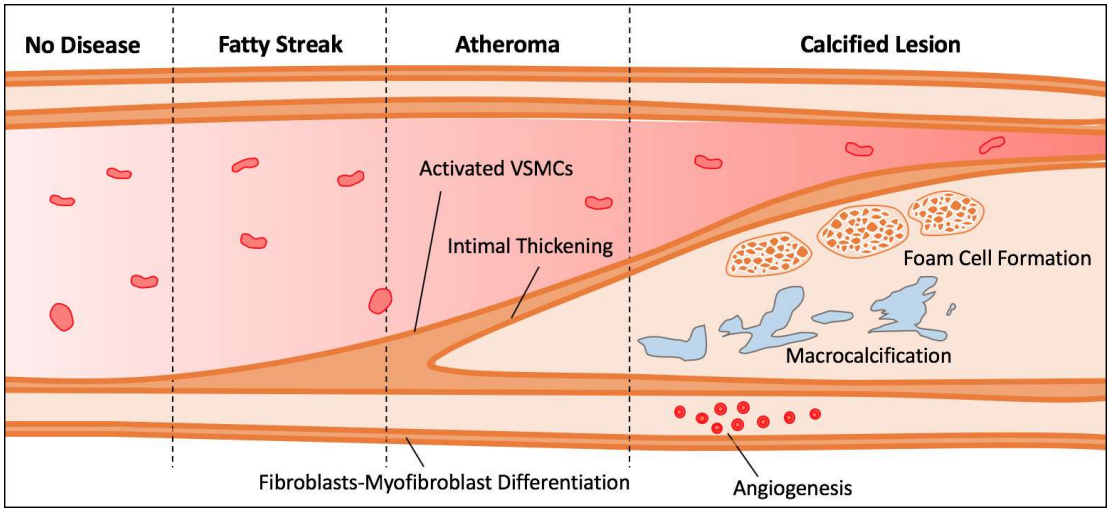




Budoff MJ et al. CONFIRM Investigators. When Does a Calcium Score Equate to Secondary Prevention?: Insights From the Multinational CONFIRM Registry. JACC Cardiovasc Imaging. 2023 Sep;16(9):1181-1189. doi: 10.1016/j.jcmg.2023.03.008.
Coronary Artery Calcification. Cleveland Clinic web site. Disponível em https://my.clevelandclinic.org/health/diseases/22953-coronary-artery-calcification (acesso em 18/02/2024).

Porém...

Escore de cálcio



Albanese I, Khan K, Barratt B, Al-Kindi H, Schwertani A. Atherosclerotic Calcification: Wnt Is the Hint. J Am Heart Assoc. 2018 Feb 8;7(4):e007356. doi: 10.1161/JAHA.117.007356. PMID: 29437603; PMCID: PMC5850186.

41

O que o escore de cálcio muda?

42

Escore de cálcio

CENTRAL ILLUSTRATION: Proposed Decision-Making Approach to Selective Use of Coronary Artery Calcium Measurement for Risk Prediction

Using 10-year ASCVD risk estimate plus coronary artery calcium (CAC) score to guide statin therapy				
Patient's 10-year atherosclerotic cardiovascular disease (ASCVD) risk estimate:	<5%	5-7.5%	>7.5-20%	>20%
Consulting ASCVD risk estimate alone	Statin not recommended	Consider for statin	Recommend statin	Recommend statin
Consulting ASCVD risk estimate + CAC				
If CAC score =0	Statin not recommended	Statin not recommended	Statin not recommended	Recommend statin
If CAC score >0	Statin not recommended	Consider for statin	Recommend statin	Recommend statin
Does CAC score modify treatment plan?	✗ CAC not effective for this population	✓ CAC can reclassify risk up or down	✓ CAC can reclassify risk up or down	✗ CAC not effective for this population

Greenland, P. et al. J Am Coll Cardiol. 2018;72(4):434-47.

Greenland P, Blaha MJ, Budoff MJ, Erbel R, Watson KE. Coronary Calcium Score and Cardiovascular Risk. J Am Coll Cardiol. 2018 Jul 24;72(4):434-447. doi: 10.1016/j.jacc.2018.05.027. PMID: 30025580; PMCID: PMC6056023.

Para quem solicitar escore de cálcio?

Escore de cálcio

Table 1
SCCT CAC expert consensus recommendations.

1. It is appropriate to perform CAC testing in the context of shared decision making for asymptomatic individuals without clinical ASCVD who are 40–75 years of age in the 5–20% 10-year ASCVD risk group and selectively in the <5% ASCVD group, such as those with a family history of premature coronary artery disease.
2. In patients for whom the development or progression of CAC would support intensification or alteration in preventive management, it may be appropriate to consider repeat CAC scanning at an interval of 5 years for patients with 0 CAC and a 3–5-year interval for patients with >0 CAC.
3. As an alternative to filtered back projection and 120 kVp acquisition, iterative and model based reconstruction and 100 kVp acquisition may be utilized with caution after site-based or literature-based validation for each scanner vendor, with documented <10% difference in mean CAC scores and risk group classification compared to filtered back projection and 120 kVp studies.
4. Consistent with a prior guideline from the SCCT/STR, CAC scoring of noncontrast chest CT scans is appropriate in all lung cancer screening patients and patients greater than 40 years of age without established ASCVD. The presence of CAC should be noted in the report of all NCCT studies.
5. The presence of BAC on mammography should be discussed with the patient and detailed in the final report. Shared decision making regarding dedicated CAC scanning may be considered for patients with BAC.
6. It may be appropriate to include CAC scanning in CCTA protocols in symptomatic patients without established CAD undergoing CTA, and in high risk asymptomatic individuals for whom the CCTA appropriateness criterion is uncertain, as well as in asymptomatic patients referred for preoperative evaluation prior to major surgery.
7. It is appropriate to incorporate CAC scanning in SPECT and PET MPI protocols in patients who are free of known clinical coronary artery disease.

Hecht H, Blaha MJ, Berman DS, Nasir K, Budoff M, Leipsic J, Blankstein R, Narula J, Rumberger J, Shaw LJ. Clinical indications for coronary artery calcium scoring in asymptomatic patients: Expert consensus statement from the Society of Cardiovascular Computed Tomography. J Cardiovasc Comput Tomogr. 2017 Mar-Apr;11(2):157-168. doi: 10.1016/j.jcct.2017.02.010. Epub 2017 Feb 24. PMID: 28283309.

Escore de cálcio para quem?

	Typical Angina		Atypical		Non-anginal		Dyspneu	
Age	Men	Women	Men	Women	Men	Women	Men	Women
30-39	3%	5%	4%	3%	1%	1%	0%	3%
40-49	22%	10%	10%	6%	3%	2%	12%	3%
50-59	32%	13%	17%	6%	11%	3%	27%	9%
60-69	44%	16%	26%	11%	22%	6%	27%	6%
70+	52%	27%	34%	19%	24%	10%	32%	12%

Probabilidade pré-teste de DAC >15%

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

Escore de cálcio para quem?

Dor retroesternal

Com piora ao esforço ou estresse

Com melhora com nitrato ou repouso

Angina pectoris

Collection of Medical Illustrations, Heart - Volume 5. Author:Frank H. Netter, MD Chapter:Acquired Diseases of the Heart Page:223. Pharmacology - Raffa 1E

Escore de cálcio para quem?

	Typical Angina		Atypical		Non-anginal		Dyspneu	
Age	Men	Women	Men	Women	Men	Women	Men	Women
30-39	3%	5%	4%	3%	1%	1%	0%	3%
40-49	22%	10%	10%	6%	3%	2%	12%	3%
50-59	32%	13%	17%	6%	11%	3%	27%	9%
60-69	44%	16%	26%	11%	22%	6%	27%	6%
70+	52%	27%	34%	19%	24%	10%	32%	12%

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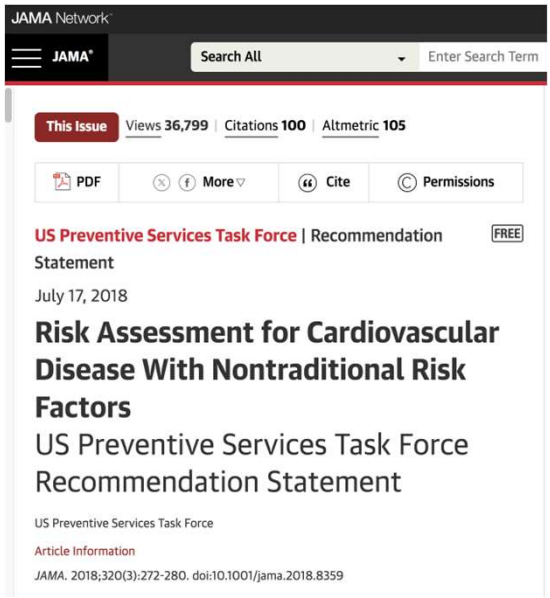
Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

Escore de cálcio



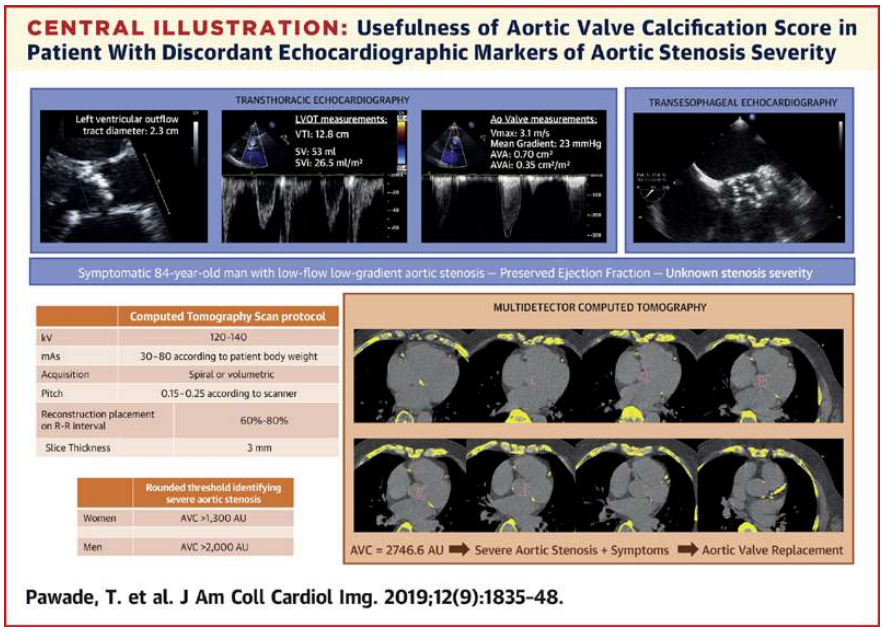
Conclusions and Recommendation The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of adding the ABI, hsCRP level, or CAC score to traditional risk assessment for CVD in asymptomatic adults to prevent CVD events. (I statement)

Ainda não é universalmente aceito

US Preventive Services Task Force; Curry SJ, Krist AH, Owens DK, Barry MJ, Caughey AB, Davidson KW, Doubeni CA, Epling JW Jr, Kemper AR, Kubik M, Landefeld CS, Mangione CM, Silverstein M, Simon MA, Tseng CW, Wong JB. Risk Assessment for Cardiovascular Disease With Nontraditional Risk Factors: US Preventive Services Task Force Recommendation Statement. JAMA. 2018 Jul 17;320(3):272-280. doi: 10.1001/jama.2018.8359. PMID: 29998297.

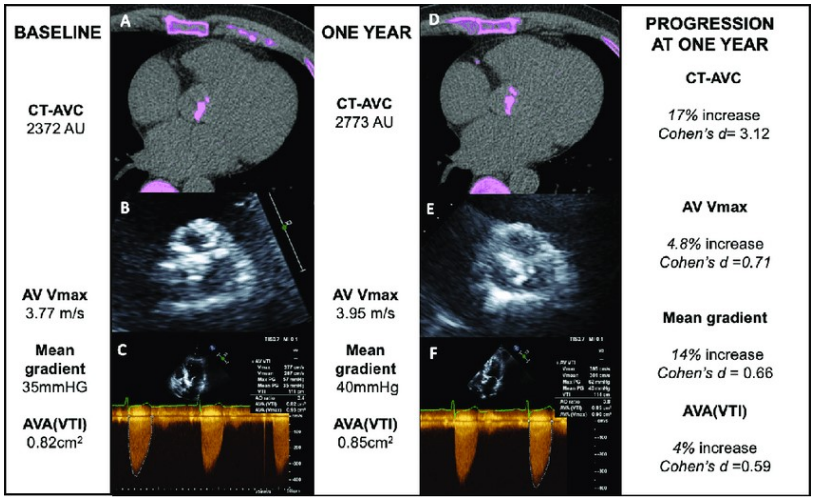
Outros empregos

Escore de cálcio



Hecht H, Blaha MJ, Berman DS, Nasir K, Budoff M, Leipsic J, Blankstein R, Narula J, Rumberger J, Shaw LJ. Clinical indications for coronary artery calcium scoring in asymptomatic patients: Expert consensus statement from the Society of Cardiovascular Computed Tomography. J Cardiovasc Comput Tomogr. 2017 Mar-Apr;11(2):157-168. doi: 10.1016/j.jcct.2017.02.010. Epub 2017 Feb 24. PMID: 28283309.

Escore de cálcio

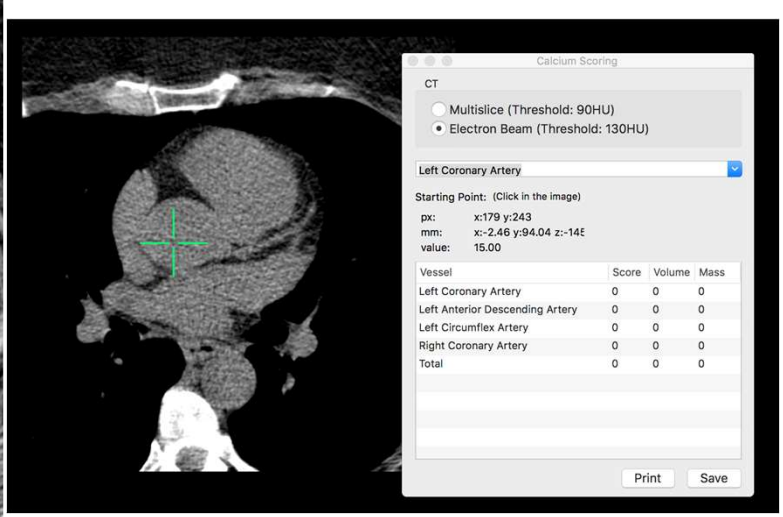


Guzzetti E, Clavel MA. Measuring progression of aortic stenosis: computed tomography versus echocardiography. Heart. 2020 Dec;106(24):1873-1875. doi: 10.1136/heartjnl-2020-317340. Epub 2020 Oct 9. PMID: 33037021.

Casos

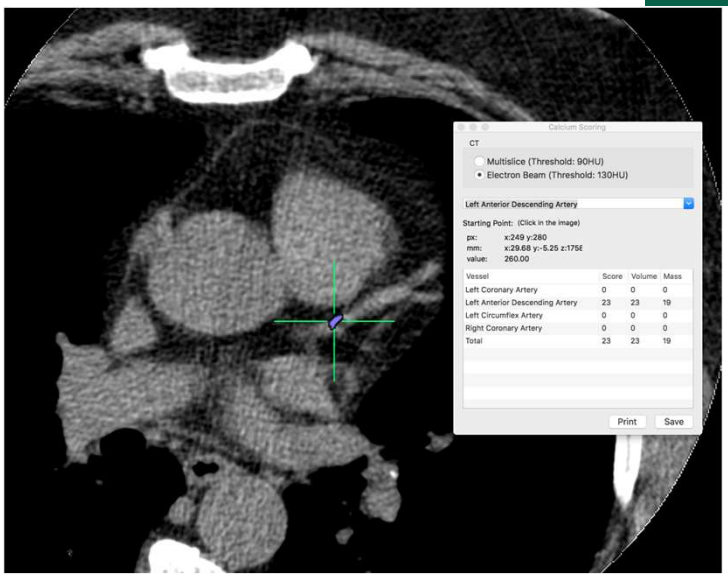
53

Escore de cálcio: 0



54

Escore de cálcio: 10-99



55

Escore de cálcio: 100-299

56

Escore de cálcio: ≥300

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Questionário 1

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Angiotomografia de coronárias

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Indicações

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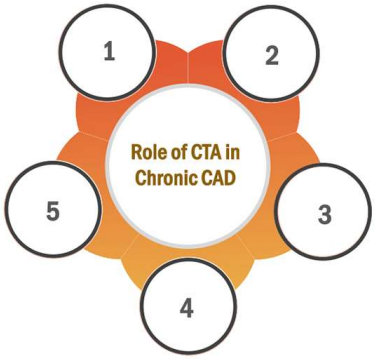
Indicações

First line test for evaluating patients with:
- No known CAD and Stable Typical or Atypical Chest Pain, or Anginal Equivalent

Reasonable test for evaluating patients with:
- Known CAD and Stable Typical or Atypical Chest Pain, or Angina Equivalent



First line test for evaluating patients with:
- Coronary Anomalies
- Prior CABG, particularly if graft patency or location of LIMA is the primary objective

Reasonable test for evaluating patients with:
- A non-conclusive functional test; to obtain more precision regarding diagnosis and prognosis

Reasonable test for evaluating patients with:
- Coronary Stents > 3.0 mm
- Proximal, Non Bifurcation thin strut Stents < 3.0 mm
- Prior to Non Cardiac Surgery in younger patients with low-intermediate probability of CAD
- Evaluating Coronary Anatomy in patients with suspected Dissection of the Aorta

Narula J, Chandrashekhar Y, Ahmadi A, Abbara S, Berman DS, Blankstein R, Leipsic J, Newby D, Nicol ED, Nieman K, Shaw L, Villines TC, Williams M, Hecht HS. SCCT 2021 Expert Consensus Document on Coronary Computed Tomographic Angiography: A Report of the Society of Cardiovascular Computed Tomography. J Cardiovasc Comput Tomogr. 2021 May-Jun;15(3):192-217. doi: 10.1016/j.jcct.2020.11.001.

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Técnica

62

Técnica

Posicionamento: decúbito dorsal com braços acima da cabeça

Voltagem do tubo: fixo em 120 kVp

mAs: variável pelo IMC

-IMC <30: 40mAs

-IMC 30-34: 50 mAs

-IMC >34: 60 mAs

Aquisição em inspiração

Reconstruções de 2,5 mm com FOV de 25 cm

FC: <60 bpm

Gupta A et al. Coronary Artery Calcium Scoring: Current Status and Future Directions. Radiographics. 2022 Jul-Aug;42(4):947-967. doi: 10.1148/rg.210122.

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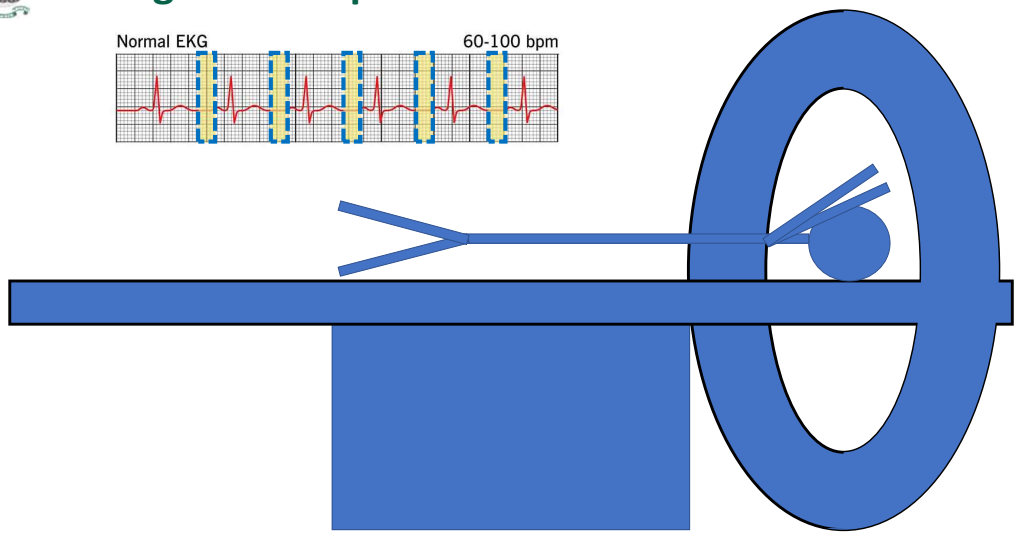
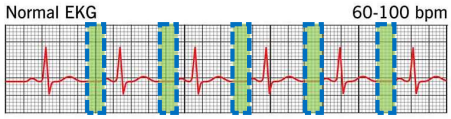
Tomografia computadorizada com ECG

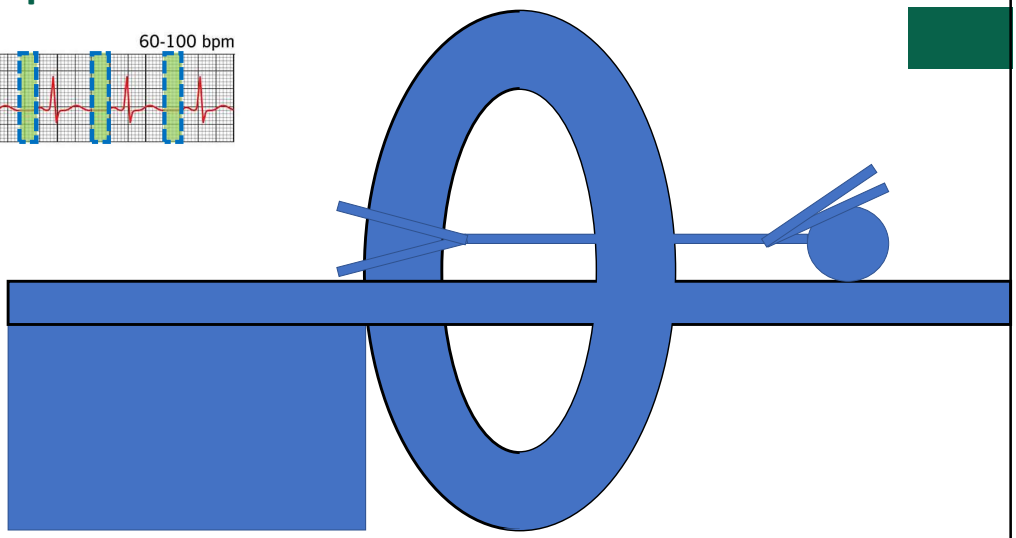


Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).

64

Tomografia computadorizada com ECG





TC de pelo menos 64 canais

Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).

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Preparo

66

Preparo

Controle de FC com beta-bloqueadores (*atenolol)

Controle de FC com outras medicações (*ivabradina)

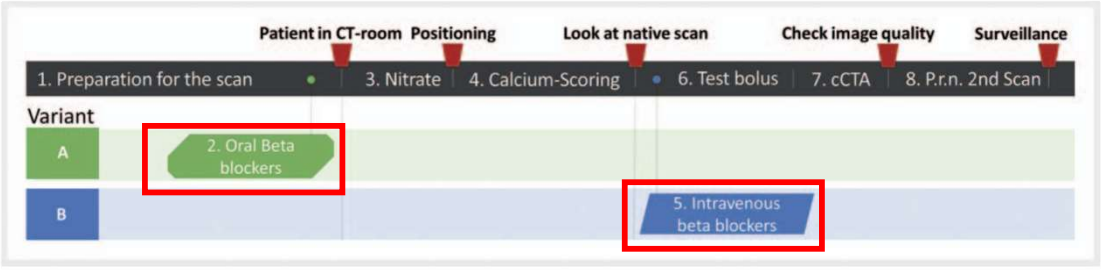
Dilatação das coronárias com nitrato (*dinitrato de isossorbida)

Término do controle de FC com o paciente na sala de TC com complemento de beta-bloqueadores (*metoprolol)

!!!Atenção para contraindicações!!!

Abbara S et al. SCCT guidelines for the performance and acquisition of coronary computed tomographic angiography: A report of the society of Cardiovascular Computed Tomography Guidelines Committee: Endorsed by the North American Society for Cardiovascular Imaging (NASCI). J Cardiovasc Comput Tomogr. 2016 Nov-Dec;10(6):435-449. doi: 10.1016/j.jcct.2016.10.002.
Soschynski M et al. Update for the Performance of CT Coronary Angiography - Evidence-Based Application and Technical Guidance According to Current Consensus Guidelines and Practical Advice from the Clinical Routine. Rofo. 2022 Jun;194(6):613-624. English, German. doi: 10.1055/a-1747-3554.

Indicações



Narula J, Chandrashekhar Y, Ahmadi A, Abbara S, Berman DS, Blankstein R, Leipsic J, Newby D, Nicol ED, Nieman K, Shaw L, Villines TC, Williams M, Hecht HS. SCCT 2021 Expert Consensus Document on Coronary Computed Tomographic Angiography: A Report of the Society of Cardiovascular Computed Tomography. J Cardiovasc Comput Tomogr. 2021 May-Jun;15(3):192-217. doi: 10.1016/j.jcct.2020.11.001.

Dificuldades

Dificuldades

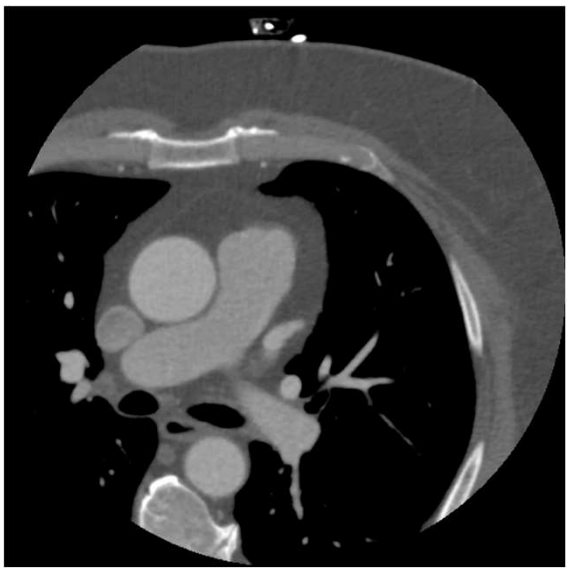
- Apneia insatisfatória
- Ritmo cardíaco irregular (fibrilação atrial, bigeminismo, etc)
- Extrassístoles
- Pacientes obesos
- Meios de contraste de baixa concentração de iodo
- Equipamentos mais antigos

Abbara S et al. SCCT guidelines for the performance and acquisition of coronary computed tomographic angiography: A report of the society of Cardiovascular Computed Tomography Guidelines Committee: Endorsed by the North American Society for Cardiovascular Imaging (NASCI). J Cardiovasc Comput Tomogr. 2016 Nov-Dec;10(6):435-449. doi: 10.1016/j.jcct.2016.10.002.
Soschynski M et al. Update for the Performance of CT Coronary Angiography - Evidence-Based Application and Technical Guidance According to Current Consensus Guidelines and Practical Advice from the Clinical Routine. Rofo. 2022 Jun;194(6):613-624. English, German. doi: 10.1055/a-1747-3554.

Aquisição

71

AngioTC de coronária

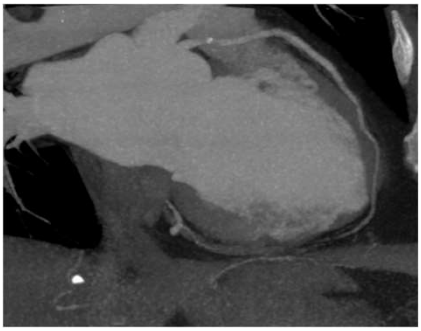


72

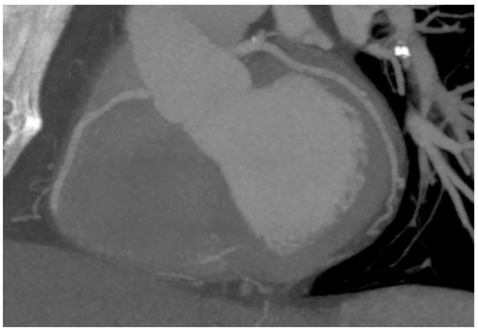
AngioTC de coronária

Tronco E

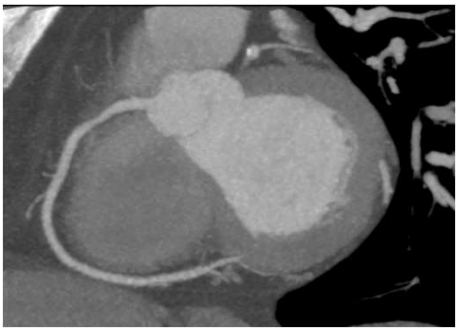
DA



Cx



CD



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Grau de estenose

CAD-RADS categories

Score	Stenosis	Interpretation	Further investigation
0	0%	Absence of CAD	None
1	1–24%	Minimal non-obstructive CAD	None
2	25–49%	Mild non-obstructive CAD	None
3	50–69%	Moderate stenosis	Consider functional assessment
4A	70–99% single or 2- vessel	Severe stenosis	Consider ICA or functional assessment
4B	Left main >50% or 3- vessel ≥70%		ICA
5	100%	Total coronary occlusion	Consider ICA and viability assessment
CadRads N	Non-diagnostic study	Obstructive CAD cannot be excluded	Additional evaluation needed

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

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Grau de estenose

CAD-RADS categories

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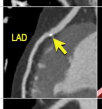
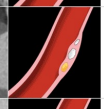
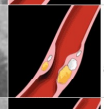
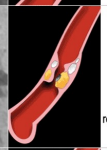
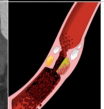
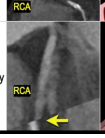
CadRads N	Non-diagnostic study	Obstructive CAD cannot be excluded	Additional evaluation needed

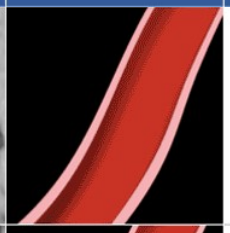
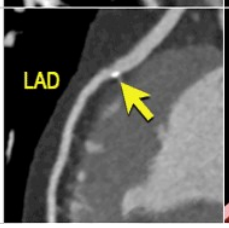
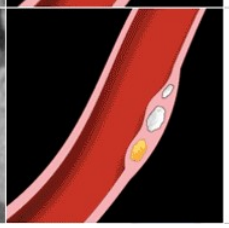
Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

Grau de estenose

Cad-Rads	Stenosis	CT imaging	Illustration	Additional Tests
Cad-Rads 0	0% No stenosis			None
Cad-Rads 1	1-24% Minimal stenosis			None
Cad-Rads 2	25-49% Mild stenosis			None
Cad-Rads 3	50-70% Moderate stenosis			Consider functional assessment
Cad-Rads 4	A: 70-99% stenosis in 1 or 2 vessels B: >50% stenosis in the left main or >70% stenosis in 3-vessels			A: Consider functional assessment or ICA B: ICA is recommended
Cad-Rads 5	100% total occlusion			ICA and/or viability assessment
Cad-Rads N	Non-diagnostic study			Additional evaluation

Radiology Assistant. Web site disponível em https:/ ırtery-disease-reporting-and-data-system (acesso em 18/02/2024)

Grau de estenose

Cad-Rads	Stenosis	CT imaging	Illustration	Additional Tests
Cad-Rads **0**	0% No stenosis			None
Cad-Rads **1**	1-24% Minimal stenosis			None

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

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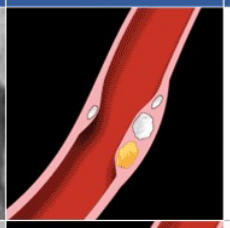
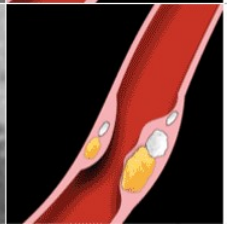
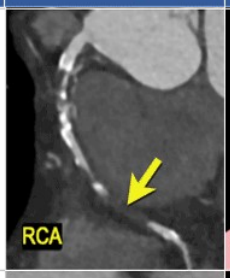
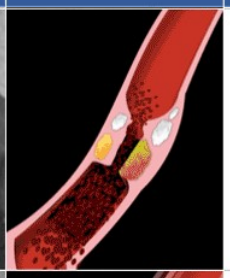
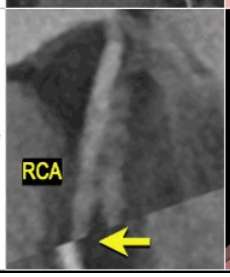
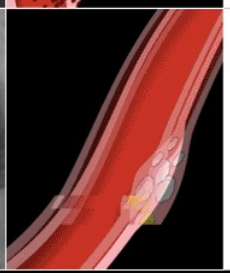
Grau de estenose

Cad-Rads	Stenosis	CT imaging	Illustration	Additional Tests
Cad-Rads **2**	25-49% Mild stenosis			None
Cad-Rads **3**	50-70% Moderate stenosis			Consider functional assessment

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

78

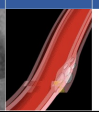
Grau de estenose

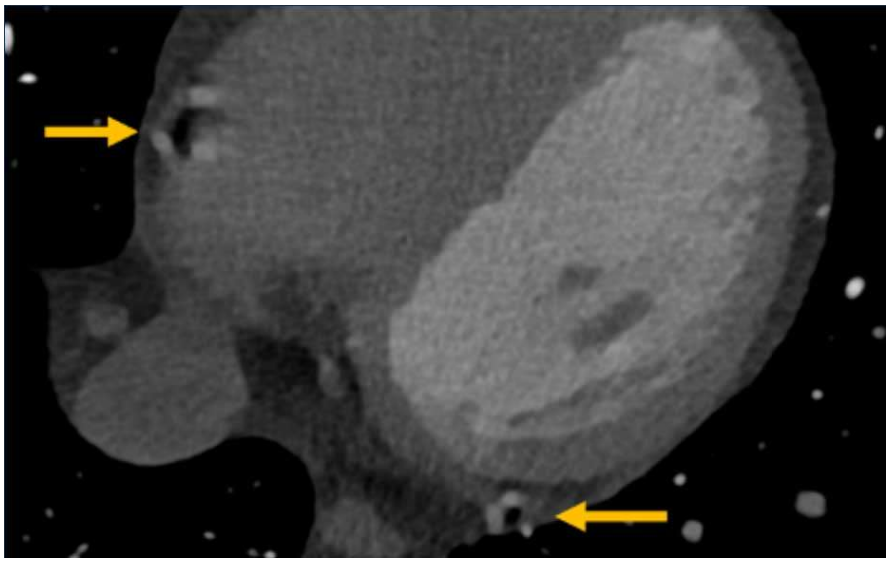
Cad-Rads	Stenosis	CT imaging	Illustration	Additional Tests
Cad-Rads **5**	100% total occlusion			ICA and/or viability assessment
Cad-Rads **N**	Non-diagnostic study			Additional evaluation

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

79

Grau de estenose

Cad-Rads	Stenosis	CT imaging	Illustration	Additional Tests
Cad-Rads **N**	Non-diagnostic study			Additional evaluation



Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

80

Burden de placa (por escore de cálcio)

Coronary Plaque Burden				
	Amount of plaque	Calcium score	SIS*	Visual
P1	Mild	1-100	≤2	1-2 vessels with mild amount of plaque
P2	Moderate	101-300	3-4	1-2 vessels with moderate amount; 3 vessels with mild amount of plaque
P3	Severe	301-999	5-7	3 vessels with moderate amount; 1 vessel with severe amount of plaque
P4	Extensive	>1000	≥8	2-3 vessels with severe amount of plaque

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

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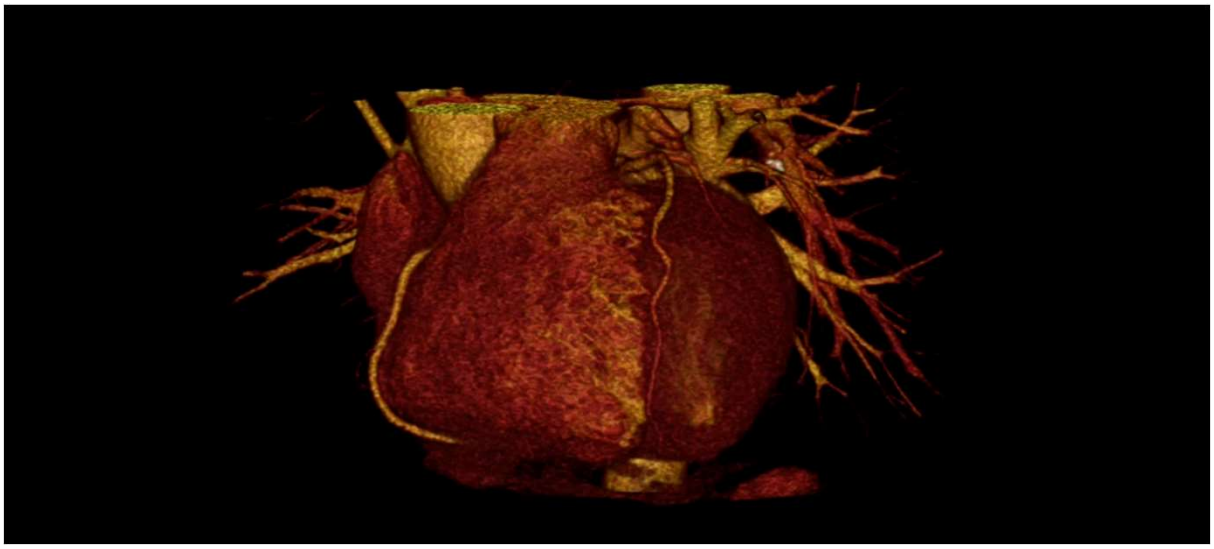
Manejo dos resultados

Management considerations based on plaque burden	
CAD-RADS1	Consider non-atherosclerotic causes P1: Consider risk factor modification and preventive pharmacotherapy P2: Risk factor modification and preventive pharmacotherapy P3/P4: Aggressive risk factor modification and preventive pharmacotherapy
CAD-RADS 2	Consider non-atherosclerotic causes P1/P2: Risk factor modification and preventive pharmacotherapy P3/P4: Aggressive risk factor modification and preventive pharmacotherapy
CAD-RADS 3	P1/P2/P3/P4: Aggressive risk factor modification and preventive pharmacotherapy Other treatments (including anti-anginal therapy) should be considered per guideline When modifier I+, consider ICA, especially if frequent symptoms persist after guideline-directed medical therapy
CAD-RADS 4A/B	P1/P2/P3/P4: Aggressive risk factor modification and preventive pharmacotherapy Other treatments (including anti-anginal therapy and options of revascularization) should be considered per guideline
CAD-RADS 5	P1/P2/P3/P4: Aggressive risk factor modification and preventive pharmacotherapy Other treatments (including anti-anginal therapy and options of revascularization) should be considered per guideline

Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system (acesso em 18/02/2024)

82

Volume rendering



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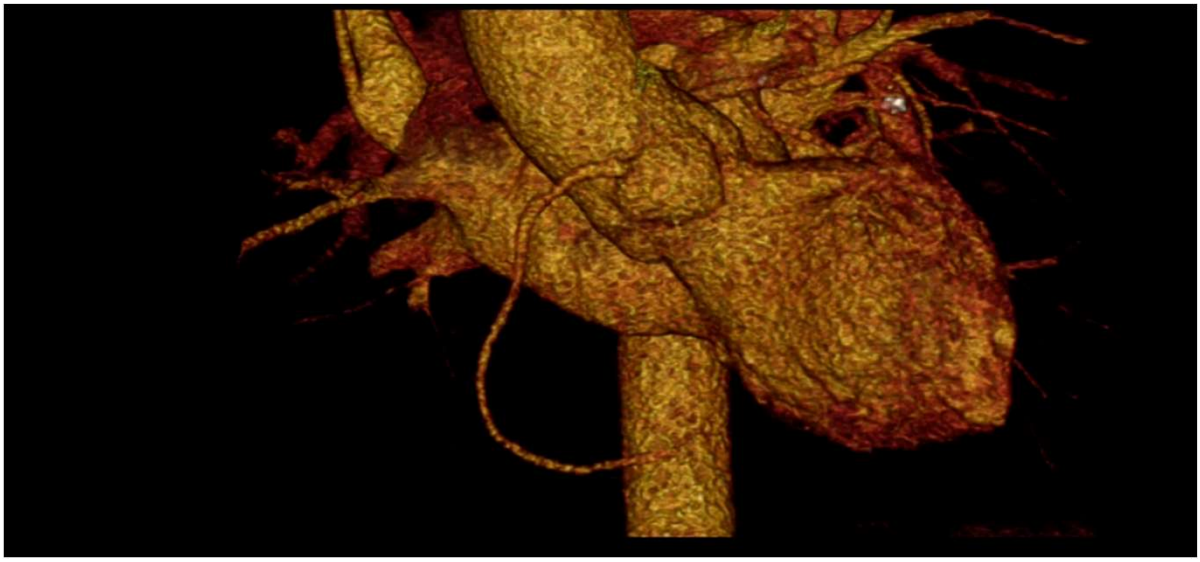
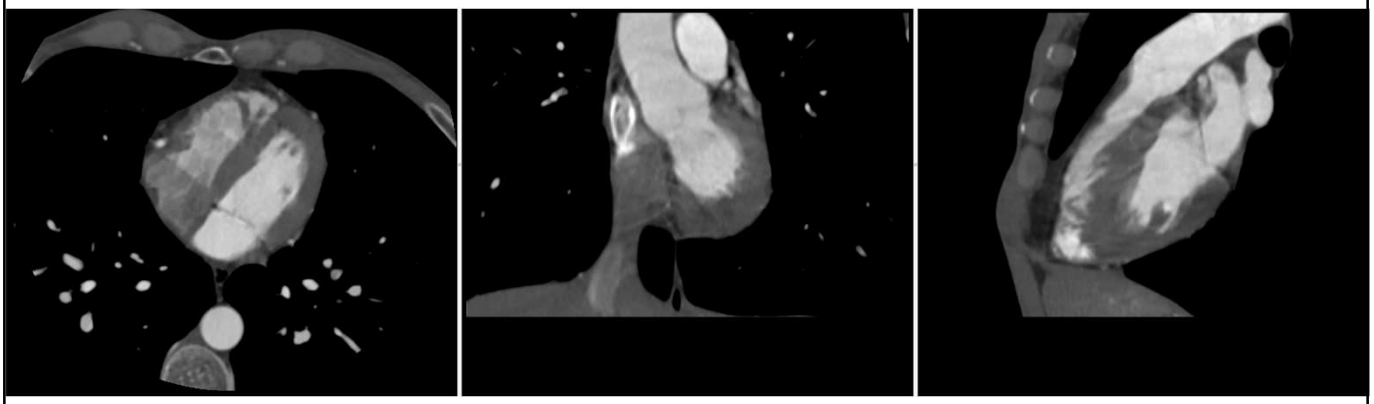
Volume rendering



84

Avaliação 4D



85

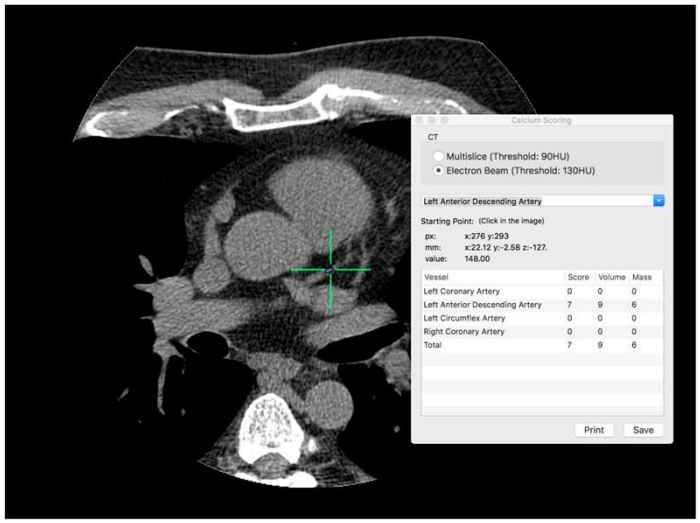
Avaliação 4D

86

Casos

87

Escore de cálcio: <100



88

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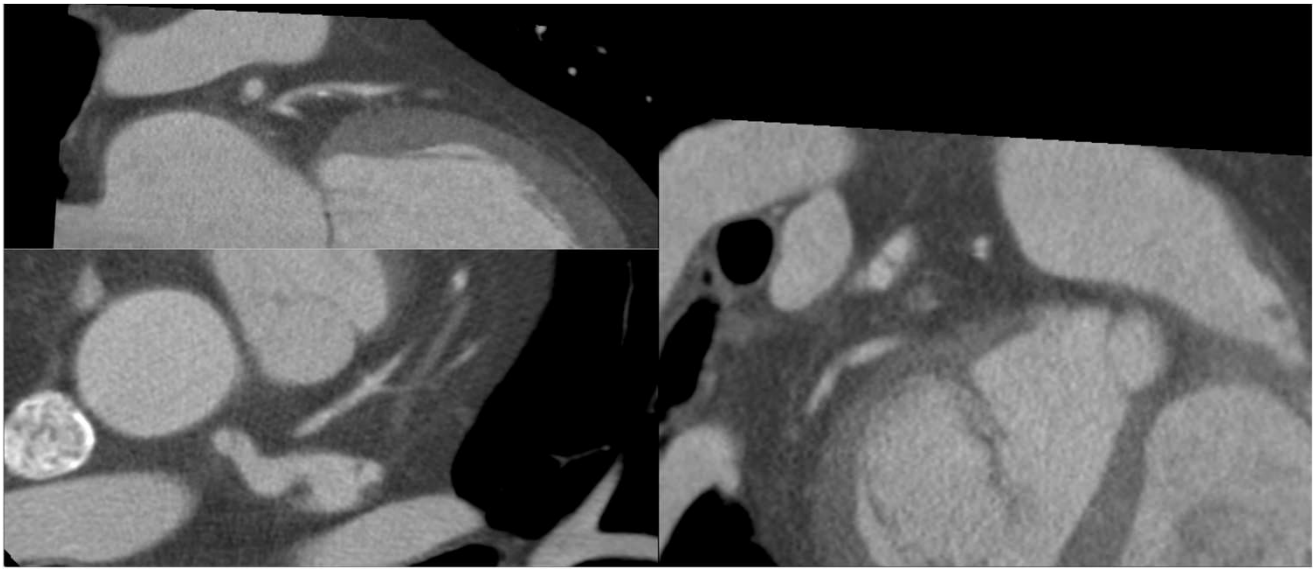

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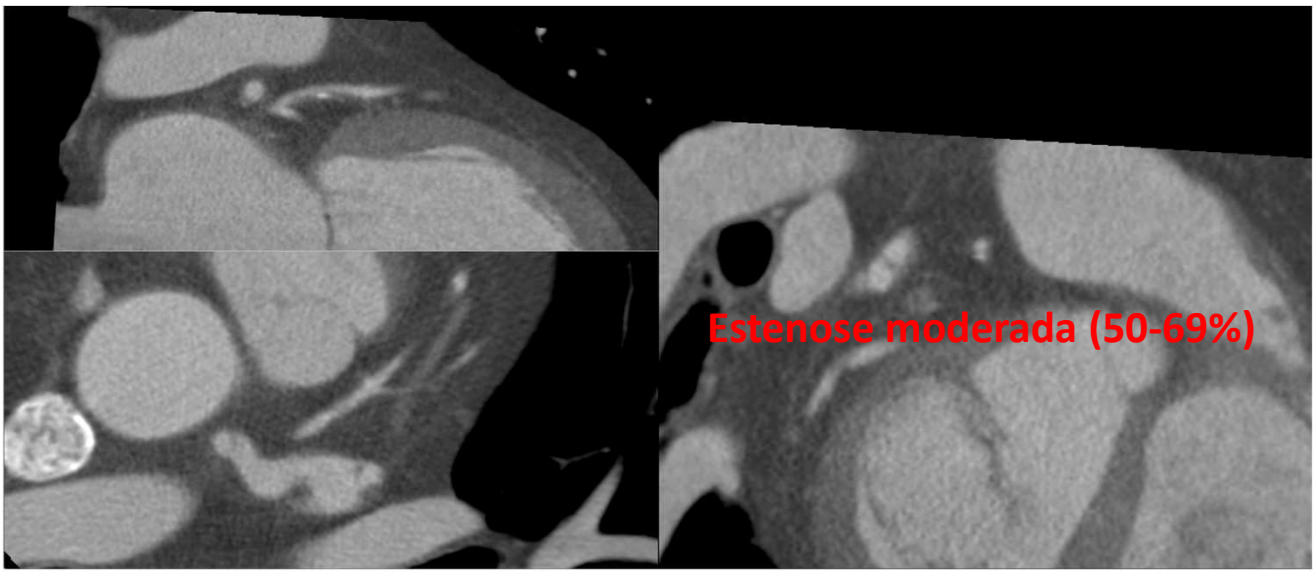

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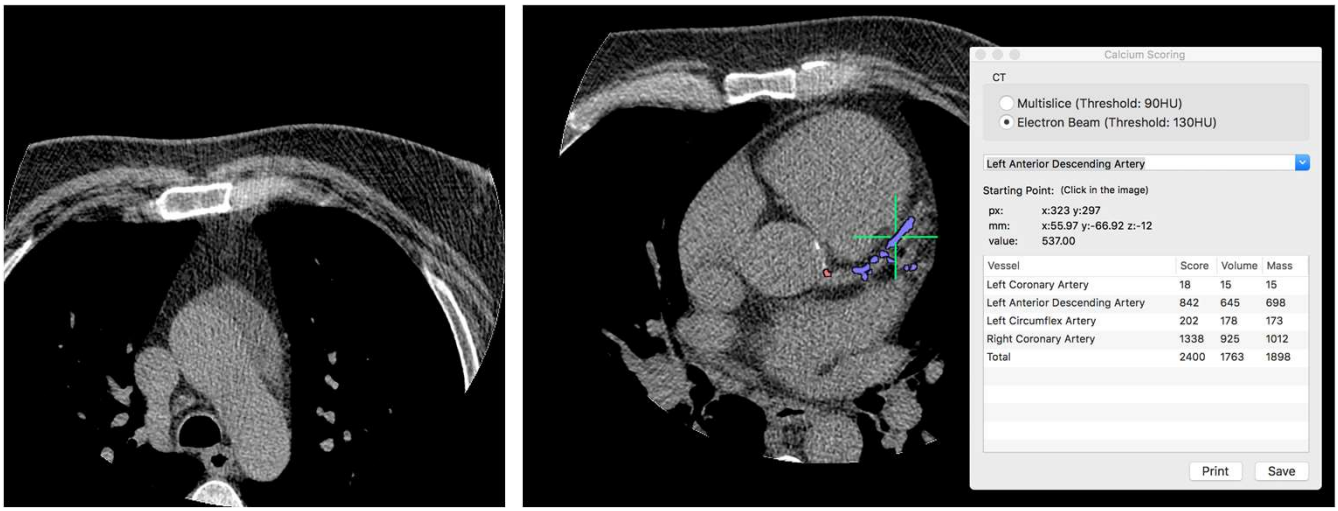

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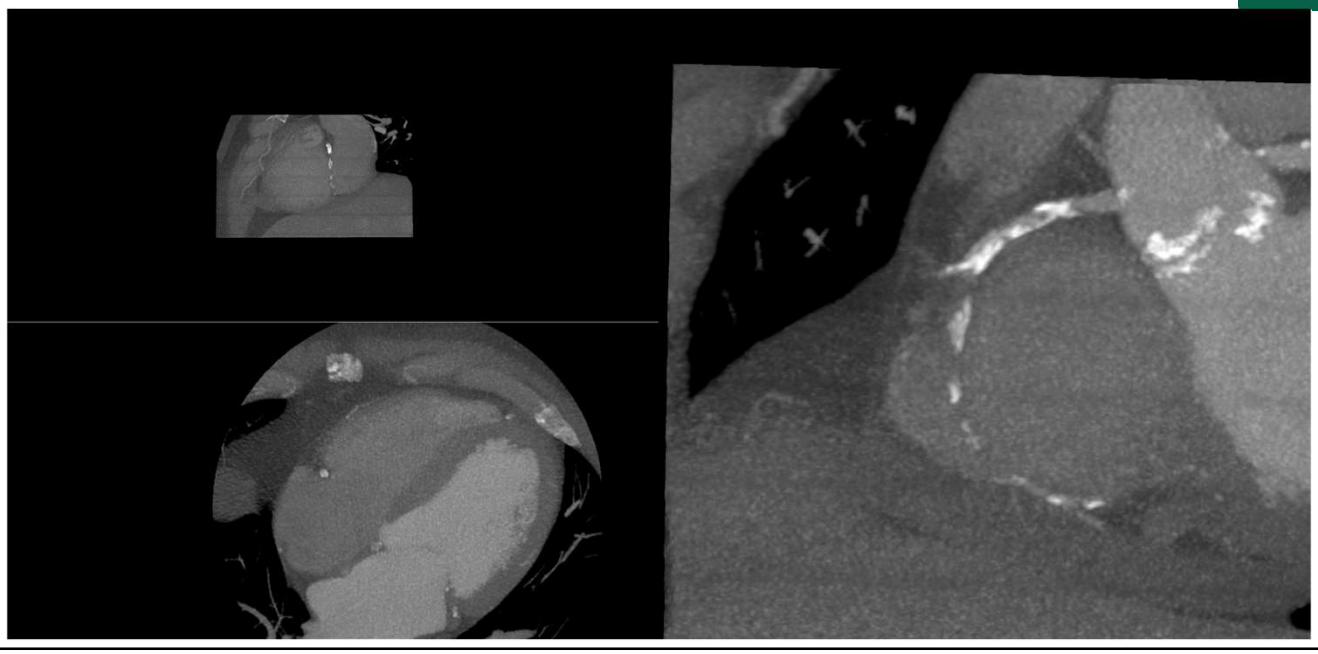

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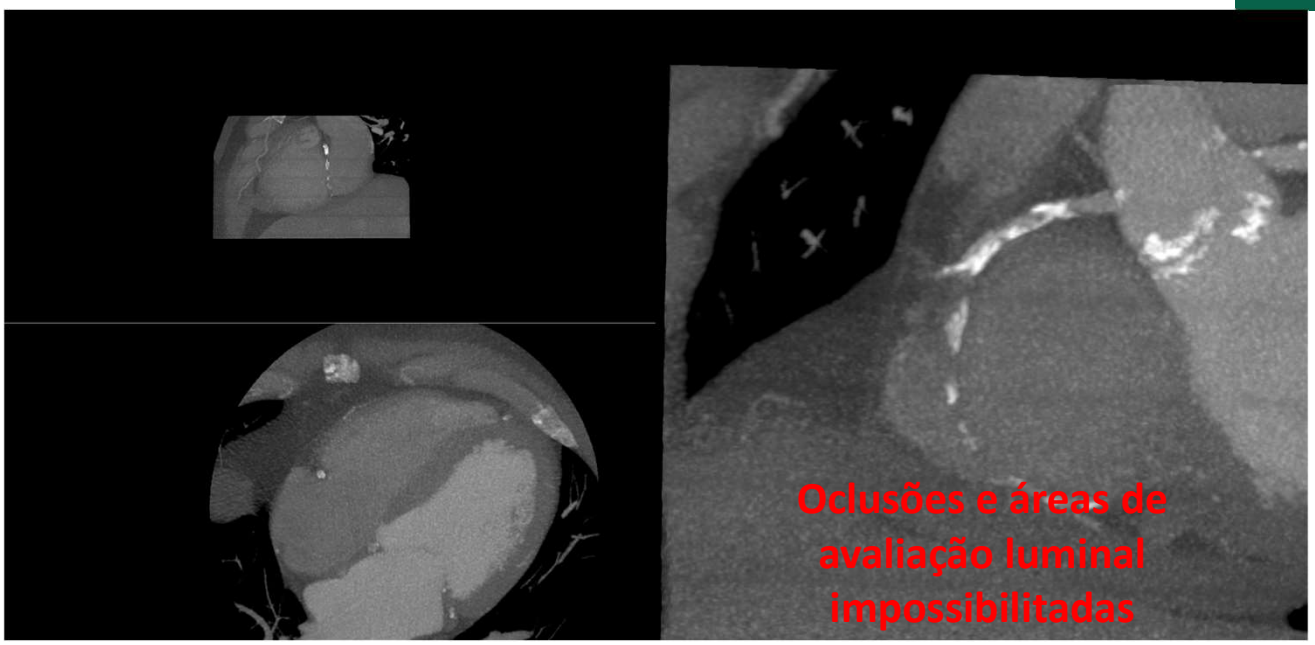

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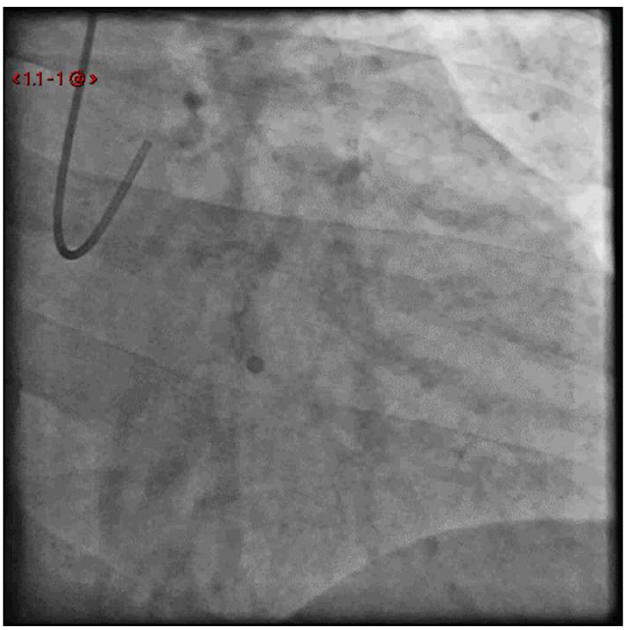

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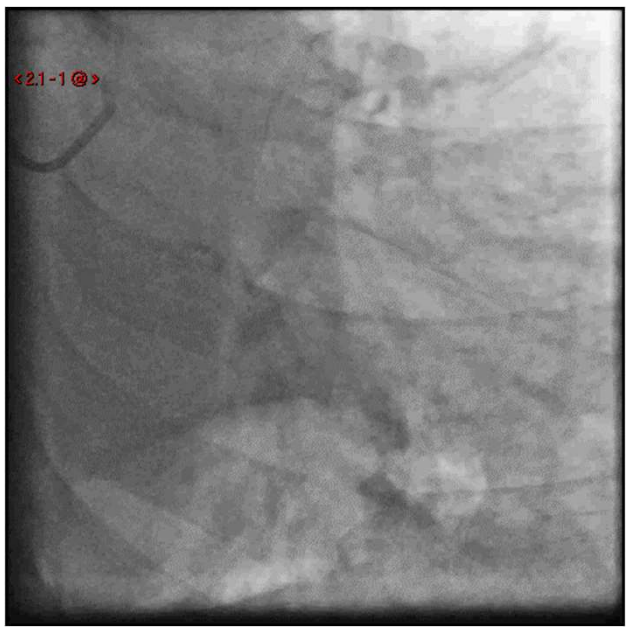

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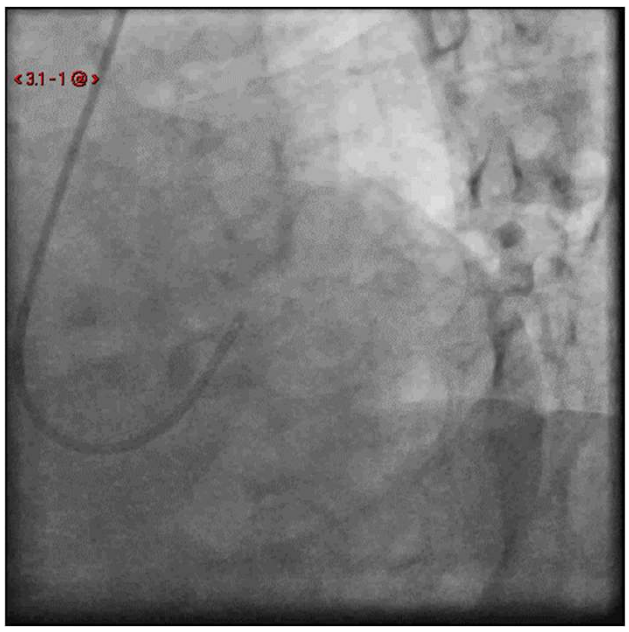

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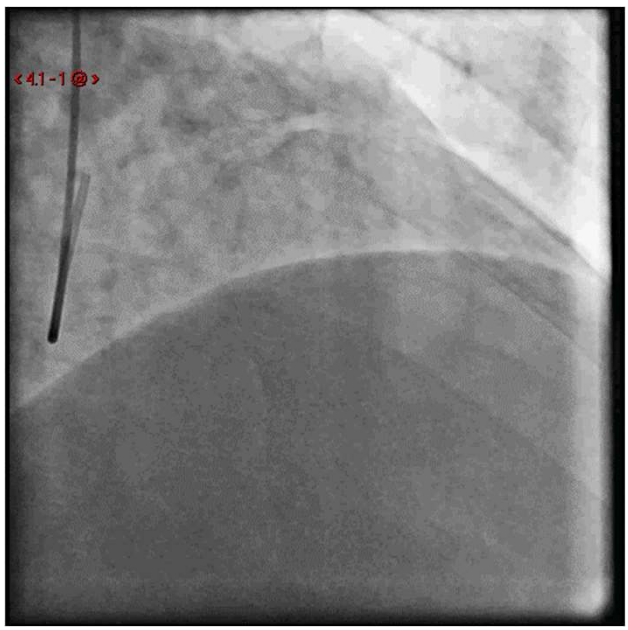

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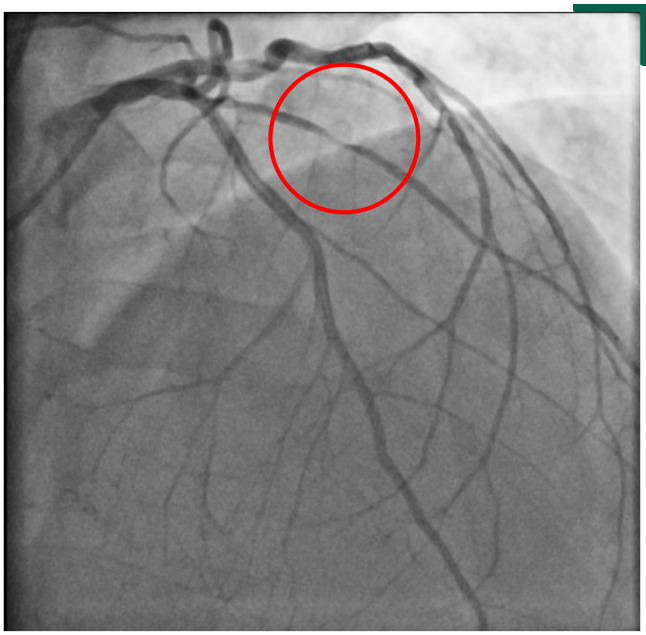

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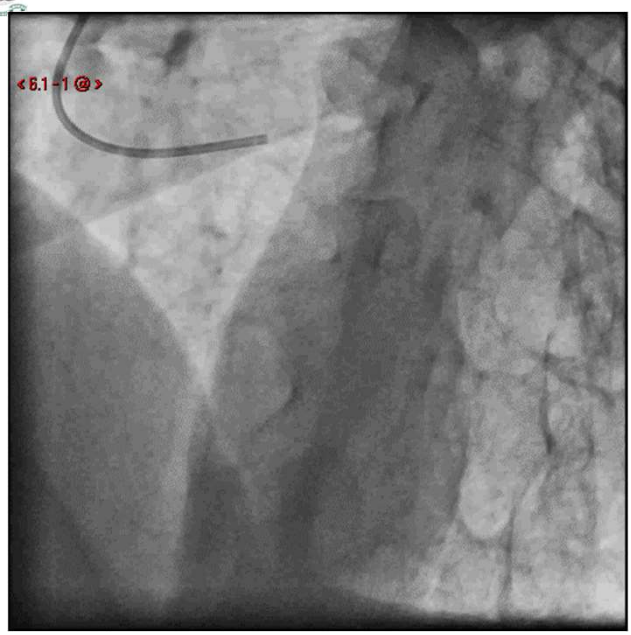

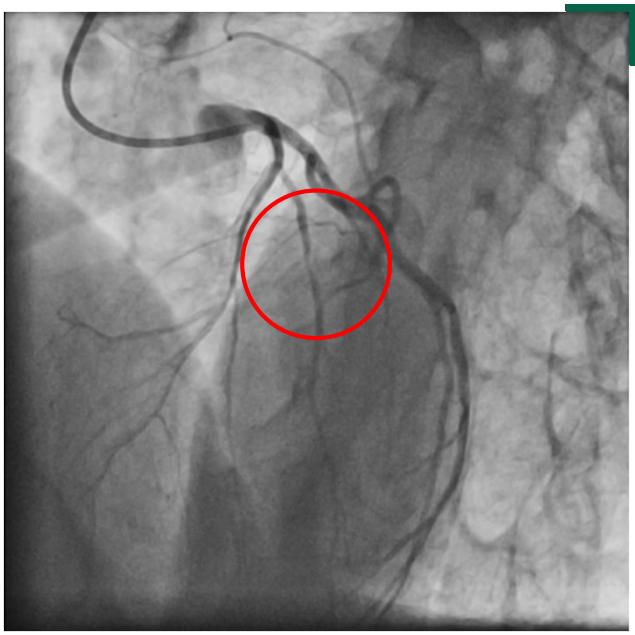

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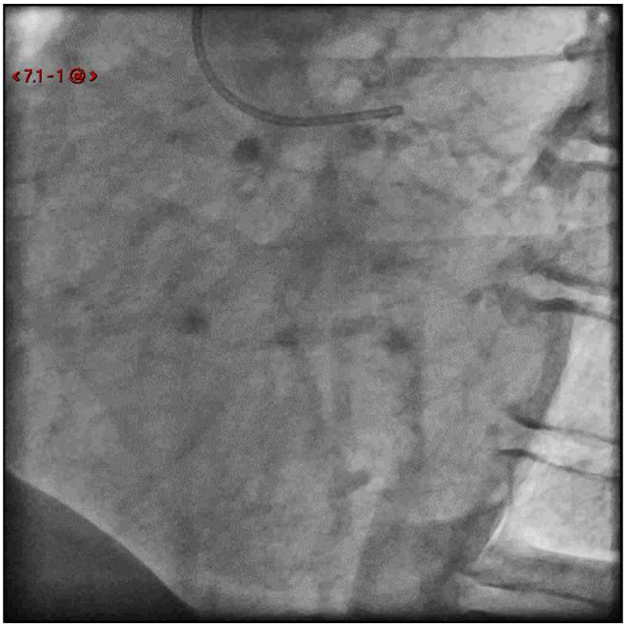

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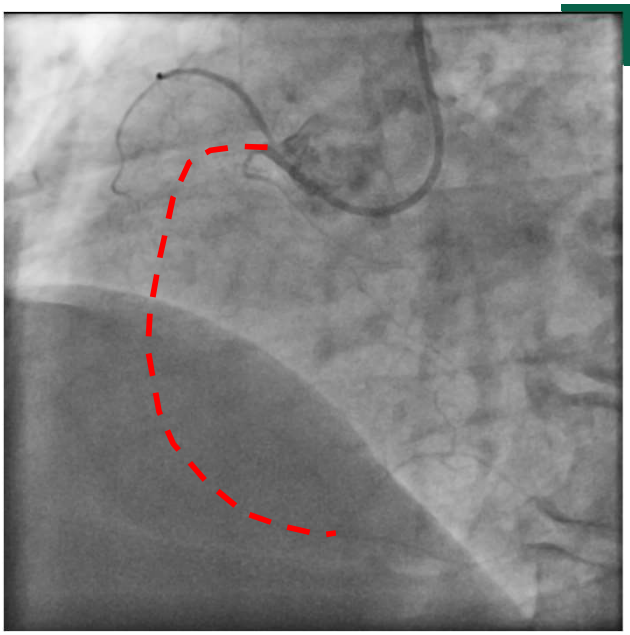
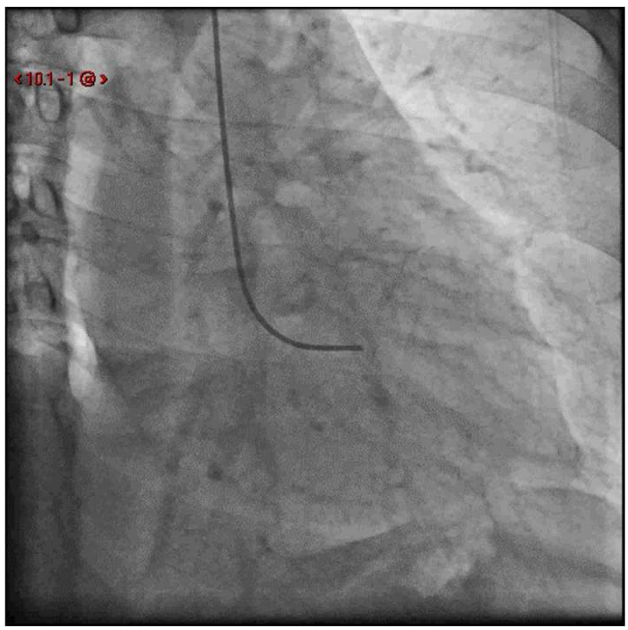


101

102



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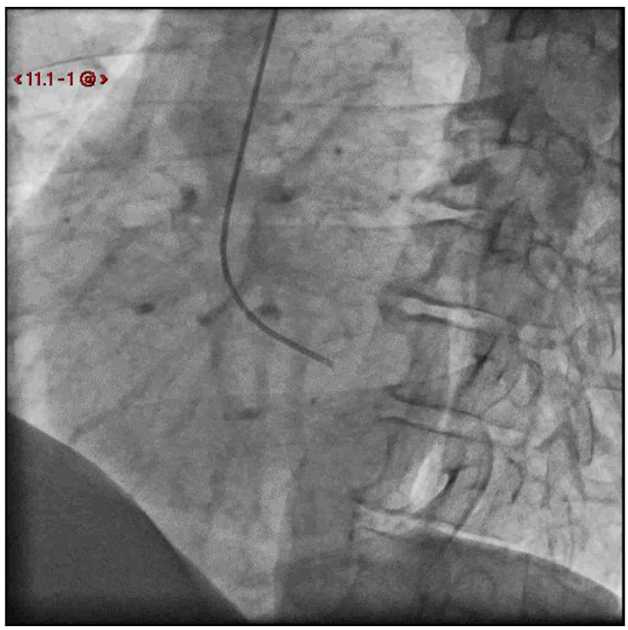


104

Questionário 2

Ressonância magnética cardíaca

Técnica

107

Técnica

Posicionamento: decúbito dorsal com braços acima da cabeça

Bobina superficial de corpo

Aquisições de sequências em expiração

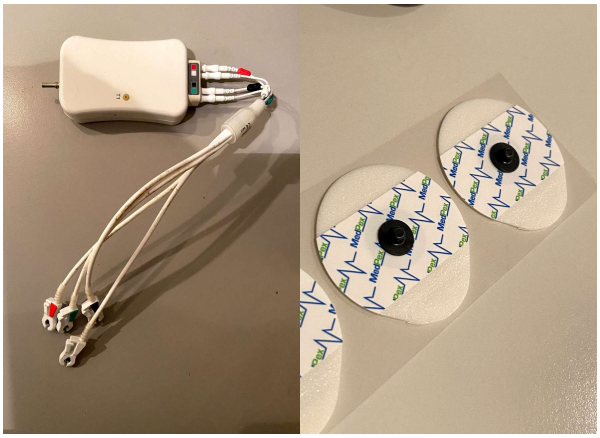
Aquisições nos planos do coração

Tempo de exame: 25-60 min

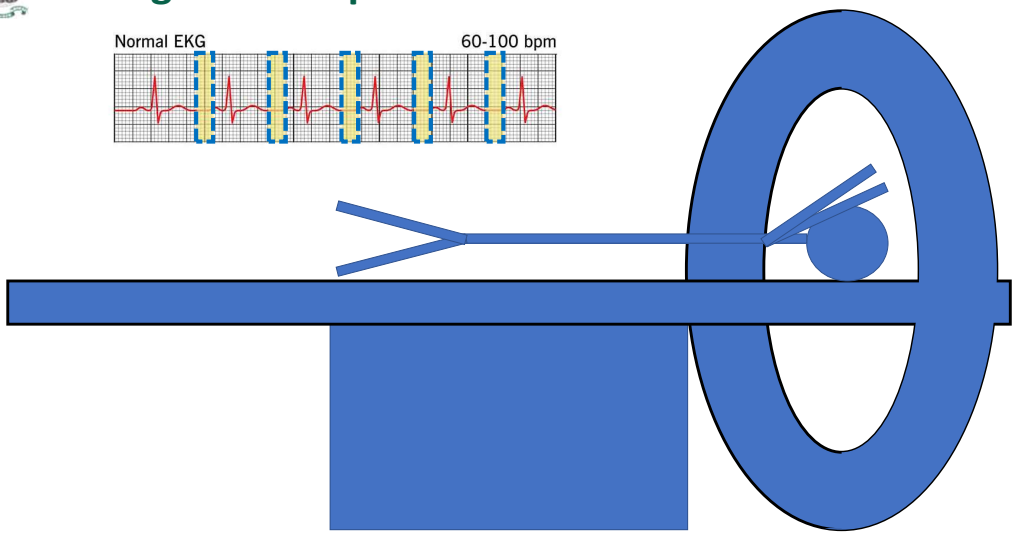
Ref

108

O exame

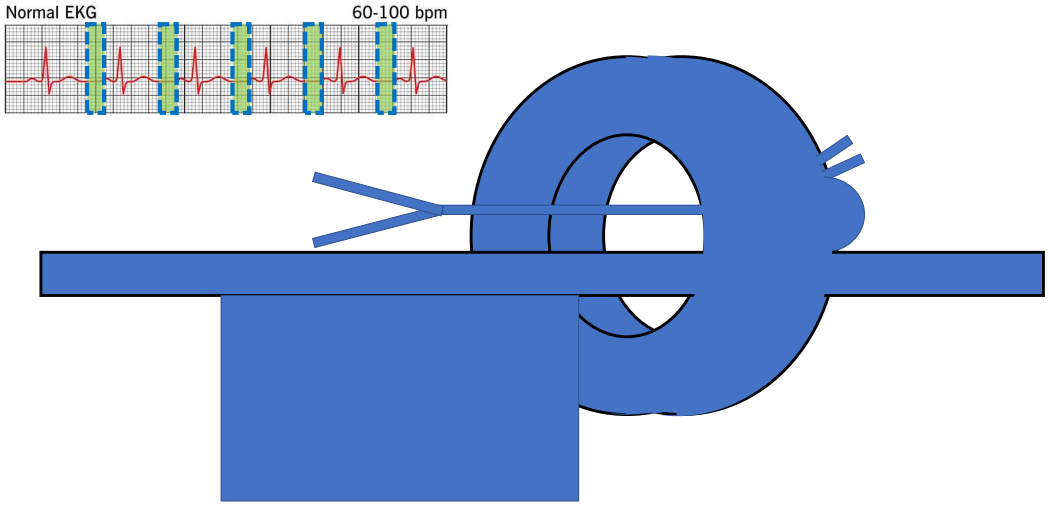


Tomografia computadorizada com ECG



Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).

Ressonância magnética com ECG



Espaço menor

Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).

111

O exame

112

Preparo

113

Preparo

Nenhum específico

Exceto: casos de indução farmacológico de estresse para pesquisa de isquemia miocárdica

Gupta A et al. Coronary Artery Calcium Scoring: Current Status and Future Directions. Radiographics. 2022 Jul-Aug;42(4):947-967. doi: 10.1148/rg.210122.

114

Contraindicações

115

Contraindicações

Aparelhos médicos incompatíveis (dispositivos eletrônicos cardíacos incompatíveis, alguns componentes de marcapassos, implantes cocleares, etc.)

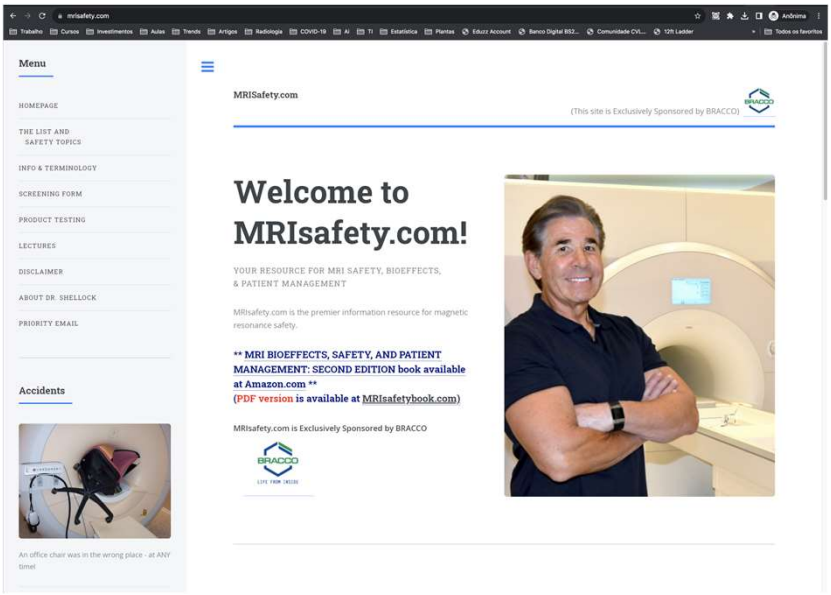
Outros objetos metálicos no corpo

*Claustrofobia

REF

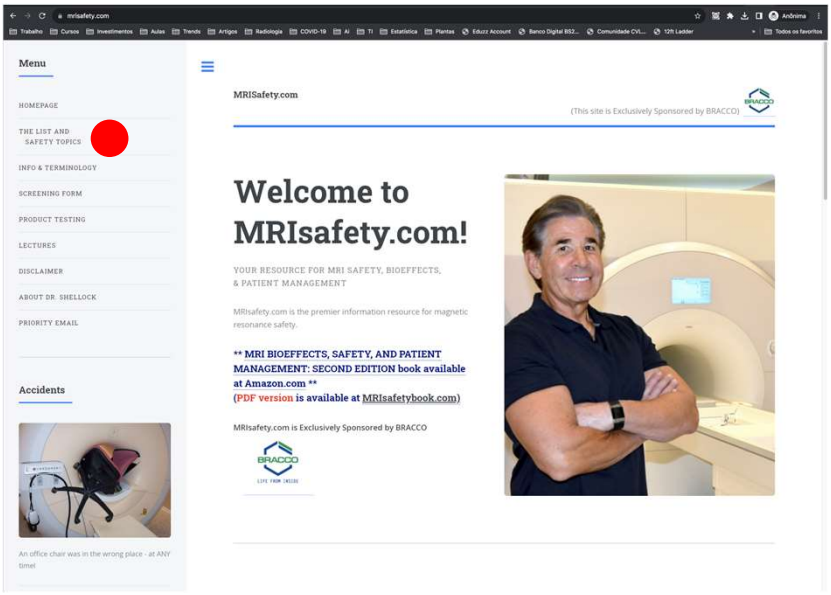
116

Contraindicações



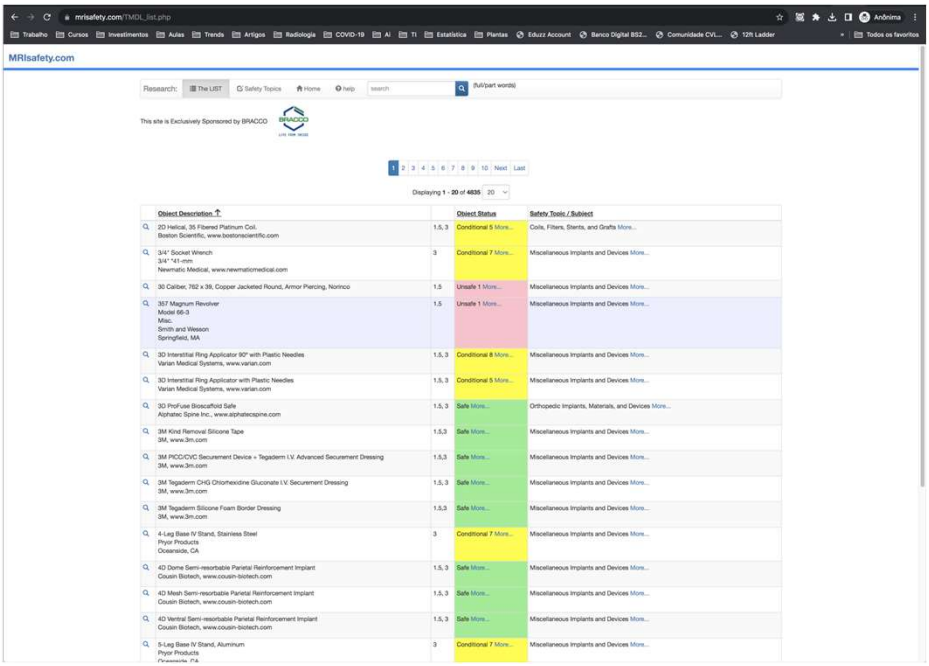
MRI Safety. Web site disponível em https://www.mrisafety.com/ (acesso 18/02/2024).

Contraindicações



MRI Safety. Web site disponível em https://www.mrisafety.com/ (acesso 18/02/2024).

Contraindicações



MRI Safety. Web site disponível em https://www.mrisafety.com/ (acesso 18/02/2024).

Contraindicações

Research: The LIST | Safety Topics | Home | help | hearing | (full/part words)

This site is Exclusively Sponsored by BRACCO

Displaying 1 - 5 of 5 | 20

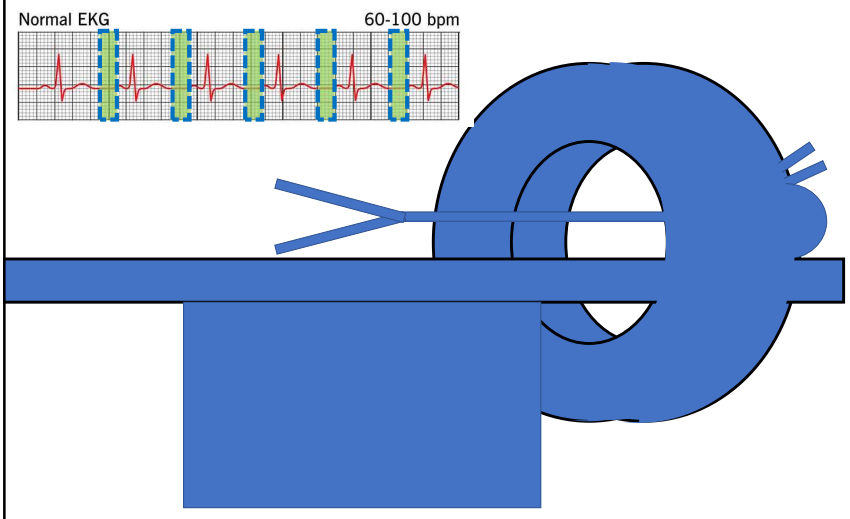
Object Description		Object Status	Safety Topic / Subject
Alpha (M) Magnetic Implant, Bone Conduction Hearing System Sophono, Inc., www.sophono.com	1.5,3	Conditional 5 More...	Cochlear Implants More...
Esteem System, which includes a Model 2001 Sound Processor with the 7002/7004/7010 Sensors and 7502/7504/7510 Drivers, Hearing Implant Envoy Medical www.envoymedical.com MR Conditional labeling - htt More ...	1.5, 3	Conditional 5 More...	Miscellaneous Implants and Devices More...
Lyric Hearing Device InSound Medical Newark, CA	1.5	Unsafe 1 More...	InSound XT Series and Lyric Hearing Device More...
MAXUM System, MAXUM Hearing Implant Ototronix, www.ototronix.com	1.5	Unsafe 1 More...	Otologic Implants More...
Ponto Wide Implant, Used With Bone Conduction Hearing System Oticon Medical, www.oticonmedical.com	3	Conditional 6 More...	Miscellaneous Implants and Devices More...

Shellock R & D Services, Inc. email: **Frank.Shellock@MRIsafety.com.**

MRI Safety. Web site disponível em https://www.mrisafety.com/ (acesso 18/02/2024).

Como são as imagens de um exame?

Ressonância magnética com ECG



Encha o peito de ar
Solte todo o ar
Pare de respirar
zzzzzzzzzzzzz (aquisição)
Relaxe

~51 apneias num exame

Electrocardiogram (EKG) Cleveland Clinic site. Disponível em https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (acesso em 18/02/2024).

Planos cardíacos
(exemplos pela angioTC de coronárias)

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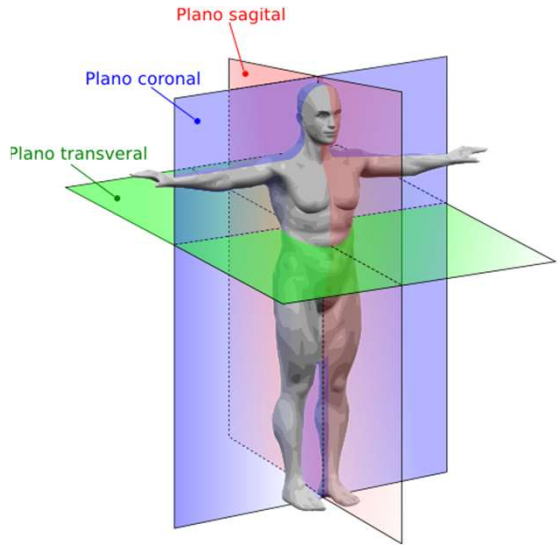
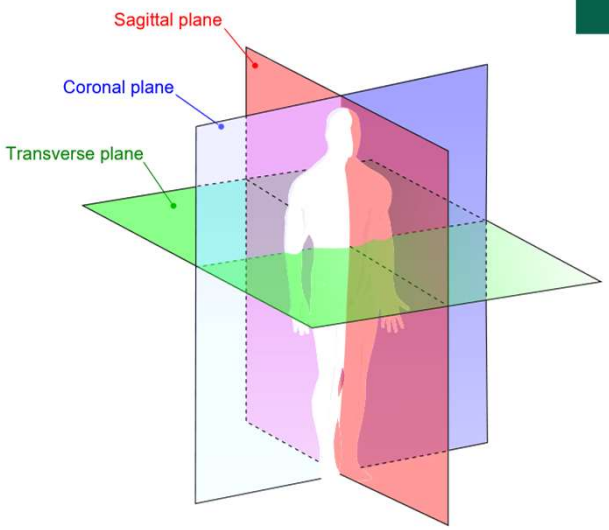
Planos anatômicos





124

Planos anatômicos

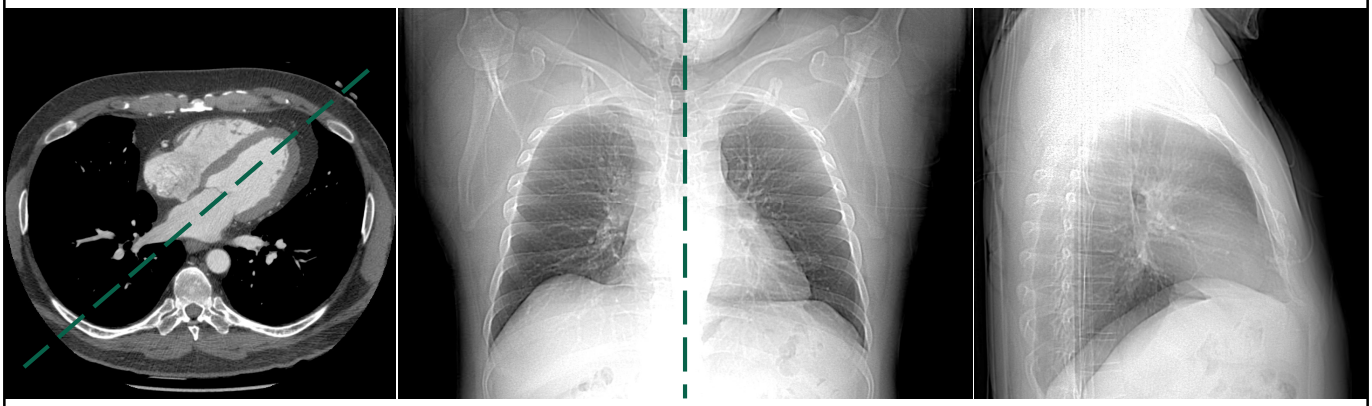
125

Planos anatômicos

Sagital

126

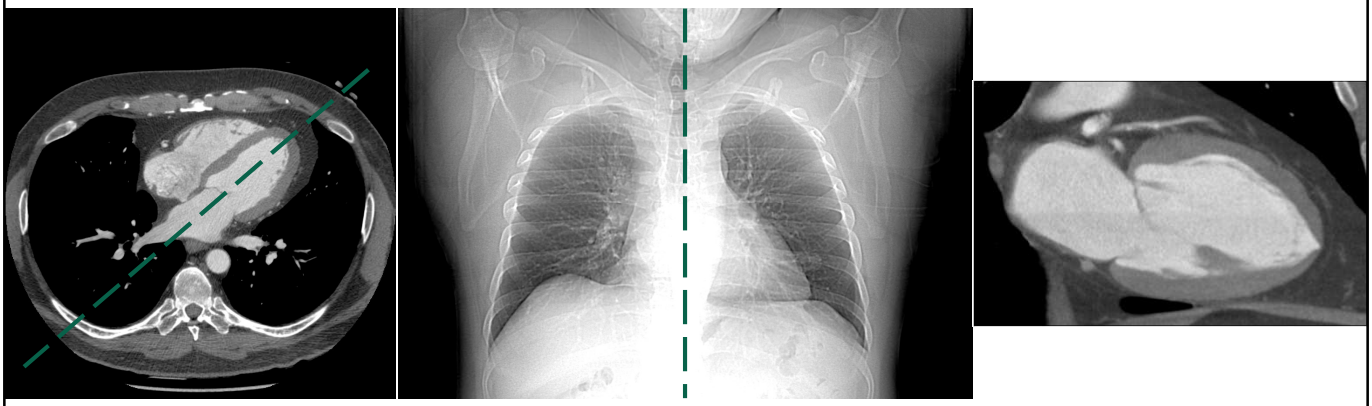
Planos anatômicos



Loc eixo longo do ventrículo esquerdo (ELVE)

127

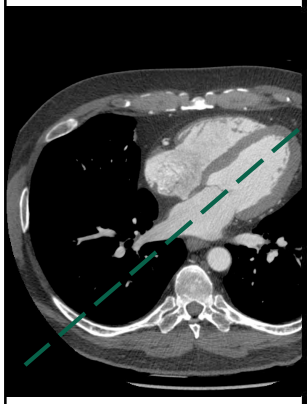
Loc ELVE

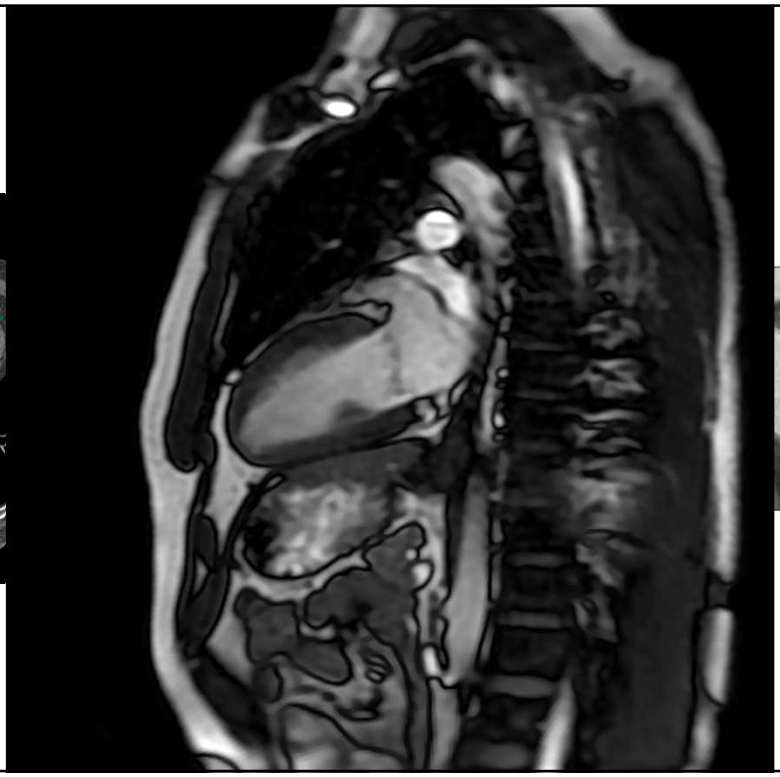


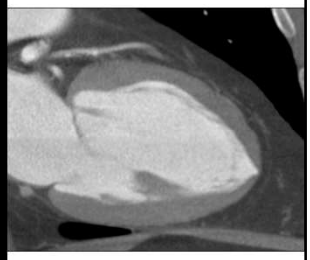
Loc eixo longo do ventrículo esquerdo (ELVE)

128

Loc ELVE

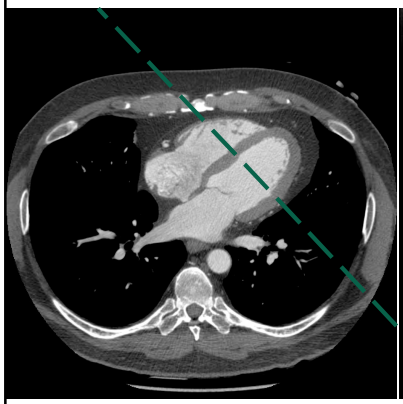


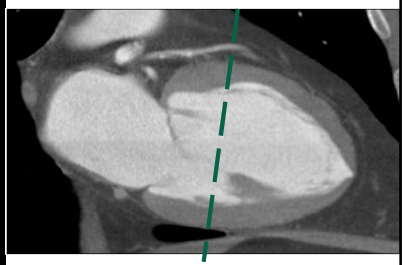




129

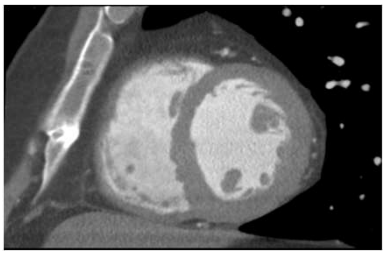
Loc eixo curto (loc EC)

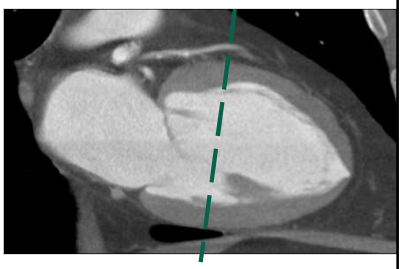




130

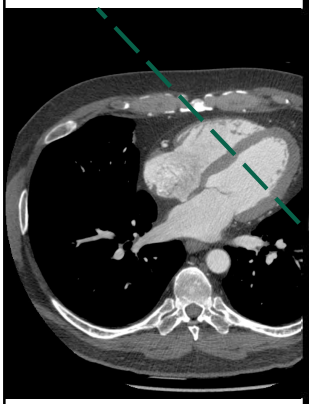
Loc eixo curto (loc EC)

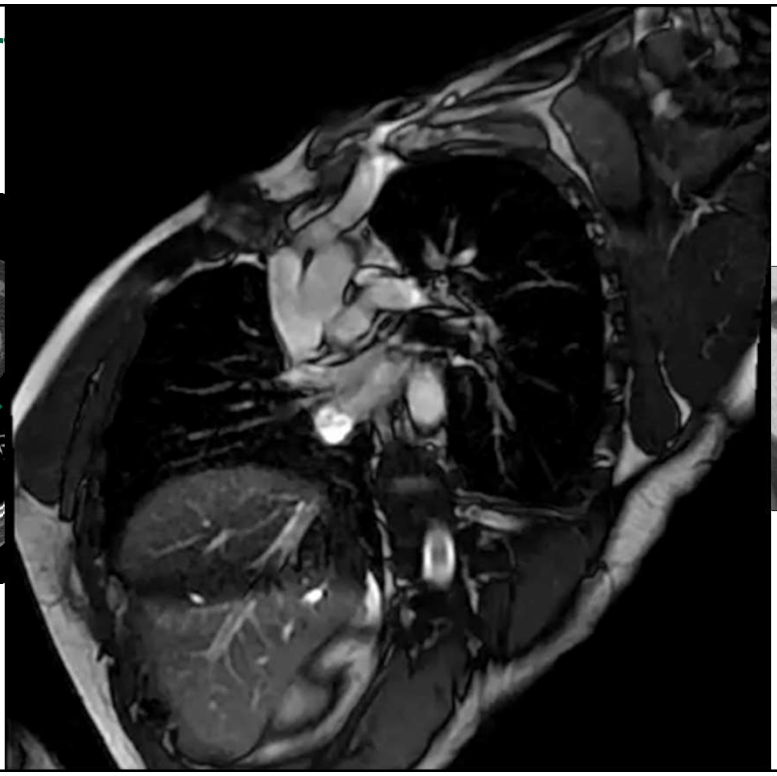


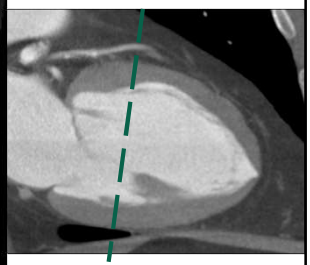


131

Loc eixo cur

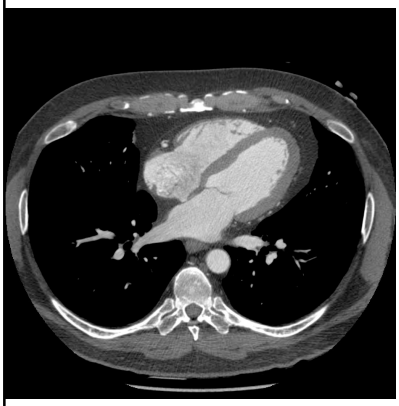


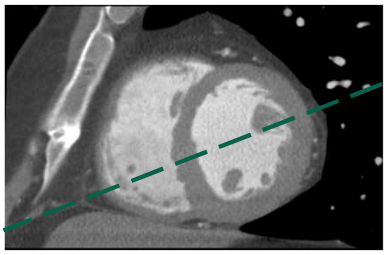


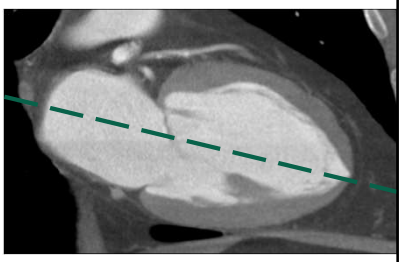


132

4 câmaras (4C)







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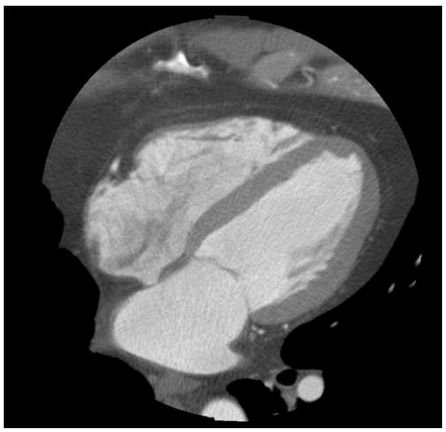
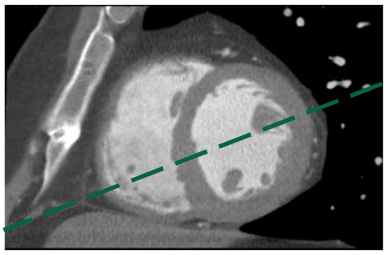
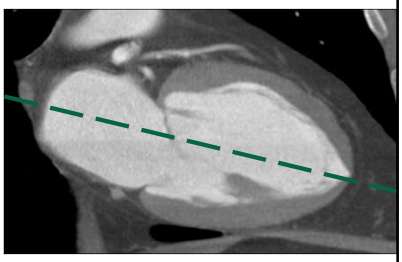
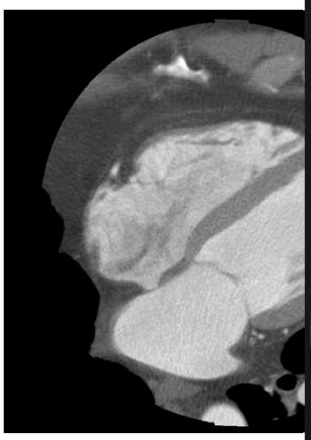


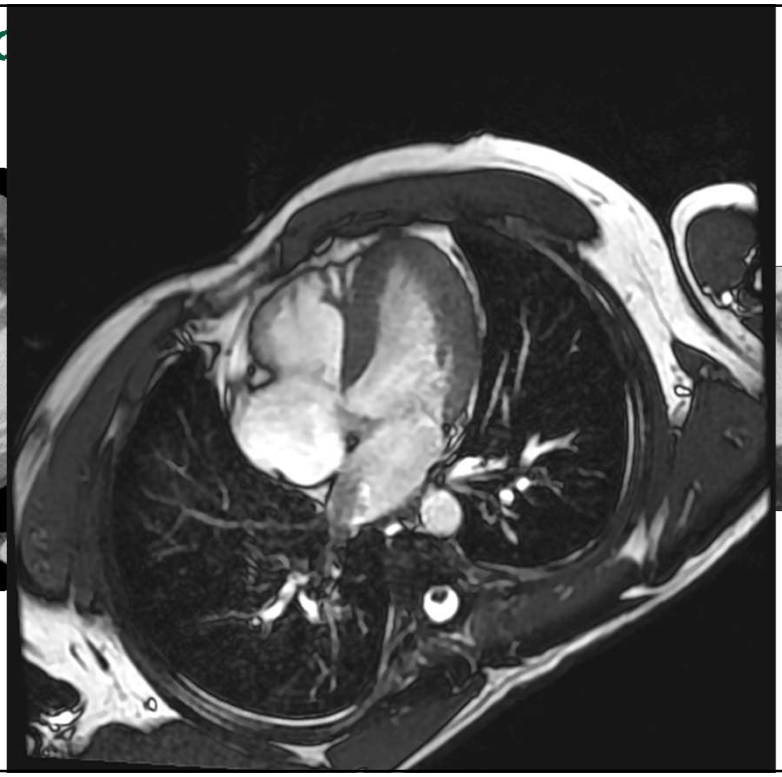


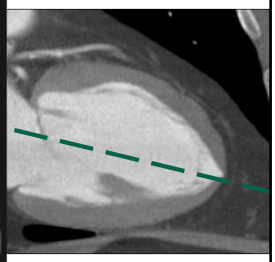


134

4 câmaras (4C

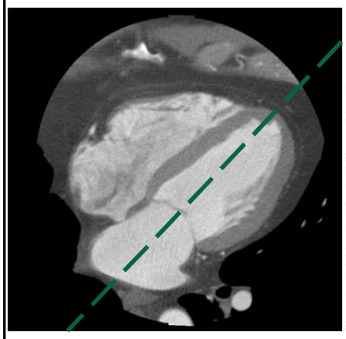


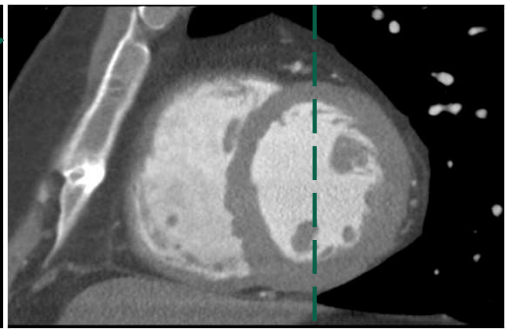


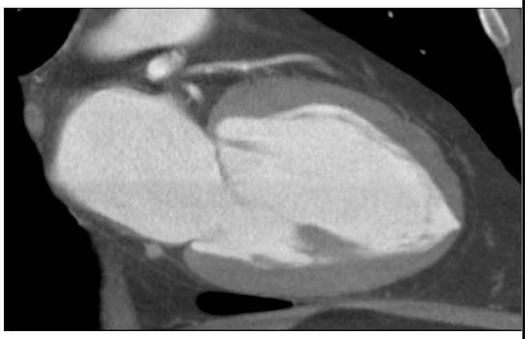


135

Eixo longo do ventrículo esquerdo (ELVE)

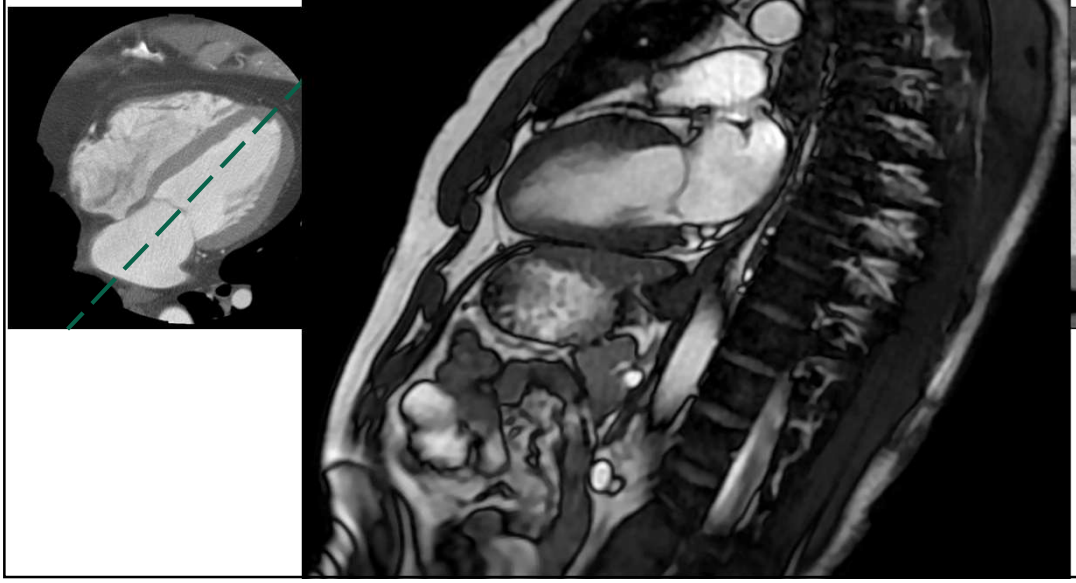






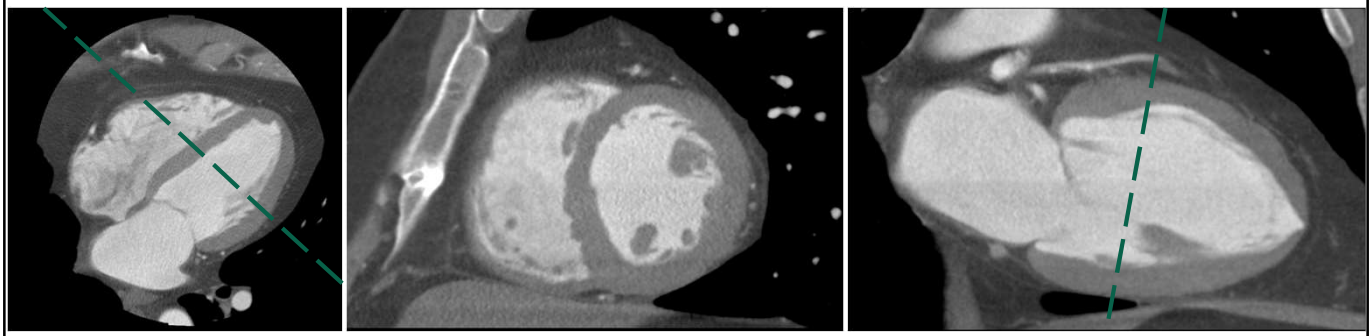
136

Eixo longo d



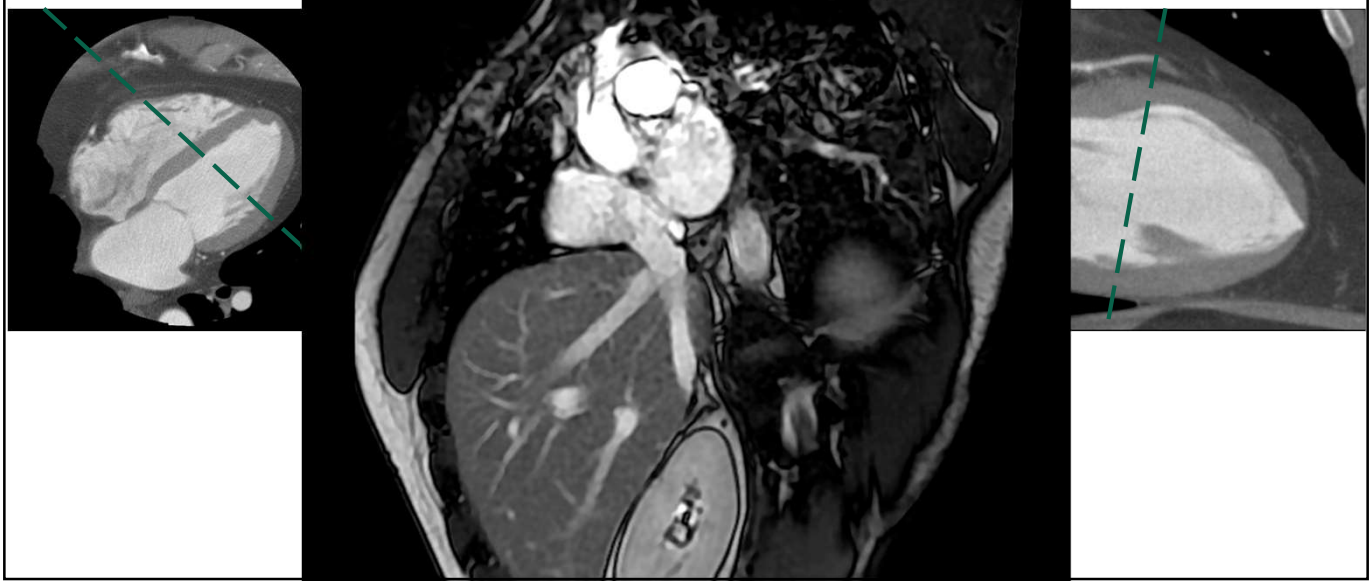
137

Eixo curto (EC)



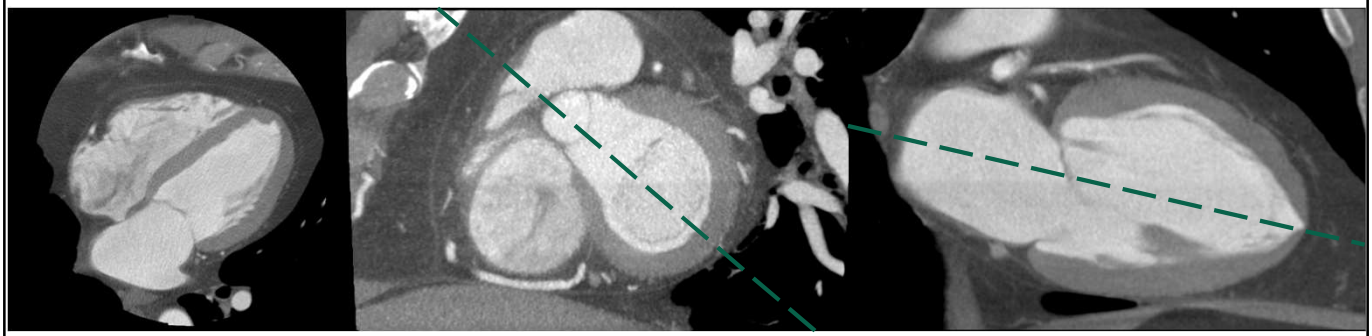
138

Eixo curto (E



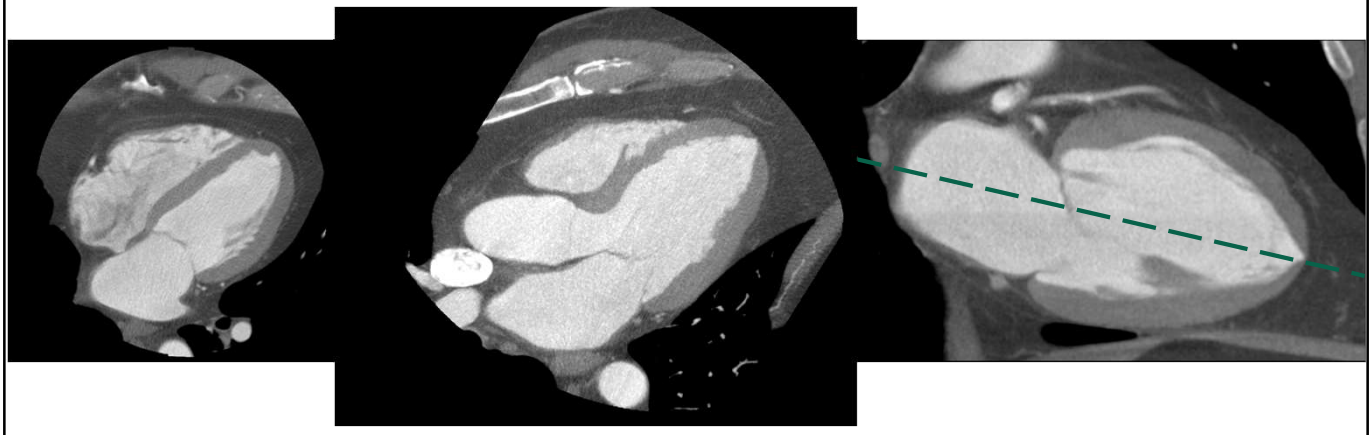
139

Via de saída do ventrículo esquerdo (VSVE)



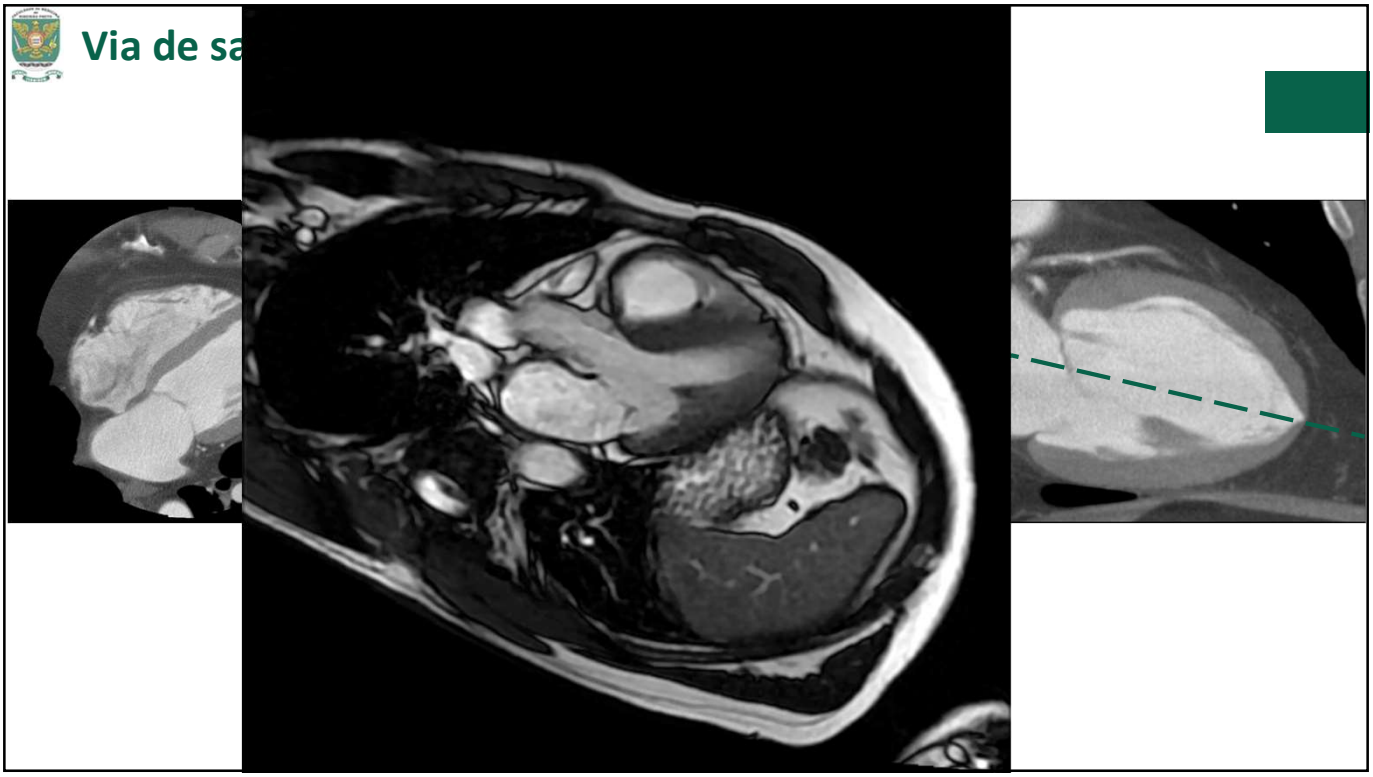
140

Via de saída do ventrículo esquerdo (VSVE)



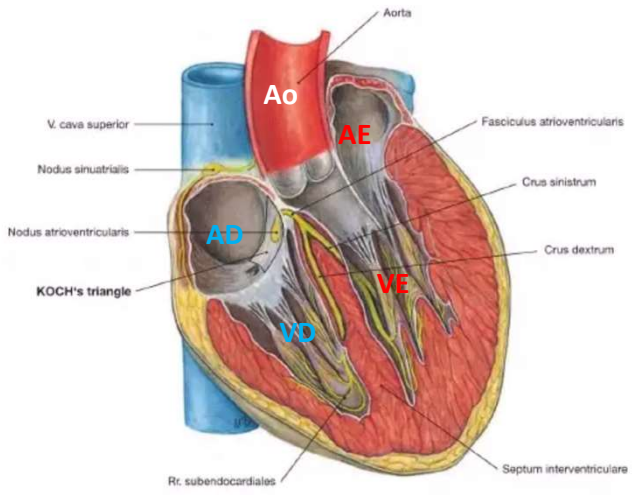
141

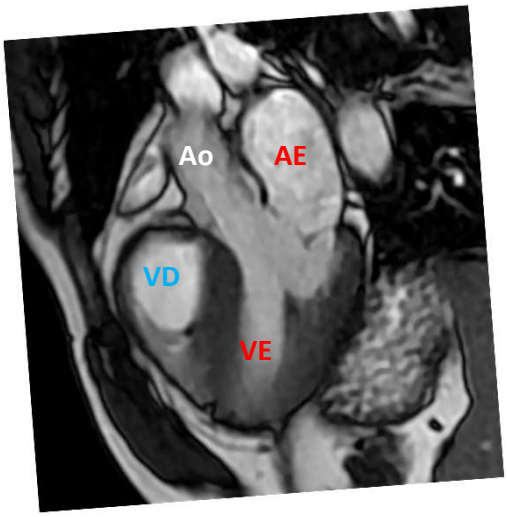
Via de sa



142

Coração

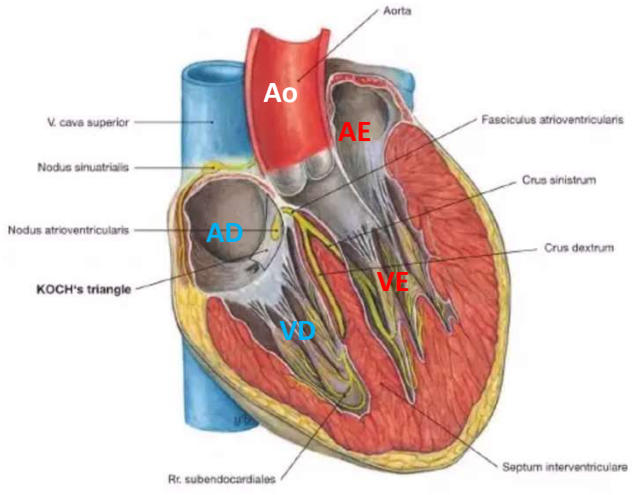


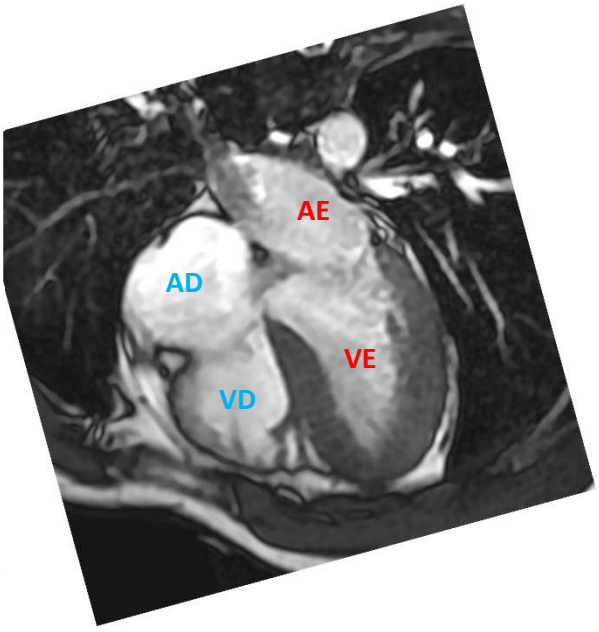


Paulsen Friedrich and J Waschke. 2011. Sobotta Atlas of Human Anatomy 15th edition English version. Munich: Elsevier.

143

Coração



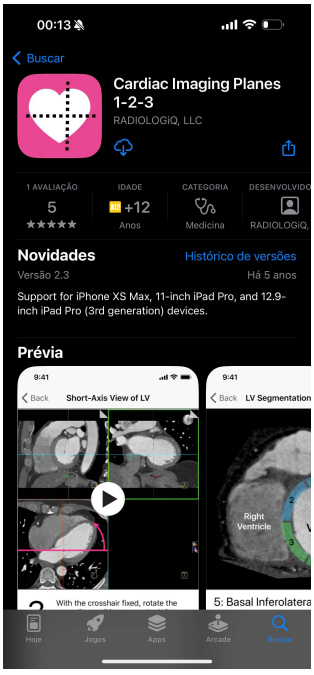


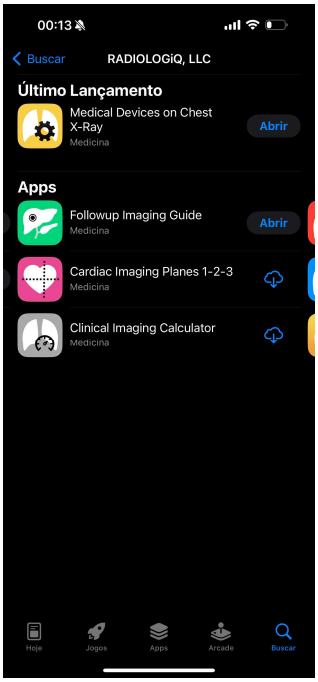
Paulsen Friedrich and J Waschke. 2011. Sobotta Atlas of Human Anatomy 15th edition English version. Munich: Elsevier.

144

Atividade extra

Planos cardíacos



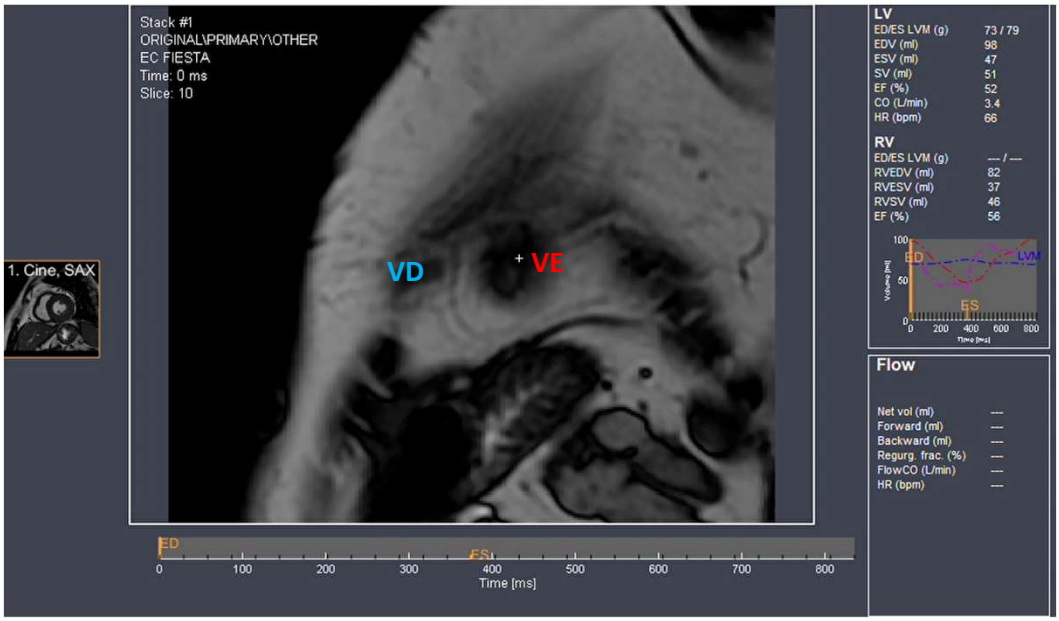


RADIOLOGiQ, LLC

Segmentação

147

Coração

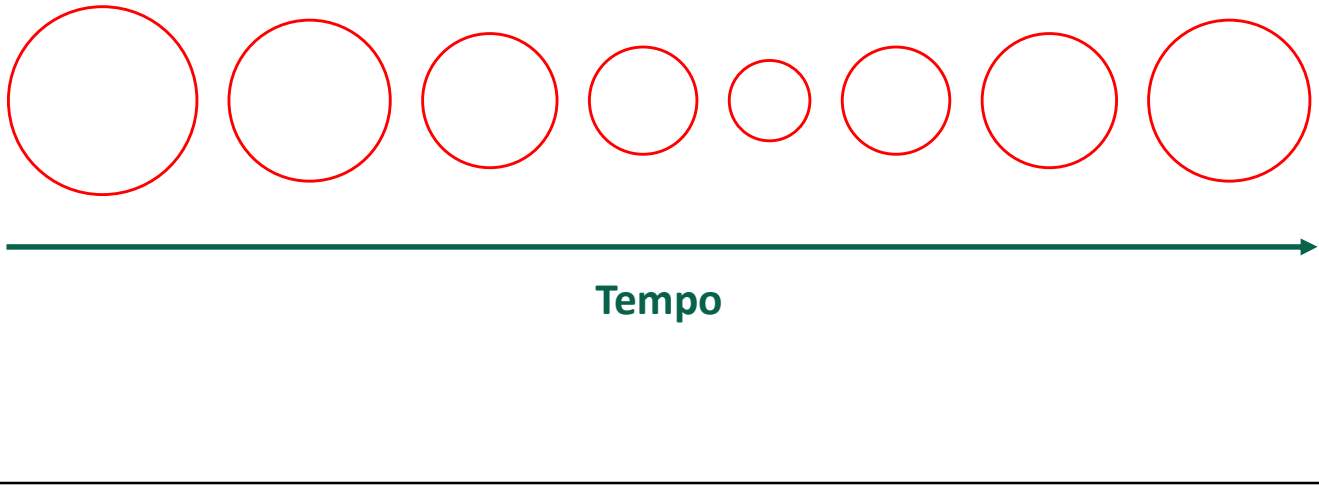


Paulsen Friedrich and J Waschke. 2011. Sobotta Atlas of Human Anatomy 15th edition English version. Munich: Elsevier.

148

Coração

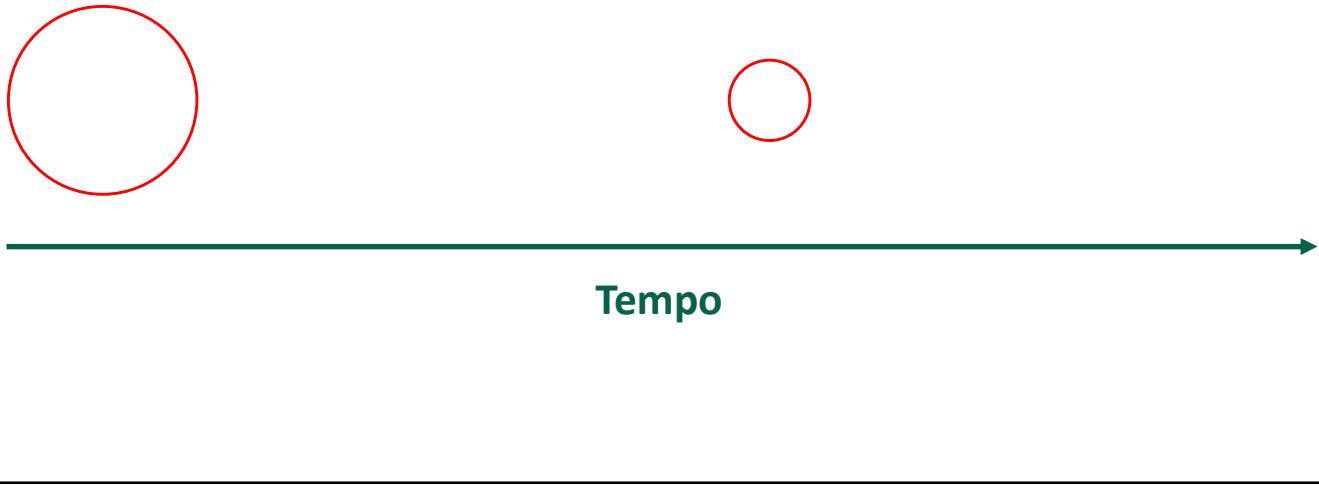
Contorno endocárdico do VE



149

Coração

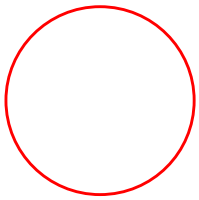
Contorno endocárdico do VE



150

Coração

Contorno endocárdico do VE



Diástole

Sístole

151

Coração

Contorno endocárdico do VE

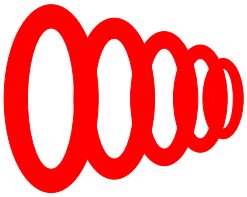
Diástole

Sístole

152

Coração

Contorno endocárdico do VE



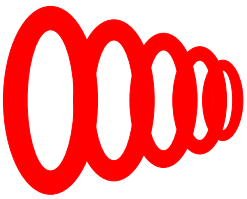
Volume diastólico final do VE

Volume sistólico final do VE

153

Coração

Contorno endocárdico do VE

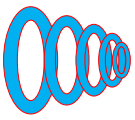


Volume diastólico final do VE

-

Volume sistólico final do VE

=

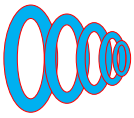


Volume sistólico do VE

154

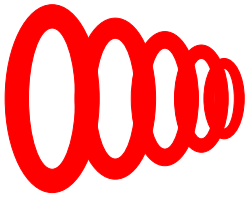
Coração

Contorno endocárdico do VE



Volume sistólico do VE

-



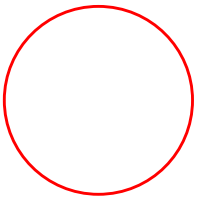
Volume diastólico final do VE

=

Fração de ejeção do VE (FEVE%)

Coração

Contorno endocárdico do VE



Diástole

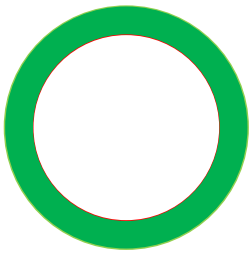
Contorno epicárdico do VE

Diástole

Coração

Contorno endocárdico do VE

Contorno epicárdico do VE



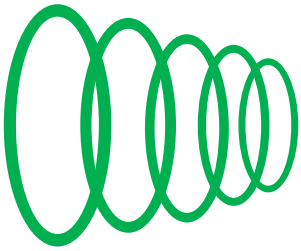
Diástole

Diástole

157

Coração

Volume miocárdico do VE



Densidade miocárdio: 1,05 g/ml

Diástole

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Anatomia miocárdica

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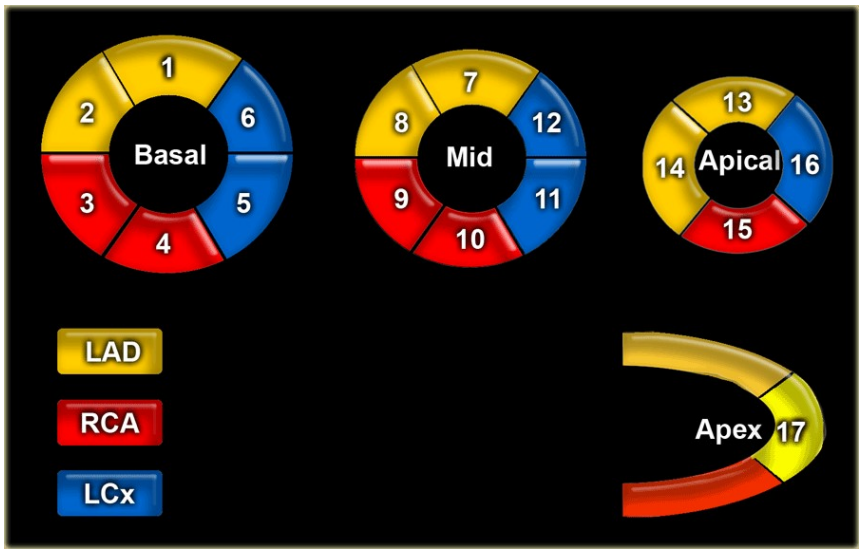
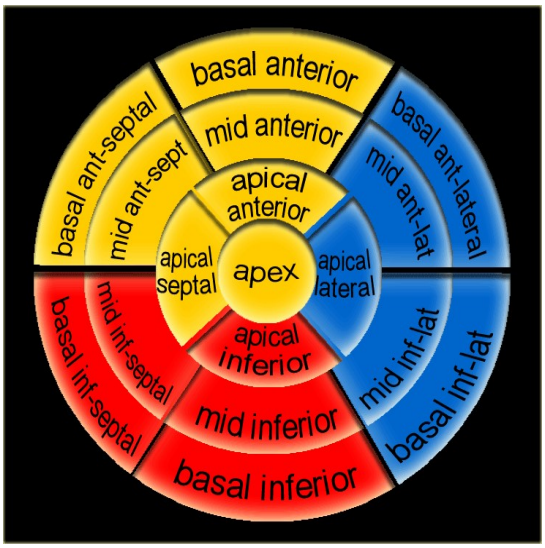
Segmentos



Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cardiomyopathy/ischemic-and-non-ischemic-cardiomyopathy (acesso em 18/02/2024)

160

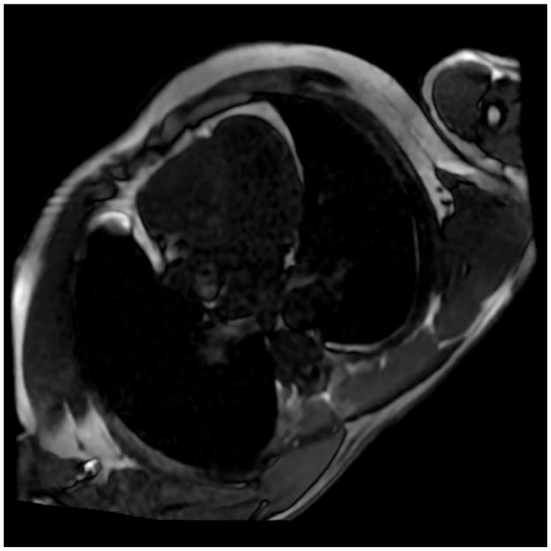
Segmentos



Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cardiomyopathy/ischemic-and-non-ischemic-cardiomyopathy (acesso em 18/02/2024)

Avaliação perfusão

Perfusão miocárdica



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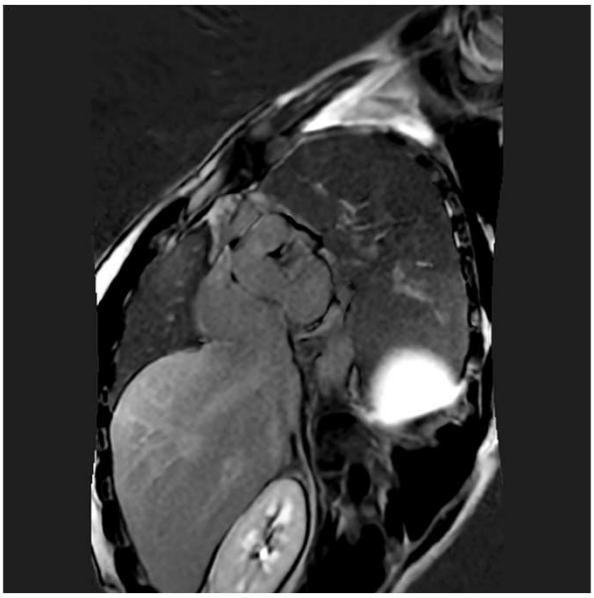
Avaliação realce tardio

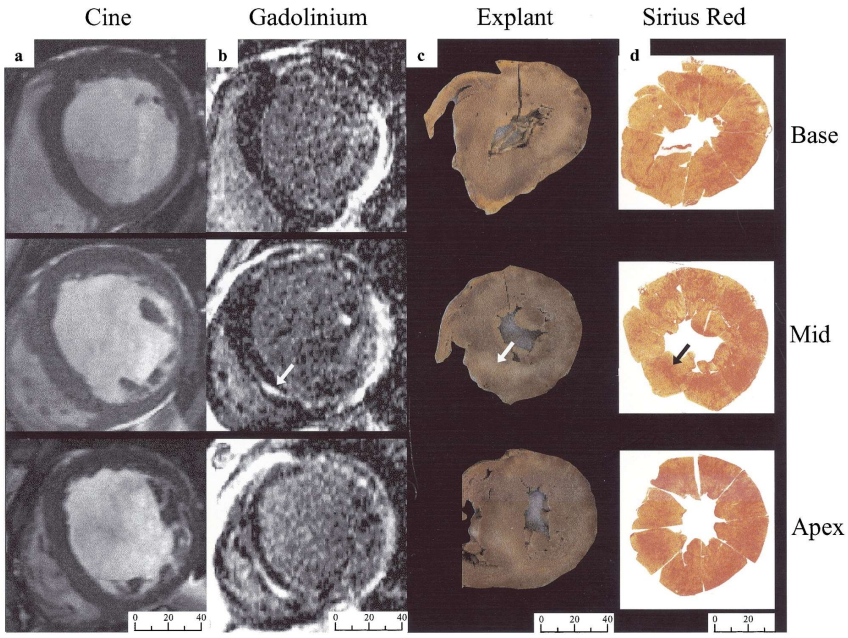
164

Realce tardio



165

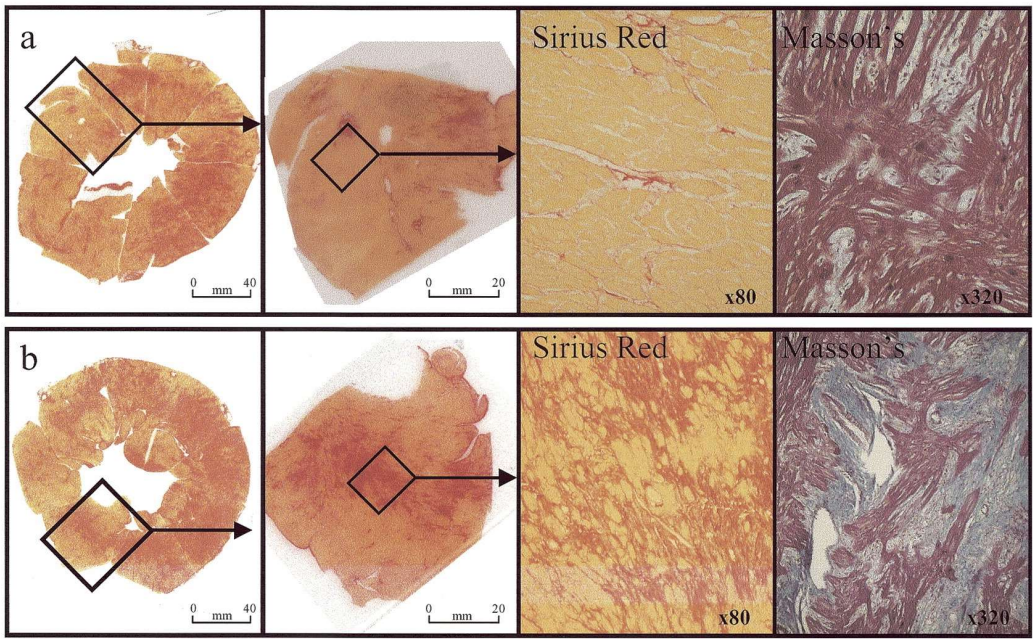
Realce tardio



Moon JC, Reed E, Sheppard MN, Elkington AG, Ho SY, Burke M, Petrou M, Pennell DJ. The histologic basis of late gadolinium enhancement cardiovascular magnetic resonance in hypertrophic cardiomyopathy. J Am Coll Cardiol. 2004 Jun 16;43(12):2260-4. doi: 10.1016/j.jacc.2004.03.035. PMID: 15193690.

166

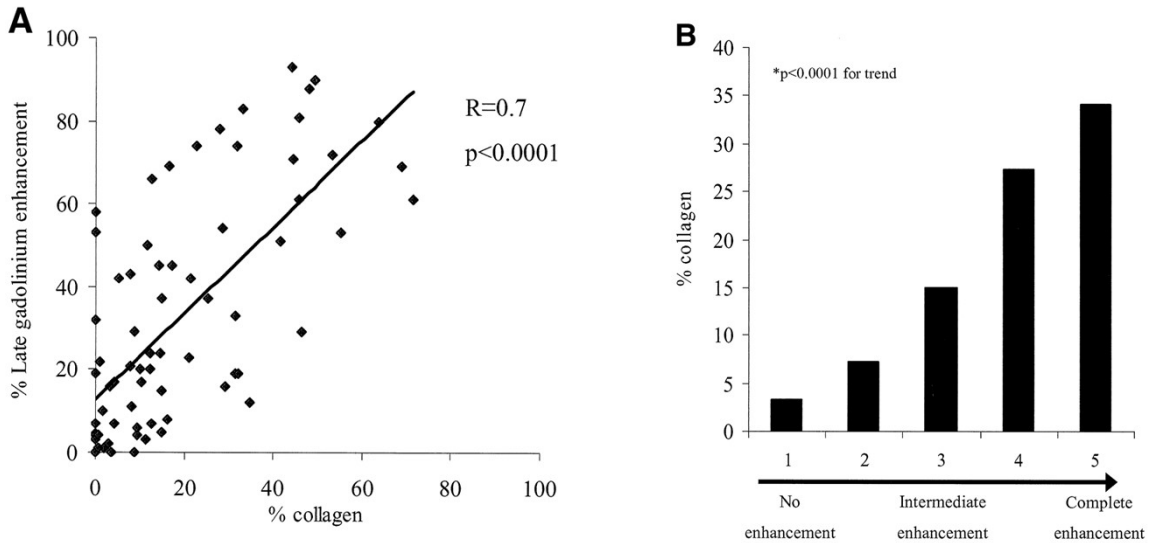
Realce tardio



Moon JC, Reed E, Sheppard MN, Elkington AG, Ho SY, Burke M, Petrou M, Pennell DJ. The histologic basis of late gadolinium enhancement cardiovascular magnetic resonance in hypertrophic cardiomyopathy. J Am Coll Cardiol. 2004 Jun 16;43(12):2260-4. doi: 10.1016/j.jacc.2004.03.035. PMID: 15193690.

167

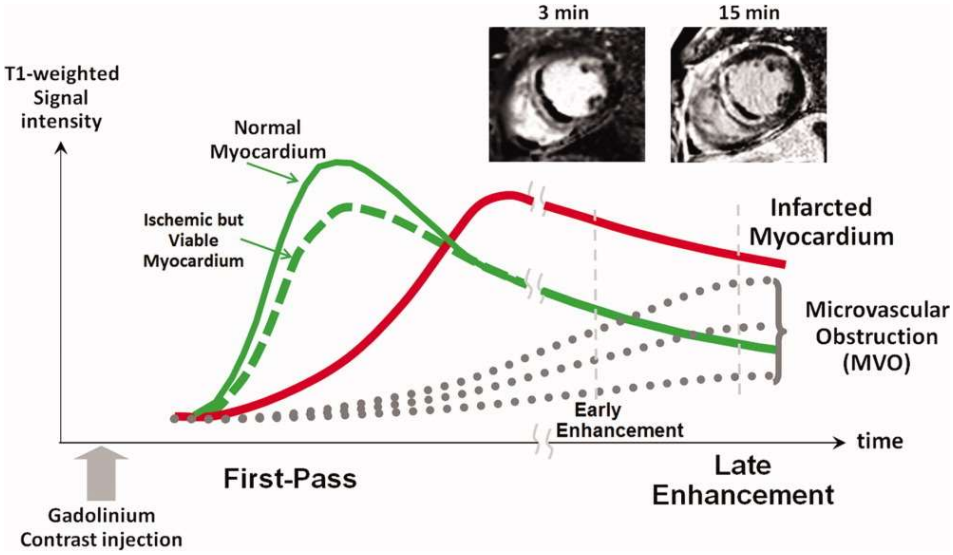
Realce tardio



Moon JC, Reed E, Sheppard MN, Elkington AG, Ho SY, Burke M, Petrou M, Pennell DJ. The histologic basis of late gadolinium enhancement cardiovascular magnetic resonance in hypertrophic cardiomyopathy. J Am Coll Cardiol. 2004 Jun 16;43(12):2260-4. doi: 10.1016/j.jacc.2004.03.035. PMID: 15193690.

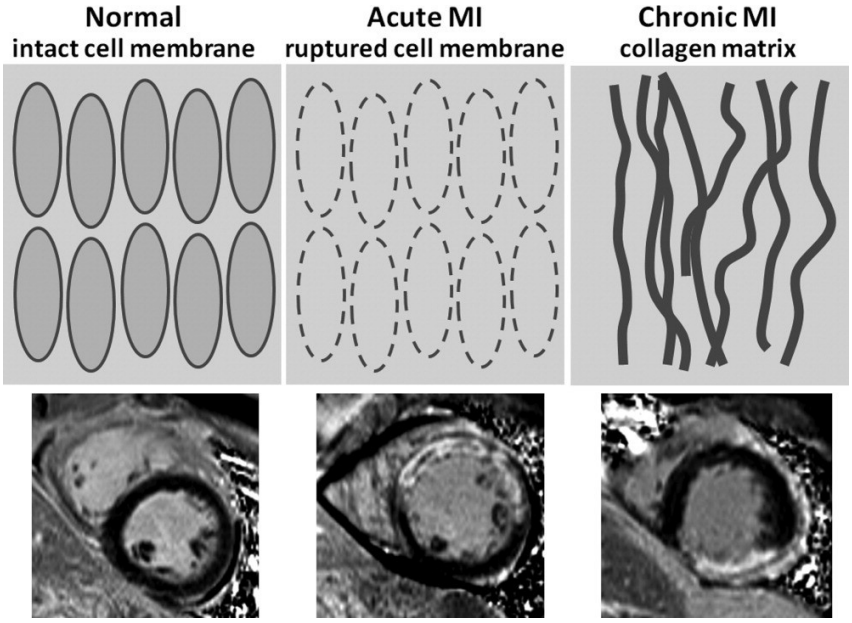
168

Realce tardio



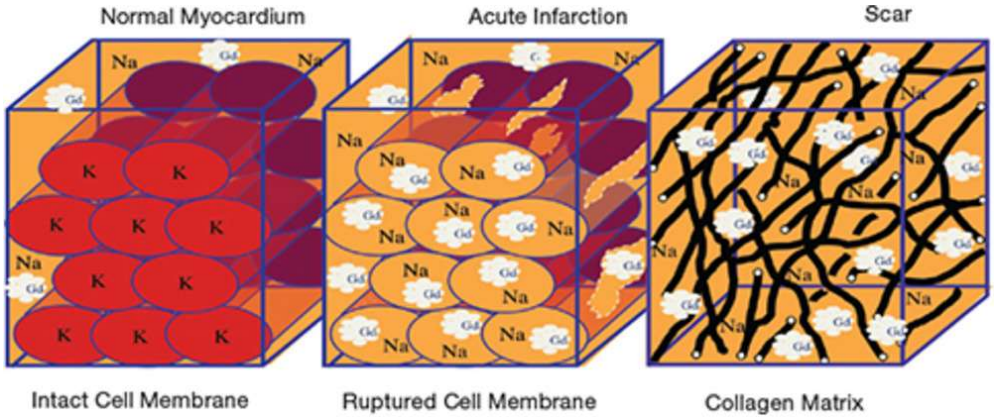
Kellman P, Arai AE. Cardiac imaging techniques for physicians: late enhancement. J Magn Reson Imaging. 2012 Sep;36(3):529-42. doi: 10.1002/jmri.23605. PMID: 22903654; PMCID: PMC3428749.

Realce tardio



Kellman P, Arai AE. Cardiac imaging techniques for physicians: late enhancement. J Magn Reson Imaging. 2012 Sep;36(3):529-42. doi: 10.1002/jmri.23605. PMID: 22903654; PMCID: PMC3428749.

Realce tardio



Garcia MJ, Kwong RY, Scherrer-Crosbie M, Taub CC, Blankstein R, Lima J, Bonow RO, Eshtehardi P, Bois JP; American Heart Association Council on Cardiovascular Radiology and Intervention and Council on Clinical Cardiology. State of the Art: Imaging for Myocardial Viability: A Scientific Statement From the American Heart Association. Circ Cardiovasc Imaging. 2020 Jul;13(7):e000053. doi: 10.1161/HCI.0000000000000053. Epub 2020 Jul 13. PMID: 32833510.

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Realce tardio

Mesocardial
- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Pulmonary hypertension

Patchy
- Sarcoid
- Amyloid
- Myocarditis

Transmural
- Infarction *(most common)*
- Myocarditis, severe
- Sarcoid, chronic

Subendocardial

Vascular
- Infarction

Non-vascular
- Amyloid
- Hypereosinophilic syndrome
- Histiocytoid cardiomyopathy
- Cardiac transplant

Subepicardial
- Myocarditis *(most common)*
- Sarcoid

Cummings KW, Bhalla S, Javidan-Nejad C, Bierhals AJ, Gutierrez FR, Woodard PK. A pattern-based approach to assessment of delayed enhancement in nonischemic cardiomyopathy at MR imaging. Radiographics. 2009 Jan-Feb;29(1):89-103. doi: 10.1148/rg.291085052. PMID: 19168838.

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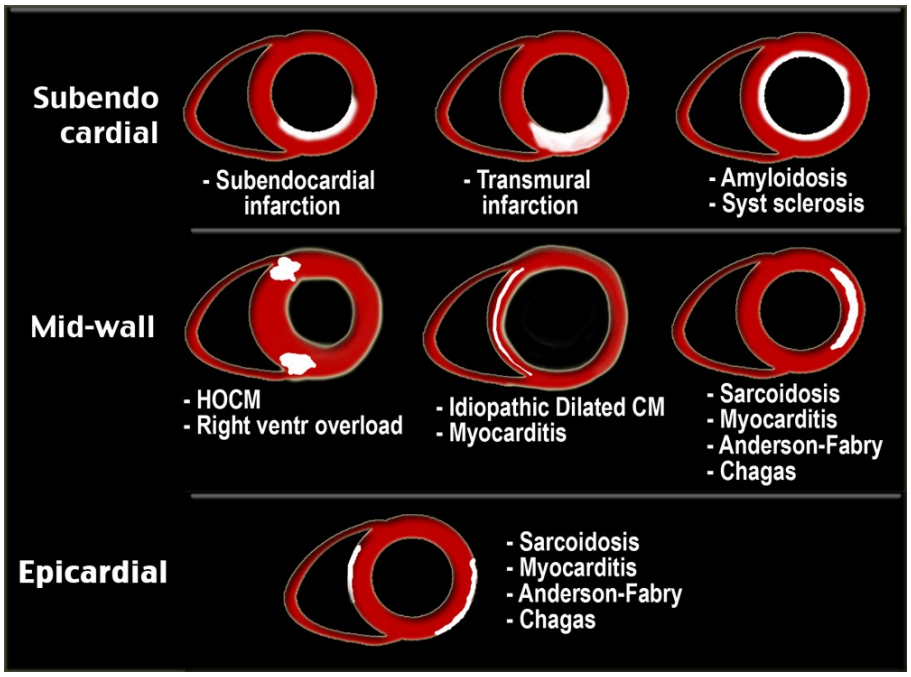
Segmentos



Radiology Assistant. Web site disponível em https://radiologyassistant.nl/cardiovascular/cardiomyopathy/ischemic-and-non-ischemic-cardiomyopathy (acesso em 18/02/2024)

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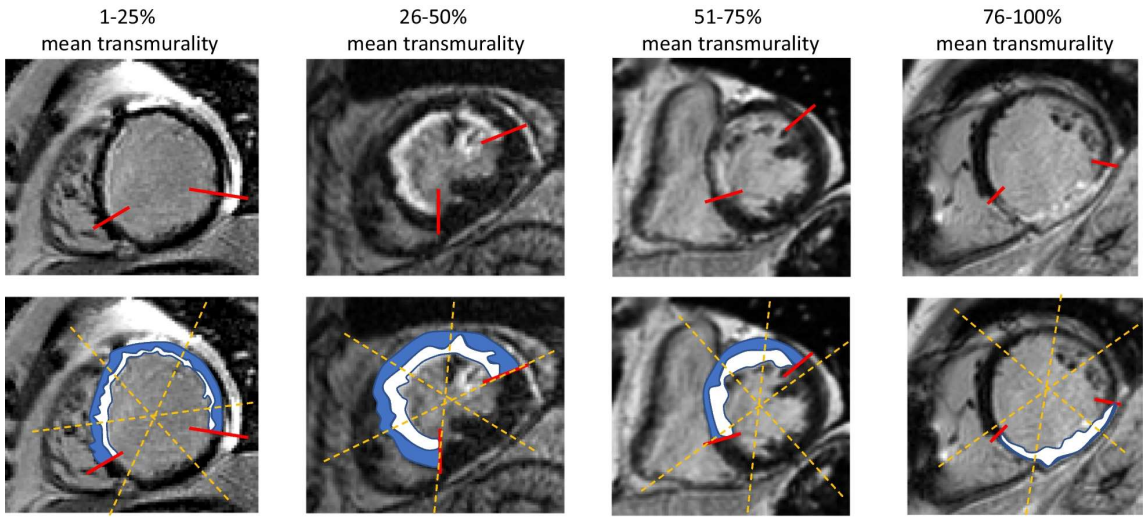
Realce tardio



Increasing likelihood of improved contractile function with revascularization

Jenista ER, Wendell DC, Azevedo CF, Klem I, Judd RM, Kim RJ, Kim HW. Revisiting how we perform late gadolinium enhancement CMR: insights gleaned over 25 years of clinical practice. J Cardiovasc Magn Reson. 2023 Mar 16;25(1):18. doi: 10.1186/s12968-023-00925-0. PMID: 36922844; PMCID: PMC10018965.

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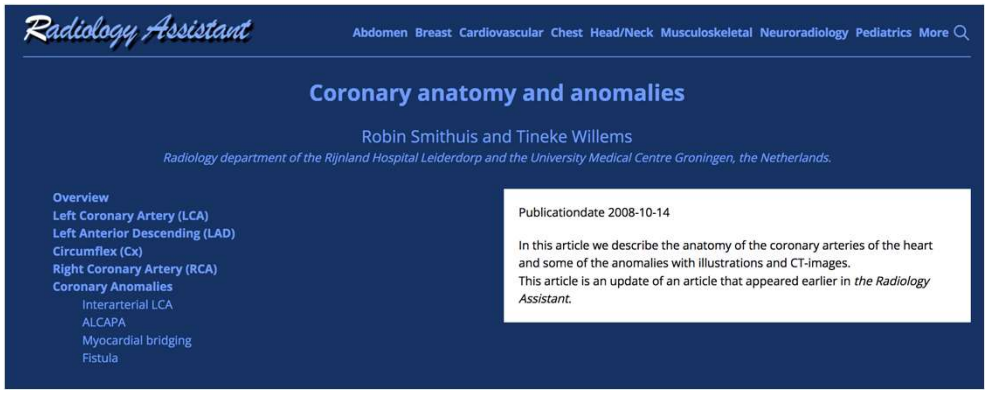
Questionário 1

Referências para estudo



https://radiologyassistant.nl/cardiovascular/anatomy/coronary-anatomy-and-anomalies

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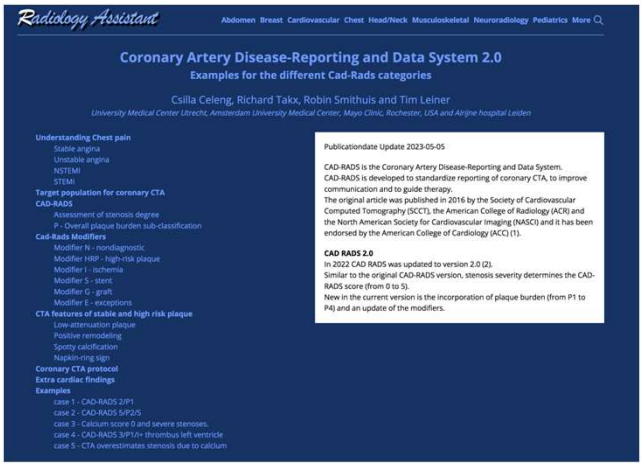

https://radiologyassistant.nl/cardiovascular/cad-rads/coronary-artery-disease-reporting-and-data-system

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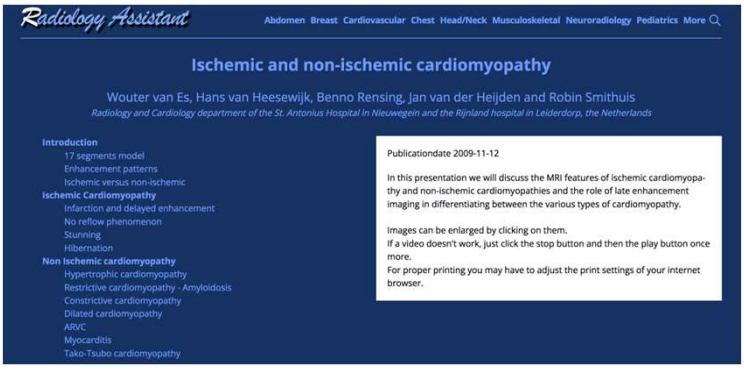

https://radiologyassistant.nl/cardiovascular/cardiomyopathy/ischemic-and-non-ischemic-cardiomyopathy

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Journal of Cardiovascular Computed Tomography (2009) 3, 122–136

Journal of Cardiovascular Computed Tomography

Guidelines

SCCT guidelines for the interpretation and reporting of coronary computed tomographic angiography

Gilbert L. Raff, MD*, Chair, Aiden Abidov, MD, PhD, Stephan Achenbach, MD, Daniel S. Berman, MD, Lawrence M. Boxt, MD, Matthew J. Budoff, MD, Victor Cheng, MD, Tony DeFrance, MD, Jeffrey C. Hellinger, MD, Ronald P. Karlsberg, MD

Society of Cardiovascular Computed Tomography, 2400 N Street NW, Washington, DC 20037, USA

https://www.journalofcardiovascularct.com/article/S1934-5925(09)00070-7/fulltext

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dwada@hcrp.usp.br