

Coronary Arteriography : Our Initial Experience

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57 cases (five females) of ischaemic heart disease (IHD) diagnosed clinically and having objective evidence of ischaemia were subjected to coronary arteriography (CART). Age ranged from 43-74 years (mean age 63 years). 40 patients had stable class III angina and 17 unstable angina, five of them post-MI angina. The commonest risk factors were smoking and hypertension. CART revealed single vessel disease in 8, double vessel disease in 12, triple vessel disease in 32 and five patients had normal coronaries. One female patient had left main disease (99% obstruction) and one had left main equivalent disease with severe trifurcational lesion. One had coronary ectasia, 16 total blocks, extensive collaterals in 26, calcification of coronary arteries in 11, myocardial bridge in one and one had both coronaries arising from left sinus. Left ventricular systolic dysfunction was noted in 5 cases and diastolic dysfunction in 42 cases. One female patient died of electromechanical dissociation. So far 14 patients have undergone bypass graft surgery and three percutaneous transluminal coronary angioplasty. CART is a "gold standard" for diagnosis of IHD and thus helps in management.

Key words : Coronary Arteriography, Ischaemic Heart Disease

Coronary arteriography (CART) is a "gold standard" investigation for diagnosis of ischaemic heart disease (IHD)¹. It is generally employed for pre-operative evaluation to delineate coronary anatomy and thus also helps in validation of other diagnostic techniques and exclusion of IHD in suspected cases. The interventional procedures as coronary artery bypass graft (CABG) surgery, percutaneous transluminal coronary angioplasty² (PTCA) and coronary atherectomy/stenting have further necessitated repeat CART in patients to assess continued success of these procedures. We present here our experience of coronary arteriography in evaluation and management of IHD in patients known to have clinical IHD and those suspected to have asymptomatic IHD.

Material and Methods

A total of 57 cases studied during last one year are presented. The patients were ex-servicemen and their families (45 cases) and serving personnel (12 cases). The study was done at Command Hospital, Air Force, Bangalore. The CART was done by the authors at Yellamma Dasappa Hospital, Bangalore for Ex-servicemen and their families while service personnel were subjected to CART at Apollo Hospital, Madras. The indications for CART were taken as NYHA class III-IV angina, post-myocardial infarction (MI) angina and those suspected to have IHD on non-invasive evaluation. Clinical examination was performed to look for S4 (fourth heart sound i.e. sound of stress suggesting LV diastolic dysfunction), S3 (third heart sound ie sound of distress, suggesting LV systolic dysfunction) and cardiac enlargement/congestive heart failure. Risk factor profile was assessed in all cases including biochemical profile. In cases with NYHA class III angina and suspected to have IHD, treadmill exercise test (TMT) was done using standard or modified (for post MI cases) Bruce protocol to have objective evidence of ischaemia. The patients with unstable angina (NYHA class IV) and post-MI angina were subjected to CART after echocardiographic study only, as TMT is contraindicated in these cases.

Echocardiographic study was aimed to assess LV diastolic dysfunction apart from calculating ejection fraction, looking for mural thrombi and regional wall motion abnormalities (RWW-Ab). Pulsed Doppler flow velocities³ were measured at mitral valve to assess early (E) and late (A) velocities and their ratio (E/A). In LV diastolic dysfunction (LVDD) the E decreases, A increases and E/A ratio either equals or reverses. Normally E is more than A. Coronary

arteriography was performed through right femoral artery using percutaneous Seldinger technique^{2,4} and valved arterial sheath of 8 F size (IF=0.33mm). The catheters used were Judkins left (JL 7.4F) and right (JR 7.4F) and in 7 cases Amplatz catheter was used for right coronary artery (RCA). In two cases multipurpose catheter was used to engage RCA and left coronary artery (LCA). Standard views were obtained in right and left anterior oblique (RAO & LAO) planes with cranial and caudal angulations. The catheter measured LV diastolic pressure which was compared with Echo derived LV diastolic functions to correlate the findings. Coronary artery obstruction was calculated as percent diameter stenosis comparing with pre-stenotic segment (post-stenotic dilatation gives poor comparison) and obstructions above 50% were taken as haemodynamically significant. The CART data obtained were analysed in light of clinical status and inducible ischaemia to decide for interventions like PTCA/CABG.

Observations

A total of 57 cases were subjected to CART, 52 were males and five females. Age ranged from 43-74 years (mean 63 years). In three patients, we had to go through left femoral artery because of extensive disease of iliofemoral arteries on right side and in one case we had to do right brachial approach as even the guidewire could not be negotiated through the left common iliac artery.

Indications for CART. In our study group the indications for CART were as follows: unstable angina (12), post-MI angina (5) and chronic stable angina NYHA class III (40).

Non-invasive Evaluation. TMT was strongly positive in 30, moderately positive in 12 and mildly positive TMT but disabling symptoms (angina, dyspnoea or palpitation) in three cases. In 12 cases with unstable angina, no TMT was done. The echo study showed LVDD in 25 cases with $E > A$ and E/A ration reversion (Figure-1). 5 cases had systolic dysfunction with LVEF-% less than 50%. Most patients with LVDD had LV diastolic pressure (LVDP) elevated above 20 mmHg and in one case it was 40 mm Hg but he

had normal E/A ratio because the systolic dysfunction with low output overcame the diastolic dysfunction. Among five patients who were eventually found to have normal coronaries, the TMT was positive in four (two females) and in one because of recurrent MI, the TMT was not done. Echo study in these five cases showed normal LV systolic and diastolic functions. The CART was done to arrive at final diagnosis.

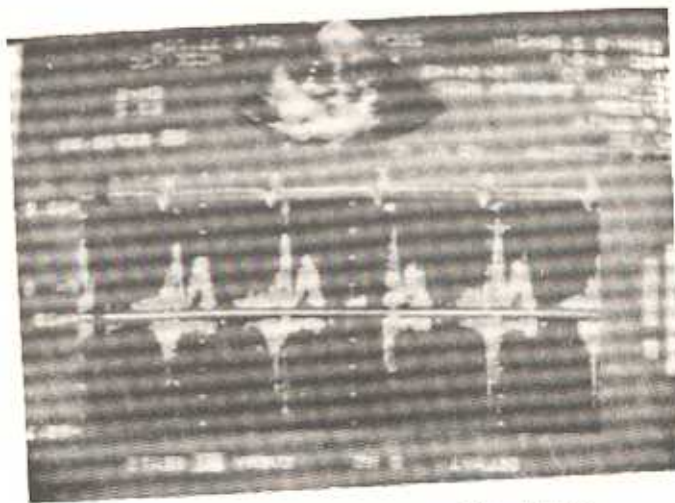


Fig. 1. Pulsed Doppler Velocities at Mitral Valve Showing A>E Suggesting LV Diastolic Dysfunction.

Coronary Arteriography. The findings on CART were as mentioned below:

(i) Single vessel disease (SVD)	8
(ii) Double vessel disease (DVD)	12
(iii) Triple vessel disease (TVD)	32
(iv) Normal coronaries	5

One had left main coronary lesion with TVD (Figure-2). A female patient with strong family history of IHD and LV diastolic dysfunction had left main disease. She developed electromechanical dissociation and died. Most patients with triple vessel disease were above 60 years age; they had multiple lesions, diffuse disease, calcification of coronaries, severe symptoms and severe systolic and diastolic dysfunctions of left ventricle. Most cases with diffuse disease had associated diabetes mellitus and chronic IHD. One patient had normal

coronaries with MI (? Coronary spasm) while another one had mild coronary artery disease with LV aneurysm and both of them were, young males.



Fig. 2. Angio in RAO View Shows Left Main Lesion at Bifurcation with TVD.

Other Coronary Morphological Features:

(a) Diffuse disease	5
(b) Coronary ectasia	1
(c) Total occlusion (100% block)	16
(d) Double lesion in one coronary artery	24
(e) Calcification	11
(f) Collateral circulation	26
(g) Myocardial bridge on LAD	1
(h) Both coronaries from left coronary sinus	1

The total occlusion was mostly in infarct related artery but even 5 patients with chronic IHD and no past history of MI, had total occlusion, mostly in right coronary artery (RCA) (Figure 3). Collaterals were well developed in patients with TVD and chronic disease and these were the patients who had diffuse disease of RCA and left anterior descending (LAD) or circumflex (CX). Coronary ectasia (a form of diffuse disease) (Figure 4) was observed in one patient.



Fig. 3. Shows Total Block of Right Coronary Artery with Intra-coronary Collaterals.

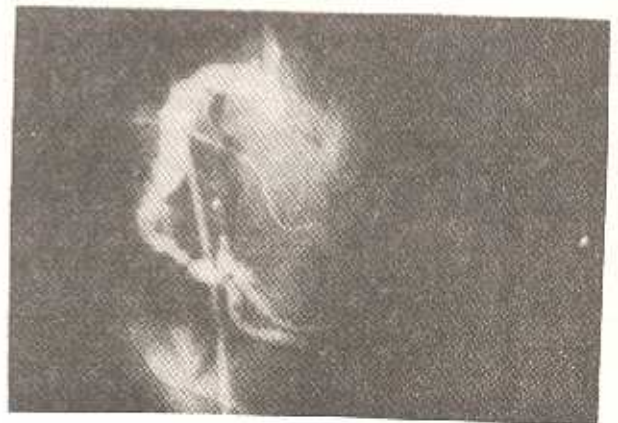


Fig. 4. Right Coronary Artery in Left Oblique View Shows Full Length Ectasia.

Among the patients who had normal coronaries, two were females, two had angina and mildly positive TMT and one patient had recurrent MI (responded to nitroglycerin and streptokinase) and finally coronaries were normal (coronary spasm causing MI).

Left Ventricular Functions

The diastolic pressure of LV suggests LV compliance. The compliance was inferred to be reduced when LV diastolic pressure was raised above 20 mm Hg and this was observed in 42 cases with 18 of them having LV diastolic pressure above 25 mm Hg. Three patients out of these had LV diastolic pressure of 40 mm of Hg. The LV ejection fraction (LVEF) varied from 40-70%, 5 of them having LVEF below 50%. The LV showed regional wall motion abnormality in old MI cases and two had LV aneurysm at apex and 3 had mitral regurgitation (one of them of moderate grade).

Complications

The complications observed in our study are as follows :-

(a) Minor allergy to dye	3
(b) Femoral artery thrombosis	1
(c) Right coronary dissection	1
(d) Prolonged bleeding	1
(e) Electromechanical dissociation leading to death	1

Interventions. So far 14 patients have undergone CABG and three PTCA and rest are in the process to undergo further interventions. Medical management is being continued. Patients with normal coronaries have been placed on medical therapy and are being followed as IHD with normal coronaries because small vessels disease can not be excluded by CART.

Discussion

The interesting observations of this study could be summarised as (i) relatively older age group catheterised, (ii) most had severe symptoms and about 25% had unstable angina (a high risk group), (iii) the coronary anatomy was significantly diseased and (iv) LV functions were significantly compromised (diastolic more than systolic). The women had equally severe disease as men, both clinically and angiographically, though one who died had severe left main disease with unstable angina, CHF and severe anaemia and she died of electromechanical dissociation.

Since Sones⁵ accidental discovery of selective coronary angiography, the CART has become the "gold standard" for diagnosis of IHD and has tremendously improved our understanding of all subsets of IHD i.e. from asymptomatic IHD to sudden cardiac death. Especially with PTCA⁶ and CABG, the CART has not only to be done for diagnosis but for follow up also to assess continued patency of the vessels/grfts. Chronic IHD in older age group^{6,8} produces more diffuse lesions and calcification of proximal coronaries though calcification is found less in Indians as compared to Western population, possibly related to nutritional status. Ectasia⁷ of coronary arteries is another form of diffuse CAD with multiple obstructions, aneurysmal dilatations and sluggish flow of blood. These cases have frequent ischaemic episodes, are inoperable and hence have to be managed on medical therapy only.

As compared to young, the older age group is known to have more TVD but Indian data⁸ have shown that TVD and SVD in young age occur with equal frequency. Patients need to be subjected to PTCA of the "culprit" lesion (the obstruction responsible for causing angina and ischaemia on ECG) or CABG if he has left main disease, TVD with LV systolic dysfunction and in other subsets if the PTCA can not be done and medical therapy in maximally tolerated doses fails to control the symptoms.

We have presented our data on initial experience in CART and now it is widely accepted that CART should be done in all cases of IHD to decide intervention and to confirm the diagnosis in asymptomatic IHD cases. MI in young (<40 years) constitutes a special group where CART should be done irrespective of symptoms and TMT status to decide early intervention and thus prevent second MI which may claim life at the prime age. Barring few complications, CART is a safe procedure. We feel that all cases of clinically suspected IHD with or without objective evidence of ischaemia should be subjected to CART, keeping in view the false negativity of noninvasive tests. This is particularly applicable to patients with disabling symptoms and younger age group. The CART findings may be used as guideline for

further management, either medical or interventional.

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