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Case Report

Dilatation of Coronary Artery: Non-Invasive Technique

Shibendra Kumar Saha[1] and *Swapan Kumar Adhikari[2]
[1]*West Bengal Medical Education Service, Netaji Subhas Open University, Kolkata.*
[2]*GUMV, Howrah, Netaji Subhas Open University, Kolkata.*
35/1, Krishnataran Naskar Lane, Ghusuri, Howrah, West Bengal, 711107
**Author for Correspondence*

ABSTRACT

Coronary artery disease (CAD) is increasing day-by-day and likely to assume an epidemic dimension in near future. This necessitates a simple non-invasive house-hold technique which will give a practicable idea of appropriate time for invasive interference. Coronary artery is or was supposed to be end-artery which may not allow adequate anastomoses naturally. Neo-angiogenesis is not unknown even in the coronary field. This arouses hope of attaining workable flow status after gradual coronary obstruction in atherosclerosis [Saha & Adhikari, 2008: Ref.4]. The physiological idea of stunned and / or hibernating myocardium and reversibility of myocardial blood-flow has contributed towards this high ambition of modulating coronary blood-flow at the time of stable angina.

CASES

Pilot study was undertaken at the Department of Cardiac Imaging Unit of APOLLO GLEANGLES HOSPITAL, KOLKATA. Simple non-invasive techniques for comparison of coronary artery diameter before and after physiological modulation were undertaken. We were not concerned with the absolute measurement; rather we preferred to bank upon the changes in diameter and inferred the consequent flow.

A pilot study was undertaken with two male volunteers aged above 60 years. One of them was suffering from stable angina with risk factors of dyslipidaemia and hypertension. Another person was a diabetic patient for last 7 years without any coronary symptom. In both these cases it would be seen that diameter of the proximal portions of all the four main distribution of coronary arteries [i.e. Left main coronary artery (LMCA), Right coronary artery (RCA), Left anterior descending (LAD), Circumflex] were increased remarkably after non-invasive modulation. We measured diameter at rest and observed after step-I technique which showed significant increase within minutes. The second step of modulation was enforced within next few minutes which again showed further significant increase in diameter[Saha & Adhikari, 2009: Ref.3]. For the convenience of non-invasiveness and repeatability we preferred echocardiographic measurement of coronary artery diameter rather than the standard coronary angiography.

Table 1: Analysis of Results Case-I (1st Author himself). Hypertensive for 15 years; on PPM (permanent pace-maker) 1-year; start-up angina at times

Name of Arteries	Basic	Deep Coughing		Guided Respiratory modulation	
	Diameter	Diameter	% of increase	Diameter	% of increase
LMCA	3.52 mm	3.73 mm	+5.96	4.51 mm	+28.12
RCA	3.17 mm	3.64 mm	+14.82	3.70 mm	+16.72
LAD	2.75 mm	3.70 mm	+34.54	3.48 mm	+26.54
Circumflex	2.03 mm	2.59 mm	+27.58	3.40 mm	+67.48

Observation: Percentage-wise dilatation from 5.96 to 67.48 was obtained at various segments.

Fig.1A: Left Main Coronary Artery Diameter before modulation (LMCA Diameter) 3.52 mm.

Fig.1B: Right Coronary Artery Diameter before modulation (RCA Diameter) 3.17 mm.

Fig.1C: Left Anterior Descending Diameter before modulation (LAD Diameter) 2.75 mm.

Fig.1D: Circumflex Diameter: 2.03 mm.

Figure 1 (A-D): [Case-I before modulation (Basic)] analysis of Results for 1st Author (SKS) himself who is Hypertensive for 15 years; on PPM (permanent pace-maker) for 1-year; with start-up angina at times.

Fig.2A: Left Main Coronary Artery Diameter after first modulation (Deep Coughing) 3.73 mm.

Fig.2B: Right Coronary Artery Diameter after first modulation (Deep Coughing) 3.64 mm.

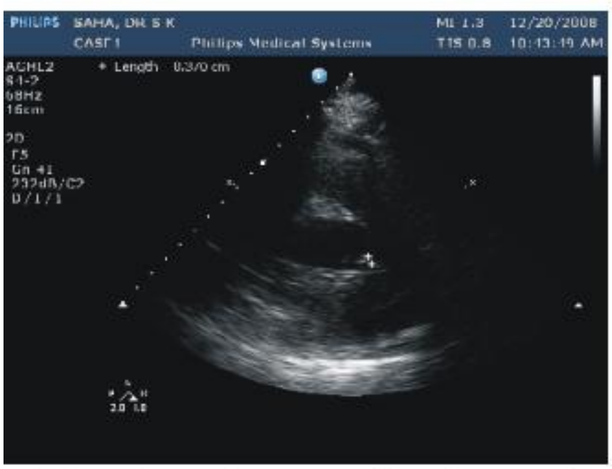

Fig.2C: Left Anterior Descending Diameter after first modulation (Deep Coughing) 3.70 mm.

Fig.2D: Circumflex Diameter after first modulation (Deep Coughing) 2.59 mm.

Figure 2 (A-D): (Case-I after modulation with deep coughing) analysis of Results for 1st Author (SKS) himself who is Hypertensive for 15 years; on PPM (permanent pace-maker) for 1-year; with start-up angina at times.

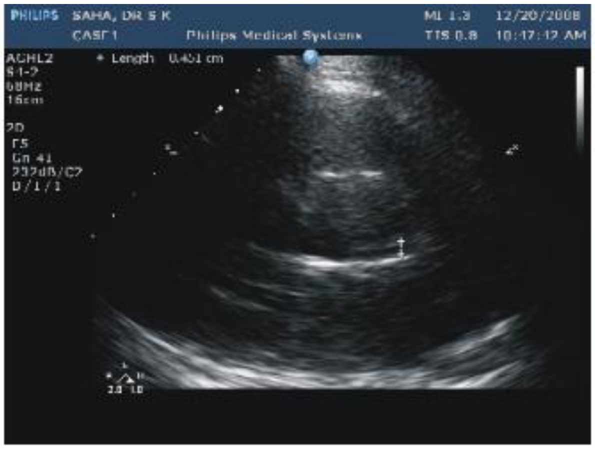

Fig.3A: Left Main Coronary Artery Diameter after add on modulation (Respiratory) 4.51 mm.

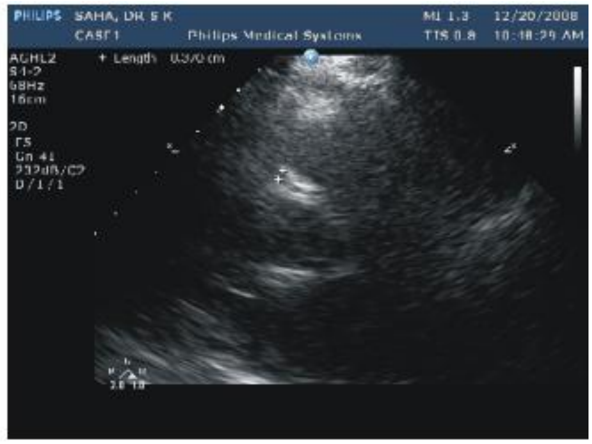

Fig.3B: Right Coronary Artery Diameter after add on modulation (Respiratory) 3.70 mm.

Fig.3C: Left Anterior Descending Diameter after add on modulation (Respiratory) 3.48 mm.

Fig.3D: Circumflex Diameter after add on modulation (Respiratory) 3.40 mm.

Figure 3 (A-D): [Case-I after further modulation add on procedure (Respiratory Modulation)] analysis of Results for 1st Author (SKS) himself who is Hypertensive for 15 years; on PPM (permanent pace-maker) for 1-year; with start-up angina at times.

Fig.4A: Left Main Coronary Artery Diameter before modulation 3.55 mm

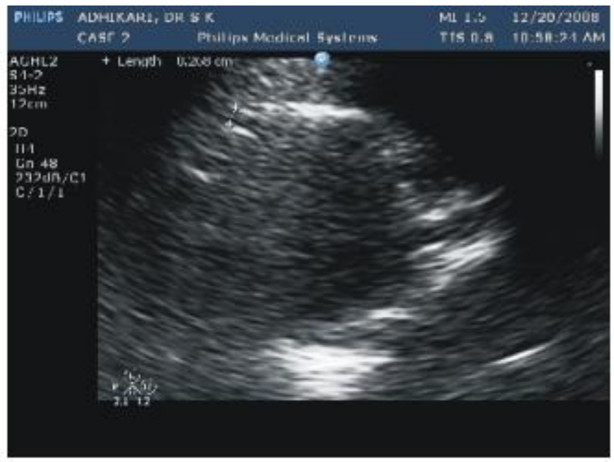

Fig.4B: Right Coronary Artery Diameter before modulation 2.68 mm.

Fig.4C: Left Anterior Descending Diameter before modulation 2.64 mm.

Fig.4D: Circumflex Diameter before modulation 2.17 mm.

Figure 4 (A-D): [Case-II before modulation (Basic)] analysis of Results for 2nd Author (SKA) himself who is Diabetic with no end organ damage; normotensive.

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Fig.5A: Left Main Coronary Artery Diameter after first modulation (Deep Coughing) 4.02 mm.

Fig.5B: Right Coronary Artery Diameter after first modulation (Deep Coughing) 2.91mm.

Fig.5C: Left Anterior Descending Diameter after first modulation (Deep Coughing) 2.99 mm.

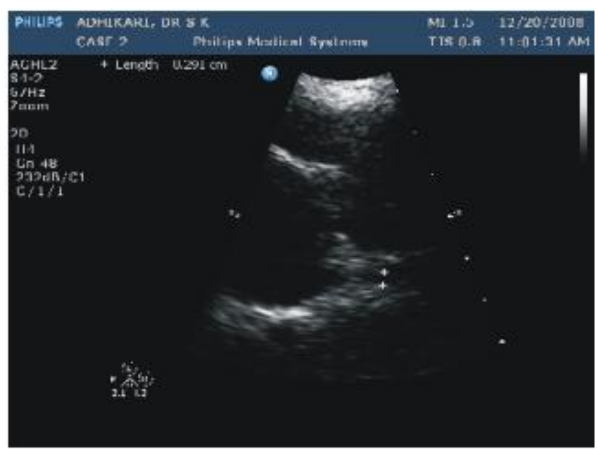

Fig.5D: Circumflex Diameter after first modulation (Deep Coughing) 2.91 mm.

Figure 5 (A-D): (Case-II after modulation with deep coughing) Analysis of Results for 2nd Author (SKA) himself who is Diabetic with no end organ damage; normotensive.

Fig.6C: Left Anterior Descending Diameter after add on modulation (Respiratory) 2.75 mm.

Fig.6D: Circumflex Diameter after add on modulation (Respiratory) 2.99 mm.

Fig.6A: Left Main Coronary Artery Diameter after add on modulation (Respiratory) 4.01 mm.

Fig.6B: Right Coronary Artery Diameter after add on modulation(Respiratory) 4.12 mm.

Figure 6 (A-D): [Case-II after further modulation add on procedure (Respiratory Modulation)] analysis of Results for 2nd Author (SKA) himself who is Diabetic with no end organ damage; normotensive

Table 2: Analysis of Results Case-II (2nd Author, as volunteer); Diabetes Mellitus with no end organ damage; normotensive

Name of Arteries	Basic Diameter	Deep Coughing		Respiratory modulation	
		Diameter	% of increase	Diameter	% of increase
LMCA	3.55 mm	4.02 mm	+13.24	4.01 mm	+12.96
RCA	2.68 mm	2.91 mm	+8.58	4.12 mm	+53.73
LAD	2.64 mm	2.99 mm	+13.26	2.75 mm	+ 4.17
Circumflex	2.17 mm	2.91 mm	+34.10	2.99 mm	+37.79

Observation: Percentage-wise dilatation from 4.17 to 53.73 was obtained at various segments.

DISCUSSION

Coronary Artery disease, diagnosed with modern techniques, shows almost an epidemic proportion: it is multi-factorial. Doctors talk about risk factors which are very much part of modern life-style. Modulation of coronary artery diameter and consequent flow can be measured by various semi-invasive techniques with catheter and dye. Non-invasive echocardiographic measurement needs high degree of technical precision and sophisticated instruments. Even then we have preferred echocardiography for convenience.

Atherosclerosis has been reported to be reversible with diet and drugs. Life-style modification has a major role in the long term management.

We can probably apply these data for primary and secondary prevention of CAD. Echocardiographic assessment of the diameter of coronary vessels gives a rough estimation only. Here we have compared the diameter of coronary vessel (any accessible segment) before and after modulatory techniques which serves our purpose. The significant increase of coronary artery diameter in both the volunteers was very much encouraging. This needs verification by further studies in many more number of cases.

Increase in diameter at the proximal end of coronary artery arouses the hope of better flow, even through the partially obstructed portion. The improvement was immediately reflected by a sense of well being in the patient. This is possible only up to the stage of isolated systolic hypertension (ISH)[2] when it is expected that elasticity is partially preserved. Isolated systolic hypertension (ISH) can be very easily identified by bed side measurement of blood pressure by sphygmomanometer.

Demonstration of the arterial width at distal portion of the site of obstruction is more difficult. Further evaluation may be considered by standard coronary angiogram for confirmation.

Coronary angiogram cannot be repeated with every step of suggested non-invasive modulatory technique. Our results will require further evaluation after a specified follow-up period. More studies in this direction is being undertaken. We hope to report favourable data in near future.

A pilot study for a new technique of non-invasive method of improving coronary flow has been described with high hope. This is based on traditional yogic concept backed by modern physiological information. Preliminary results are thought provoking. Further studies are deferred for paucity of fund. Follow up study may be planned to stabilize this encouraging achievement. We are seriously considering application of this non-invasive modulatory technique as a house-hold yogic procedure under direct supervision of interested primary care physician or cardiologist for volunteers at present.

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