SHOULD MYOCARDIAL BRIDGING BE A RISK FACTOR IN HEART DISEASES? (A CADAVERIC STUDY)

Noncommunical Diseases Risk Factors

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Abstract:

Myocardial bridging is recognized as an anatomical variation of the human coronary artery in which an epicardial artery lies in the myocardium for part of its course. Thus, the artery is “bridged” by myocardium. So, myocardial bridging is a segment of coronary artery runs intramurally through the myocardium. The present study was conducted on 80 cadaveric hearts where their coronary arteries were examined by dissecting the epicardium. The left coronary artery gave rise to 2 branches (bifurcation) in 45%, 3 branches (trifurcation) in 40%, 4 branches (quadrifurcation) in 10% and 5 branches (quinitifurcation) in 5% of the examined cadaveric hearts.

Myocardial bridges were found in bifurcated left coronary artery mostly over anterior interventricular artery 75%, while over intermediate branch of the circumflex artery is 7.5% only. The percentage of the myocardial bridges over the intermediate artery became 31.25% in trifurcated left coronary artery, increased to 55% in quadrifurcated left coronary artery and to 80% in quintifurcated left coronary artery.

Conclusion: The present study suggested presence of close relationship between the existence of the intermediate artery as a separate branch from left coronary artery and the myocardial bridges which is a congenital anomaly in coronary artery with a variety of clinical manifestations. Traditionally, myocardial bridging had been considered as a risk factor to myocardial ischemia, infarction, hypertrophic cardiomyopathy and sudden cardiac death.

Introduction:

Myocardial bridging is recognized as an anatomical variation of the human coronary arteries in which an epicardial artery lies in the myocardium for part of its course **(1)**. So, small band of myocardium overlies the intramural segment of coronary artery which deviates from its usual epicardial course**(2)**. It may be congenital and it is known to cause variety of cardiac complications which may result in sudden death **(3)**. The anterior interventricular branch of the left coronary artery has been reported as the most common site of myocardial bridges but other locations have been reported **(4)**. There is wide difference in the incidences of myocardial bridging (15 – 45 %)in the autopsy studies as compared to those (0.5 – 2.5 %)in angiographic studies **(5)**.

The degree of coronary obstruction by the myocardial bridge depends on such factors as location, thickness, length of the muscle bridge and degree of cardiac contractility**(6).**The clinical significance of this common congenital condition of the coronary arteries is controversial, with some believing it to be completely benign while others attach a pathological tag to myocardial bridges **(7)**.The following complications have been reported: ischemia and acute coronary syndrome **(8, 9 & 10),** coronary spasm**(11, 12 & 13),** ventricular septal rupture **(14)**, arrhythmias **(15)**,exercise-induced atrioventricular conduction block **(16)**, stunning **(17)**, transient ventricular dysfunction **(18)**,early death after cardiac transplantation **(19)** and sudden death **(20)**.

Autopsy studies on the heart are rarely being done now-a-days, though they are of real value if they are done efficiently. Herein, we reported an unusual autopsy cases of myocardial bridging with or without anatomical variation of left coronary artery and its branches.

MATERIAL & METHODS:

In the present study, 80 human hearts were obtained from formalin-fixed adult cadavers of both sexes (52 of adult males and 28 of adult females) in the Anatomy Laboratory, College of Medicine, King Faisal University, Dammam, Kingdom of Saudi Arabia. The epicardium was removed by fine dissection and the coronary arteries were observed. The length and diameter of the main trunk of the left coronary were measured. The diameter, length and distribution of the circumflex, anterior interventricular and other branches of the left coronary artery were determined. In addition, the arteries that supply the anterior wall of the left ventricle were observed and their distribution areas were determined.

Myocardial bridging is defined as a segment of the major coronary artery running intra-murally through the myocardium, deviating from its usual epicardial course. In the present study, during the dissection of the coronary arteries we were looking for the presence of myocardial bridging of different branches of the left coronary artery supplying the anterior wall of the left ventricle.Once a myocardial bridge had been identified, the length of the bridge and the depth to which the different branches of the left coronary artery penetrated the myocardium was measured. Images from the dissected specimens were recorded with a Sony digital camera and studied using a computer-assisted images analysis system. The digital camera was connected to an image processor that was linked to a mainframe computer. After applying a standard 1 – mm scale to all digital images of the coronary arteries as well as the surrounding myocardial segment of the myocardial bridges, the program was able to calculate pixel differences between two selected points. The software allowed accurate translation of pixel differences into metric measurements **(21)**. All measurements were carried out with the Lucia program. The nomenclature for the branches of left coronary artery used in this study is that proposed by **(22 & 23).**

RESULTS:

The left coronary artery was observed to divide into two branches (bifurcated left coronary artery) in 36 hearts (45%), three branches (trifurcated left coronary artery) in 32 hearts (40%), four branches (quadrifurcated left coronary artery) in eight hearts (10%) and five branches (quintifurcated left coronary artery) in four hearts (5%). The range and mean values of the lengths of left coronary trunk and its branches as well as the diameter of left coronary trunk and its main branches:

anterior interventricular and circumflex arteries, in addition to the intermediate branches if present, are shown in a table.

I. Bifurcated left coronary artery (45%):

In this group of hearts, the left coronary artery is divided into anterior interventricular and circumflex branches which observed in 36 out of 80 hearts (45%).In 12 out of 80 hearts examined (15%), the anterior wall of the left ventricle supplied by one diagonal branch of the anterior interventricular artery and one marginal branch of the circumflex artery**(Fig. 1).** In 10 out of 80 hearts examined (12.5%), the ventricular wall was supplied by two diagonal branches of the anterior ventricular artery and one marginal branch of the circumflex artery **(Fig. 2).** In 8 out of 80 hearts examined (10%), the anterior wall of the left ventricle was supplied mainly by the circumflex artery with slight contribution of the anterior ventricular artery in one of three ways. In the first way, the anterior ventricular wall was supplied by a marginal branch and three intermediate branches of the circumflex artery in addition to one diagonal branch of the anterior interventricular artery **(Fig. 3).** In the second way, the anterior ventricular wall was supplied by a large bifurcated marginal branch and a small intermediate branch of the circumflex artery in addition to diagonal branch of the anterior interventricular artery **(Fig. 4).** In the third way, the anterior ventricular wall was supplied by a large marginal branch and a medium – sized intermediate branch of the circumflex artery in addition to two small diagonal branches of the anterior ventricular artery **(Fig. 5).**

In 6 out of 80 hearts examined (7.5%), the anterior wall of the left ventricle was supplied mainly by 2-3 large branches of the anterior ventricular artery and to some extent by one marginal branch of the circumflex artery**(Figs. 6 & 7).** The left coronary artery was not identified in two hearts out of 80 hearts examined (2.5%), and instead both anterior interventricular and circumflex arteries arose directly from the left posterior sinus of the ascending aorta **(Fig. 7).**

In the hearts with bifurcated left coronary artery, the myocardial bridge was identified as short or long intra-myocardial segment of some branches of the left coronary artery which supply anterior wall of the left ventricle. These myocardial bridges are identified arising from diagonal branch of anterior interventricular artery and marginal branch of the circumflex artery **(Figs. 1, 6 & 7),** from marginal branch of the circumflex artery only **(Fig. 2)**, from intermediate branches of the circumflex artery only **(Fig. 3)**, from diagonal branch of anterior interventricular artery only **(Fig. 4)**, or from both diagonal branch of anterior interventricular artery and intermediate branch of circumflex artery **(Fig. 5)**. SO, 80 myocardial bridges of bifurcated left coronary artery in 36 hearts are identified , mostly in anterior interventricular artery and its diagonal branch (75%), or in marginal branch (17.5%) and intermediate branch (7.5%) of the circumflex artery **(Table 1)**.

II. Trifurcated left coronary artery (40%):

In this group of the hearts; 32 out of 80 hearts (40%); the anterior interventricular, the circumflex and intermediate arteries arose directly from the left coronary artery**(Figs. 8, 9 & 10).** In 28 out of 80 hearts investigated (35%), the intermediate artery penetrated the myocardium as single myocardial bridge supplying anterior ventricular wall**(Figs. 8 & 9)**. In 4 out of 80 hearts investigated (5%), the intermediate artery divided into two branches before penetrating the myocardium as double myocardial bridges supplying anterior ventricular wall**(Fig. 10)**. In this group in addition to the myocardial bridges of intermediate artery, other branches also give myocardial bridges supplying the anterior wall of the left ventricleincluding diagonal branch of anterior interventricular artery and marginal branch of circumflex artery **(Figs. 8 & 10)** or diagonal branch of the anterior interventricular artery only **(Fig. 9)**. SO, 80 myocardial bridges of trifurcated left coronary artery in 32 hearts are identified , mostly in anterior interventricular artery and its diagonal branch (43.75%), then in intermediate branch of left coronary artery (31.25%); and lastly in the marginal branch (25%) of circumflex artery **(Table 2).**

III. Quadrifurcated left coronary artery (10%):

In this group of the hearts; 8 out of 80 hearts (10%); in addition to the circumflex and anterior interventricular arteries, two intermediate arteries arose directly from the left coronary trunk and they descended on the anterior wall of the left ventricle for variable distance, then they penetrated the myocardial wall of anterior ventricular wall as myocardial bridges **(Figs. 11, 12 & 13).** The anterior wall of the left ventricle was supplied also by a large diagonal branch of the anterior interventricular artery**(Fig. 11)** or a large marginal branch of the circumflex artery and a small diagonal branch of the anterior interventricular artery **(Fig. 12).** In one heart, the anterior wall of the left ventricle was mostly supplied by two intermediate arteries **(Fig. 13).**SO, 20 myocardial bridges of quadrifurcated left coronary artery in 8 hearts are identified , mostly in 1^{st} and 2^{nd} intermediate branches of the left coronary artery (55%), then in anterior interventricular artery and its diagonal branch (30%); and lastly in the marginal branch (10%) of circumflex artery **(table 3).**

IV. Quintifurcated left coronary artery (5%):

In this group of the hearts; 4 out of 80 hearts (5%); the left coronary artery was divided into five terminal branches including anterior interventricular artery, circumflex artery, two intermediate artery and small atrial arteries **(Figs. 14 & 15)**. The small atrial branch arises from the left coronary trunk itself **(Fig. 14),** or from the beginning of the circumflex artery **(Fig. 15)**. The anterior wall of the left ventricle was supplied mostly through two intermediate arteries which penetrated the ventricular wall forming myocardial bridges **(Fig. 14 & 15).** A myocardial bridge arose also from the anterior interventricular artery **(Fig. 14).**SO, 10 myocardial bridges of quintifurcated left coronary artery in 4 hearts are identified , mostly in 1st and 2nd intermediate branches of the left coronary artery (80%); and then in the anterior interventricular artery and its diagonal branch (20%) **Table 4.**

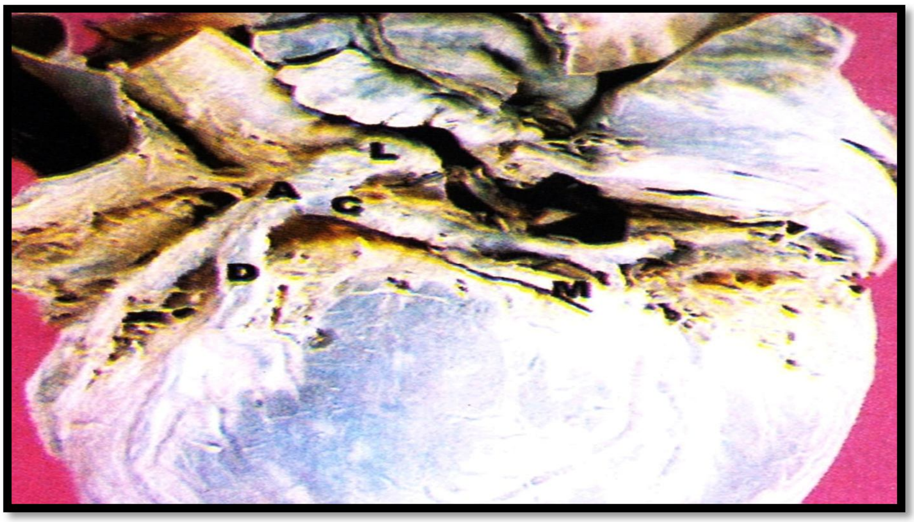

Fig. (1): A photograph of a cadaveric human heart showing a bifurcated left coronary artery (L) dividing into anterior interventricular (A) and circumflex (C) arteries. The anterior wall of the left ventricle receives diagonal branch (D) of the anterior interventricular artery and marginal branch (M) of the circumflex artery. Notice the presence of myocardial bridge (B) of both diagonal and marginal arteries.

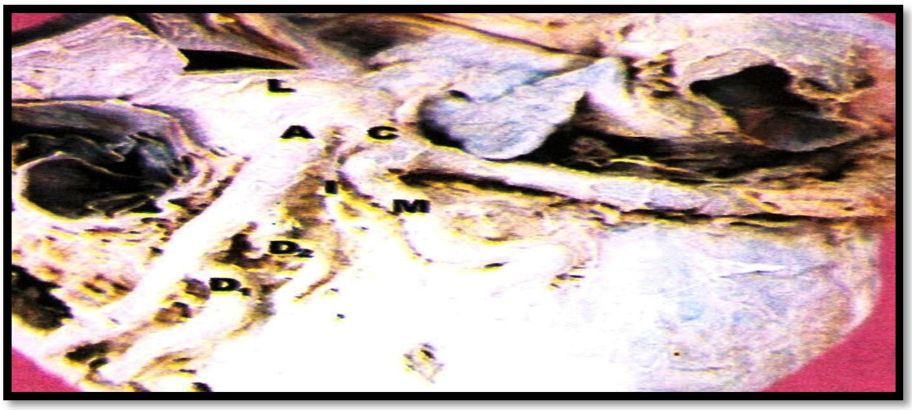

Fig. (2): A photograph of a cadaveric human heart showing a short-stem and bifurcated left coronary artery (L) dividing into anterior interventricular (A) and circumflex (C) arteries. The anterior wall of left ventricle receives two diagonal branches(D1 and D2) of the anterior interventricular artery and one marginal branch (M) of the circumflex artery. A small intermediate artery (I) is observed arising from the circumflex artery. Notice the presence of myocardial bridge (B) which arises from the marginal artery.

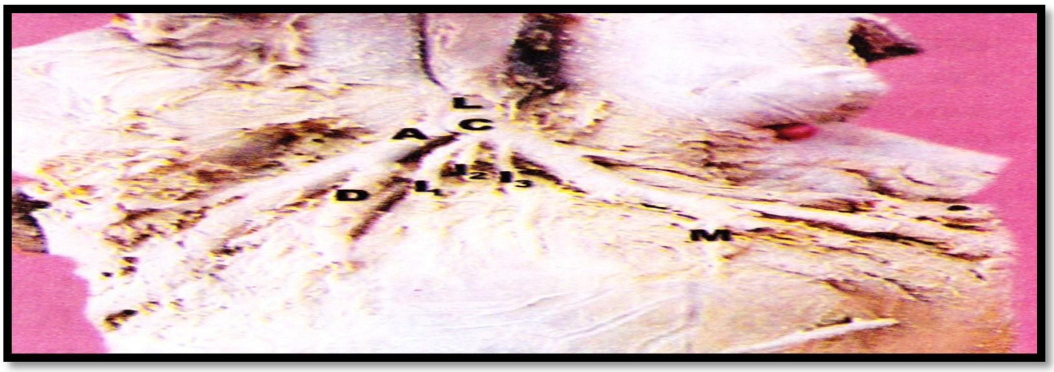

Fig. (3): A photograph of a cadaveric human heart showing a short-stem and bifurcated left coronary artery (L) dividing into anterior interventricular (A) and circumflex (C) arteries. One diagonal branch (D) from the anterior interventricular artery and one marginal branch (M) from the circumflex artery are observed supplying anterior ventricular wall. Three intermediate arteries (I_1 , I_2 &I_3) are seen originating from the circumflex artery. Notice the presence of myocardial bridge (B) which arises from intermediate and diagonal arteries.

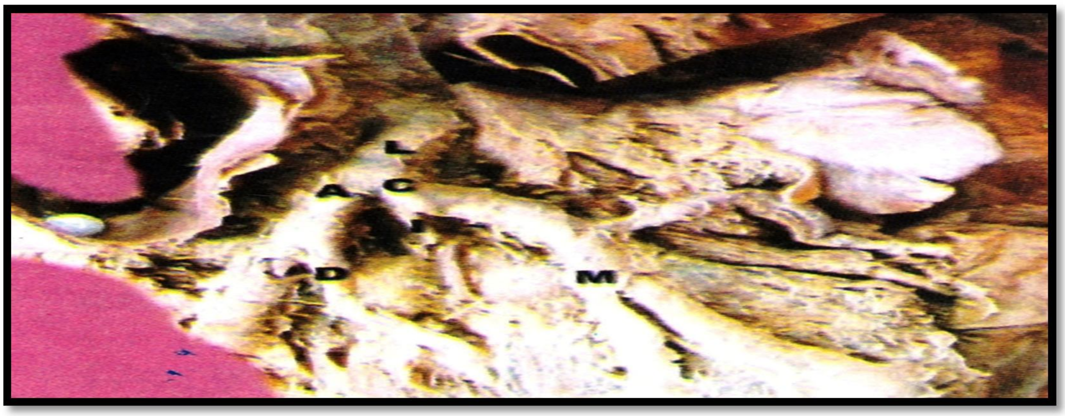

Fig. (4): A photograph of a cadaveric human heart showing bifurcated left coronary artery (L) dividing into anterior interventricular (A) and circumflex (C) arteries. The anterior wall of left ventricle receives a diagonal branch (D) from anterior interventricular artery and a bifurcated marginal branch (M) from the circumflex artery. In addition, a small intermediate branch (I) arises from circumflex artery. Notice the myocardial bridge (B) which arises from the diagonal artery.

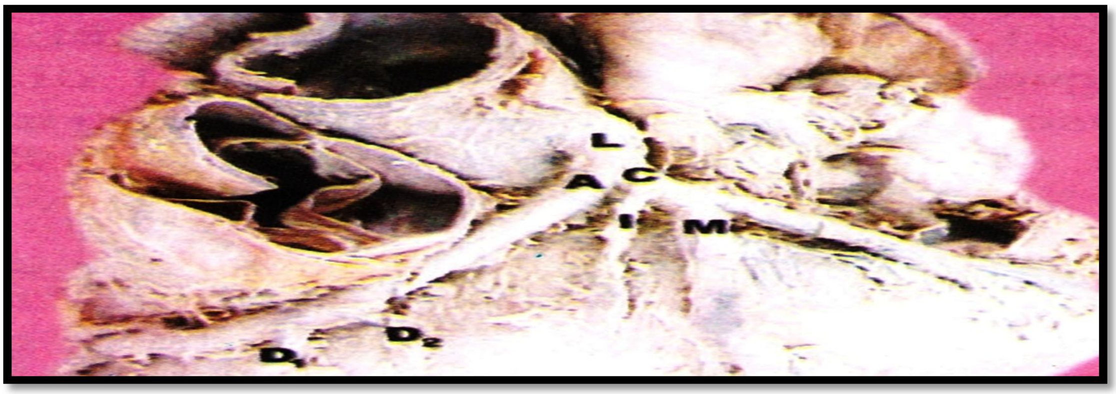

Fig. (5): A photograph of a cadaveric human heart showing a bifurcated left coronary artery (L) dividing into anterior interventricular (A) and circumflex (C) arteries. The anterior wall of the left ventricle receives one large marginal branch (M) and a small –sized intermediate branch (I)from the circumflex artery. In addition, two small diagonal branches (D1 & D2) are seen arising from anterior interventriculararterу. Notice the presence of the myocardial bridges(B) which arise from the diagonal and intermediate arteries.

Fig. (6): A photograph of a cadaveric human heart showing a bifurcated left coronary artery (L) as a short-stem artery dividing into anterior interventricular (A) and circumflex (C) arteries. The anterior wall of the left ventricle receives three diagonal branches (D1 , D2 & D3) from anterior interventricular artery and one marginal branch (M) from the proximal part of the circumflex artery. Notice the presence of myocardial bridges (B) which arise from diagonal and marginal arteries.

Fig. (7): A photograph of a cadaveric human heart showing that both anterior interventricular (A) and circumflex (C) arteries which arise separately from the ascending aorta (Asc. Aorta). The anterior wall of the left ventricle receives three diagonal branches (D1 , D2 &D3) from anterior interventricular artery and only one marginal branch (M) from circumflex artery. Notice the presence of myocardial bridges (B) which arise from diagonal and marginal arteries

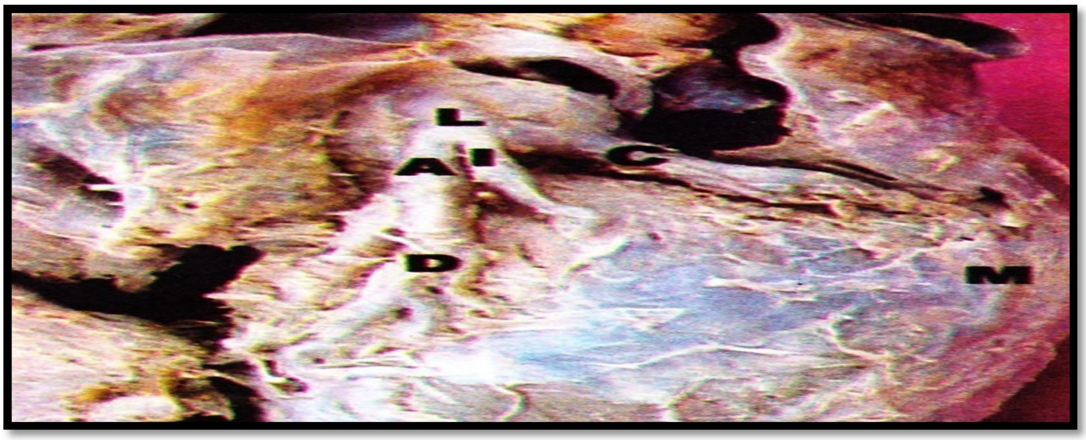

Fig. (8): A photograph of a cadaveric human heart showing a short-stem trifurcated left coronary (L) dividing into anterior interventricular (A), intermediate (I) and circumflex (C) arteries. The anterior wall of the left ventricle receives diagonal branch (D) from anterior interventricular artery, a marginal branch (M) from circumflex artery and intermediate branch (I) from the left coronary itself. Notice the presence of myocardial bridges (B) which arise from diagonal, marginal and intermediate arteries.

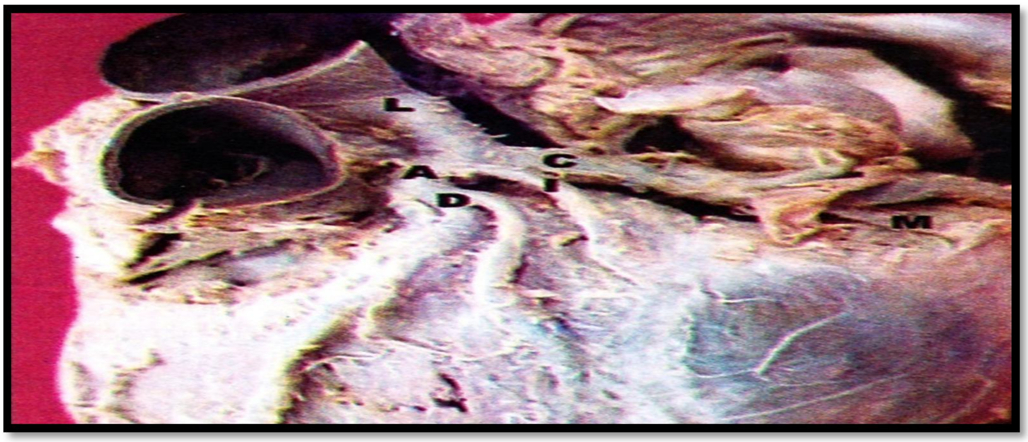

Fig. (9): A photograph of a cadaveric human heart showing a trifurcated left coronary artery (L) dividing into anterior interventricular (A), intermediate (I) and circumflex (C) arteries. The anterior wall of the left ventricle receives a large diagonal branch (D), intermediate branch (I) and marginal branch (M). Notice the presence of myocardial bridges (B) which arise from diagonal and intermediate arteries.

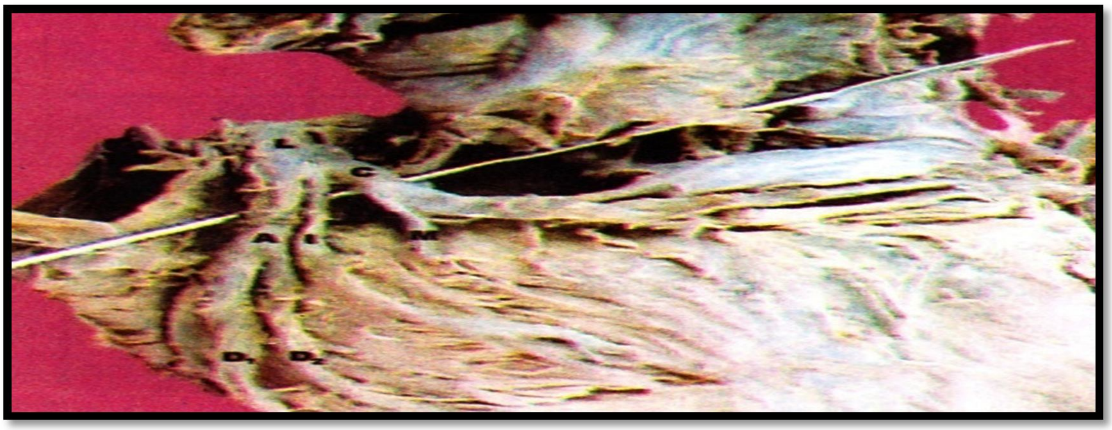

Fig. (10): A photograph of a cadaveric human heart showing a trifurcated left coronary artery (L) dividing into anterior interventricular(A), intermediate (I) and circumflex (C) arteries. The anterior interventricular artery divides into two diagonal branches (D1 & D2) which supply the anterior wall of left ventricle, in addition to intermediate branch (I) and diagonal branch (M). Notice the presence of myocardial bridges (B) which arise from diagonal, intermediate and marginal arteries.

Fig. (11): A photograph of a cadaveric human heart showing quadrifurcated left coronary artery (L) dividing into anterior interventricular(A), two intermediate (I 1 &I 2) and circumflex (C) arteries. The anterior wall of the left ventricle receives a bifurcated diagonal branch (D) from the anterior interventricular artery and two intermediate arteries. Notice the presence of myocardial bridge (B) which arises from intermediate artery.

Fig. (12): A photograph of a cadaveric human heart showing quadrifurcated left coronary artery (L) dividing into anterior interventricular (A), two intermediate (I1&I2) and circumflex (C) arteries. The anterior wall of left ventricle receives small diagonal branch (D) from anterior interventricular artery and a large marginal branch (M) from the circumflex artery. Notice the presence of myocardial bridges (B) which arise from anterior interventricular, diagonal, intermediate and marginal arteries.

Fig. (13): A photograph of a cadaveric human heart showing quadrifurcated left coronary artery (L) dividing into anterior interventricular (A), two intermediate (I1&I2) and circumflex (C) arteries. Notice the presence of myocardial bridges (B) which arise from anterior interventricular and intermediate arteries.

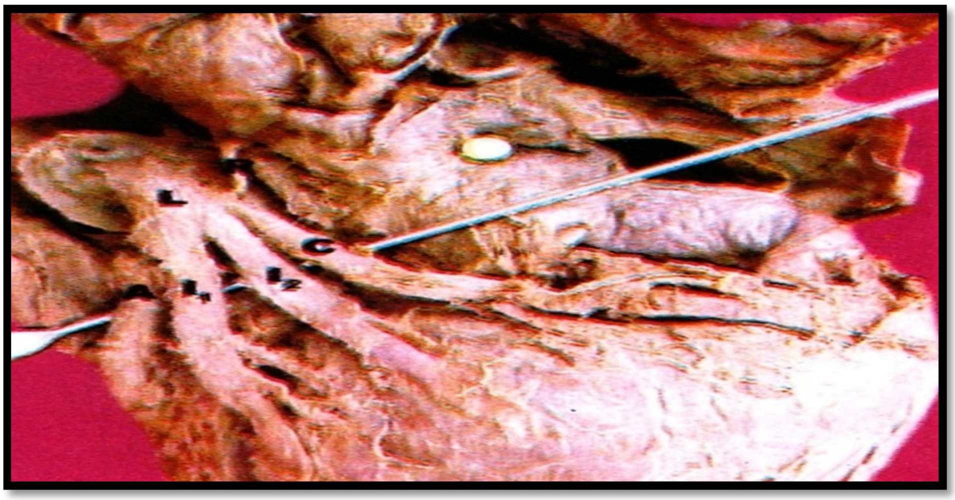

Fig. (14): A photograph of a cadaveric human heart showing quintifurcated left coronary (L) dividing into anterior interventricular (A), two intermediate (I1&I2), circumflex (C) and small atrial (R) arteries. Notice the presence of myocardial bridges (B) which arise from anterior interventricular and intermediate arteries.

Fig. (15): A photograph of a cadaveric human heart showing quintifurcated left coronary artery (L) dividing into anterior interventricular (A), two intermediate (I1&I2), circumflex (C) and atrial (R) arteries. Notice the presence of myocardial bridges (B) which arise from intermediate arteries.

Location	Number +(%)	Mean length (mm)	Mean depth (mm)
Anterior interventricular	26 (32.5%)	12	32
Diagonal branch of ant. interventricular artery	34 (42.5%)	10	30
Marginal branch of circumflex artery	14 (17.5%)	12	30
Intermediate branch of circumflex artery	6 (7.5%)	2	12

Table (1): Classification of 80 myocardial bridges in bifurcated left coronary artery

Location	Number +(%)	Mean length (mm)	Mean depth (mm)
Anterior interventricular	5 (6.25%)	12	28
Diagonal branch of ant. interventricular artery	30 (37.5%)	10	32
Marginal branch of circumflex artery	20 (25%)	10	30
Intermediate branch of left coronary artery	25 (31.25%)	6	20

Table (2):Classification of 80 myocardial bridges in trifurcated left coronary artery

Location	Number + (%)	Mean length (mm)	Mean depth (mm)
Anterior ventricular artery	4 (20%)	14	30
Diagonal branch of ant. Interventricular artery	2 (10%)	10	24
Marginal branch of circumflex artery	2 (10%)	11	25
1st intermediate branch of left coronary artery	7 (35%)	18	32
2nd intermediate branch of left coronary artery	5 (25%)	16	30

Table (3):Classification of 20 myocardial bridges in quadrifurcated left coronary artery

Location	Number + (%)	Mean length (mm)	Mean depth (mm)
Anterior ventricular artery	1 (10%)	10	22
Diagonal branch of ant. Interventricular artery	1(10%)	8	24
Marginal branch of circumflex artery	0 (0%)	……	…….
1st intermediate branch of left coronary artery	4 (40%)	16	34
2nd intermediate branch of left coronary artery	4 (40%)	16	32
Atrial branch of left coronary artery	0 (0%)	…….	……

Table (4):Classification of 10 myocardial bridges in quintifurcated left coronary artery

DISCUSSION:

Autopsy studies on heart are rarely being done now- a-days, though they are of real value if they are done efficiently. Because myocardial bridging is a common finding at autopsy of normal subjects, it had been thought to be a benign anatomic variation. Although this malformation is present at birth, symptoms usually do not develop before the 3rd decade; the reason for this is not clear. Bridging of the coronary arteries was observed in up to 40% of patients with angina pectoris and normal coronary arteries **(24)**. The diagnosis of clinically important myocardial bridging should be considered in patients who have angina and do not have the traditional risk factors and the evidence of ischemia **(25)**. Also, myocardial bridging is associated with varieties of cardiac complications in the form of myocardial infarction, coronary spasms, ventricular septal perforations, cardiac arrhythmias and sudden cardiac deaths **(26)**. The possible pathology for vascular dysfunction is at the level of endothelial or smooth muscle cells which are proximal to the myocardial bridge which can result on coronary spasm **(27)**. Further, the degree of obstruction caused due to myocardial bridge depends on factors such as location, thickness and length of the muscle bridge **(28).**

In the present study, the branching pattern of the left coronary artery showed that the percentage of bifurcated left coronary artery is 45%, of trifurcated left coronary artery is 40%, of quadrifurcated left coronary artery is 10%; and of quintifurcated left coronary artery is 5%. Also, the present work found that myocardial bridges over the branches of left coronary artery differed according to type of branching pattern of it. The myocardial bridges over anterior interventricular artery and its diagonal branch was 75% in bifurcated left coronary artery; to become 43.75% in trifurcated left coronary artery; 30% in quadrifurcated left coronary artery; and lastly 20% in quintifurcated left coronary artery. The myocardial bridges over intermediate artery was increased progressively from 7.5% in bifurcated left coronary artery; to become 31.25% in trifurcated artery; 55% in quadrifurcated left coronary artery; and lastly 80% in quintifurcated left coronary artery.

In agreement with the branching pattern of the left coronary artery in the present study, **(29 & 30)**reported the branching frequency of the left coronary artery as follows: 47% for bifurcated artery; 40 – 47 % for trifurcated artery; 2.5 – 11% for quadrifurcated artery ;and 1 – 2.5% for quintifurcated artery. While, **(31 to 35)** reported the branching pattern of the left coronary artery as follows: 52 – 62% for bifurcated artery; 33 – 42% for trifurcated artery; and 2 – 8% for quintifurcated left coronary artery.

There is controversy between authors in naming the 3rd and 4th branches of the left coronary artery. In the present study, the third and fourth arteries originating from the left coronary trunk are called the 1st and 2nd intermediate arteries because they are originating between the circumflex and anterior interventricular arteries, coursing on the anterior surface of the left ventricle. In agreement of the present work, **(22)** named these arteries as 1st and 2nd intermediate arteries. Some authors defined the 3rd and 4th branches of the left coronary artery as the median arteries **(30 , 31 & 36)**. Other authors named 3rd and 4th branches of the left coronary artery as ramus intermedius**(37 & 38)** or ramus anterior ventriculisinistrilateralis and ramus anterior ventriculisinistrimedialis**(39).**

In consistent with the percentage of myocardial bridges over the branches of the left coronary artery of the present study, **(40)** performed a comprehensive study on 82 human hearts where they found myocardial bridges over the anterior interventricular artery in 35.4% of the specimens. While, **(41)** found myocardial bridges over the anterior interventricular artery in 39 human hearts and over diagonal branch of the left coronary artery in 18% of the hearts. **(42 & 43)** reported that the myocardial bridges are most commonly localized over the middle segment of the anterior interventricular artery. **(4)** reported that the myocardial bridges were most found over the anterior interventricular artery and its diagonal branch; and also over the right coronary artery.

In the present work, the myocardial bridges over intermediate artery was increased progressively from 7.5% in bifurcated left coronary artery; to become 31.25% in trifurcated artery; 55% in quadrifurcated left coronary artery; and lastly 80% in quintifurcated left coronary artery. In agreement of the results of the present study, **(36)**reported that 22 out of 27 hearts (81.5%) were found to have a median artery and the existence of myocardial bridges over branches of the left coronary artery. The authors suggested that there was a statistically significant relationship between the presence of the median artery and myocardial bridges. Also, **(38)** reported that the branches of the trifurcated left coronary artery including ramus intermedius are covered by myocardial bridges. However, **(44)** reported that myocardial bridges are present at birth, but there are no signs or symptoms before the 3^{rd} decade of life.

Major part of the blood flow to the cardiac musculature occurs during the diastolic phase. The myocardial bridge causes coronary artery narrowing during systole and therefore technically speaking, myocardial bridges should not compromise blood supply to the musculature during diastole **(45)**. The study by **(46)** stated that milking effect of the myocardial bridge on the coronary artery extends from systole into diastole, leading to delay in early diastolic diameter gain and also mid-diastolic diameter reduction. The reduction in the diameter of the coronary artery during diastole can have clinical effects like ischemia when the patient has a rapid heart rate where the diastolic phase is relatively shortened, leading to decreased blood supply to the musculature **(45).** One of the hypothesis stated that the systolic kinking may lead to trauma to the endothelial cells and starting off platelet aggregation and vasospasm, resulting in an acute coronary syndrome **(7)**. Hence, coronary vasospasm of the atherosclerosed arterial segment possibly could have led to the myocardial ischemia. Atherosclerosis combined with vasospasm lead to decreased blood supply during diastole. So, the musculature deriving blood supply from affected artery showed early changes of myocardial infarction **(6).**

The heart regulates the amount of vasodilatation or vasoconstriction of the coronary arteries based upon the oxygen requirements of the heart. This contributes to the filling difficulties of the coronary arteries. Compression remains the same. Failure of oxygen delivery caused by a decrease in blood flow in-front of increased oxygen demand of the heart results in tissue ischemia, a condition of oxygen deficiency. Brief ischemia is associated with intense chest pain, known as angina. Severe ischemia can cause the heart muscle to die from hypoxia, such as during a myocardial infarction. Chronic moderate ischemia causes contraction of the heart to weaken, known as myocardial hibernation. In addition to metabolism, the coronary circulation possesses unique pharmacologic characteristics where the sympathetic innovation to the coronary arteries ultimately causes vasodilatation **(47 & 48).**

To assess the clinical significance of the myocardial bridge of coronary arteryas stress factor for myocardial diseases,**(49)** reported that myocardial bridging might cause ischemic complications including angina, myocardial infarction, life-threatening arrhythmias and sudden death either from direct compression of the coronary artery during systolic contraction or by enhancement of the natural progression of atherosclerosis in the coronary segment. Both mechanisms are closely associated with changes in hemodynamic stress driven by the force of a combination of anatomical properties such as the location, length and thickness of the myocardial bridges. **(50)** indicated that myocardial bridge is associated with elevated mean platelet volume value. So, they might explain the increased cardiovascular events in patients with myocardial bridge. However,**(51)** reported that the deep type of myocardial bridge is positively associated in significant stenosis proximal to myocardial bridge. Meanwhile, superficial type of myocardial bridge is negatively associated with significant stenosis proximal to myocardial bridge and predicts a better prognosis not only in normal subjects but also in patients with coronary artery diseases.

Myocardial bridge occurs frequently in patients with hypertrophic cardiomyopathy , with a prevalence as high as 30% **(52).** Myocardial bridge .

In children with hypertrophic cardiomyopathy was studied retrospectively by reviewing angiogram from 36 children, 10 of whom had myocardial bridge. Compared with patients without bridging, those with bridging had a greater frequency of chest pain, cardiac arrest, ventricular tachycardia, reduction in systolic pressure with exercise & greater ST – segment depression with exercise **(53).**In a series of 425 patients with hypertrophic cardiomyopathy, **(54)**did not exclude the possibility that myocardial bridging could contribute to increased risk in some patients, potentially impacting management decision-making on a case – by – case basis. However, **(55)** evaluated 64 adults who had myocardial bridging and compared their survival with that of the 361 patients who had hypertrophic cardiomyopathy but not myocardial bridging. After a mean follow-up of 6.8 years, there was no difference between the two groups in long-term survival free of all-cause mortality and cardiac death.

CONCLUSION

Myocardial bridging with or without variations of the coronary artery is a congenital, generally benign condition that is a common angiographic and autopsy findings. Knowledge of coronary artery variations is important in planning the treatment and in interpretation of findings of cardiovascular diseases. Myocardial bridging should be kept in mind as a differential diagnosis in patients who have angina but do not have the traditional risk factors. Also, several case reports have associated between myocardial bridging and hypertrophic cardiomyopathy. The present study is concluded that there is a close relation between the existence of intermediate artery and myocardial bridge.

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