Hospital Cruz Vermelha

BOLUS E PÓS - PROCESSAMENTO EM ANGIO TC

"UMA VISÃO"

SERVIÇO DE IMAGIOLOGIA

2ª Radiologia de Fusão
05 e 06 de Outubro 2018

Pedro Silva

Introdução

- Bolus
- Pós - Processamento
- Diagnóstico

Material e Métodos

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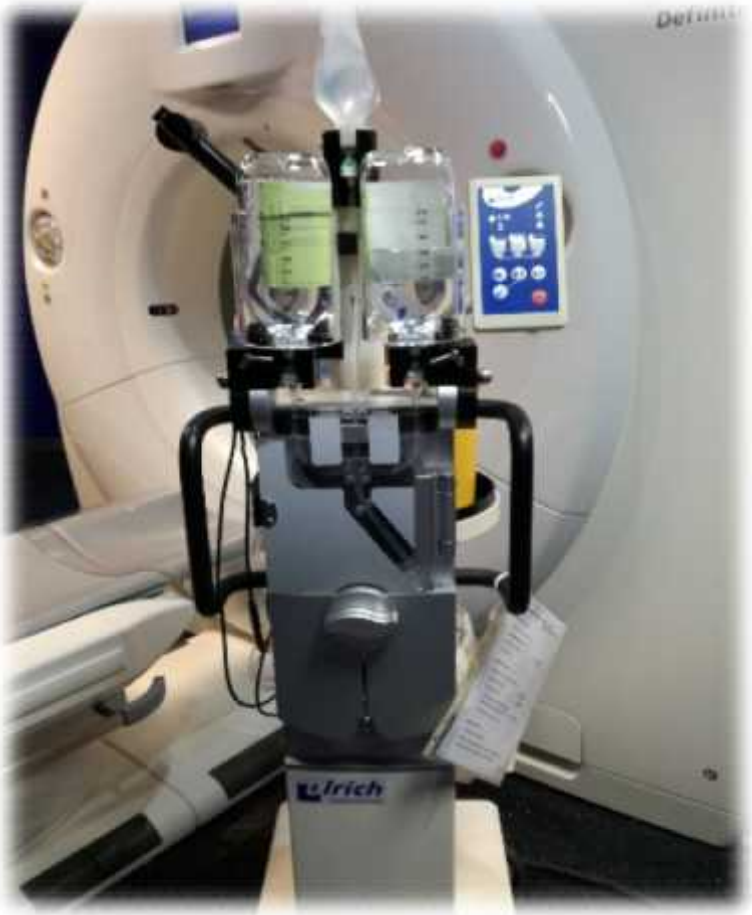
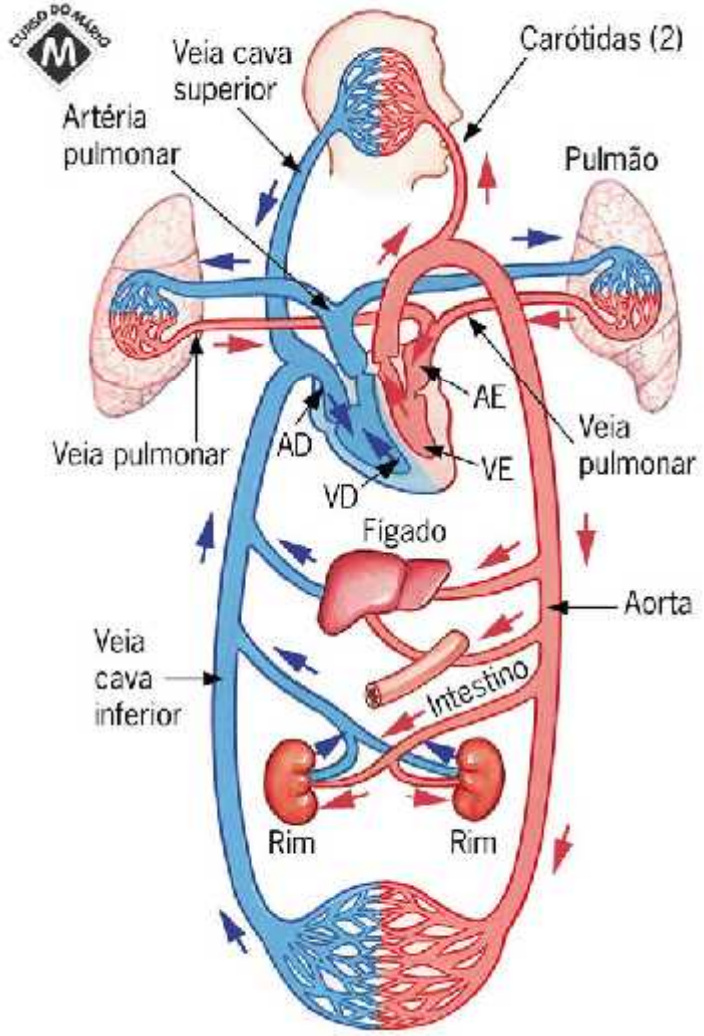


Tempos

Right atrium	6-12 s
Pulmonary artery	9-15 s
Left atrium	13-20 s
Aorta	15-22 s
Carotids	16-24 s
Renal arteries	18-27 s
Femoral arteries	22-33 s
Jugular vein	22-30 s
Renal veins	22-30 s
Suprarenal IVC	24-32 s
Infrarenal IVC	120-250 s
Splenic vein	30-45 s
Mesenteric veins	35-50 s
Liver veins	50-80 s
Femoral veins	120-250 s



Contrastes

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Product	Chemical Name	Iodine Concentration (mgI/mL)	Osmolality (mOsm/kg H_2O)	Viscosity (cps @ 37°C)
ENTRAVASCULAR, NONIONIC				
Ultravist® 240 (Bayer HealthCare)	Iopromide	240	483	2.8
Optiray® 240 (Mallinckrodt)	Ioversol	240	502	3.0
Omnipaque® 240 (GE Healthcare)	Iohexol	240	520	3.4
Isovue® 250 (Bracco)	Iopamidol	250	524	3.0
Visipaque® 270 (GE Healthcare)	Iodixanol	270	290	6.3
Oxilan® 300 (Guerbet)	Ioxilan	300	585	5.1
Ultravist® 300 (Bayer HealthCare)	Iopromide	300	407	4.9
Isovue® 300 (Bracco)	Iopamidol	300	616	4.7
Optiray® 300 (Mallinckrodt)	Ioversol	300	651	5.5
Omnipaque® 300 (GE Healthcare)	Iohexol	300	672	6.3
Visipaque® 320 (GE Healthcare)	Iodixanol	320	290	11.8
Optiray® 320 (Mallinckrodt)	Ioversol	320	702	7.5
Oxilan® 350 (Guerbet)	Ioxilan	350	695	8.1
Optiray® 350 (Mallinckrodt)	Ioversol	350	792	9.0
Omnipaque® 350 (GE Healthcare)	Iohexol	350	844	10.4
Ultravist® 370 (Bayer HealthCare)	Iopromide	370	774	10.0
Isovue® 370 (Bracco)	Iopamidol	370	796	9.4
ENTRAVASCULAR, IONIC				
Conray® (Mallinckrodt)	Meglumine Iothalamate	282	1400	4.0
Reno® 60 (Bracco)	Diatrizoate Meglumine	282	1404	4.3
Renografin® 60 (Bracco)	Diatrizoate Meglumine and Diatrizoate Sodium	292.5	1450	4.2
Hexabrix® (Mallinckrodt)	Ioxaglate Meglumine and Ioxaglate Sodium	300	600	7.5
MD-76® (Mallinckrodt)	Diatrizoate Meglumine and Diatrizoate Sodium	370	1550	10.5
Conray® 400 (Mallinckrodt)	Meglumine Iothalamate	400	2300	4.5

The advantage of use of contrast media with a lower iodine concentration is the lower osmolarity and viscosity than those of high-iodine-concentration contrast media. Both chemical properties, especially viscosity, of contrast media have been associated with toxic side effects, such as nephrotoxicity [28, 29]. Seeliger et al. [30] found that the viscosity of contrast media may play an important role in contrast-induced nephropathy by decreasing glomerular filtration rate and renal medullary blood flow. Administration of

Intraindividual comparison showed better chest attenuation values in the arterial phase with use of a contrast medium containing 300 mg I/mL than with an agent containing 370 mg I/mL. In portal venous phase imaging of the abdomen, there was no statistically significant difference in attenuation at standard or high iodine concentration in any anatomic site.

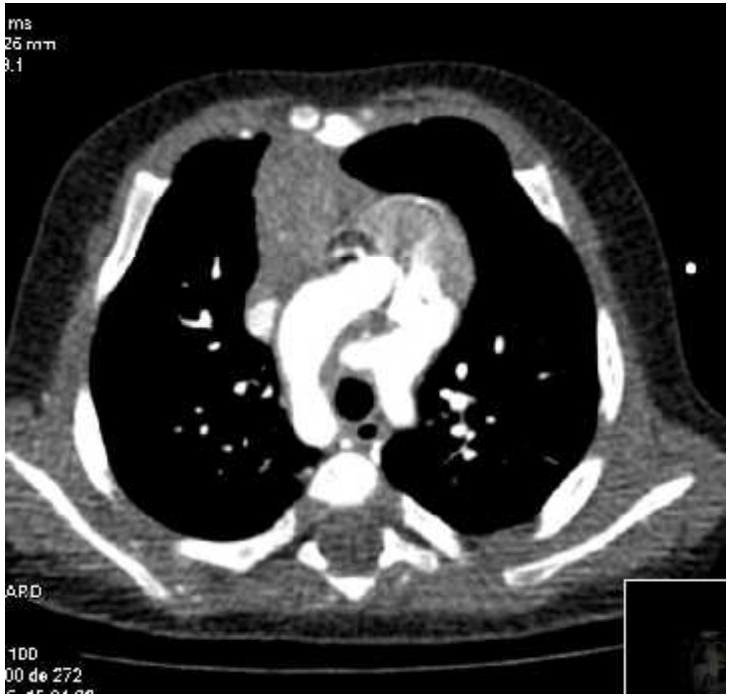
To obtain the same iodine delivery rate with standard and high iodine concentrations, contrast medium with the standard concentration has to be administered at a faster injection rate. In previous studies [31, 32], the increased injection rate was discussed as a potential disadvantage because of a higher risk of extravasation. To our knowledge, how-

Contrast Opacification Using a Reduced Volume of Iodinated Contrast Material and Low Peak Kilovoltage in Pulmonary CT Angiography: Objective and Subjective Evaluation

OBJECTIVE. The purpose of our study was to evaluate whether a reduced volume of iodinated contrast material for pulmonary CT angiography (CTA) using a low peak kilovoltage (kVp) technique yields equivalent opacification in all vessels.

CONCLUSION. Both objective and subjective measures of contrast opacification support a reduction from 125 to 75 mL of contrast medium required for pulmonary CTA.

80 kV - Pediatria

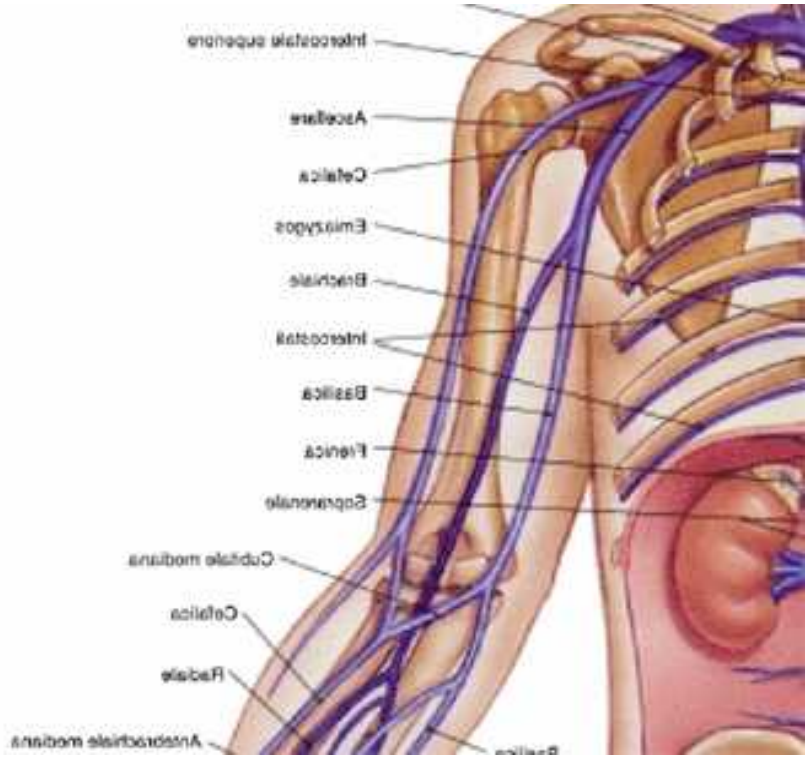


10 – 50 DLP

Vasos

- Vasos Periféricos
- Normalmente veia cubital

TAMANHO AGULHA	FLOW
22 Gauge	1,5
20 Gauge	2
18 Gauge	**4 - 6**



Cateter

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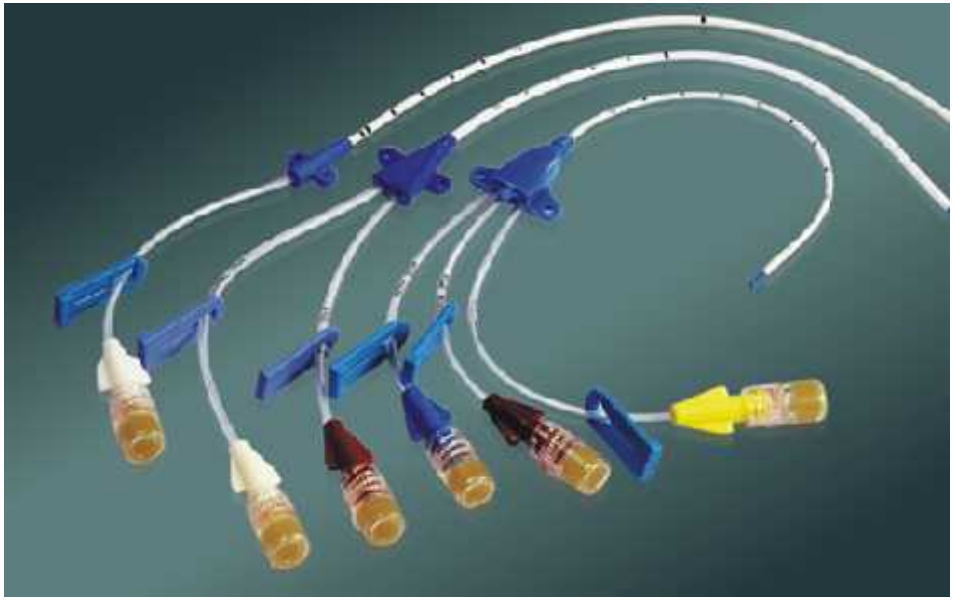
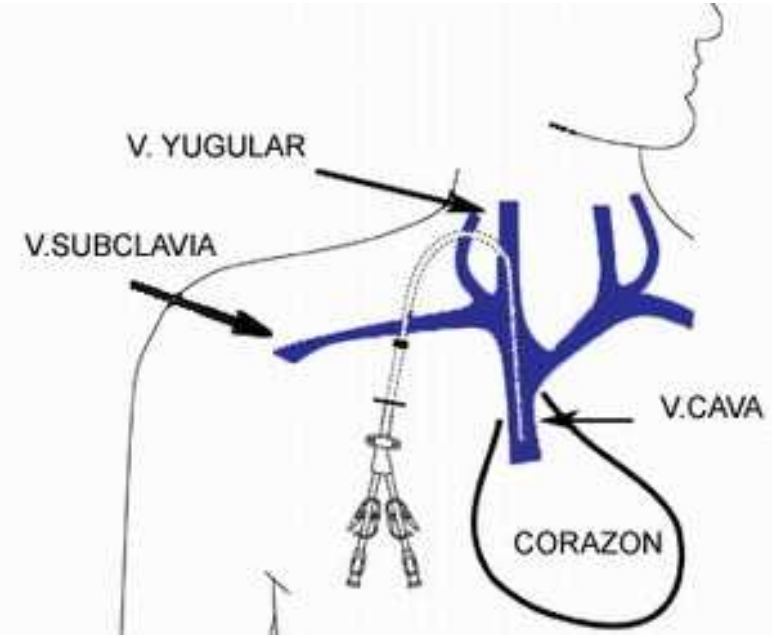
Technical Characteristics

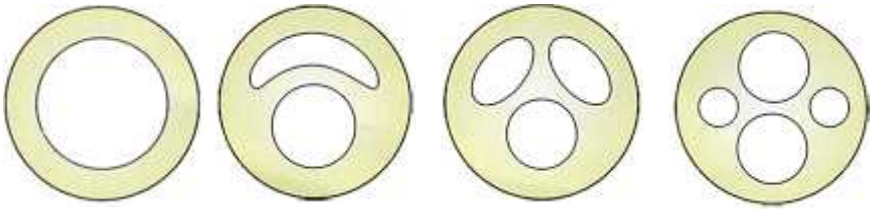
Product Specifications

Article Code (EU)	Gauge	Catheter Lenght (inch(mm))	Catheter ø (mm)	Flow Rate (ml/min)	Flow Rate (ml(hour)
4251127-01	24	3/4 (19)	0.7	22	1320
4251128-01	22	1 (25)	0.9	35	2100
4251129-01	20	1 (25)	1.1	65	3900
4251130-01	20	1 1/4 (32)	1.1	60	3600
4251131-01	18	1 1/4 (32)	1.3	105	6300
4251132-01	18	1 3/4 (45)	1.3	100	6000

Cateter Central







Injecção

- **50 – 90 ml Contraste Iodado**

  (Tipo equipamento) / (Concentração / (Doente)

- **30 – 60 ml Soro Fisiológico**

- **4 ml/s – 6 ml/s**

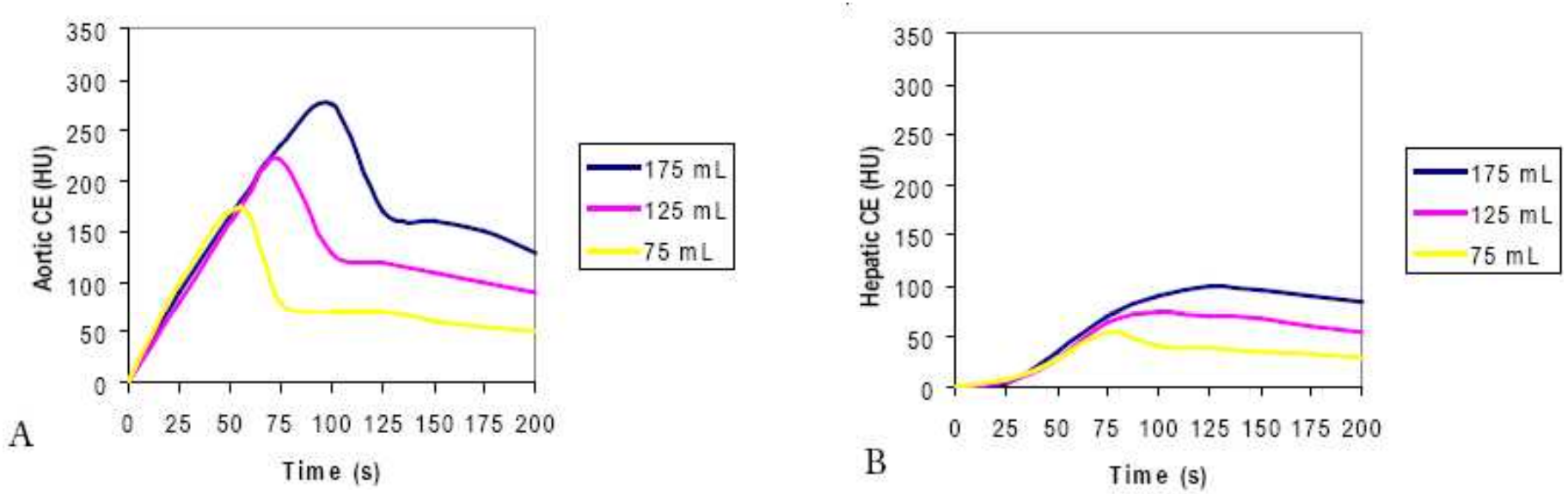
- **Acesso venoso dto**

Fonte: R. Bruening, A, Kuettner, T, Flohr – Protocols for Multislice CT - Springer

Paciente

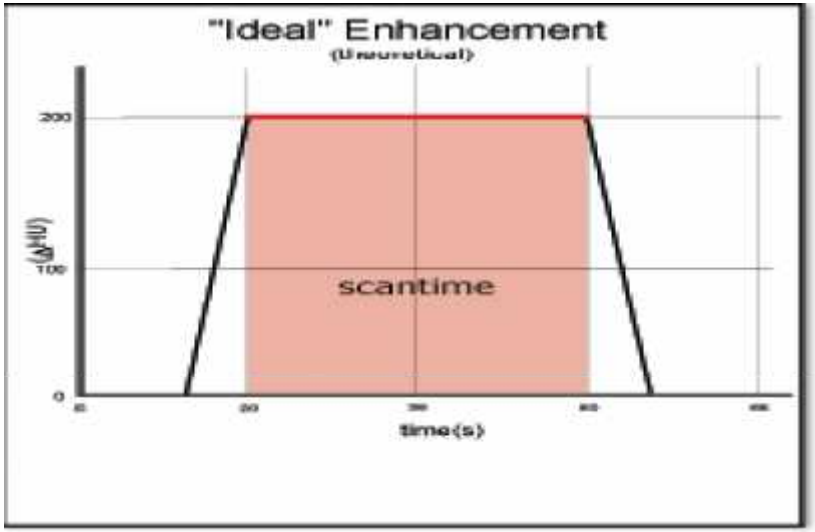
- Idade
- Sexo
- Altura
- Peso
- Função cardíaca
- Função renal
- Outras doenças

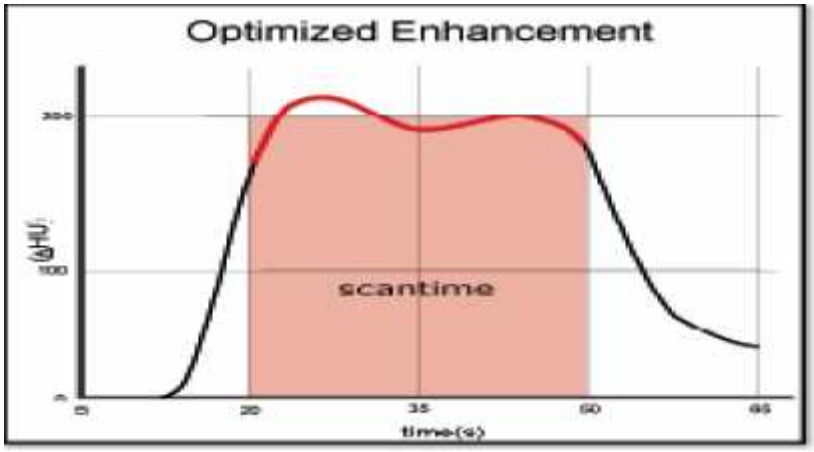
Volume

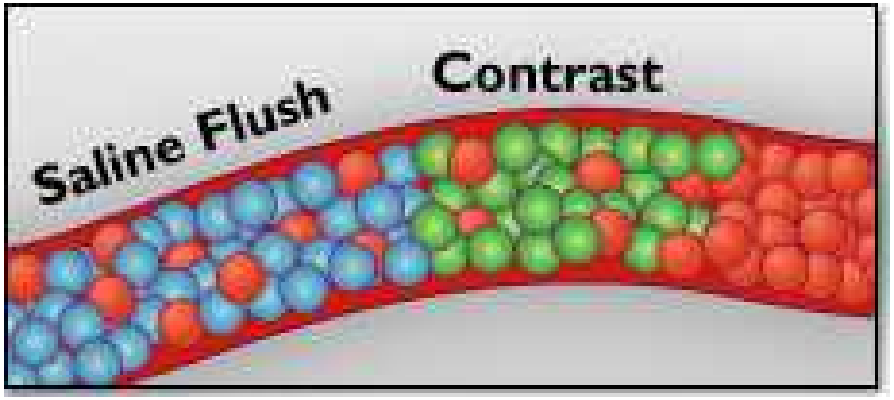


Peso do paciente e da concentração de iodo

Coluna soro







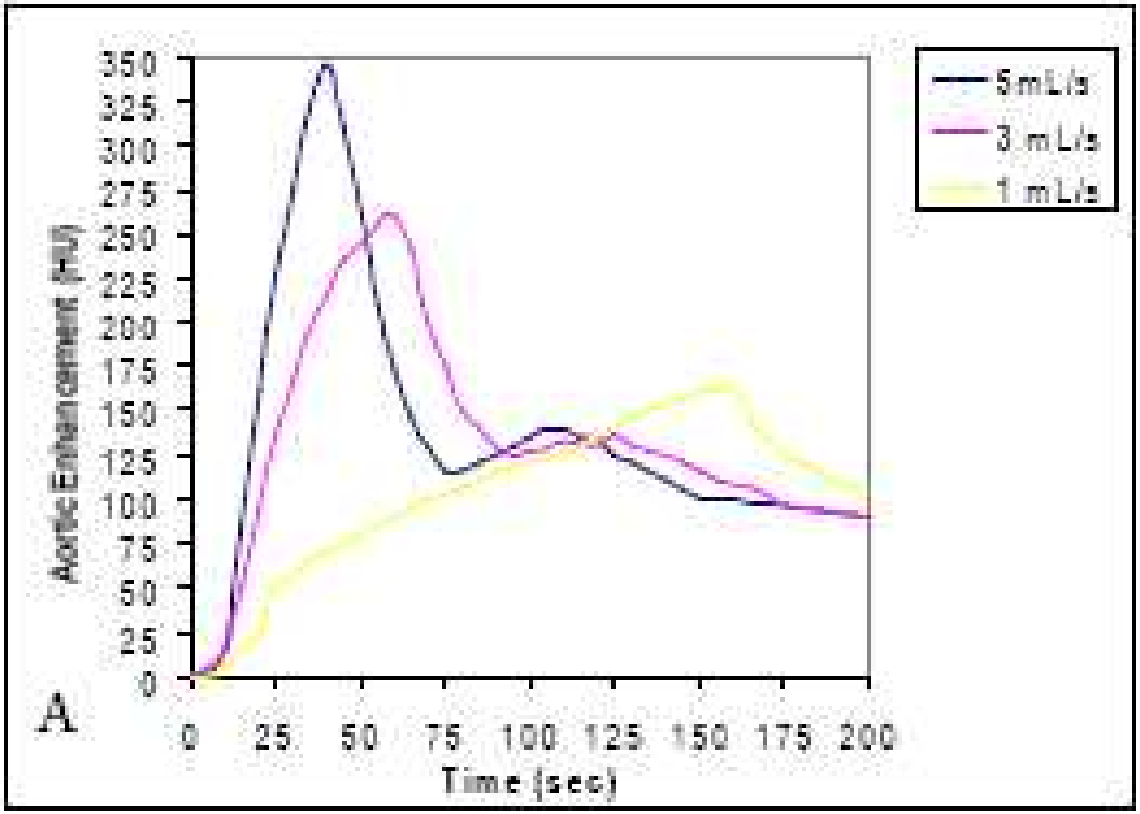
- Progressão
- Aumenta o tempo de contraste
- Redução de contraste
- Diminuição de artefactos

Reduction of Contrast Material Dose and Artifacts by a Saline Flush Using a Double Power Injector in Helical CT of the Thorax

OBJECTIVE. Our objective was to evaluate a combined method of contrast material bolus followed by saline solution flush for thoracic helical CT and statistical comparison with a uniphasic injection protocol.

CONCLUSION. Injection of contrast material followed by a saline solution bolus using a double power injector when performing thoracic helical CT allows a 20% reduction of contrast material volume to 60 ml with a similar degree of enhancement. In addition, perivenous artifacts in the superior vena cava are significantly reduced.

Fluxo


Aortic Enhancement (HU)
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
A
0
25
50
75
100
125
150
175
200
Time (sec)
5 mL/s
3 mL/s
1 mL/s

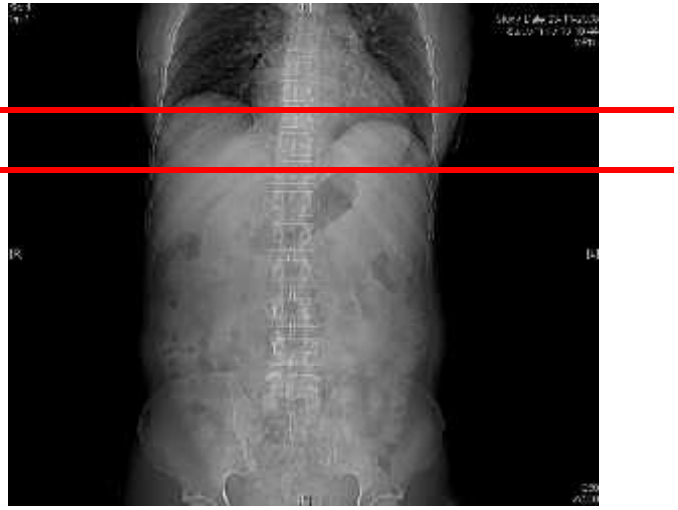
Efeitos

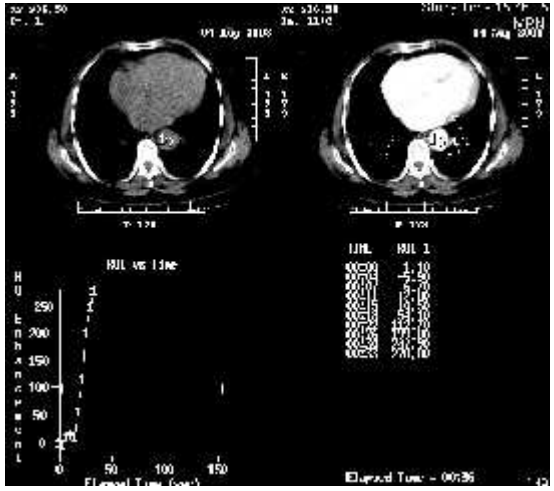
- Diminuiu os iões de cálcio → hipocalcemia → diminuição do debito cardíaco
- Altera o sistema eléctrico → arritmias (bradicardia)
- Menor aporte de O2 → angina cardíaca e membros

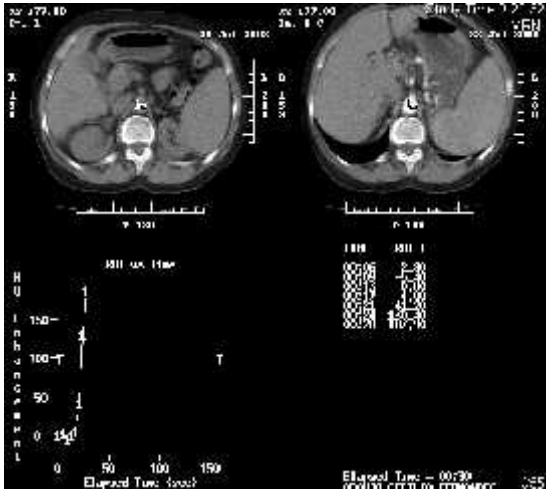
Delays

- SmartPrep, Care Bolus, **Bolus Tracking**
- **Bolus Timing (20 ml)**
- Delay – fixo

Monitorização

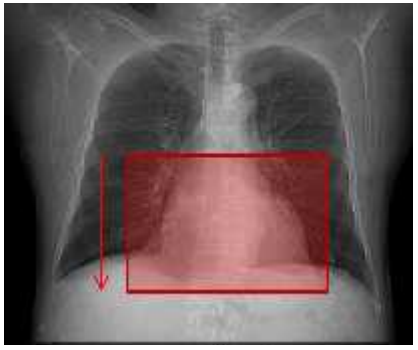


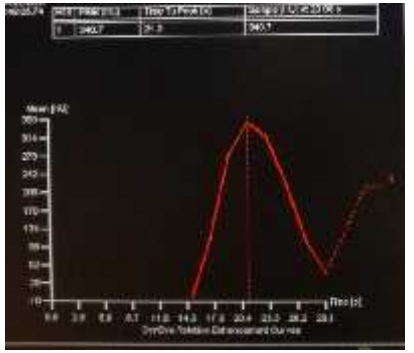




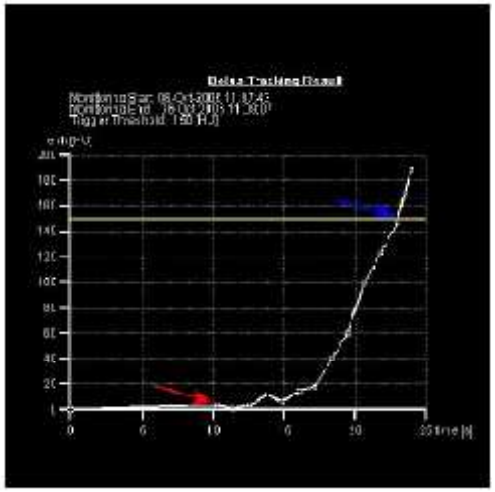
Angio TC Cardíaca

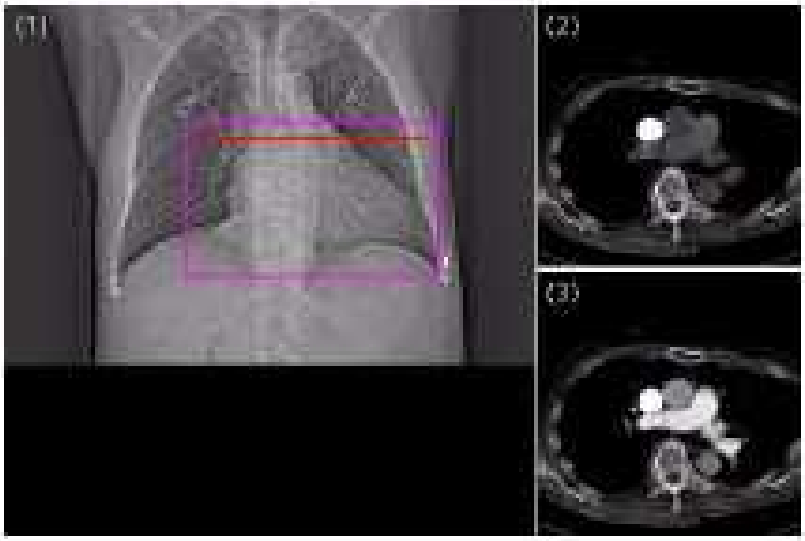
- Topograma
- Score Cálcio
- Teste de Bolus
- Aquisição

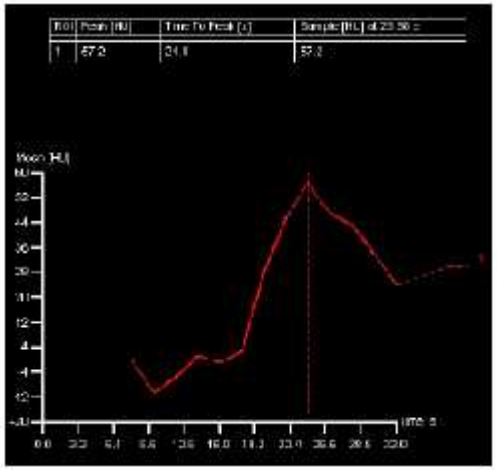


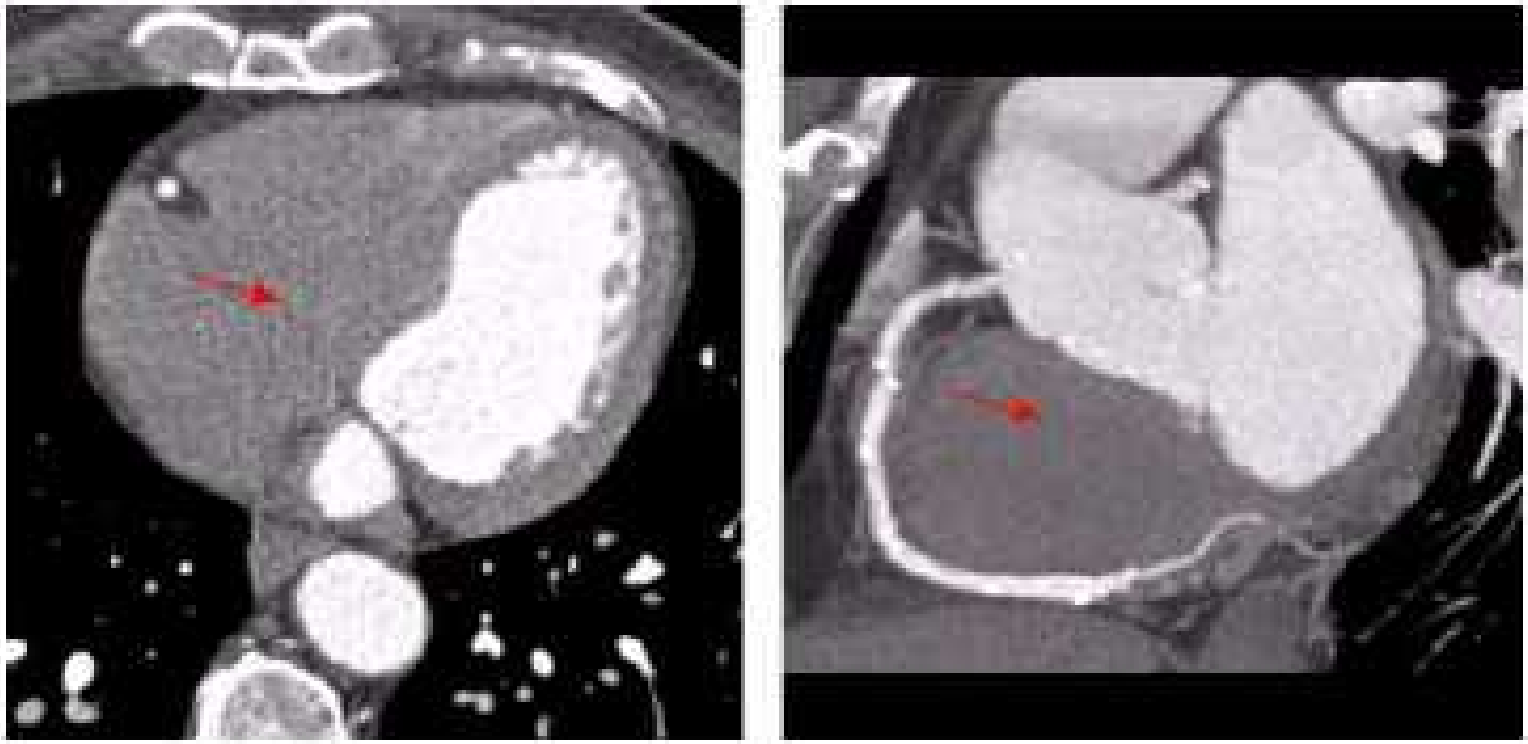


Monitorização







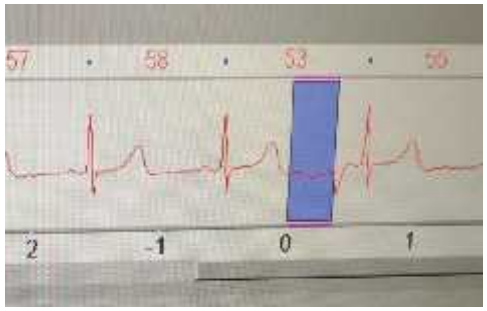


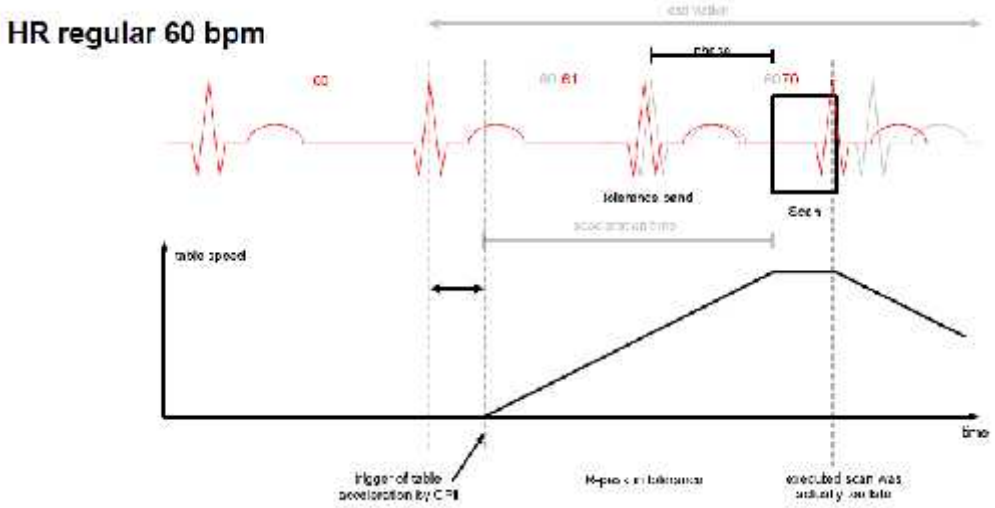
Protocolo de Injecção

	Iomeron 350 ®	NaCl	Débito
Timing Bolus	20 ml	20 ml	5 ml/s
Cardíaco	70 ml	50 ml	5 ml/s

Protocolo de Aquisição

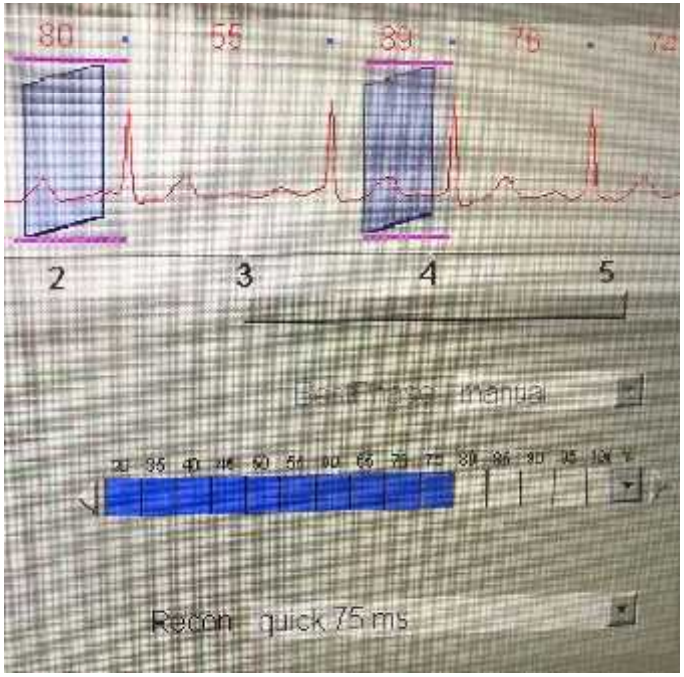
- FLASH Cardio (HR < 70 bpm, Helicoidal)

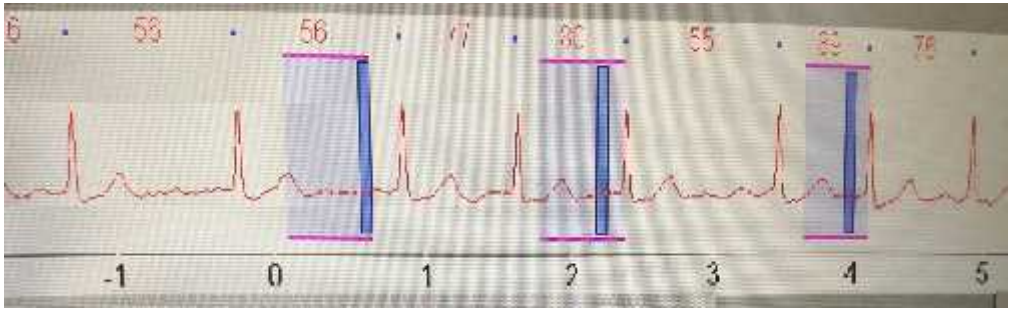




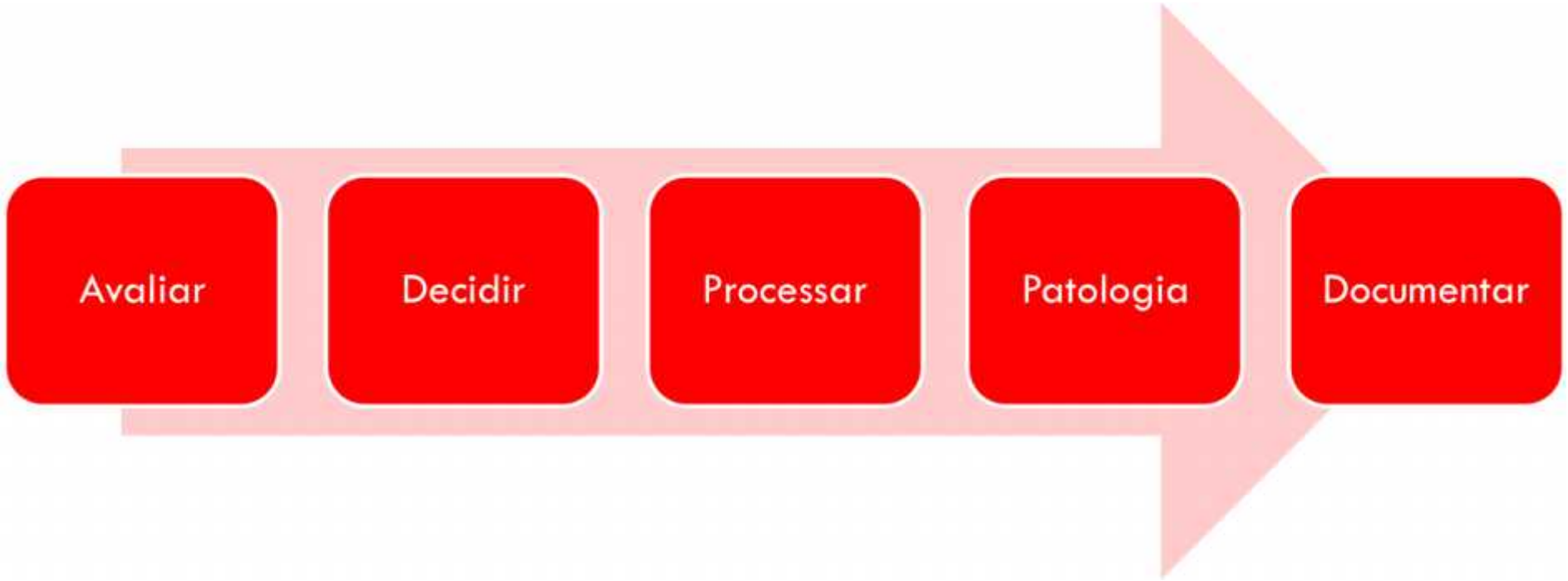
Protocolo de Aquisição

- DS_CARDIO (HR >70 bpm, Sequencial Adaptativo)

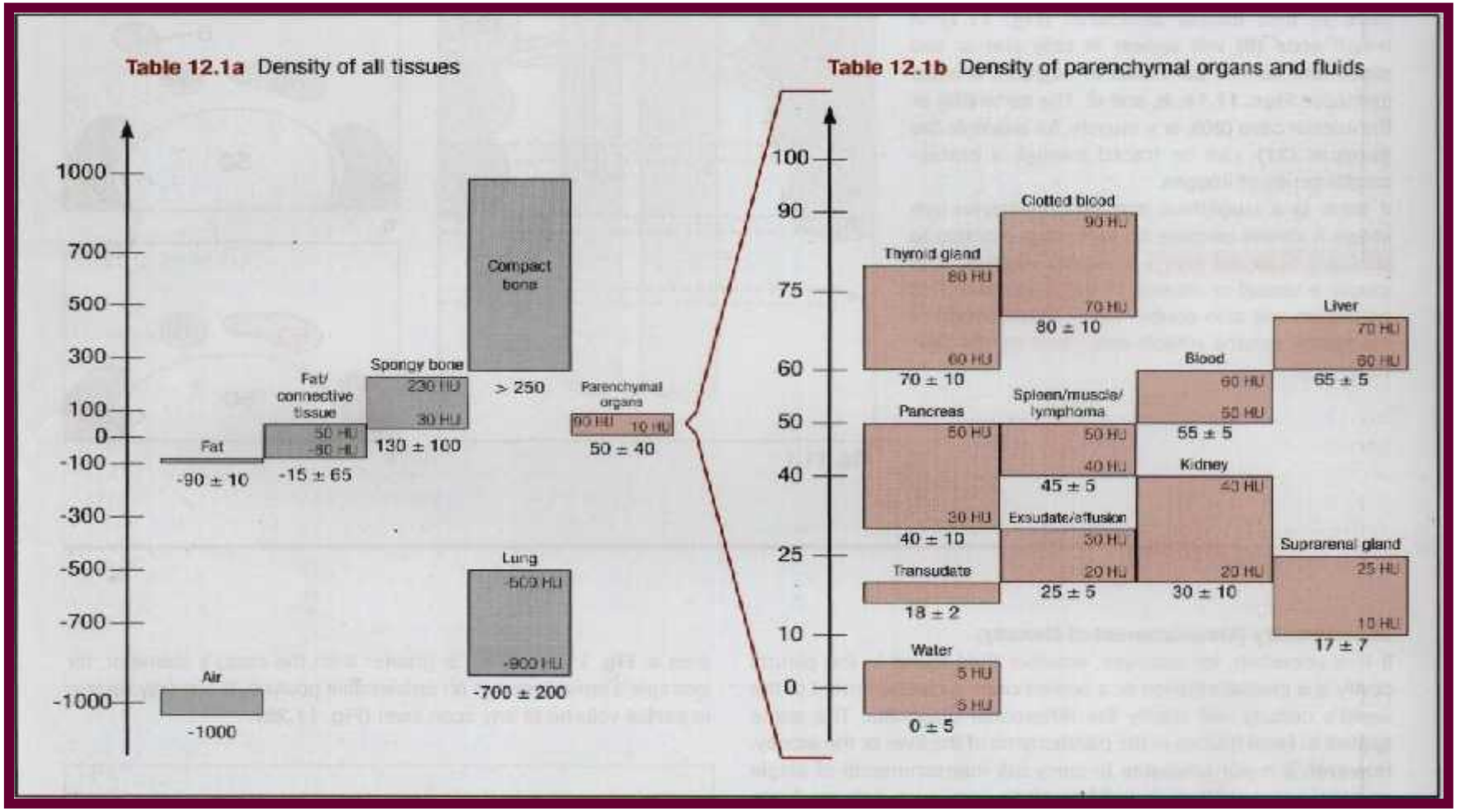




Pós - processamento



Densidade dos tecidos



Janela

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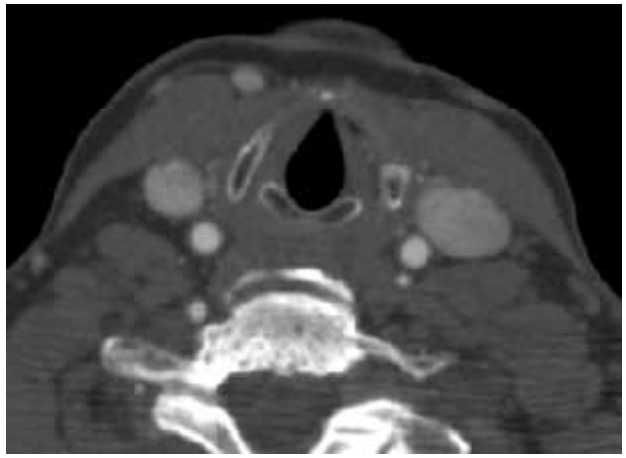
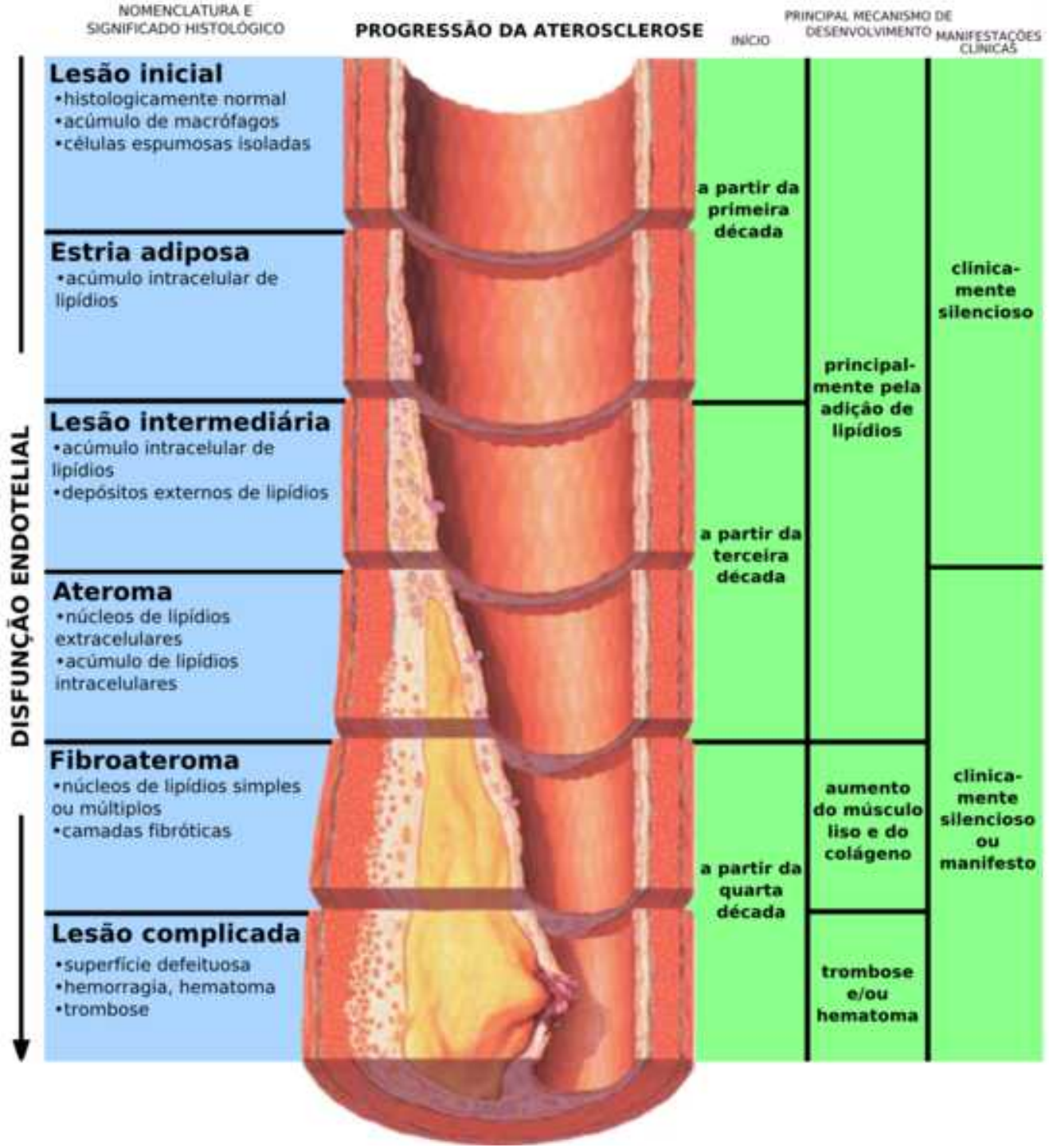
Abertura e nível (W/L)

W/L 450/50

W/L 600/200

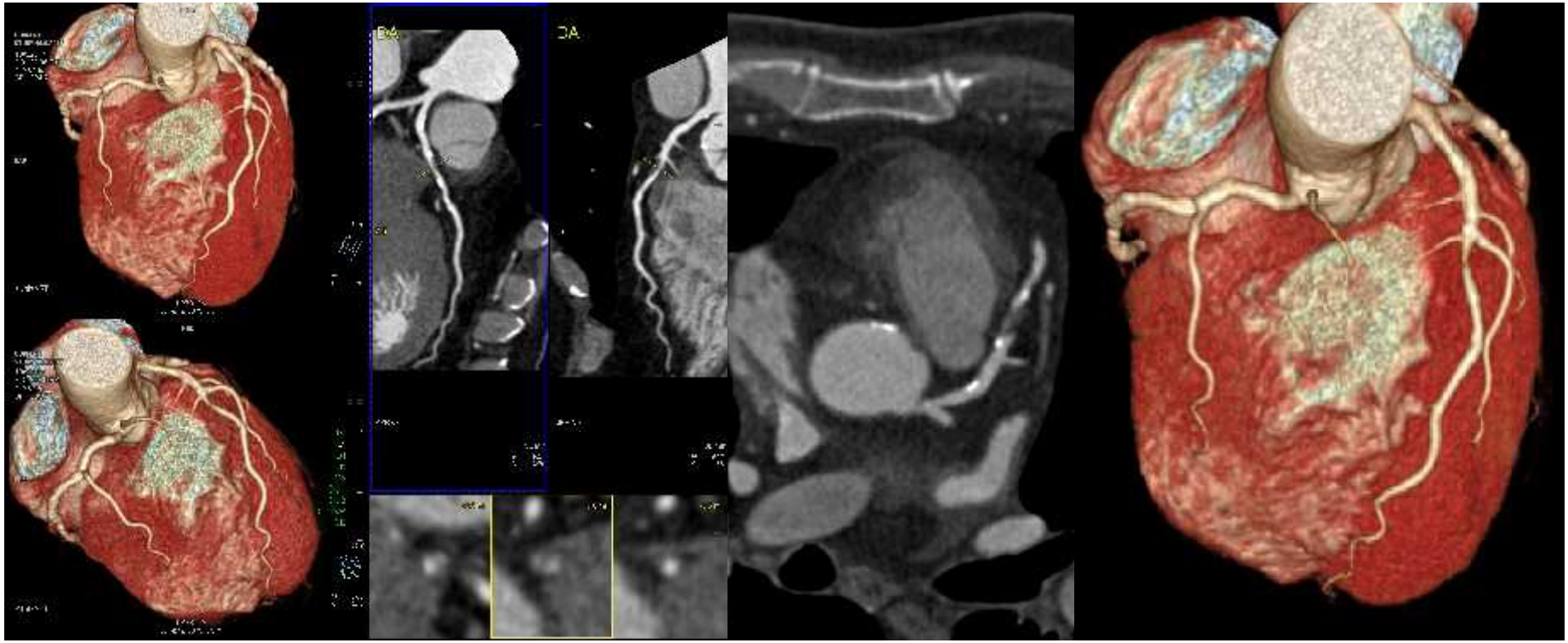


W/L 1200/300


NOMENCLATURA E SIGNIFICADO HISTOLÓGICO
PROGRESSÃO DA ATEROSCLEROSE
INÍCIO
PRINCIPAL MECANISMO DE DESENVOLVIMENTO
MANIFESTAÇÕES CLÍNICAS
DISFUNÇÃO ENDOTELIAL
Lesão inicial
•histologicamente normal
•acúmulo de macrófagos
•células espumosas isoladas
Estria adiposa
•acúmulo intracelular de lipídios
Lesão intermediária
•acúmulo intracelular de lipídios
•depósitos externos de lipídios
Ateroma
•núcleos de lipídios extracelulares
•acúmulo de lipídios intracelulares
Fibroateroma
•núcleos de lipídios simples ou múltiplos
•camadas fibróticas
Lesão complicada
•superfície defeituosa
•hemorragia, hematoma
•trombose
a partir da primeira década
a partir da terceira década
a partir da quarta década
principal-mente pela adição de lipídios
aumento do músculo liso e do colágeno
trombose e/ou hematoma
clinica-mente silencioso
clinica-mente silencioso ou manifesto

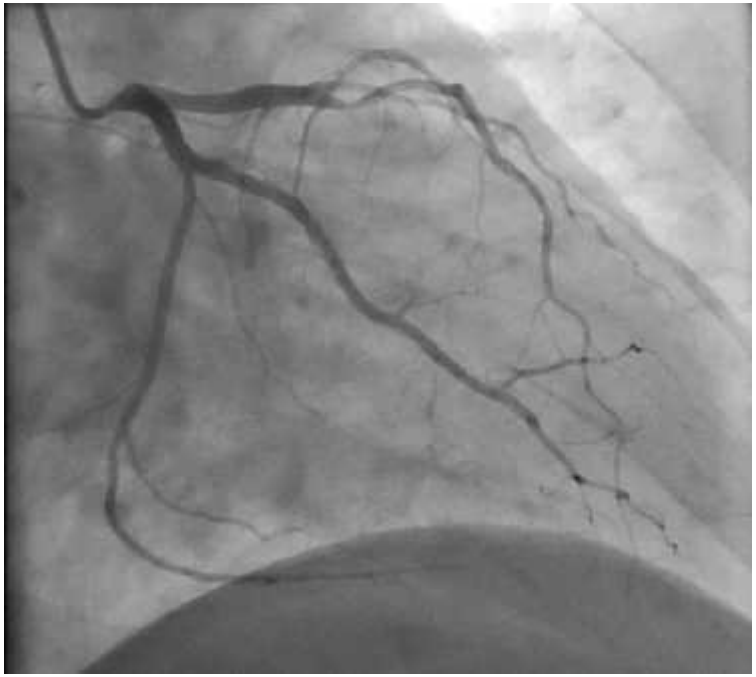
PP – Caso 1

- Doente com angina de peito, prova de esforço positiva com recurso a “PTCA”



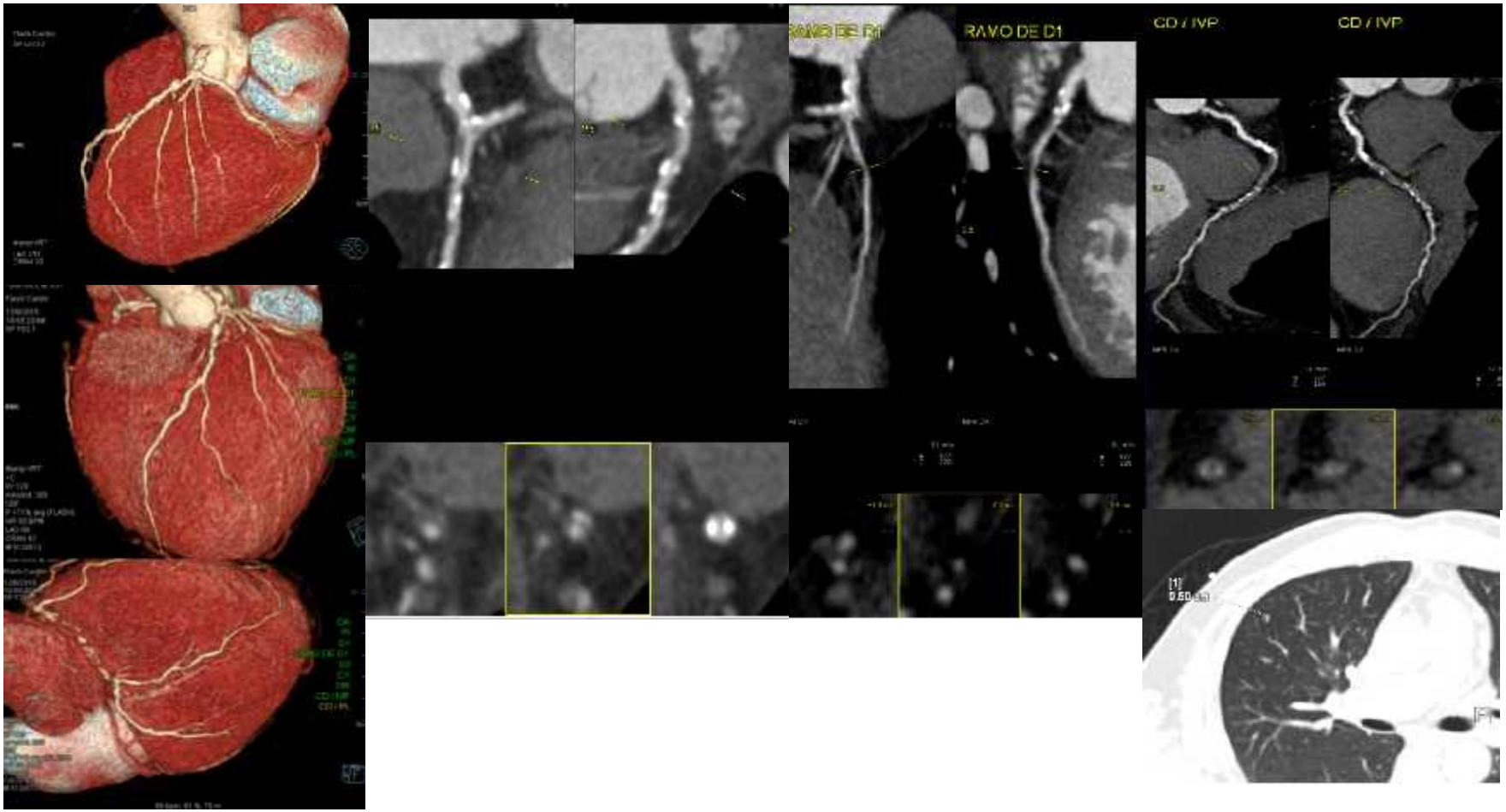
PP – Caso 1

- Doente com angina de peito, prova de esforço positiva com recurso a “PTCA”



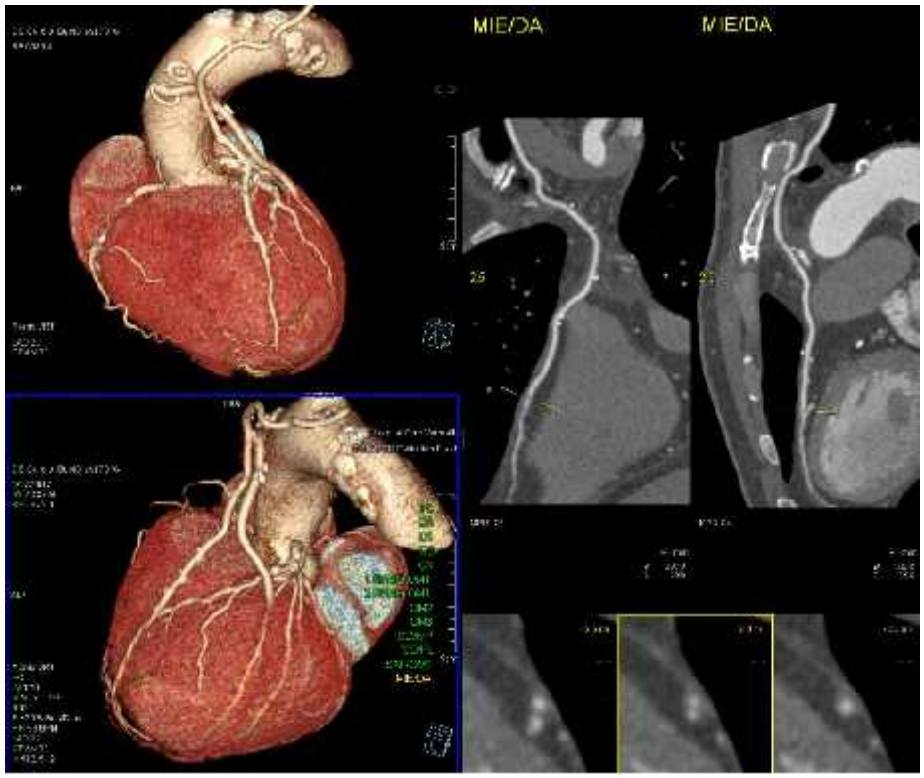
PP – Caso 2

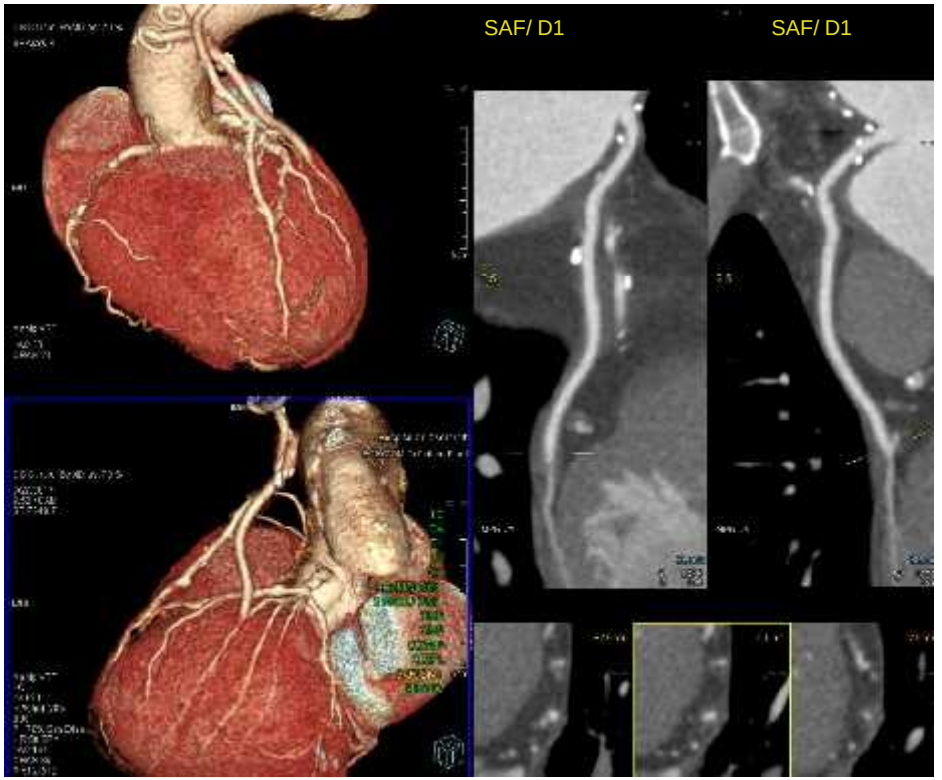
- Doença de três vasos com recurso a cirurgia por “bypass”



PP – Caso 2

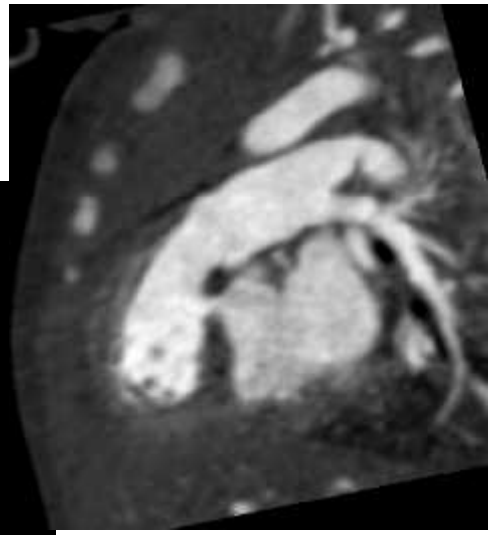
- Doença de três vasos com recurso a cirurgia por “bypass”

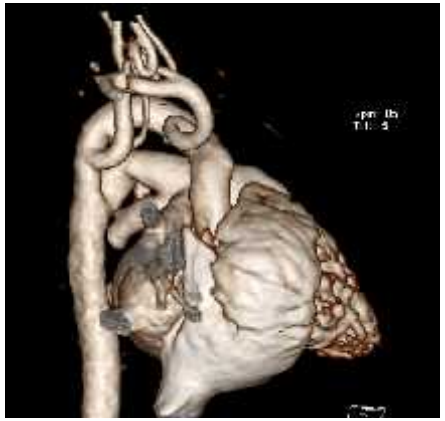




PP – Caso 3

	Scan	KV	mAs / ref.	CTDIvol* mGy	DLP mGycm	TI s	cSL mm
Patient Position F-SP							
Topogram	1	80	19 mA	0.02 L	0	1.8	0.6
Contrast							
FI_CorCTA	2D	70	90 / 720	0.29 L	4	0.28	0.6





Conclusão

- **Bolus**
- **Pós - Processamento**
- **Diagnóstico**

Hospital Cruz Vermelha

Obrigado!

www.hospitalcruzvermelha.pt

Pedro Silva