

“A Cadaveric Study of Coronary Predominance in Eastern India”

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ABSTRACT

Ischaemic heart disease is one of the modernday pandemics. Human hearts with left coronary predominance are more prone for developing such ischaemic coronary events compared to hearts with right coronary predominance whereas hearts with balanced coronary circulation appear to be protected against ischaemic heart disease. In the current study, 60 human adult formalin preserved cadaveric hearts of either sex were dissected to look for the origin of posterior interventricular artery. It was observed that in 42 cases (70%) the posterior interventricular artery was a branch from right coronary artery (right coronary predominance). The posterior interventricular artery was found to arise from left coronary artery (left coronary predominance) in 6 cases (10%). In 12 cases (20%) the posterior interventricular artery was noted to be originating from both right as well as left coronary artery (balanced coronary circulation). The findings of the current study will be of particular interest to cardiologists performing coronary angiography, an essential prerequisite in managing coronary artery disease. Cardiothoracic-vascular surgeons will also find the information useful besides anatomists and forensic pathologists.

Key words- Coronary predominance, ischaemic heart disease, risk factor.

INTRODUCTION

Coronary heart disease has acquired epidemic proportions in the developed world. Mortality and morbidity due to cardiac ischaemic events are of grave concern in middle aged population and young adults. Coronary artery narrowing is the basic pathology behind the said ischaemic event mostly due to subintimal atheromatous plaques with superimposed thrombus formation resulting in partial or complete blocks in the coronary arteries and subsequent cardiac ischaemia. Coronary heart disease is also on the rise in the developing countries and has become a chief health concern in recent years¹. Although hypercholesterolemia has been implicated as the main culprit behind the surge of ischaemic cardiac events certain other factors like unhealthy and sedentary lifestyle and anatomical factors also play a part in its pathogenesis. Coronary predominance plays an important role in

predisposing towards or preventing ischaemic heart disease. The posterior interventricular artery runs in the posterior interventricular groove of human heart accompanied by the middle cardiac vein. The posterior interventricular artery can arise from the right coronary artery or left coronary artery or on occasions from both the coronary arteries. If the posterior interventricular artery arises from the right coronary artery the condition is called right coronary predominance. If the posterior interventricular artery arises from the left coronary artery the condition is called left coronary predominance. In case the posterior interventricular artery is derived from both the right and left coronary arteries it is called as balanced type of coronary circulation. It's documented that human hearts with left coronary predominance are more susceptible to develop coronary ischaemic events compared to hearts with right coronary predominance as in the former case there's greater circulatory load on the left coronary artery as it supplies more volume of cardiac tissue compared to right coronary predominance. This can be attributed to the fact that the interventricular septum is solely supplied by the left coronary artery in left coronary predominance whereas the blood supply to the interventricular septum is shared by both the coronary arteries in right coronary predominance. In addition, hearts with balanced coronary circulation appear to be less predisposed towards ischaemic heart disease and rather seem protected against cardiac ischaemic events². As coronary predominance greatly influences the emergence of coronary heart disease the present study is an endeavour to explore the different types of coronary predominance in Eastern India.

METHODS

The current study is a descriptive study carried out on human hearts extracted from sixty formalin preserved cadavers used in routine dissection classes for teaching anatomy to MBBS students. The cadavers belonged to adults of either sex. Thoracotomy was done followed by reflection of the pericardium and the great vessels were severed to harvest the hearts. The coronary arteries deep to the epicardial fat were dissected and the origin of posterior interventricular artery from the coronary arteries was noted in each specimen. Significant findings were photographed and relevant data was tabulated using Microsoft Excel software.

RESULTS

The posterior interventricular artery was found to arise from the right coronary artery in 42 hearts (70%) indicating right coronary predominance (Figure 1). Left coronary predominance was documented in 6 hearts (10%) where the posterior interventricular artery originated from the left coronary artery (Figure 2). Balanced type of coronary circulation was observed in rest 12 hearts (20%) denoting origin of the posterior interventricular artery from both right and left coronary arteries (Figure 3 and Figure 4)

DISCUSSION

Many authors have documented different types of coronary predominance in various studies. Paulsen and Vetner³ have reported 70.8% cases of right coronary predominance, 9.5% cases of left coronary predominance and 9.5% cases of balanced type of coronary circulation. Didio and Wakefield⁴ have documented right coronary predominance in 73.5% cases, left coronary predominance in 19.4% cases and balanced type of coronary circulation in 7.1% cases. In the study by Jain and Hazary,⁵ 56.6% of hearts exhibited right coronary predominance, 10% of hearts exhibited left coronary predominance and 33.4% of hearts exhibited balanced type of coronary circulation. Blumgart et al⁶ have reported 48% cases of right coronary predominance, 18% cases of left coronary predominance and 34% cases of balanced type of coronary circulation. Hadzisclimovic⁷ has authenticated 70% cases of right coronary predominance, 10% cases of left coronary predominance and 20% cases of balanced type of

coronary circulation in his study. In India, Amgain et al⁸ have put forward that in their study, 61.34% cases of hearts showed right coronary predominance, 24% cases of hearts showed left coronary predominance and 14.67% cases of hearts showed balanced type of coronary circulation. In another Indian study, Kalpana⁹ has implicated 89% cases of right coronary predominance and 11% cases of left coronary predominance with no hearts showing balanced type of coronary circulation. In yet another study by Cavalcanti et al¹⁰ have also reported no hearts with balanced type of coronary circulation. They have reported that 82% of hearts showed right coronary predominance while rest 18% of hearts showed left coronary predominance. As evident most of the studies have established the right coronary predominance as the most common pattern just like our study. Our study elucidates that the second common pattern is balanced type of coronary circulation followed by left coronary predominance which is also established by most other studies. However, Didio and Wakefield⁴ and Amgain et al⁸ have put forward left coronary predominance as the second most common pattern in their respective studies. In addition, Kalpana⁹ and Cavalcanti et al¹⁰ have reported no cases of balanced type of coronary circulation in their studies. Average frequency of critical narrowing is highest for anterior interventricular branch of left coronary artery (40- 50%) followed by right coronary artery (30- 40%) and circumflex branch of left coronary artery (10- 20%) respectively⁸. Pattern of coronary predominance plays a very critical role in the prevalence of coronary ischaemic events. Morbidity and mortality due to coronary ischaemic events is more common in left coronary predominance compared to the right predominance variety¹¹. In left predominance, the anterior interventricular branch of the left coronary artery wraps round the apex of the heart and supplies greater portion of myocardium¹². In right coronary predominance, the major portion of myocardium is supplied by the right coronary artery. So any narrowing of the anterior interventricular artery will be more critical in left predominance compared to right predominance¹³. Angiographic studies have shown that left predominant hearts are at higher disadvantage than right predominant hearts as far as cardiac ischaemia is taken into consideration¹⁴.

CONCLUSION

The people of Eastern India seem to have more frequency of right coronary predominance which is protective from coronary ischaemic events. The findings of the study will be of great significance in understanding and managing coronary ischaemic events.

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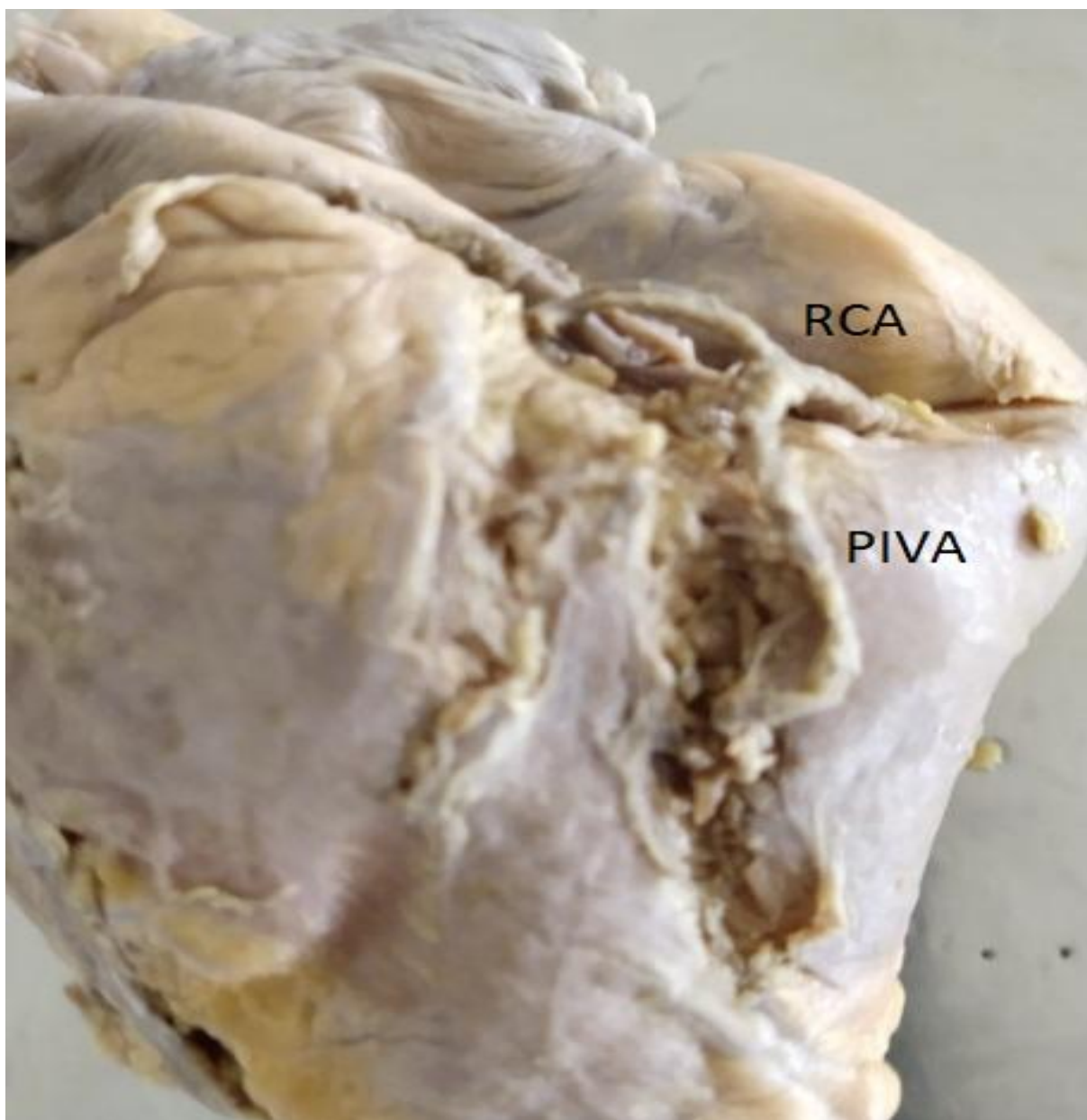


FIGURE 1 (Right coronary predominance: posterior interventricular artery [PIVA] arising from right coronary artery [RCA])

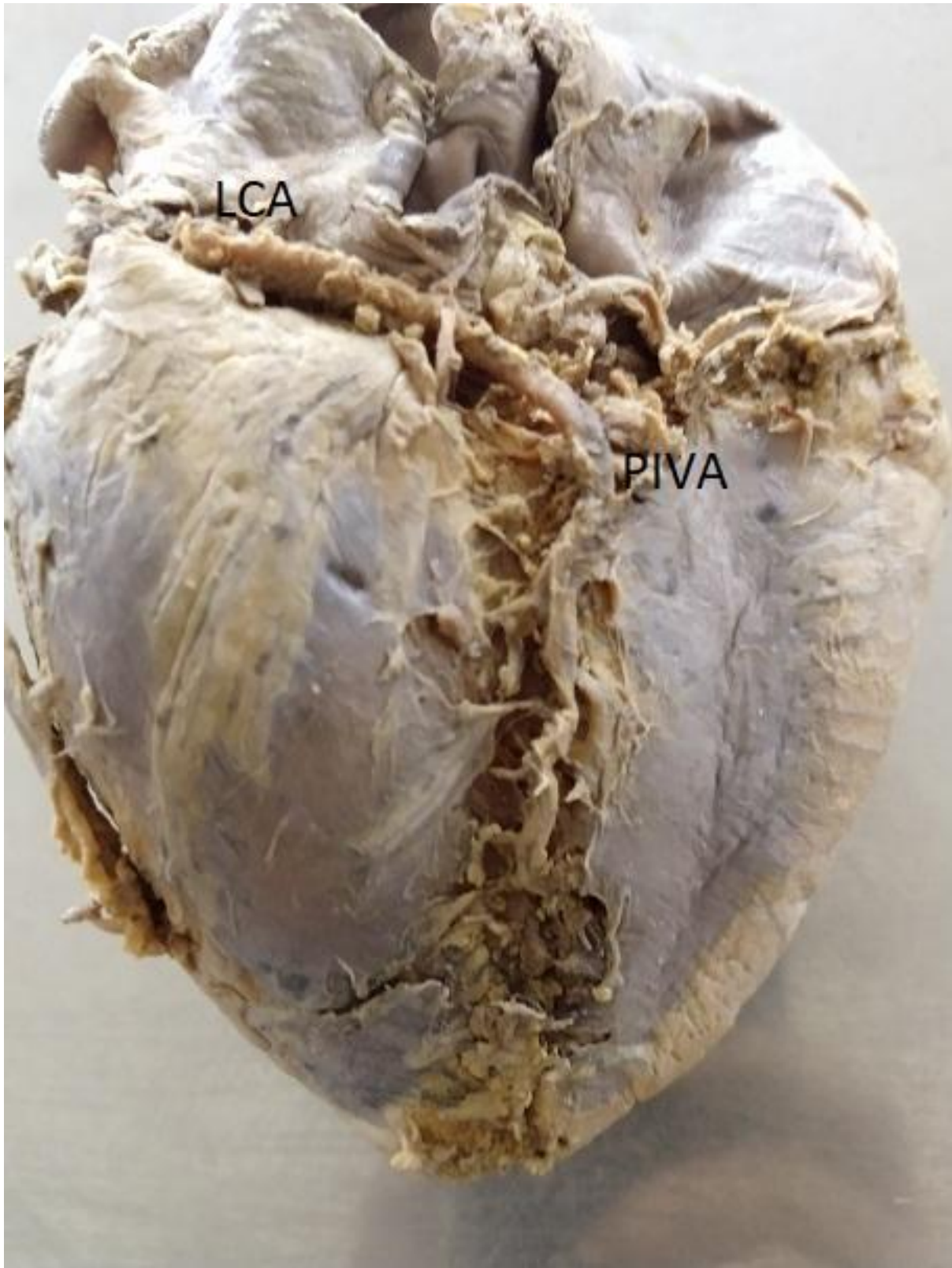


FIGURE 2 (Left coronary predominance: posterior interventricular artery [PIVA] arising from left coronary artery [LCA])

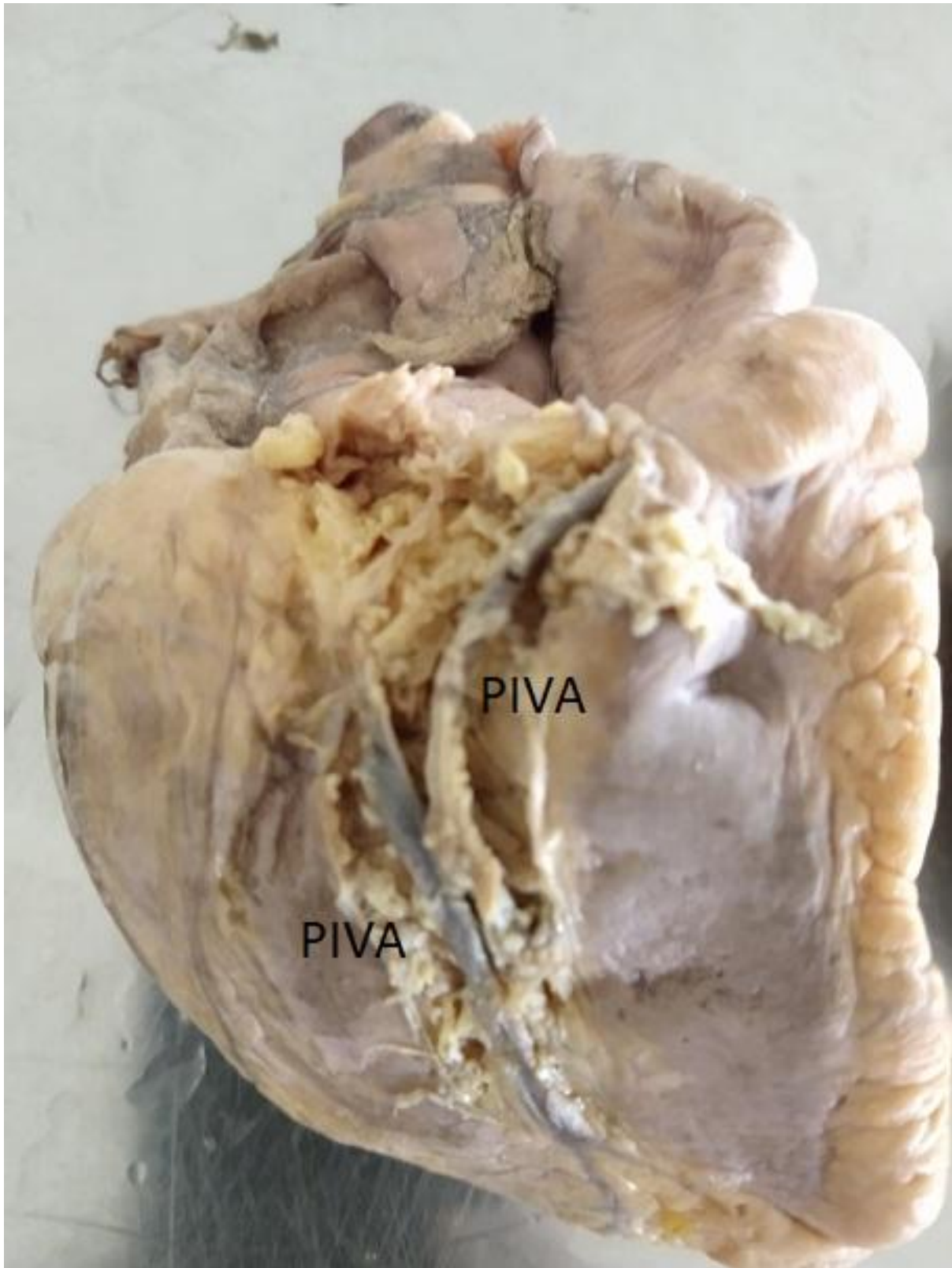


FIGURE 3 (Balanced type coronary circulation: posterior interventricular artery [PIVA] arising from both coronary arteries)

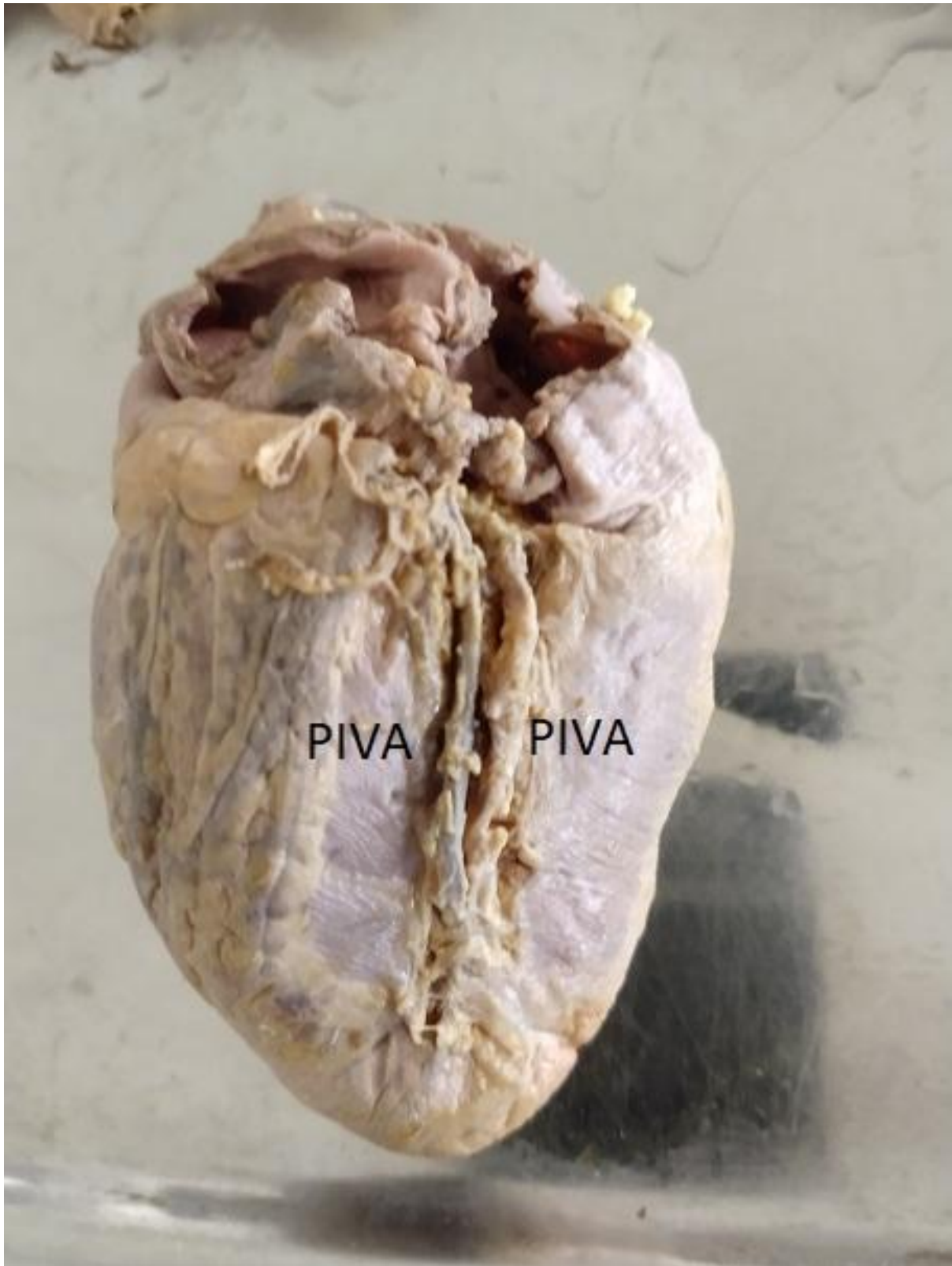


FIGURE 4 (Balanced type coronary circulation: posterior interventricular artery [PIVA] arising from both coronary arteries)