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Assessment of Left Atrial Volume in Cases of Ventricular Septal Defects in Childern

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BY

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List of Abbreviation

AR:	Aortic regurge
A O	Aortic root
B S A	Body surface area
B W	Body weight
C H D	Congenital heart disease
C H F	Congestive heart failure
E C G	Electrocardiography
ECHO	Echocardiography
E F	Ejection fraction
F S	Fractional shortening
F T T	Failure to thrive
I S W T	Interventricular septal wall thickness
I V C	Inferior vena cava
I V S	Interventricular septum
L A	Left atrium
LA D	Left axis deviation
L A D (cm)	left atrial dimension in cm
L/AO	Left atrial aortic root ratio
L V	Left ventricle
LVDD	Left ventricular diastolic dimension
L V H	Left ventricular hypertrophy
LV S D	Left ventricular systolic dimension
M R	Mitral regurge
Pa	Pulmonary artery
P A	Pulmonary atresia
P A P	Pulmonary artery pressure
PG	Pressure gradient
P S	Pulmonary stenosis
P V R	Pulmonary vascular resistance
R A	Right atrium
R A D	Right axis deviation
R V	Right ventricle
R V H	Right ventricular hypertrophy
T A R	Thrombocytopenia absent radius
2 D ECHO	Two dimensional echocardiography
T R	Tricuspid regurge
V.S.D	Ventricular septal defect
V. S. D PG	Pressure gradient across vsd defect

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INTRODUCTION

Vetricular septal defects are the most common congenital cardiac anomalies . They are found in 30-60%of all newborns with congenital heart defect.or about 2-6 per1000 births. During heart formation when the heart begins as ahollow tube,it begins to partition forming a septa.If this does not occur properly it can lead to an opening being left within the ventricular septum.it is debatable whether all these defects are true heart defects,or if some of them are normal phenomena,since most of the trabecular VSDs close spontaneously **(Roguin et al,1995).**

Two-dimentional echocadiography,along with Doppler echocardiography and colour flow imaging can assess the size and location of virtually all ventricular septal defects (VSDs).Doppler echocardiography also provides physiological information including right ventricular pressure,pulmonary artery pressure and the difference in pressure between the ventricles.Measurment of left atrial and left ventricular diameter provides semi-quantitative information about shunt volume.Defect size is often given in terms of the size of the aortic root.defects that are about the size of the aortic root are classified as large,those one third to two thirds of the diameter of the aorta are moderate,and those less than one third of the aortic root diameter are small **(Arora et al,2003).**

Left atrial volume has been showen to reflect diastolic function and is powerfull predector of cardiac morbidity and mortality ,normative left atrial volume values in childern with congenital heart diseases and ventricular septal defects are lacking **(Taggart Nw. et al,2010).**

Increase left atrial volume is an indicator of diastolic dysfunction and asurrogate marker of significant left to right shunts (**Bhtala**,**etal**,**2012**).

Increased left atrial dimension easured by M-mode echocardiography is arisk factor for atrial fibrillation,stroke,and death. (**Pritchett**,**etal**,**2003**).

AIM OF THE WORK

Evaluation of percentage of different types of ventricular septal defects in children and assessment of left atrial volume in these cases.

Ventricular septal defect (VSD)

Definition

A ventricular septal defect (VSD) is an opening in the interventricular septum resulting in direct communication between the left and right ventricles. VSD can be single or multiple. ***(Nichols, 2008)***

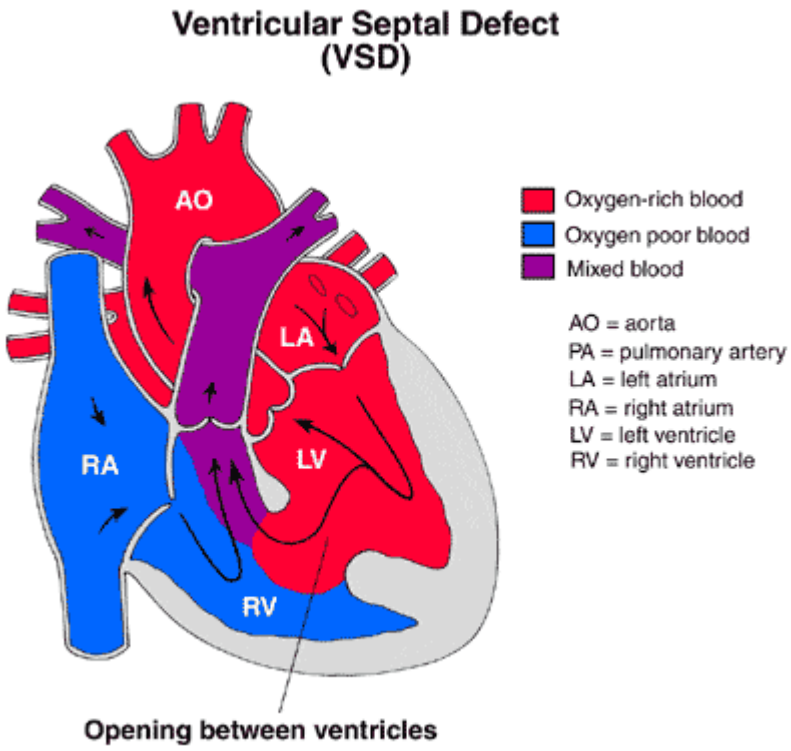

Figure (1): Showing ventricular septal defect

Prevalence

Ventricular septal defects (VSDs) are the most common form of congenital heart disease if bicuspid aortic valve is excluded. The defect can be in any portion of the ventricular septum, and the physiologic consequences can range from trivial to severe (M***oss***&***adam***,**2008**).

Approximately 20% of patients in congenital heart disease registries have VSD as a solitary lesion recent echocardiographic studies demonstrated an incidence of VSD in newborns to be 5 to 50 per 1,000). Outlet: 5% -7% Inlet: 5% -8%, posterior and inferior to perimembranous defect Muscular: 5%-20% .The lower prevalence in adults with congenital heart disease is due to spontaneous closure of many defects. VSDs are slightly more common in females: Approximately 56% female, 44% male. VSDs are the most common lesion in many chromosomal syndromes, including trisomy 13, trisomy 18, and trisomy 21 groups, as well as in rarer syndromes). patients with VSDs (>95%), the defects are not associated with a chromosomal abnormality. A multifactorial cause has been proposed in which interaction between hereditary predisposition and environment results in the defect) ***(Moss and adam,2008).***

Anatomy of ventricular septal defect

The ventricular septum is a complex structure that can be divided into four components. The largest component is the muscular septum. The inlet or posterior septum comprises endocardial cushion tissue. The subarterial or supracristal septum comprises conotruncal tissue. The membranous septum is below the aortic valve and is relatively small. VSDs occur when any of these components fails to develop normally perimembranous VSDs are the most common of all VSDs 67%)Although the location of the VSD is important prognostically and in approach to repair, physiologically, the amount of flow crossing a VSD depends on the size of the defect and the pulmonary vascular resistance (***Nelson ess,2010).***

the ventricular septum is considered to have four components: 1- An inlet septum separating the mitral and tricuspid valves; 2- a trabecular septum, which extends from the attachments of the tricuspid leaflets outward to the apex and

upward to the crista supraventricularis; the smooth-walled 3-outlet or infundibular septum, which extends from the crista to the pulmonary valve; and 4- the membranous septum, which is relatively small and is usually divided into two parts by the septal leaflet of the tricuspid valve (***Moss&adam,2008***).

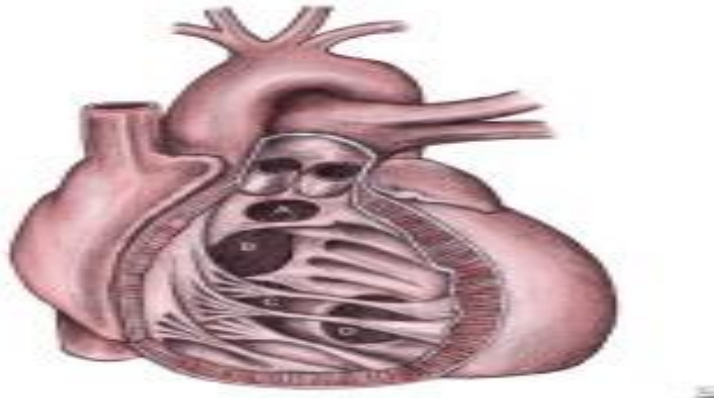

Figure (2): the location of various types of ventricular septal defects (VSDs) from the right ventricular aspect. A = Doubly committed subarterial ventricular septal defect; B = Perimembranous ventricular septal defect; C = Inlet or atrioventricular canal–type ventricular septal defect; D = Muscular ventricular septal defect.

1. **The muscular septum** has three components: the inlet septum, the trabecular septum, and the outlet (infundibular or conal) septum. The trabecular septum (also simply called muscular septum) is further divided into anterior, posterior, middle, and apical portions. Therefore, a VSD may be classified as a membranous, inlet, outlet (or infundibular), midtrabecular (or midmuscular), anterior trabecular (or anterior muscular), posterior trabecular (or posterior muscular), or apical muscular defect).

2-**The Membranous septum** is a relatively small area immediately beneath the aortic valve. The membranous defect involves varying amounts of muscular tissue adjacent to the membranous septum (perimembranous VSD). According to the accompanying defect in the adjacent muscular septum, perimembranous VSDs have been called perimembranous inlet (atrioventricular [AV] canal type), perimembranous trabecular, or perimembranous outlet (tetralogy type) defects. Perimembranous defects are most common (70%) **(Park**,**2008**).

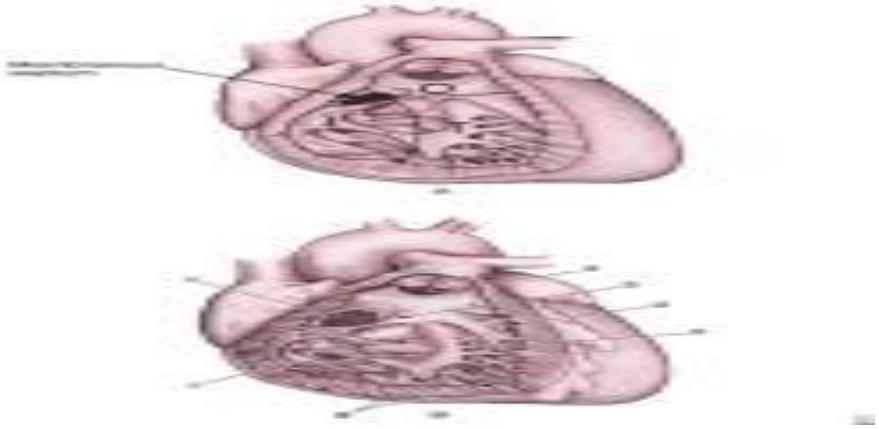

Figure (3) :show membranous septum

Membranous septum Lies between the anterior and the septal tricuspid leaflets and below the right and the noncoronary cusps of the aortic valve A: Image shows a ventricular septum viewed from the right side. It has the following 4 components: inlet septum from the tricuspid annulus to the attachments of the tricuspid valve (I); trabecular septum from inlet to apex and up to the smooth-walled outlet (T); outlet septum, which extends to the pulmonary valve (O); and membranous septum. B: Anatomic positions of the defects are as follows: outlet defect (a); papillary muscle of the conus (b);

perimembranous defect (c); marginal muscular defects (d); central muscular defects (e); inlet defect (f); and apical muscular defects (g) (**Hurset**,**2009**).

Perimembranous defect lies in the outflow tract of the left ventricle immediately beneath the aortic valve. Synonyms include membranous defect and infracristal defect.

When viewed from the right side of the heart, the defect is beneath the crista supraventricularis and posterior to the papillary muscle of the conus..

With the perimembranous defect, there can be a variable degree of anterior malalignment between the infundibular septum and the anterior ventricular septum such that the aortic valve appears to override the defect . Posterior or leftward malalignment also occurs, producing subaortic stenosis. . Outlet VSDs constitute approximately 5% to 7% of defects seen.Inlet defects that are posterior and inferior to the membranous defect beneath the septal leaflet of the tricuspid valve and inferior to the papillary muscle of the conus have been called atrioventricular septal defects (**Moss and adam,2010**).

A)-Outlet septum : 5% -7% of autopsy and surgical series (29% in the Far East), situated just beneath the pulmonary value (synonyms: supracristal, conal, infundibular, subpulmonary, doubly committed subarterial) ***(Moss and adam,2008).***

In an infundibular defect, the right coronary cusp of the aortic valve may herniate through the defect. This may result in an actual reduction of the VSD shunt but may produce aortic regurgitation (AR) and cause an obstruction in the right ventricular outflow tract. A similar herniation of the right and /or noncoronary cusp occasionally occurs through perimembranous defects***(park,2008).***

B)-Inlet septum It lies beneath the septal leaflet of the tricuspid valve) (***park,2008).***

The ventricular septum is curved and therefore does not lie in a single plane. Multiple views are required to examine the entire septal region, and a single imaging plane will neither interrogate the complete structure nor detect every defect ,Visualization of a ventricular septal defect in more than one imaging plane is the most direct . means of diagnosis. In general, false-negative findings are more common than false-positive results. The sensitivity of two-dimensional echocardiography for diagnosis of a ventricular septal defect depends on location. Sensitivity is highest for inlet and outlet defects (approaching 100%), slightly less for perimembranous defects (80%-90%), and least for trabecular defects (as low as 50% in some earlier studies but considerably higher with modern equipment and techniques). The reasons for this low detection rate are that trabecular defects can occur anywhere within a. fairly large area **(Figenbaum,2009).**

Anatomy of left atrium

oval-shaped chamber with thin, muscular walls, the left atrium is easily visualized posterior to the aortic root and superior to the left ventricle. With the advent of transesophageal echocardiography, the ability to thoroughly interrogate the left atrium, including its appendage, became possible, and a thorough assessment of its structure and function is now routinely performed.

The ventricular septum may be divided into a small membranous portion and a large muscular portion **(Park,2008).**