THE VALUE OF ECHOCARDIOGRAPHY IN THE DIAGNOSIS OF CONGENITAL HEART DISEASE

THESIS

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Contents

List of Abbreviations

Ant	:	Anterior.
Ao	:	Aorta.
Ao. V	:	Aortic Valve.
ASD	:	Atrial septal defect.
Cath	:	Catheter.
Cong	:	Congenital
Diag	:	Diagnosis.
2 dim echo	:	Two-dimensional echocardiography.
Eject	:	Ejection.
Grad	:	gradient.
ht	:	Heart.
IVS	:	Interventricular septum.
LA	:	Left atrium.
LV Lt.Vent	:	Left ventricle.
max	:	Maximum
MPA	:	Main pulmonary artery.
MV	:	Mitral valve.
ms	:	months
MS	:	Mitral stenosis.
murm	:	murmur
Pansyst	:	Pansystolic.
PA	:	Pulmonary artery.
PDA	:	Patent ductus arteriosus.
Peric.	:	Pericardium.

O

Post.	:	Posterior.
Pr	:	Pressure
Prom	:	Prominent
Ps	:	Pulmonary stenosis
Pulm.	:	Pulmonary
RV Rt.Vent	:	Right ventricle
TI	:	Tricuspid incompetence.
VSD	:	Ventricular septal defect.
Yrs	:	years

INTRODUCTION AND AIM OF WORK

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Since the introduction of echocardiography as a new non-invasive method for examination of the heart, it has become the most widely used imaging technique for evaluation of patients with congenital heart disease. Consequently, there has been much controversy regarding its accuracy in diagnosing congenital cardiac lesions and whether or not it could partly replace cardiac catheterization or even reduce the number of patients subjected to it. The aim of this study is to emphasize the role of echocardiography in diagnosing some of the congenital cardiac anomalies and to define its accuracy in this respect.

REVIEW OF LITERATURE

Review of Literature

Echocardiography has made a great progress since its introduction by Drs. Edler and Hertz from Sweden in the early 1950s. Today it is recognized as one of the most important diagnostic techniques available in cardiovascular medicine. In the 1950s its main use was in evaluating pericardial effusion and mitral stenosis. In a relatively short time, it has made a tremendous impact on almost all aspects of cardiovascular disease (Kleid et al 1978).

With the availability of high frequency transducers and a flexible acoustic window, echocardiographic imaging of the neonate or young infant now provides anatomic definition comparable and perhaps superior to angiography; yet, a complete and accurate diagnosis of congenital cardiac lesions remains an unfullfilled goal of echocardiography as it is generally practiced today. The major diagnostic challenge is the wide anatomic spectrum encountered in this age group. Also, the newborn's shifting physiologic state and sometimes unstable cardiac output conceal clinical evidence that could aid in arriving at an accurate diagnosis. Although the technical aspects of imaging are easier in this age group than in older patients, the diagnostic demands are greater (Williams, 1985).

Two-dimensional phased array sector scanners allow high resolution imaging of large cross sections of the heart from small echocardiographic windows (silverman,& Schiller,1978).Conventionally, precordial window transducer placement has been used to produce the images (Grifith et al, 1974). Alternative transducer application in the suprasternal notch, as experienced by Sahn et al, in (1977), over the cardiac apex and subxiphoid areas allows alternative approaches for obtaining tomographic images of cardiac chambers. Silverman & Schiller (1978) have used the apex as a point to display simultaneously the four cardiac chambers, the atrioventricular valves, and the cardiac septa. They stated that because of this unique presentation, this view has been useful in defining a wide variety of congenital heart defects. They finally came to the conclusion that apex echocardiography has greatly augmented the perception of two-dimensional echocardiographic images in congenital heart disease and, with a number of lesions, it appears to be the most valuable view for delineation and often is easier to record than precordial images.

The subxiphoid (subcostal) approach deserves special mention in the discussion of cardiac imaging of the newborn and young infant because of the unique applications of the approach to multiple plane imaging of the complex disorders frequently found in this age group . In such patients in whom cardiac chamber position is extremely variable, the ability to sweep the transducer in a variety of positions and directions is of utmost importance (Williams, 1985).

The subxiphoid M-mode technique was introduced as an alternative method for visualizing the left ventricle and left ventricular outflow tract (Lange et al, 1979).

Sahn et al (1978), used the subxiphoid technique to attain a better image of the right ventricular body and outflow tract. Their final deduction was that this technique produced better images of the right ventricular body and outflow tract than echoes obtained from the chest wall.

Lange et al (1979) enumerated some of the advantages of the subxiphoid technique by saying that it was tolerated well by most of the patients, without discomfort. Sector scan instruments as well as linear array systems could be used. Severe chest deformities or surgical dressings presented little problem.

Nowadays, this approach has developed into the single most useful transducer position in small infants because it offers a wide, soft and flexible accustic window and because the other transducer positions may be compromised in this patient group (Williams, 1985).

Contrast echocardiography was first used clinically for the identification of the aortic root and intracardiac structures by Gramiak et al in (1968). Subsequently, a number of reports appeared in the literature outlining the clinical applications of contrast echocardiography. These studies involved intra-cardiac injection of substances, usually indocyanine green, during routine cardiac catheterization (Valdes-Cruz et al, 1976).

In 1972, Gramiak et al, stated that M-mode Echocardiography can help to detect valvular pulmonary stenosis.

King et al, (1973), described visualization of ventricular septal defect with B-scan ultrasonography.

In 1973, as well, Lundstrom stated that mild forms of Ebstein anomaly were difficult to diagnose by echocardiography per se, additional invasive techniques such as angiocardiography were needed.

Reports by Sahn et al in 1974 suggested that the interatrial septum could be visualized directly by M-mode or B-mode echocardiography.

Williams et al, (1974), Komatsu et al, (1976) and Bass et al, (1978) stated that the older M-mode echocardiographic criteria for diagnosis of endocardial cushion defects relied on detection of abnormalities of the atrioventricular valves. Williams et al (1974), added two basic characteristics, common to both complete and incomplete forms of endocardial cushion defects.

In 1974, Sahn et al identified patients with tetralogy of Fallot by demonstrating overriding of the ventricular septum by the aorta in cross-sectional echocardiogr aphic images obtained parallel to the long axis of the left ventricle.

Weyman et al (1974) stated that M-mode diagnosis of valvular pulmonary stenosis rests on the observed effects of altered right ventricular and pulmonary artery pressure relationships on pulmonary leaflet motion.

In 1974 as well, Davis et al, described the echocardiographic abnormalities of the aortic valve in cases of subaortic obstruction.

Hirschfeld et al, in 1975, refined the recognition of simple d-transposition by utilizing systolic time intervals to identify the aortic and pulmonary valves.

In 1975, Henry et al provided additional clues to the diagnosis of conotruncal abnormalities using two-dimensional echocardiography.

Nanda et al, (1975) and Aziz et al, (1978), currently stated that two dimensional echocardiography not only can provide a sensitive and specific diagnosis of this conoventricular abnormality, but also can demonstrate the presence and nature of associated lesions such as subpulmonary stenosis, ventricular septal defect and patent ductus arteriosus.

Morris et al (1975) and Assad-Morell et al, (1976), described the M-mode echocardiographic criteria for diagnosis of tetralogy of Fallot.

In 1975, Weyman stated that both M-mode and two-dimensional echocardiography play a role in the diagnosis of subvalvular or infundibular pulmonic stenosis.

Komatsu et al, 1976, studied visualization of the atrial septal defects by both M-mode and B-mode. Their reports agreed with those of Sahn et al, published in (1974).

In 1976, Feigenbaum pointed out that in the majority of patients with membranous-type ventricular septal defect, which is the most common type, no clear space is seen between the top of the ventricular septum and the anterior portion of the aortic root in the long-axis parasternal view, thus limiting the valve of this technique.