# Left Ventricular Mass Index Among Young Healthy Egyptians Evaluated By Echocardiography

**Thesis**

Submitted for partial Fulfillment of M.Sc. degree In cardiovascular medicine

*Presented by*


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2009

# Introduction

- Left ventricular hypertrophy (LVH) plays acentral role in chronic adaptation to pressure or volume overload of the systemic circulation. The degree of hypertrophy parallels the severity of overload and detection of extreme hypertrophy may indicate a poor prognosis **(Devereux *et al*.,1974).**

- Recent studies have shown that LVH is an even stronger predictor of cardiovascular events in adults than systolic or diastolic blood pressure. This relation persists even after adjustments are made for blood pressure,obesity, sex,and other cardiovascular risk factors **(Levy *et al*.,1990)**. Thus ,logically, serial determination of left ventricular muscle mass (LVM) should be an essential element in the study of such disorders **(De Simone *et al*.,2001).**

- Left ventricular mass (LVM) results from the complex interaction between genetic,environmental , and lifestyle factors.

- Known or postulated determinant of LVM include gender,age,body size,systolic blood pressure,physical activity,smoking,alcohol consmption,and salt intake

**(De Simon *et al*.,2001).**

# Aim of the work

Is to define the normal values of the left ventricular mass index of the young healthy Egyptians living in El-Sharkia Governorate.

## The Anatomy of Left Ventricle

The shape of the left ventricle is that of a truncated ellipsoid it is also described as a cone with blunted apex and slightly convex sides. In transverse cross section, it is circular or nearly so at its base, midsection, and apex, so the LV chamber is roughly symmetrical in shape unlike the right ventricle (**Geiser *et al*., 1984**).

### *External anatomy of the LV:*

The base of the LV, the mitral annulus, is marked externally by the coronary sulcus, in which runs the circumflex branch of the left coronary artery. On the posterior LV aspect, the coronary sinus runs obliquely just above the junction between the left atrium and LV. Anteriorly and inferiorly, shallow interventricular groove demarcate the junction between the right and left ventricles. The left anterior descending and posterior descending arteries course in these grooves.

▪ Externally, the LV has five surfaces; however, there are no sharp borders or defining line separating these surfaces; **(*Edwards*., 1991)** the surfaces are:

1◗ The anterolateral surface.

2◗ The left lateral surface.

3◗ The inferior or diaphragmatic surface.

4◗ The true posterior or posterobasal surface.

5◗ The anterobasal surface.

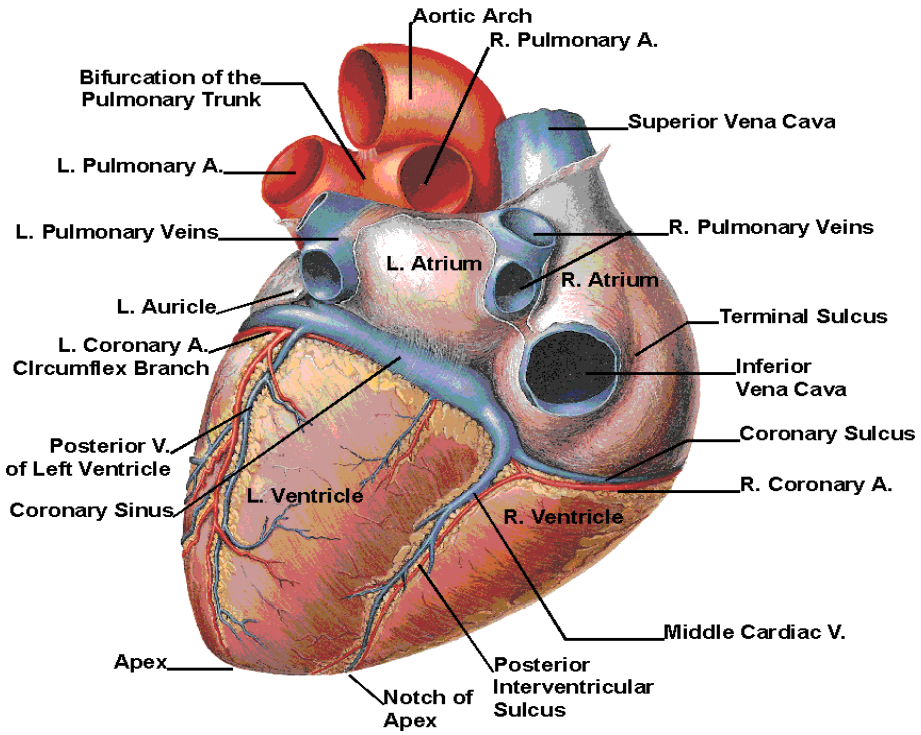



**Figure 1**

External anatomy of the heart

**(*Edwards*., 1991)**

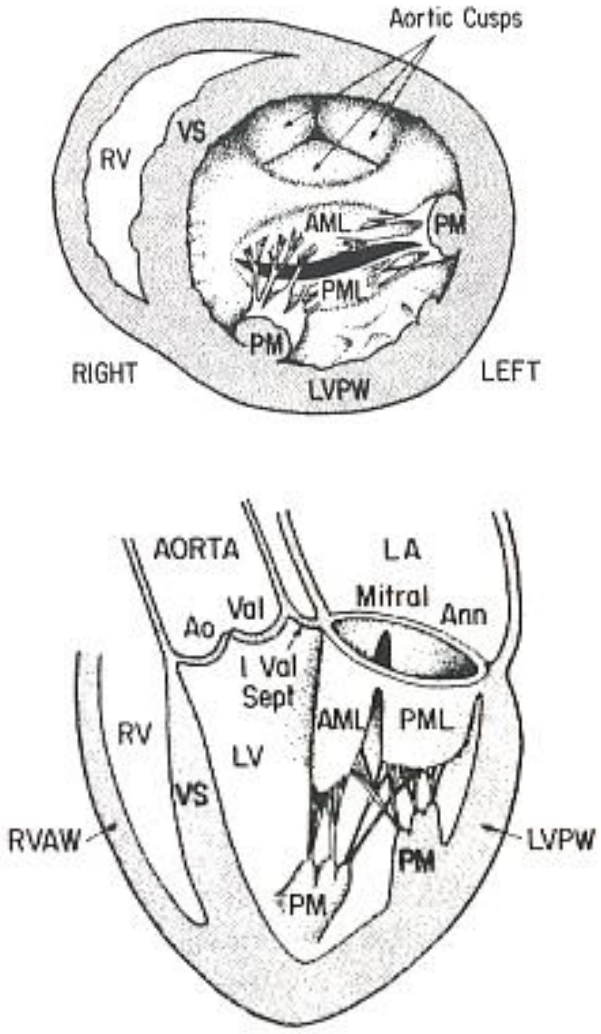
## ☞ *Internal anatomy of the LV:*

▪ The various external surfaces prescribed above are together referred to as the LV free wall; the remainder of the LV is formed by the interventricular septum.

▪ The IVS is triangular, has a transverse curvature, concave to the LV chamber, conforming to the circular cross-sectional LV contour. Most of the ventricular septum is muscular (i.e., myocardial), except for a small oval area of collagenous tissue just below the right coronary and non-coronary cusps of the aortic valve. This membranous part of the septum is thin and continuous with the fibrous support and attachment of the aortic valve, reinforced at either side by the right and left fibrous trigone.

▪ The LV chamber is divided into a posterior inflow tract leading from the mitral orifice to the LV apex and an anterior outflow tract from the apex to the aortic valve. They are separated by the anterior mitral leaflet **(Figure 2)**. The long axes of both inflow and outflow tracts meet at an acute angle at the apex ($30 – 45^0$).

▪ The LV outflow just below the aortic valve makes an angle of 30 – $45^0$ with the lower LV outflow apex, especially in elderly people, giving the septum a sigmoid shape **(Goor *et al*., 1989)**. The upper 1/2 or 1/3 of the LV outflow tract is smooth, whereas the lower septum has on its surface small irregular trabeculae (trabeculae cornea). Trabeculations vary in configuration from mere ridges on the endocardium to bands fixed at both ends but separated from endocardium. Trabeculations augment systolic emptying of the LV chamber **(Rushmer, 1980)**.




**ꕥ Figure (2a) ꕥ**

Diagram showing short axis view (below) and long axis view (above) of left ventricular anatomy

**(D'Cruz,1995).**

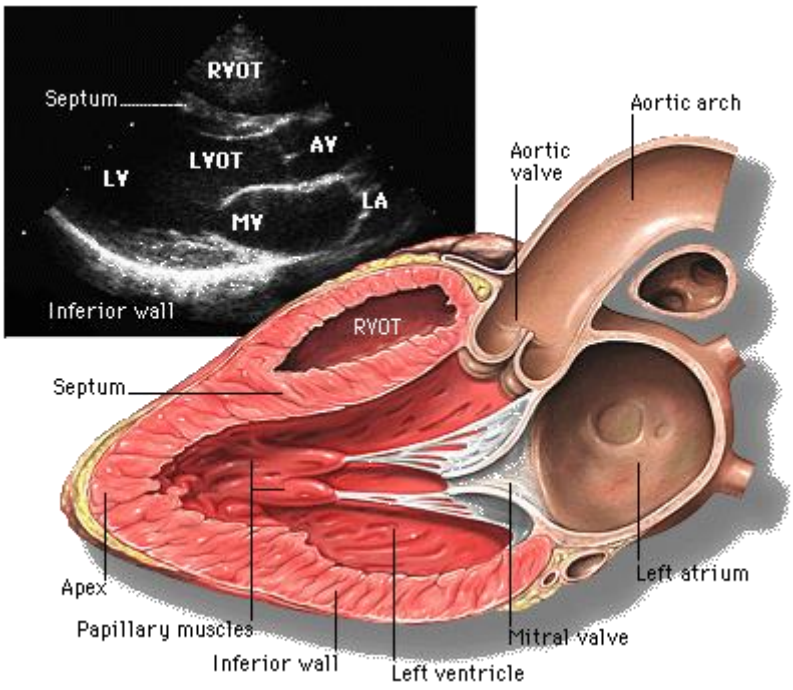



**Figure (2b)**

Diagram showing short long axis view

of left ventricular anatomy

**(Atlas of Echocardiography,1999)**

## ☞*Wall thickness:*

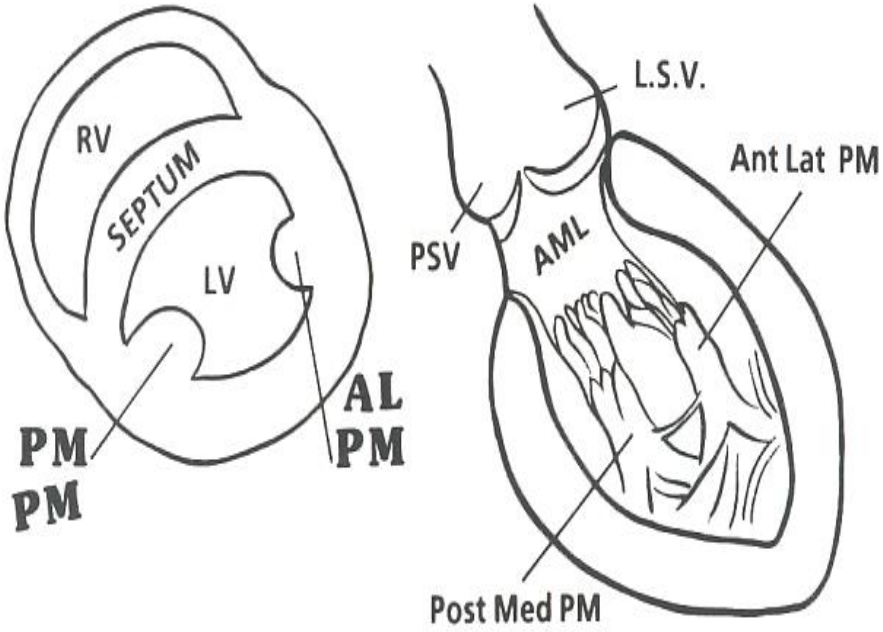
▪ The thickness of the ventricular septum and of the LV wall were measured in several autopsy studies. The thickness in postmortem specimens is an average of 1.3 cm ± 0.2; however, these values are higher than actual diastolic measures during life **(Hutchins *et al*., 1988)**.

▪ Echocardiographic study of septal and LV wall thickness demonstrated that the range of normal thickness on M-mode tracing is 7 to 11 mm.

▪ The ventricular septum is thinnest at its membranous part and thickest at the junction of its middle and basal third. The LV free wall tends to be thickest at basal level and thinner near the apex; the later may be only 2mm thick at its very tip **(Bradifield *et al*., 1987)**.

▪ The papillary muscles are designated posteromedial and anterolateral with respect to their LV locations **(Figure 3)**. However, in the parasternal short-axis view their locations appear to be medial and lateral, respectively. The lateral papillary muscle is longer than the medial one, and its apex extends higher than the later.

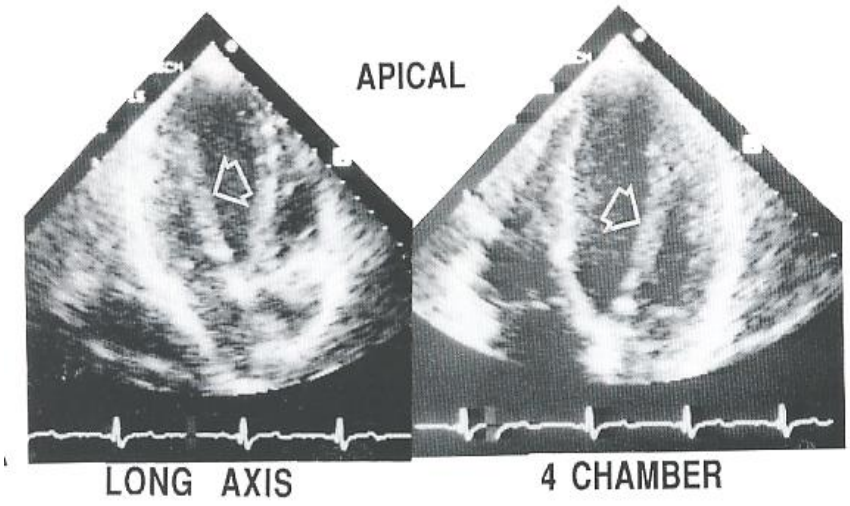
The lateral papillary muscle has a simple grooved head in70% to 85% of cases; the medial one is shorter and is divided into two, three, or more heads in 60% to 70% of cases **(Roberts *et al*., 1982)**. The two papillary muscles are always located in the LV free wall; unlike the RV, there are never any papillary muscles on the septum. Extra papillary muscles are not very uncommon, located in between the usual two muscles. Chordae muscularis (muscular instead of tendinous chordae from the papillary muscle to the mitral leaflet attachment) is another anatomic variant recognizable on echocardiography **(Figure 4)**.




**ꕥ Figure (3) ꕥ**

Diagram showing LV chamber with posteromedial and anterolateral papillary muscles short axis view(left) and in interior of LV chamber with septum removed (right)

**(D'Cruz,1995).**




**ꕥ Figure (4) ꕥ**

Apical four-chamber view (left) and apical long-axis view (Right) showing abnormal muscle band arising in papillary muscle and inserting at the site of attachment of the anterior mitral leaflet (*chorda muscularis*)

**(D'Cruz,1995).**

## ☞*Bands and strands in the LV chamber:*

▪ False tendons or pseudo tendons are structures like chordae in morphology but arise and insert elsewhere. These are sometimes grouped together with muscular bands and can be seen spanning the LV chamber. They have been called anomalous or aberrant LV chordae tendinae, chordae, or cords in addition to false tendons **(Figure 5,6) (Nishimura *et al*., 1981)**.