Casual Friday Series

Spotting CVD on Bloodwork

A BIOGENETIX CLINICAL PRESENTATION

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Cardiovascular diseases (CVD) remain among the 2 leading causes of death in the United States since 1975 with 633,842 deaths or 1 in every 4 deaths, heart disease occupied the leading cause of death in 2015 followed by 595,930 deaths related to cancer.[2] CVD is also the number 1 cause of death globally with an estimated 17.7 million deaths in 2015, according to the World Health Organization (WHO). The burden of CVD further extends as it is considered the most costly disease even ahead of Alzheimer disease and diabetes with calculated indirect costs of $237 billion dollars per year and a projected increased to $368 billion by 2035.[20]

Although the age-adjusted rate and acute mortality from MI have been declining over time, reflecting the progress in diagnosis and treatment during the last couple of decades, the risk of heart disease remains high with a calculated 50% risk by age 45 in the general population.[7][21] The incidence significantly increases with age with some variations between genders as the incidence is higher in men at younger ages.[2] The difference in incidence narrows progressively in the post-menopausal state.[2]

https://www.ncbi.nlm.nih.gov/books/NBK535419/

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Atherosclerosis is the pathogenic process in the arteries and the aorta that can potentially cause disease as a consequence of decreased or absent blood flow from stenosis of the blood vessels.[22]

It involves multiple factors dyslipidemia, immunologic phenomena, inflammation, and endothelial dysfunction. These factors are believed to trigger the formation of fatty streak, which is the hallmark in the development of the atherosclerotic plaque[23]; a progressive process that may occur as early as in the childhood.[24] This process comprises intimal thickening with subsequent accumulation of lipid-laden macrophages (foam cells) and extracellular matrix, followed by aggregation and proliferation of smooth muscle cells constituting the formation of the atheroma plaque.[25] As this lesions continue to expand, apoptosis of the deep layers can occur, precipitating further macrophage recruitment that can become calcified and transition to atherosclerotic plaques.[26]

Other mechanisms like arterial remodeling and intra-plaque hemorrhage play an important role in the delay and accelerated the progression of atherosclerotic CVD but are beyond the purpose of this article.[27]

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Cardiovascular disease generally refers to 4 general entities: CAD, CVD, PVD, and aortic atherosclerosis.

CVD is the main cause of death globally.

Measures aimed to prevent the progression of atherosclerosis are the hallmark for primary prevention of CVD.

Risk factor and lifestyle modification are paramount in the prevention of CVD.

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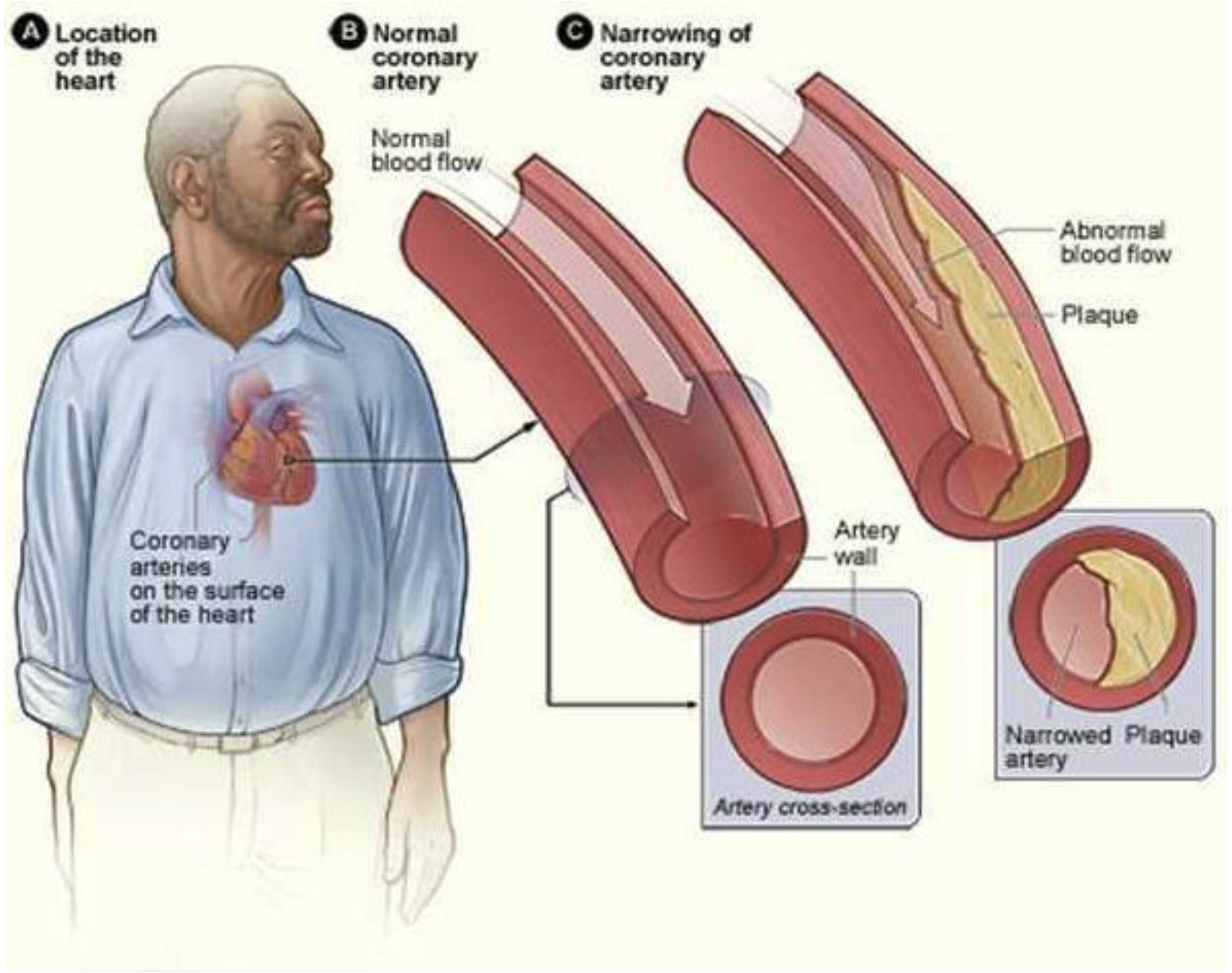

https://www.ncbi.nlm.nih.gov/books/NBK535419/

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The Case:

60 Year old female

Dizziness
Stiffness
Muscle spasms
Left sided pain
Arthritis
Numbness
Upper back pain

Family hx:
Heart disease c/ HA (mother)
Chest pain (mother)
Stroke (mother)
Depression (mother)

BP: 159/85
184lbs

Drugs:

Tylenol
Gabapentin
Atorvastatin 80mg
Allopurinol 100mg
Fosamax
Bisoprolol 25mg
Lisinopril 10mg
Omeprazole 40mg
Escitalapram 10mg
Ropinirole1mg

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Test Result Released: Yes (seen)

Component Ref Range & Units	1/13/25 0734	7/3/24 0728	1/4/24 0800
Sodium 136 - 145 mmol/L	141	142	135 ↓
Potassium 3.5 - 5.1 mmol/L	4.5	3.9	3.9
Chloride 98 - 107 mmol/L	103	102	97 ↓
CO2 22 - 29 mmol/L	27	30 ↑	28
Anion Gap 8.0 - 16.0 mmol/L	11.0	10.0	10.0
Glucose 65 - 99 mg/dL	103 ↑	107 ↑ CM	105 ↑ CM

Comment: The American Diabetes Association has developed the following interpretive guidelines:

Fasting Glucose
Normal: 65-99 mg/dL
Imparied: 100-125 mg/dL
Possible Diabetes: > 125 mg/dL

Random Gluose
Possible Diabetes: >= 200 mg/dL

BUN 6 - 20 mg/dL	23 ↑	14	23 ↑
Creatinine 0.50 - 0.90 mg/dL	0.89	0.84	0.79
BUN/Creatinine Ratio 10 - 20	26 ↑	17	29 ↑
Total Protein 6.6 - 8.7 g/dL	7.6	7.4	7.6

Alkaline Phosphatase 35 - 105 U/L	86	63	77
AST 0 - 33 U/L	38 ^	29	32 R
ALT 0 - 35 U/L	27	21	25 R
CK 20 - 180 U/L	257 ^	227 ^	87
Iron 37 - 145 ug/dL	117	53	91
Cholesterol, Total 0 - 199 mg/dL	283 ^	250 ^ CM	254 ^ CM
Comment: Desirable: <200 mg/dL Borderline High: 200-240 mg/dL High: >240 mg/dL			
Triglycerides 0 - 149 mg/dL	331 ^	351 ^ CM	295 ^ CM
Comment: Triglycerides <150 mg/dL Optimal 150-199 mg/dL Borderline High 200-499 mg/dL High >500 mg/dL Very High			
HDL 40 - 60 mg/dL	84 ^	72 ^	50
LDL Direct 0 - 99 mg/dL	152 ^	126 ^ CM	153 ^ CM
Comment:			

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GGT 0 - 39 U/L	133 ^	77 ^	58 ^
LD 0 - 250 U/L	292 ^	216	213
Magnesium 1.6 - 2.4 mg/dL	1.9	1.6	1.8 R
Uric Acid 2.4 - 5.7 mg/dL	5.0	5.9 ^	5.9 ^
TSH 0.27 - 4.20 uIU/mL	2.72	3.43	2.57

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Component Ref Range & Units	1/13/25 0734	1/4/24 0800	10/25/23 1039
WBC 4.40 - 10.40 th/uL	6.67	6.13	8.91
RBC 4.04 - 5.48 mi/uL	3.07 ↓	3.67 ↓	3.31 ↓
Hemoglobin 12.2 - 16.2 g/dL	11.6 ↓	11.2 ↓	10.5 ↓
Hematocrit 37.7 - 47.9 %	34.3 ↓	34.8 ↓	32.7 ↓
MCV 80.0 - 94.0 fl	111.7 ↑	94.8 ↑	98.8 ↑
MCH 26.0 - 32.0 pg	37.8 ↑	30.5	31.7
MCHC 32.0 - 36.0 g/dL	33.8	32.2	32.1
RDW 11.5 - 14.5 %	13.8	15.5 ↑	12.0
RDW-SD 38.2 - 49.2 fl	56.5 ↑	53.4 ↑	43.8
Platelets 142 - 424 th/uL	337	258	317

Neutrophils Relative %	46.7	70.6	72.9
Immature Grans Relative %	0.7	0.5	0.3
Lymphocytes Relative %	41.4	20.9	18.6
Monocytes Relative %	9.4	5.5	6.8
Eosinophils Relative %	1.2	2.0	1.1
Basophils Relative %	0.6	0.5	0.3

	Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
	Iron Bind.Cap.(TIBC)	388			ug/dL	250-450
	UIBC [01]	326			ug/dL	131-425
	Iron [01]	62			ug/dL	27-159
▲	**Ferritin** [01]	**178**	**High**		ng/mL	15-150

CBC With Differential/Platelet

	Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
	WBC [01]	6.2			x10E3/uL	3.4-10.8
▼	**RBC** [01]	**2.82**	**Low**		x10E6/uL	3.77-5.28
	Hemoglobin [01]	11.2			g/dL	11.1-15.9
▼	**Hematocrit** [01]	**33.0**	**Low**		%	34.0-46.6
▲	**MCV** [01]	**117**	**High**		fL	79-97
▲	**MCH** [01]	**39.7**	**High**		pg	26.6-33.0
	MCHC [01]	33.9			g/dL	31.5-35.7
	RDW [01]	12.8			%	11.7-15.4
	Platelets [01]	274			x10E3/uL	150-450
	Neutrophils [01]	60			%	Not Estab.
	Lymphs [01]	26			%	Not Estab.
	Monocytes [01]	10			%	Not Estab.
	Eos [01]	2			%	Not Estab.
	Basos [01]	1			%	Not Estab.
	Neutrophils (Absolute) [01]	3.8			x10E3/uL	1.4-7.0
	Lymphs (Absolute) [01]	1.6			x10E3/uL	0.7-3.1
	Monocytes(Absolute) [01]	0.6			x10E3/uL	0.1-0.9
	Eos (Absolute) [01]	0.1			x10E3/uL	0.0-0.4
	Baso (Absolute) [01]	0.0			x10E3/uL	0.0-0.2
	Immature Granulocytes [01]	1			%	Not Estab.
	Immature Grans (Abs) [01]	0.0			x10E3/uL	0.0-0.1

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Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
▲ **Glucose** [01]	**112**	**High**		mg/dL	70-99
BUN [01]	16			mg/dL	8-27
Creatinine [01]	0.68			mg/dL	0.57-1.00
eGFR	100			mL/min/1.73	>59
BUN/Creatinine Ratio	24				12-28
Sodium [01]	139			mmol/L	134-144
Potassium [01]	4.3			mmol/L	3.5-5.2
Chloride [01]	99			mmol/L	96-106
Carbon Dioxide, Total [01]	24			mmol/L	20-29
Calcium [01]	9.6			mg/dL	8.7-10.3
Protein, Total [01]	6.9			g/dL	6.0-8.5
Albumin [01]	4.3			g/dL	3.8-4.9
Globulin, Total	2.6			g/dL	1.5-4.5
Bilirubin, Total [01]	0.4			mg/dL	0.0-1.2
Alkaline Phosphatase [01]	58			IU/L	44-121
AST (SGOT) [01]	21			IU/L	0-40
ALT (SGPT) [01]	15			IU/L	0-32

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	Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
	Urinalysis Gross Exam [01]					
	Specific Gravity [01]	1.022				1.005-1.030
	pH [01]	5.5				5.0-7.5
	Urine-Color [01]	Yellow				Yellow
	Appearance [01]	Clear				Clear
▶	**WBC Esterase** [01]	**2+**	**Abnormal**			Negative
	Protein [01]	Negative				Negative/Trace
	Glucose [01]	Negative				Negative
	Ketones [01]	Negative				Negative
	Occult Blood [01]	Negative				Negative
	Bilirubin [01]	Negative				Negative
	Urobilinogen,Semi-Qn [01]	0.2			mg/dL	0.2-1.0
	Nitrite, Urine [01]	Negative				Negative
	Microscopic Examination [01]	See below: Microscopic was indicated and was performed.				
▶	**WBC** [01]	**11-30**	**Abnormal**		/hpf	0-5
	RBC [01]	None seen			/hpf	0-2
	Epithelial Cells (non renal) [01]	0-10			/hpf	0-10
	Casts [01]	None seen			/lpf	None seen
▶	**Bacteria** [01]	**Moderate**	**Abnormal**			None seen/Few
	Urinalysis Reflex [01]	This specimen has reflexed to a Urine Culture.				
	Urine Culture, Routine [01]	Will Follow				

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Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Cholesterol, Total [01]	181		mg/dL	100-199
Triglycerides [01]	129		mg/dL	0-149
HDL Cholesterol [01]	67		mg/dL	>39
VLDL Cholesterol Cal	22		mg/dL	5-40
LDL Chol Calc (NIH)	92		mg/dL	0-99
T. Chol/HDL Ratio	2.7		ratio	0.0-4.4
Please Note: [01]		T. Chol/HDL Ratio Men Women 1/2 Avg.Risk 3.4 3.3 Avg.Risk 5.0 4.4 2X Avg.Risk 9.6 7.1 3X Avg.Risk 23.4 11.0		
Non-HDL Cholesterol	114		mg/dL	0-129

Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
▼ **Vitamin B12** [01]	**151**	**Low**		pg/mL	232-1245

Magnesium

Test	Current Result and Flag		Previous Result and Date	Units	Reference Interval
▼ **Magnesium** [01]	**1.5**	**Low**		mg/dL	1.6-2.3

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Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
TSH [01]	1.680		uIU/mL	0.450-4.500
Thyroxine (T4) [01]	8.1		ug/dL	4.5-12.0
T3 Uptake [01]	34		%	24-39
Free Thyroxine Index	2.8			1.2-4.9

Hgb A1c with eAG Estimation

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Hemoglobin A1c [01]	4.9		%	4.8-5.6
Please Note: [01]	Prediabetes: 5.7 - 6.4 Diabetes: >6.4 Glycemic control for adults with diabetes: <7.0			
Estim. Avg Glu (eAG)	94		mg/dL	

Vitamin D, 25-Hydroxy

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Vitamin D, 25-Hydroxy [01]	54.7		ng/mL	30.0-100.0

Vitamin D deficiency has been defined by the Institute of Medicine and an Endocrine Society practice guideline as a level of serum 25-OH vitamin D less than 20 ng/mL (1,2). The Endocrine Society went on to further define vitamin D insufficiency as a level between 21 and 29 ng/mL (2).

1. IOM (Institute of Medicine). 2010. Dietary reference intakes for calcium and D. Washington DC: The National Academies Press.
2. Holick MF, Binkley NC, Bischoff-Ferrari HA, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. JCEM. 2011 Jul; 96(7):1911-30.

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Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ **C-Reactive Protein, Cardiac** [01]	**5.82 High**		mg/L	0.00-3.00

Homocyst(e)ine

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ **Homocyst(e)ine** [01]	**75.7 High** Results confirmed on dilution.		umol/L	0.0-14.5

Phosphorus

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Phosphorus [01]	3.4		mg/dL	3.0-4.3

LDH

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ **LDH** [01]	**248 High**		IU/L	119-226

GGT

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
GGT [01]	39		IU/L	0-60

Triiodothyronine (T3)

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Triiodothyronine (T3) [01]	115		ng/dL	71-180

Thyroid Antibodies

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Thyroid Peroxidase (TPO) Ab [01]	12		IU/mL	0-34
Thyroglobulin Antibody [01]	Will Follow			

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Coronary Computed Tomography Angiography (CCTA)

A CCTA is a diagnostic test that produces detailed 3D images of the arteries in your heart to detect abnormalities in how blood flows through your heart and to diagnose cardiovascular disease. It is sometimes used to determine overall function of the heart. An abnormality of the arteries may include plaque buildup, which may consist of calcium, cholesterol or fat that can lead to cardiovascular diseases like coronary artery disease or heart failure.

You may need a CCTA if you have symptoms of cardiovascular disease or if you are diagnosed and your doctor needs more information about your condition. Reasons for a CCTA may include:

- Abnormal test results (stress testing, echocardiogram, electrocardiogram)
- Abnormal coronary artery structure
- Risk for developing coronary artery disease
- New or worsening coronary artery disease symptoms
- You have undergone coronary artery bypass graft (CABG) surgery

A CCTA can also determine any type of heart disease, including heart structure or aortic abnormalities.

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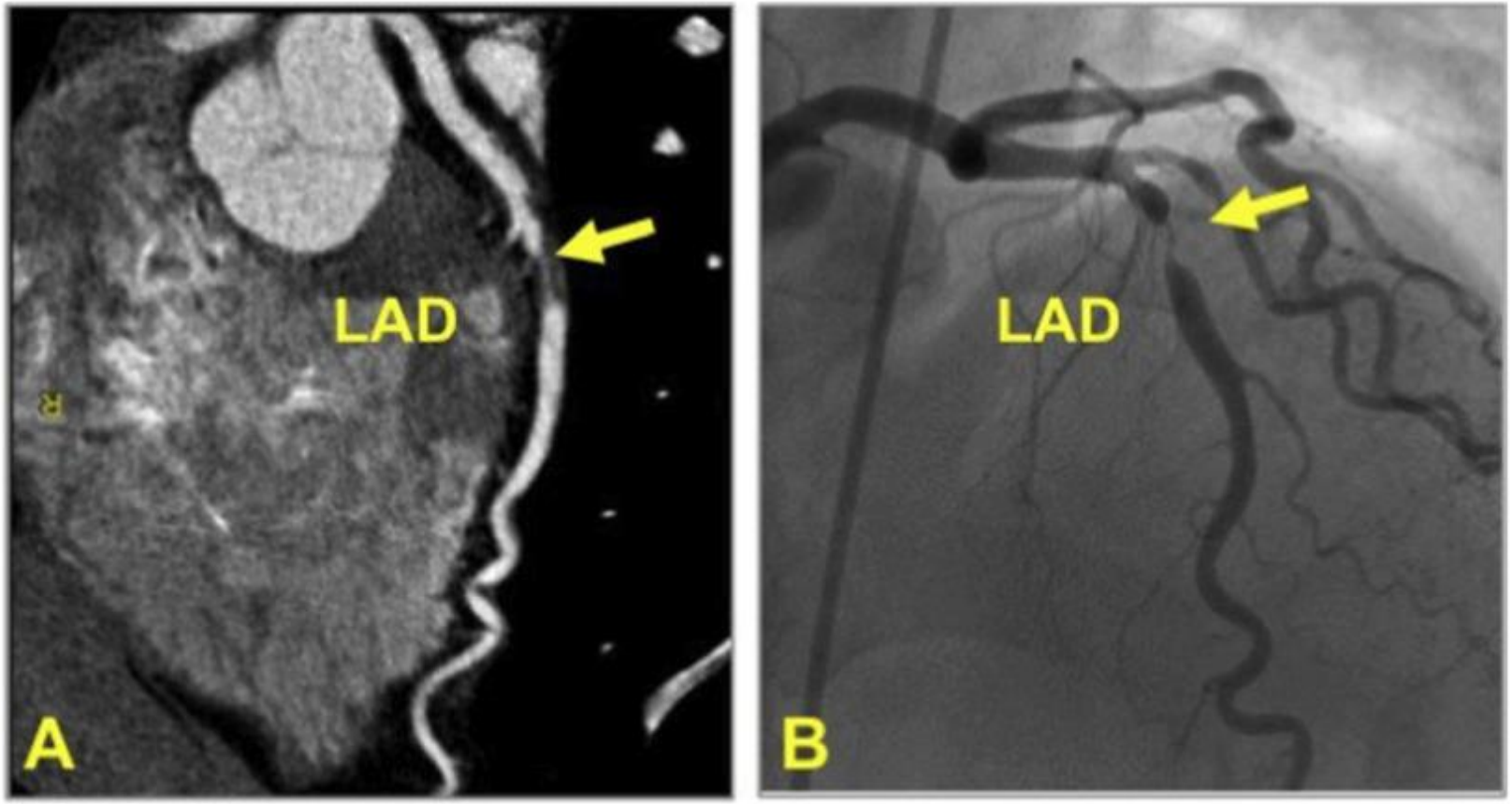

Fig. 7 CAD-RADS 4A/P1. Focal non-calcified plaque in the mid LAD (yellow arrow) with 70–99% severe coronary stenosis and mild amount of focal non-calcified plaque burden (P1) (left). Invasive coronary angiography confirming 70–99% stenosis in the mid LAD (yellow arrow, right). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Left Anterior Descending Coronary Artery -LAD

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https://www.journalofcardiovascularct.com/article/S1934-5925(22)00240-4/fulltext#fig3

Reach out to your Biogenetix Rep.

Submit your case to the CC team

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