Sudan Universe of Sciences and technology

College of Graduate Studies

Echocardiograpy Findings in Patient's with Dilated Cardiomyopathy

نتائج تصوير صدى القلب لدى مرضى تضخم عضلة القلب

A thesis submitted partial fulfillment of Requirements of the Msc Degree in Medical Diagnosis Ultrasound

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2017

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Dedication

- ***To My Mother.***
- ***To The Soul of My Father.***
  - ***To My Dear Husband.***
  - ***To My Brothers, Sisters.***
  - ***To My Sons, Daughter.***
    - ***And To My Teachers.***

Acknowledgement

I would like to thank Dr. Carolin Edward my Supervisor for her kind advice, true guidance, great help and valuable critics: Urn very grateful to Dr.Alsadig Askaur for his full advice, encouragement and great help.

I would like also to thank Dr. Hassn ALsawri for his help and good advice.

I'm continuous very full thanks to my husband for his encouragement and support

Abstract

The main objective of this study is to test the correlation between the risk factors of the dilated cardiomyopathy ,and the heart dimensions and the ejection fraction

50 cases of dilated cardiomyopathy patients who were referred to echocardiography department. For the assessment of their heart condition.

The sample included 26 male and 24 female patients ,the age for the study population was 58.20±12.60.The average of the left atrium diameter for the study population was 42.52±6.52.

The average of the left ventricular end systolic diameter for the study population was 57.12±12.51. The average of the left ventricular end diastolic diameter for the study population was55.78±9.32. The average of the left ventricular posterior wall for the study population was 21.98±20.56. The average of the interventricular septum for the study population was 11.22±2.71. The average the ejection fraction for the study population was28.62±8.92. The study showed positive correlation between the risk factors (Diabetes mellitus, Hypertention , Coronary artery disease and Alkohol abuse) and each of left atrium diameter , left ventricular diameter at end systolic , left ventricle diameter at end diastolic , internentricular septal thickness , and ejection fraction . Study showed negative correlation between ejection fraction and each of left atrium diameter , left ventricle diameter at end diastolic , left ventricle diameter at end systolic.

The echocardiography and measuring ejection fraction had great value in evaluation of patient with dilated cardiomyopathy.

الخلاصة

الهدف الأساسي لهذا البحث هو اختبار الارتباط بين العوامل المسببة لتضخم عضلة القلب وأبعاد القلب ونسبة طرد القلب للدم .تمت دراسة 50 حالة تضخم عضلة القلب تم تحويلهم لقسم الموجات فوق الصوتية لتقييم عمل عضلة القلب.تضمنت الدراسة26 من الذكور و24 من الإناث بلغ متوسط أعمارهم 12.60±58.20

بلغ متوسط أبعاد البطين الأيسر عند الانقباض9.32±55.78، بلغ متوسط أبعاد البطين الأيسر عند الانبساط لكل أفراد العينة 12.51±57.12، بلغ متوسط أبعاد الجدار الخلفي للبطين الايسر21.98±20.56، بلغ متوسط أبعاد الحاجز بين البطينين 2.71±11.22، بلغ متوسط طرد القلب للدم 8.92±28.62.

وجدت الدراسة أن الارتباط معنوي بين العوامل المسببة لتضخم عضلة القلب (مرض السكري,مرض ضغط الدم , مرض الشريان التاجي , ومتعاطيي الكحول) وكل من أبعاد الأذين الأيسر , أبعاد البطين الأيسر عند الانبساط والانقباض , الحاجز بين البطينين ونسبة طرد القلب للدم .وجدت الدراسة ارتباط عكسي بين نسبة طرد القلب للدم وكل من أبعاد البطين الأيسر عند الانقباض والانبساط.

الموجات فوق الصوتية للقلب وقياس نسبة طرد القلب للدم وسيلة مهمة في تقييم مرض تضخم عضلة القلب.

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List of Abbreviations

AA	Alkohol Abuse
AO	Aorta
AR	Aortic regurgitation
ASD	Atrial septal defects
AV	Aortic valve`
AV	Atrio Ventricular
CF	Colour Flow
COP	Cardiac Out PUT
2D	Two-dimensional echocardiography
DCM	Dilated cardiomyopathy
DM	Diabetes Mellitus
Echo	Echocardiography
ECG	Electrocardiogram
EF	Ejection fraction
IVS	InterVentricular Septum
LA	Left atrium
LV	Left ventricle
LVEDD	Left ventricular end diastolic diameter
LVESD	Left ventricular end systolic diameter
LVOT	Left ventricular outflow tract
LVPW	Left ventricular posterior wall
LVSHF	Left ventricular Severity of Heart Failure
MR	Mitral valve regurgitation
M-mode	Motion mode

MV	Mitral Valve
NYHA	New York Heart Association
RA	Right atrium
RT	Radiotherapy
RV	Right ventricle
SA	Sino Atrial node
SAS	Specific Activity Scale
TDI	Tissue Doppler Imaging
TR	Tricuspid regurgitation
TV	Tricuspid valve

Chapter One

Introduction

Chapter One

1.1Introduction:

Cardiomyopathies are varied groub of heart disease that are characterized by abnormalities of the heart muscle ,include coronary artery disease , hypertention , congenital , valvular or pericardial pathology.

Cardiomyopathy is divided in to three functional categories;Dilated ,hypertrophicand restrictive.(Solomon ,2007)

Dilated cardiomyopathycharacterizedbydilated poorly functional left ventricle.The advance stages of adilated cardiomyopathy characterized chambers.All indices of ventricular systolic function-left ventricular volumes, ejection fraction , strok volume , cardiac output and other-are generallyreduced Dilatedcardiomyopathy lead to functional mitral regurgitation by dilated mitral annulus and displacement of papillary muscle.(Solomon ,2007)

Causes of a dilated cardiomyopathy:Idiopathic[most common] ,Ischemic , Valvular heart disease.Choronichypertension ,Tagyarrythias , Toxin [alcohol , anthracycline] , Infection[viral , bacterial , paracitic]

Echocardiography has emerged as the principal tool for noninvasive assessment of the cardiovascular system.Is powerfull and safe technique has become available incardiac department for evaluation of dilated cardiomyopathy using two-dimensional[2D] ,M-mode , and Doppler.(Solomon ,2007)

1.2 Problem Of Study:

There is inadequate knowledge about dilated cardiomyopathy ,it s risk and incidence in sudan

Cardiac problem increased daily without being notice till the onset of a severecomplication.

Cardiomyopathy may lead to congestive heart failure ,but all of the cardiac methods of investigation are invasive there for we need noninvasive method to diagnose the cardiac problems , there for echocardiography is selected to examine the patients with cardiomyopathy.

1.3 Objectives of the study:

1.3.1 General objective:

Characterized heart in patient with dilated cardiomyopathy using echocardiography .

1.3.2 Specific objectives:

- To evaluate thechambers (Right and Left ventricles and atria)
- To evaluate thevalvularfunction using Doppler technique
- To determinewall dimension and ejection fraction of the ventricles

1.4 Over view of the study:

The study contains five chapters:

Chapter one: contains introduction and objectives (general and specific)

Chapter two: literature review anatomy ,physiology , pathology , echocardiographic imaging planes andprevious studies.

Chapter three: contains the material and method.

Chapter four: contains the results presentation.

Chapter five: contains the discussion ,references and appendices.

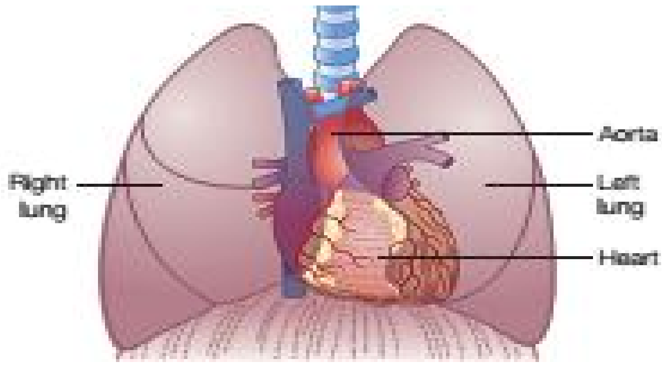
Chapter Two

Back ground& Literature Review

Chapter two

Back ground &Literature Review

2.1 Anatomy of the Heart:



Figer2.1 The heart and its relation to the rest of the thorax (Andrew, 2009)

The heart lies within the thorax ,to the left of the midline , protected by the rib cage and lying in close proximity to the lungs and , underneath , the diaphragm

The heart consists of four main chambers[left and right atria , and left and right ventricles] and fourvalves[aortic , mitral , pulmonary and tricuspid].

Afat filled grooves ,the atrioventricular sulcus , separates the surfaces of the atria from the ventricles and carries the right and left coronary sinus[Gosling.2002]

2.1.1 Pericardium:

The pericardium is asac-like structure that surrounds most of the heart.There is an outer fibrous layer-the fibrous pericardium-which blends with the diaphragm inferiorly ,and aninner layer-the serous pericardium-which it selfe has two layers[parietal pericardium , continuous with the fibrous outer layer , and the visceral pericardium , which is theepicardium of the heart]

The pericardium contains'gaps' where vessels enter and leave the heart ,and the pericardium forms asmall sleeve around these vessels. As a result , there is a small pocket of pericardium around the aorta/pulmonary artery[transverse sinus] and between the four pulmonary veins [oblique sinus].The pericardial cavity is a potential space between the parietal and visceral layers , and normally contains less than 50ml of fluid.Serous fluid is secreted into the pericardial cavity in order to lubricate the membrane and facilitate the almost frictionless continuous movement of the heart when it beats[Andrew , 2009]

2.1.2 Cardiac Chambers And Valves:

2.1.2.1 The left ventricle

The normal left ventricle is an approximately symmetrical structure , wich is cylindrical at its base[the mitral annules]and tapers to wards its apex.It is the main pumping chamber of the heart and its wall is thicker[and myocardial mass greater] , although less trabeculated , than that of the RV.TheLV myocardium is conventionally subdivided in to16 or 17 segment (Andrew ,2009)

2.1.2.2 The mitral valve

The mitral valve lies between the left atrium andventricle and has two leaflets that open during diastole and close in systole , to prevent regurgitation of blood from the LV back in to LA.The mitral valve needs to be thought of as more than just two leaflet ,however , because the mitral annulus , papillary muscles and chordae tendinea are all essential to the valve's structure and function(Andrew , 2009)

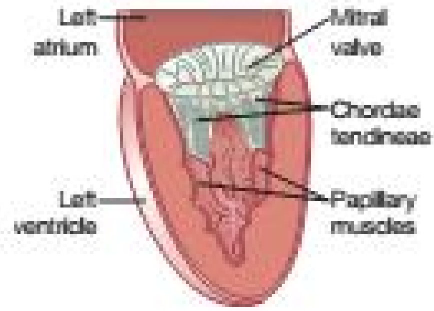


fig.2.2 Mitral valve anatomy(Andrew,2009)

2.1.2.3 THE LEFT ATRIUM

The LA is situated at the back of the heart , in front of the oesophagus. The LA is arelatively smooth walled structure , but does have an appendage which can act as a focus for thrombus formation. It is entered by four pulmonary veins carring oxygenated blood from the lungs-two from the right lung and two from the left. The LAis not just apassive conduit between the pulmonary veins and the LV , but contracts during atrial systole[immediately after the onset of the Pwave] to provideadditional diastolic filling of the LV[the a trial kick].this is particulary importantwhen diastolic filling is impaired , in the presence of elevated LV filling pressures. The LA is separated from the RA by the interatrial septum , but there can be a communication between the two in the form of a patent foramen o vale or a trial septal defect[ASD] (Andrew , 2009)

2.1.2.4 THE pulmonary valve:

The pulmonary valve lies between the right ventricle out flow tract[RVOT] and pulmonary artery , opening during systole to allow blood to pass from the ventricle in to the pulmonary circulation , and closing in diastole to prevent regurgitation[asmall amount of'physiological' pulmonary regurgitation is normal].The valves it selfe is structurally similar to the ortic valve , having three cusps[called anterior , left and right].(Andrew ,2009)

2.1.2.5 THE right ventricle:

The RV is more complex to assess by echo than the left , it is more heavily trabeculated , but thinner-walled than LV.The RVOT is not trabeculated and leads to the pulmonary valve.The RV act as the pumping chamber for deoxygenated blood returning from the body en route to the lugs

The tricuspid valve;Lies between the RA and RV , opening during diastole to allow blood to pass from the atrium to ventricle , and closing in systole to prevent regurgitation[although a small amount of tricuspid regurgitation is commonly seen in normal individuals]

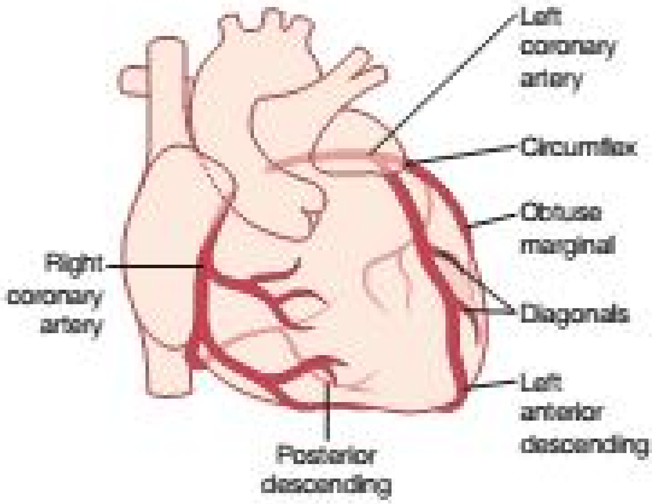
As its name the tricuspid valve has three cusps ,there are also three papillary muscles.The orifice area of the tricuspid valve is greater than that of the mitral valve.(Andrew , 2009).

2.1.2.6 THE right atrium:

The RA receives blood returing to the heart via the superior and inferior vena cavea.It also receives blood draining from the myocardium via the coronary sinus ,which enters the RA posteriorly , just superior to the tricuspid valve.(Andrew , 2009)

2.1.3 BLOOD Supply

The coronary circulation normally arises as two separate vessels from the sinuses of valsalva-The LCA from the left coronary sinus ,and the RCA from



Figer 2.3 The coronary circulation(Andrew, 2009)

The initial portion of the LCA is the left main stem , which divides in to the left anterior descending[LAD] andcircumflex[Cx]arteries.TheLADartey runs down giving rise to diagonal branches , the cx artery gives obtuse marginal branches.TheRCA gives rise to the posterior desending artery which runs down the posterior inter ventriculargroove(Andrew , 2009)

2.2Physiology of the heart

2.2.1-contractibility:

Contractibility is ability of the cardiac muscle to convert chemical energy into mechanical work. The heart act as amuscular pump and the strength of the contractibility determined its pumping power.the mechanism of contraction depend on the contractile units , the myofibrils , which contain molecules actin and myocin.The shortening of the myofibirls takes place with energy derived from adenosine triphosphate[ATP].Almost all the energy needed for contrction is derived from aerobic metabolism , so an adequate oxygen supply isessential for cardiac contractibility.(Sukkar , 2003)

2.2.2 -Rhythmicity[automaticity

Rhythmicity is the ability of cardiac muscle to contract in a regular constant manner.Therhythmicity is myogenic in origin ,i.e.its origination has nothing to do with the nerves of the heart.It is not neurogenic.(Sukkar ,2003)

2.2.3-Conductivity

Conductivity is the ability of cardiac muscle fibers to conduct the cardiac impulses that are initiated in the SA node , which is pacemaker of the heart. The cardiac conducting system is composed of the: sinoatrial(SA)node , intermodal pathways , atrioventricular (AV) node , bundle of His and its branches , purkinje system. The conducting system is richer in glycogen and has more sarcoplasm than the rest of the cardiac muscle fibres .(Sukkar , 2003)

2.2.4-The cardiac output

The cardiac output is defined as the volume of blood pumped by each ventricle per unit time. In healthy adults it is about 5litres/min. The cardiac output (COP) depends on the heart rate and on the stroke volume. In the fact ,it is equal to the product of these two parameters.

COP=Stroke Volume X Heart rate

This volume will vary with the size of the individual. Women will have smaller cardiac output than men ,and children have smaller out put than adolesents or adult. Because of this variation , it is preverbale to use the cardiac index (CI). Cardiac index equals COP/min/m2 of body surface area. The normal range of CI is 2 ,6-4 , 2(L/min/m2).During moderate muscular exercise the cariac output may increase by by two-or threefold.In athletes the cardiac output may reach30 liters/min or more.(Sukkar , 2003)

2.3 Pathology of the heart:

Heart diseases can be classified by anatomy or by etiology ,so wewillgo from most common to least common , by etiology and then by anatomy.[WWW.uptodate.com]

2.3.1-Ischemic Heart Disease:

Although atherosclerosis of the coronary arteries is the most common mechanism responsible for myocardial ischemia ,other less common mechanism can also cause ischemia.

These include: Coronary embolism ,Coronary spasm [WWW.uptodate.com]

2.3.2-Inflammatory Heart Diseases:

Endocarditis ,Myocarditis , Pericarditis , Rheumatic Heart Disease (www.uptodate.com)

2.3.3-Rheumatic Heart Disease:

Anon-suppurative inflammatory disease that may involve the joints ,heart , blood vessels , skin and CNS;it usually follows a group A beta-hemolytic streptococcal pharyngitis;it often recurs

Acute rheumatic fever is a pancarditis ,involving all layers of the heart. Pericarditis and myocarditis often responsible for initial symptoms. (www.uptodate.com)

2.3.4-Congenital Heart Disease:

Cardiomyopathies

Are a variedgroup of heart diseases that are characterized by abnormalities of the heart muscle. Cardiomyopathy is traditionally divided into three functional categories:dilated ,hypertrophic , and restrictive . (Solomon ,2007)

Dilated Cardiomyopathy:

Dilated cardiomyopathy is characterized by a dilated poorly functional left ventricle.Dilated cardiac chambers characterize advanced stages of a dilatedcardiomyopathy ALL indices of ventricular systolic function-left ventricular volumes , ejection fraction , stroke volume , cardiac output , and other are generally reduced. Wall thickness in dilated cardiomyopathy is usually in normal limits ,but may be increased or decreased. Dilated cardiomyopathy often leads to dilated mitral annulus ,papillary muscle displacement resulting in poor mitral leafletcoaptation , both contribute to mitral regurgitation. (Solomon ,2007)

Hypertrophic Cardiomyopathy:

IS typically defined as unexplained ventricular hypertrophy.and can be diagnosed in a patient with hypertrophy not associated with hypertension or other causes , such as aortic stenosis.The majority of cases of hypertrophic cardiomyopathy are caused bysarcomericgenetic mutations(Solomon , 2007)

Restrictive Cardiomyopathies:

Are characterized by diastolic dysfunction because reduced chamberdistensibility.lead to progressive biventricular stiffness and elevated filling (diastolic) pressures , (Solomon , 2007)

2.3.5-Tumours of the Heart and Pericardium:

The commonest primary tumouris the cardiac myxoma , which usually occurs in the adult life , in the left atrium.It forms agelatinous mass up to 6cm in diameter , wich may create an intermittent ball valve obstruction of the mitral valve or present with embolic phenomena or a variety of systemic symptoms. The bulk of the tumour comprises primitive polygonal or stellate cel embedded in a myxoidstroma.

Rhabdomyomas occur almost exclusively in childhood , and have are associated with tuberous sclerosis. These tumours tend to be multiple , usually involve the left ventricle and cause arrhythmias or outflow obstruction. Microscopically they consist of large branching vacuolated cells striped myofibrils. Other benign cardiac including fibromas ,lipomas , heamangiomas tend to occur in a younger age group and usually involve the ventricles.

Metastatic malignant tumours involve the heart and pericardium in up to 12% of all fetal malignancies. Squamous carcinoma of lung and adenocarcinoma of kidney have the highest reported frequency of metastatic cardiac involvement ,butmetastatic melanoma , lymphoma , breast and gastrointestinal carcinomas are also common. They very rare primary malignant cardiac tumours are sarcomas including angiosarcomas (Flemming ,1983).

2.4.Echocardiography

Is noninvasive diagnostic method that utilizes high frequency sound to assess anatomical ,functional…hemodynamic abnormalities of the cardiovascular system.

Echocardiography..echo or echocardiogram is atype of ultrasound test that uses high-pitched sound waves to produce an image of the heart , the heart is an organ with three dimension- but echocardiography is at present either a 2-D study or single point study of the cardiac motion. But by systemic study of various planes and points we can conceptualize in our minds the heart in three dimensions(Pauline ,2012)

There are 5 basic components of an ultrasound scanner that are rrquired for generation ,display and storage of an ultrasound image , pulse generator , transducer , receiver , display and memory.(Pauline.2012)

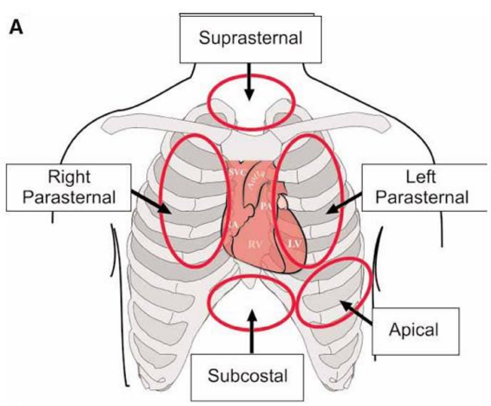


Fig 2 .4 Standard transducer position (Solomon, 2007)

2.4.1 Left Parasternal window

2.4.1.1long –Axis(PLAX) views

To evaluate left ventricular(LV) chamber size , septal wall thickness and motion , aortic valve (AV)mitral valve (MV) and left atrial(LA) dimensions (Fig 2.2 A patient and transducer positioning B ultrasound display (PLAX)

fig 2.5(Patient and transducer positioning) (Solomon, 2007)

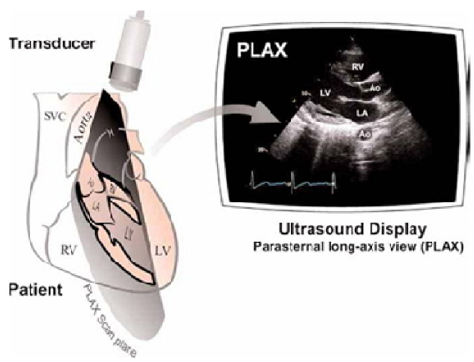


Fig 2.6 Parasternal long-axis(PLAX) (Solomon, 2007)

2.4.1.2 short-axis(PASX)

For evaluation of the aortic valve ,the mitral valve and left ventricular wall motion , wall thickness , chamber size. These views are obtained by rotating the transducer clook wise (Solomon, 2007)

2.4.1.2.2 Short-axis level of mitral leaflets(LV base).

Useful in evaluating ventricular septum ,abnormalities of the mitral valve. This is a good view to describe the anterior and the posteriormitral leaflets.(Solomon, 2007)

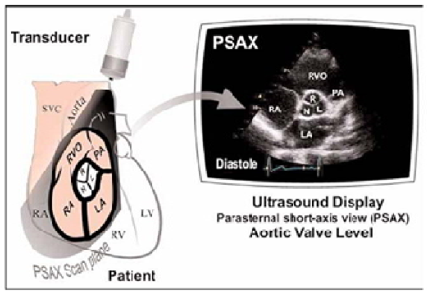


Fig 2 ,7 Parasternal short-axis (PSAX) (Solomon, 2007)

2.4.1.2.3 Short-axis level of papillary muscles (mid –LV).

Useful in locating and determining the number of papillary muscles and evaluating interventricular septal motion. (Solomon, 2007)

2.4.2 Apicalwindow

2.4.2.1Four-chamber view.

Useful for allcardiac chambers with the atrial and ventricular septa

2.4.2.3 Two-chamber view.

This view shows the anterior and inferior walls of the left ventricle.

2.4.3Subcostal window.

2.4.3.1 Subcostal four-chamber view.

Useful for evaluation of right and left atrioventricular valve and determination of right and left ventricular wall thickness. (Solomon,2007)

2.4.4Suprasternal window

Useful in determining the dimentions of the aorta ,aortic arch abnormalities and the size of right pulmonary artery.(Solomon,2007)

2.4.4.1Parasternal views

From the left parasternal postion ,the parasternal long-axis (PLAX) views , the right ventricle (RV) inflow and out flow views , and parasternal short- axis(PSAX) views are obtained.(Solomon , 2007)

2.4.4.2Apical 4-chamber view

The examination proceeds to the apical position ,with the index mark at approx. 3 o''clock position

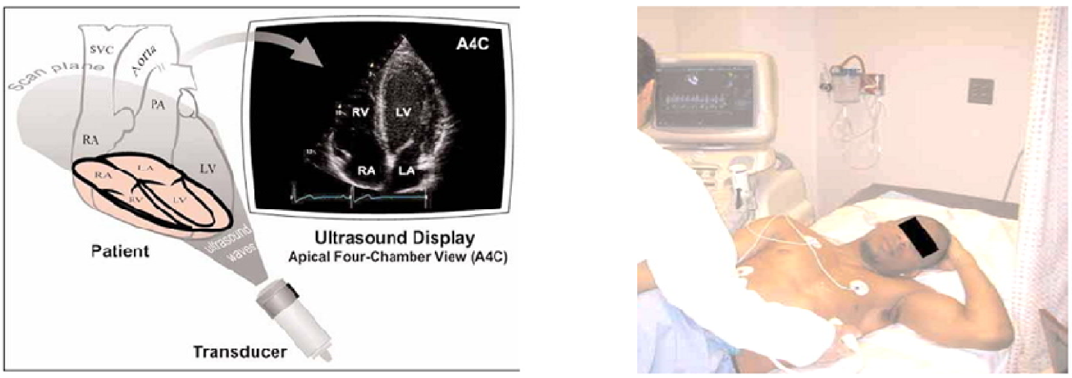


fig (2.7 A. Apical four-chamber view-B patient and transducer positioning) (Solomon, 2007)

2.4.4.3**Apical 5-chamber view**

Superior angulation of the transducer toward to aortic valve level brings the aortic root into the view (Solomon , 2007)

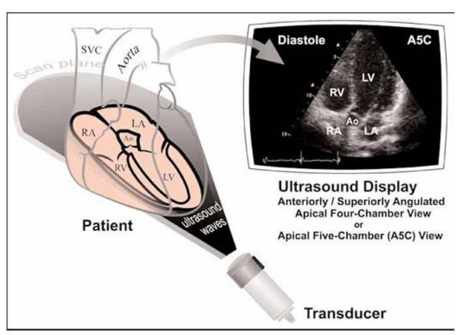
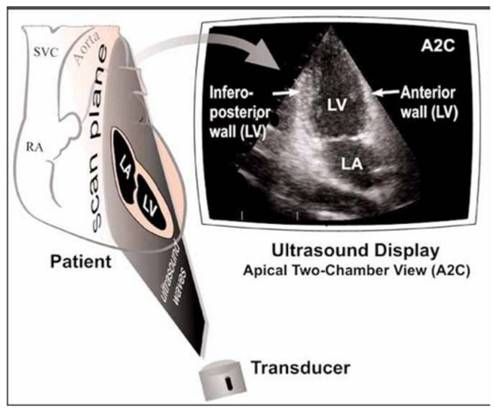


fig (2.8 Apical five-chamber (A5C) view) (Solomon, 2007)

2.4.4.4**Apical 2-chamber view**:

Counter-clock wise rotation of the transducer permits the best visualization of



fig(2-9Apical two-chamber (A2C) view) (Solomon, 2007)

2.4.4.5 **Apical 3-chamber view**

Anti-clock wise rotation of the transducerwith the index mark pointing toward the right shoulder (Solomon, 2007)

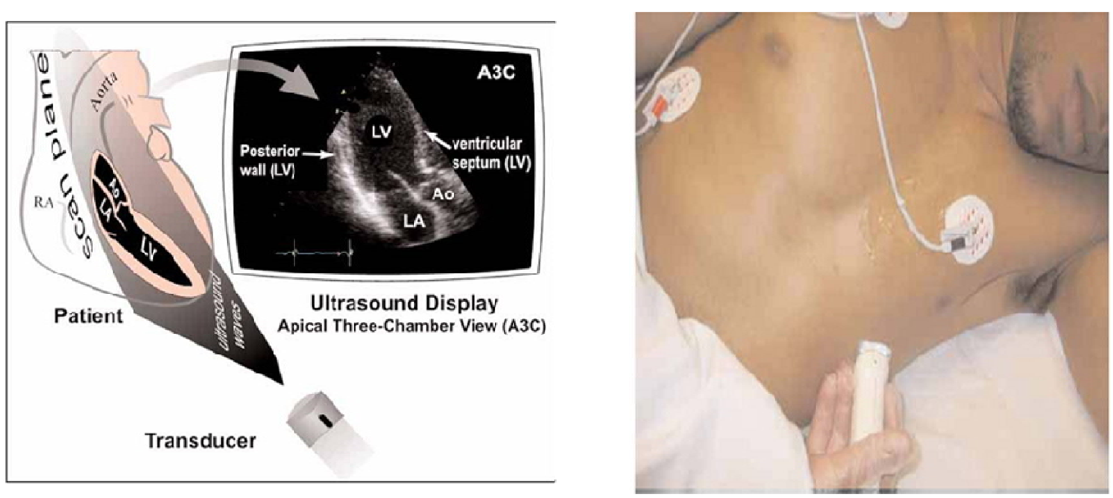


Fig (2.10 A-Apical three-chamber (A3C) view B-Patient and transducer positioning. (Solomon, 2007)

2.4.5 Subcostal views:

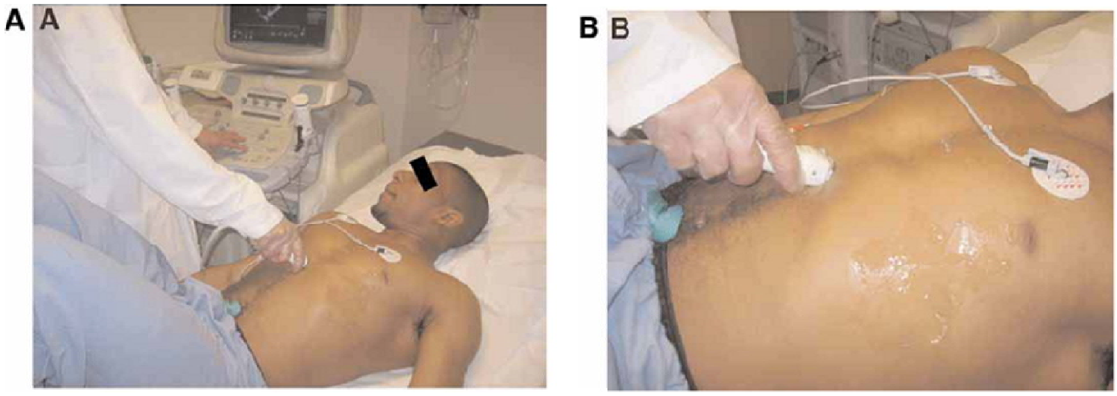


Fig 2.11 A , B Patient and transducer positioning(Solomon, 2007)

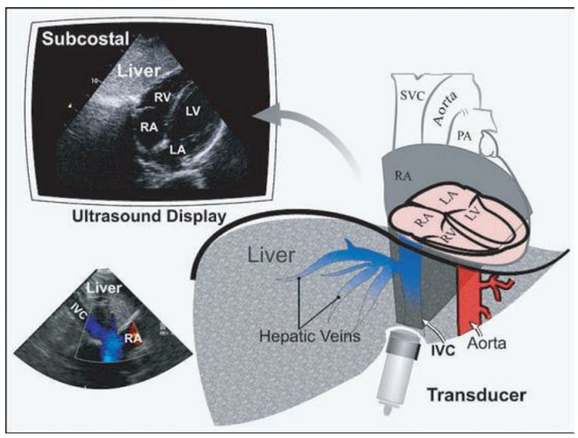


Fig 2.12 Subcostal four-chamber view (Solomon,2007)

Suprasternal views:

Coarction of the aorta can be visualizedin this view

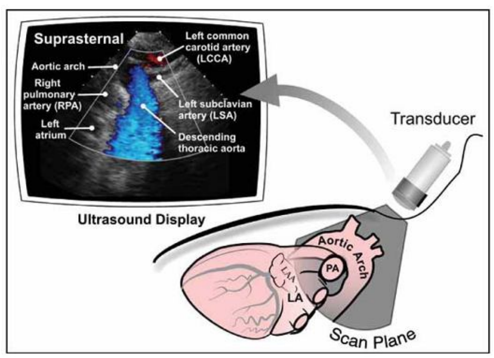


Fig 2.13A ,B Patient and transducer positioning-Suprasternal long-axis view(Solomon, 2007)

2.6 Previous study:

(Elkhayat et al , 2015)aimed to evaluated the systolic LV function , 50 patients with symptomatic LVSHF(EF<40% by echocardiography) patients assessed for functional severity of heart failure according to NYHA classification , specific activity scale {SAS} test of Goldman , six minutes walking test , conventional echocardiographic examination , and TDI for the mitral annulus.The correlation between variables was done using co , rrelation coefficient{r} between heart failure symptoms severity as assessed by NYHA function class(NYHAFC) , specific activity scale function class{SASFC} , 6 minutes walking test {6 MWT} and echo-tissue Doppler parameters.

There was no significant correlation between 6 minutes walking test andboth eho or TDI parameters.There was a significant negative correlation between systolic mitral annular velocity(Sm wave) and both NYHA function class and specific activity scale function class. However ,there was no significant correlation with six minutes walking test , and when thethe study subjects were divided in to ICM group and DCM group this correlations persist in the DCM group and lost in the ICM group. There was no significant correlation between systolic heart failure symptoms severity and both Early and late diastolic mitral annular velocities.

Systolic mitral annular motion by TDI (Sm wave) are useful noninvasive method for evaluation of the systolic LV function and correlate well with both NYHAFC and SASFC however , this correlation is significant for dilatednon ischemic cardiomyopathy.

(Mamatha B Patilet al. ,2012)assessed the diastolic dysfunctionin diabetic patients. A cross-sectional hospital-based study was done which included 50 asymptomatic patients with type2 diabetes mellitus without evidence of cardiovascular involvement and blood pressure less than 130/80 mmHg were studied. LVDD was evaluated by Doppler echocardiography

,which included E/A ratio; left atrial size was assessed in relation with age/sex , duration of diabetes and HbA1clevel.

Results showed that diastolic dysfunction was present in 32 (64 %) of the patients. Diastolic dysfunction was more common among female sex (68.18%) compared to male(60.17%).

Diastolic dysfunction was significantly associated with uncontrolled diabetes as assessed by HbA1clevels. Diastolic dysfunction was more common in patients who were on treatment with both oral hypoglycemic agents and insulin. The prevalence of diastolic dysfunction increased with longer duration of diabetes. There was a linear progression of diastolic dysfunction with the increase agegroup.

Their findings inindicatethat myocardial damage in patients with diabetes affects diastolic dysfunction before systolic function.

E/A ratio and Left atrial size are significantly altered in diabetic patients with diastolic dysfunction. Diastolic dysfunction is significantly associated with duration of disease ,glycemic levels and the type oftreatments.

(Papadopoulou et al. , 2008) Aimed to elucidated the differences in functional mitral regurgitation (FMR) between patients with ischaemic (ICM) and idiopathic dilated cardiomyopathy utilizing conventional and tissue Doppler echocardiography.They studied 21 patients with ICM and 17 with DCM , the 2 groups were similar in terms of NYHAclass , LV ejection fraction and pharmacological treatment. Patients with ICM had higher pulmonary artery systolic pressures(48+\ 16 vs. 38+\ 10mmHg , p=0.04) , more severe FMR as assessed by colour Doppler (1.9+\ 0 , 9 vs .1 , 1+\0 , 5 , p=0.006) , and a larger effective regurgitant orifice(0 , 17+/0 , 07 vs. 0 , 1 +/0 , 05 cm2 , p=0 , 003) and tenting area (2.3+/ 0.8 vs. 1 , 7+/ 0 , 7cm2 , p=0 , 02).In addition , ICM subjects had lower mitral annular systolic (Sm 2.3+/ 0.8 vs. 3.4+\0.9 cm/s , p=0.02) myocardial velocities , and ahigher ratio of early transmitral filling velocity to early mitral annular diastolic velocity (LVE/Em 42 +/ 29 vs. 22.7 +/ 7.6 , p=0.008) compared to DCM patients.Systolic and diastolic mitral annular velocities were significantly correlated with effective regurgitantorifice .Tenting area > 1.27 cm2 exhibted the higest sensitivity and regurgitant volume >42 ml the highest specificity for predicting ischaemicaetiology of LV dysfuntion.However ,only age and Sm were independent predictors of the diagnosis of ICM rather than DCM.

(Tampere.et al. , 2017) amied to evaluated conformal Radiotherapy (RT) caused echocardiographically detectable changes in the early phase after RT for early stage breast cancer patient , and to characterized the location and type of the changes.

80 patients with early-stage breast cancer underwent echocardiographic examination a week prior to the RT and within three days after the completion of RT In addition to electrocardiogram(ECG) , Holter monitoring and measurement of blood pressure.

RT induced multiple structural and functional changes in the early phase ,the walls of the left ventricle (LV) thickened , filling of the LV become impaired and LV systolic function declined. RV systolic function declined. The changes was associated with RT dose and localization.

The study demonstrated that RT for early- stage breast cancer induced multiple structural and functional echocardiographic changes

Chapter Three

Materials and Method

Chapter Three

Material and Methods

3.1 Materials:

3.1.1 Machine:

An echocardiograph machine china (8-2010) in Alshaab Teaching hospital with(phased arry 4-MHz)and ultrasound imaging system with 2D and M-mode capabilities was used.Ultrasound gel was applied to the transducer to prevent any attenuation or artifact and thermal paper printer was used ,a data collection sheet was used to collect the data

Fig 3.1(Adult transthoracic echocardiography transducers range between 2and 7 mmHz(Andrew,2009)

3.1.2 Study population:

A total of fifty patient were included with ages <40 ,ages below 40 were excluded , the sample also include patients with cardiac problems , Diabetes , hypertension and alcohol abuse.

Fig (3.1): Adult Transthoracic echocardiography transducers range between (2 and 7 mmHz) (Solomon, 2007)

3.2 Method:

The study was conductedatAlshaab TeachingHospital ,khartoum city , fromNovember 2016 toJanuary2017

3.2.1 Technique:

The patient laying on his left side with left arm under his head ,the transducer is placed on the fourth left intercostal space near sternal edge. Various section may be made long axis plane(LAX) , short axis plane (SAX) and apical views.

3.2.2 Image interpretation:

In the long axis view the left atrium ,mitral valve , left ventricle outflow , aortic valve and right ventricle outflow were demonstrated.

In the left parasternal short-axis view the left ventricle body in crossection with two cusps of the mitral (anterior and posterior leaflets) which show fish-mouth like opening and closing motion. In the apical four chamber view cutsall the four chambers left atrium (LA) , left ventricle(LV) , right atrium(RA) , right ventricle(RV) with mitral valve(MV) , aortic valve(AV) and tricuspid valve(TV) were examened.

In the apical three chamber view the left atrium(LA) ,left ventricle(LV) , mitral valve (MV) and aortic valve(AV) were viewed.

In the apical two chamber view we see the left atrium(LA) ,left ventricle(LV) , and mitral valve(MV)

3.2.3 Ethical Approval:

Verbal consent was used to collect the dataafter had been told about what should be done for him.

3.2.4 Data collection:

To collect the suitable data for the study personal information from any patient is written in the data collection sheet as the result this include the following: Age and gender of the patient and what seen in 2D-image , and by

M-mode measure the internal dimention of the left chambers and diastolic dysfuntion and function of the valves by Doppler

3.2.5 Data analysis:

Finally these data was tabulated ,represented and analyzed using SPSS.

Chapter Four

Results

Chapter Four

Results

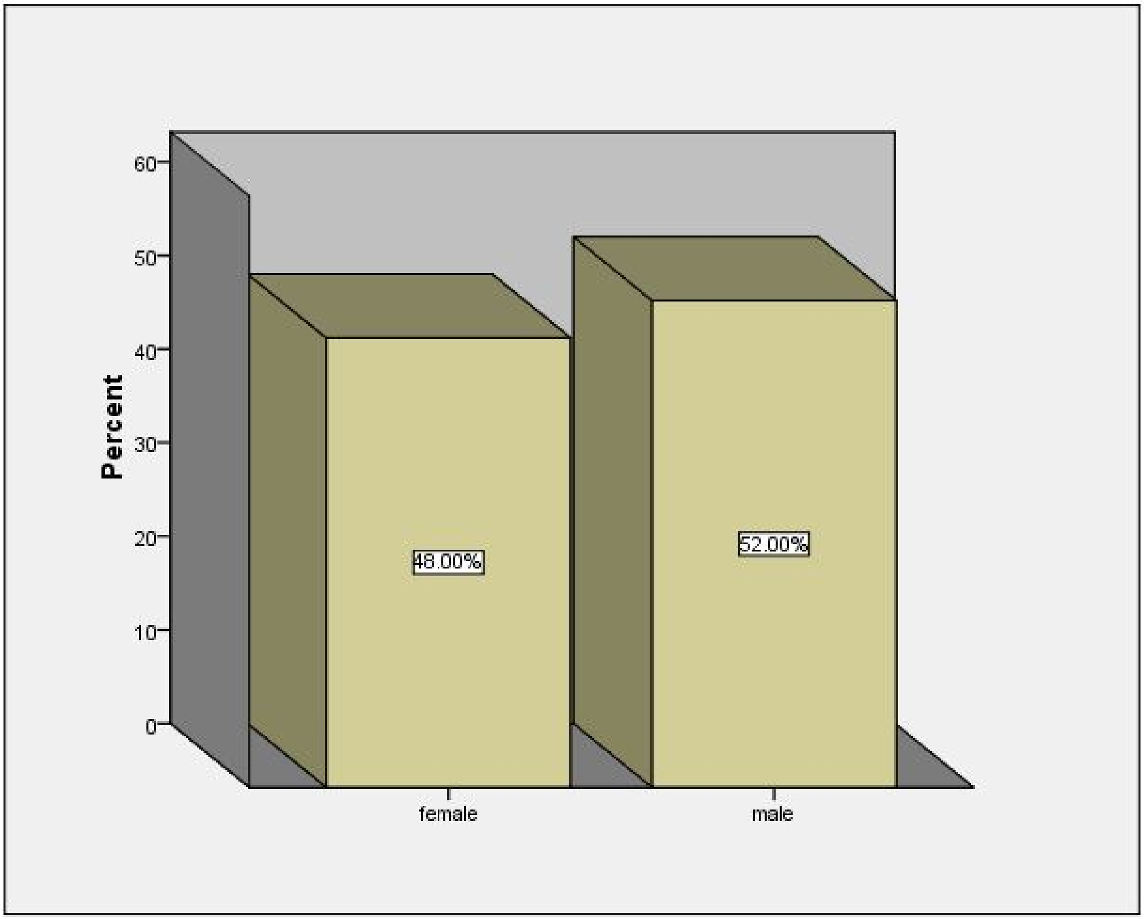


Figure (4.1) frequency distribution of gender

Table (4.1) descriptive statistic ,Frequency and percentage according to age class

Age Class	Frequency	Percentage%
30-41	4	8%
42-53	13	26%
54-65	19	38%
66-77	12	24%
>77	2	4%
Total	50	100%

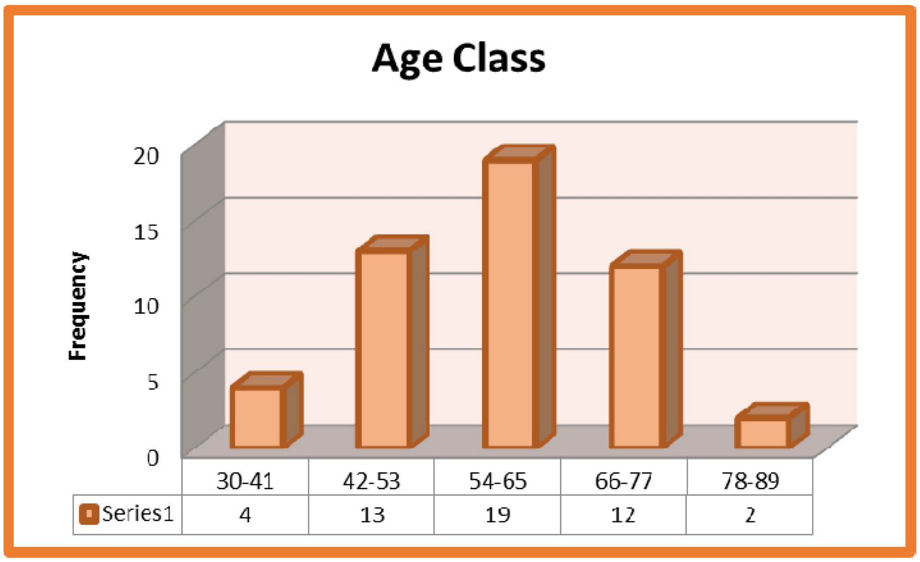


Figure (4.2) descriptive statistic ,Frequency and percentage according to age class

Table (4.2) frequency distribution of risk factors

Risk factors	Frequency	Percent
Diabetes	4	8.0
Hypertension	10	20.0
Diabetes with Hypertension	9	18.0
Coronary Artery Disease	3	6.0
AA	3	6.0
Coronary Artery Disease , Diabetes with Hypertension	3	6.0
None Of The Risk Factors	13	26.0
Coronary Artery Disease , AA	3	6.0
All Of The Risk Factors	1	2.0
Diabetes , AA	1	2.0
Total	50	100.0

Table (4.3) minimum , maximum , means and STDV for age , LA , LVS , LVD , PW and EF for all the measured parameters

Variables	N	Minimum	Maximum	Mean	Std. Deviation
LA(mm)	50	25	55	42.52	6.52
Age(years)	50	30	87	58.20	12.60
LVS(mm)	50	34	87	57.12	12.51
LVD(mm)	50	42	80	55.78	9.32
PW(mm)	50	4	68	21.98	20.56
IVS(mm)	50	4	22	11.22	2.71
EF(%)	50	15	55	28.62	8.92

Table (4.4) Mean± STDV of LA ,LVD , LVS , PW , IVS , EF values and age classified according to the risk factor.

Risk factors	LA	LVD	LVS	PW	IVS	EF%	age
DM ***M=4***	38 ±4.0	57 ±5.0	53.5 ±1.5	9.5 ±0.5	12 ±0.0	23 ±1.0	60 ±5.0
HT ***F=7 , M=3***	45.4 ±4.7	66.8 ±9.3	56.1 ±6.5	10 ±2.61	11.1 ±1.37	27.3 ±8.9	55.1 ±14.29
DM&HT ***M=2 , F=7***	41.5 ±1.5	65 ±1	52 ±2	10.5 ±0.5	13 ±0.0	36 ±20.58	35.5 ±3.5
CAD ***F=2 , M=1***	44 ±4.32	58.33 ±7.58	49.33±3.39	9 ±1.63	10.33 ±2.86	25.33 ±8.99	550. ±0.1
AA ***M=2 , F=3***	41 ±5.4	58 ±5.51	48.2 ±4.01	9 ±0.63	10.2 ±1.16	20.8 ±5.03	63.6 ±10.2
CAD , DM &HT ***M=2 , F=1***	39.5 ±2.47	61.5 ±1.06	51.5 ±2.47	10.75 ±0.88	14.5 ±0.35	37.25 ±1.59	60 ±3.53
None ***F=4 , M=7***	44 ±7.76	64.92 ±8.22	56.21 ±10.42	10.78 ±0.73	11.71±1.7	26.21 ±4.74	52.35 ±6.11
CAD , AA ***M=3***	37.66 ±10.20	58.33 ±10.71	56.33 ±11.00	7.66 ±2.04	12.66 ±0.69	20 ±7.07	61 ±11.06
All Of Factors ***M=1***	55 ±0.00	80 ±0.00	68 ±0.00	9 ±0.00	8 ±0.00	65 ±0.00	31.0 ±0.00
DM , AA ***M=1***	52 ±18.16	77 ±26.57	55 ±19.64	10 ±3.52	12 ±4.17	53 ±28.9	25 ±9.4
P value	**0.026**	**0.056**	**0.049**	**0.091**	**0.038**	**0.020**	**0.058**

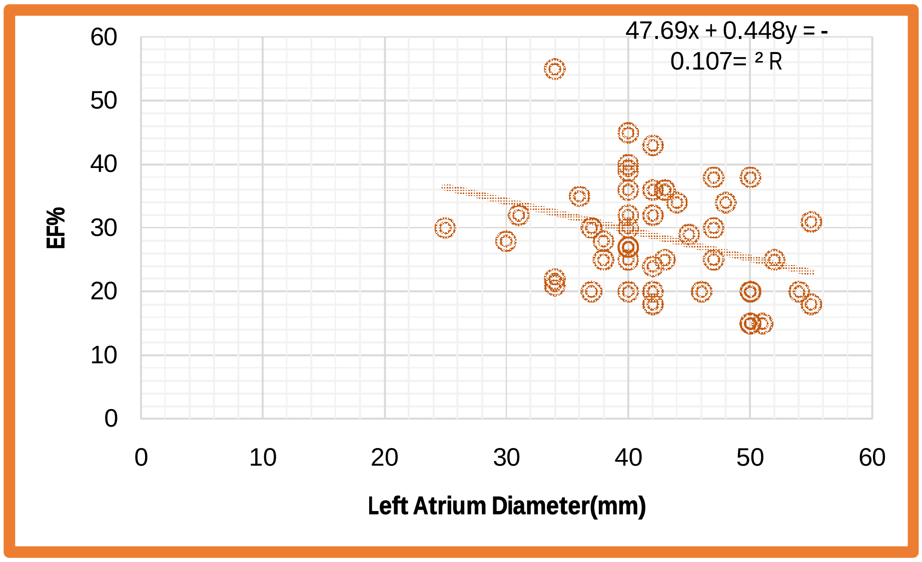
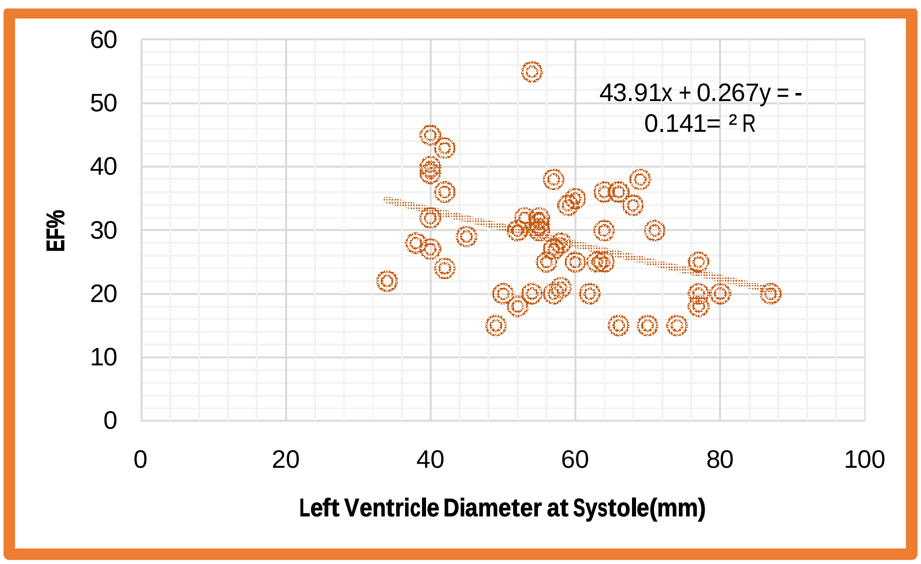


Figure (4.3) scatter plot shows relation between EF % and LA. As the LA diameter increases the EF decreases starting from 47.69% (The reduction was found to be 0.45 % for each 10 mm of the diameter)



Figure(4.4) scatter plot shows relation between EF % and Left Ventricular Diameter (Systole)(mm) As the LV diameter increases the EF decreases starting from 43.9% (The reduction was found to be 0.27 % for each 20 mm of the diameter)

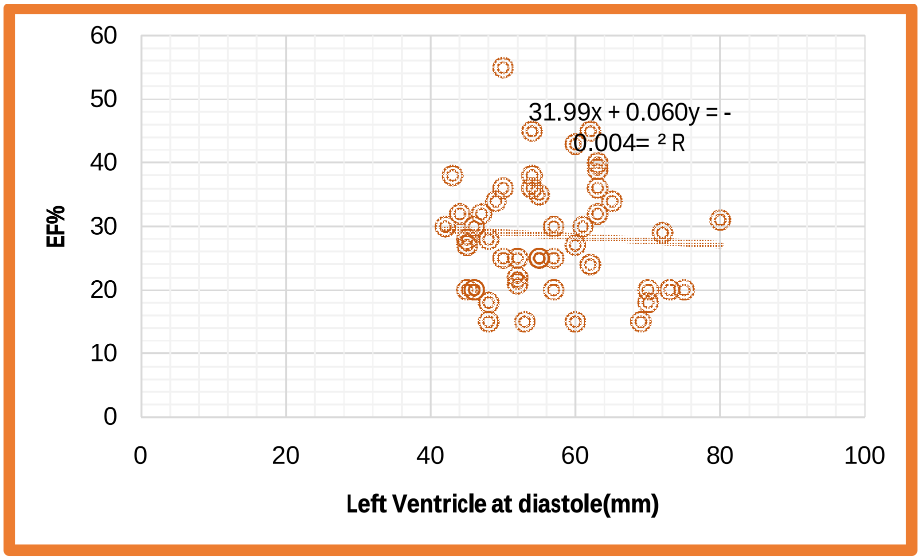


Figure (4.5) scatter plot shows relation between EF % and Left Ventricle at diastole **As the LV diameter increases the EF decreases starting from 31.9% (The reduction was found to be 0.06 % for each 20 mm of the diameter)**

Table (4.5) correlation between variables

		AGE (Years)	Left Atrium Diameter (mm)	Left Ventricular Diameter (Systole) (mm)	Left Ventricular Diameter (Diastole) (mm	Posterior wall diameter of left ventricle (mm)	Inter ventricle septum thickness (mm)	Ejection Fraction%
AGE	Pearson Correlation	1	-.247	-.203	-.191	.117	.073	.085
	Sig. (2-tailed)		.084	.156	.184	.418	.616	.558
	N	50	50	50	50	50	50	50
Left Atrium Diameter (mm)	Pearson Correlation	-.247	1	.493**	.532**	.012	-.034	-.328*
	Sig. (2-tailed)	.084		.000	.000	.932	.813	.020
	N	50	50	50	50	50	50	50
Left Ventricular Diameter (Systole) (mm)	Pearson Correlation	-.203	.493**	1	.119	-.719**	.100	-.376**
	Sig. (2-tailed)	.156	.000		.411	.000	.491	.007
	N	50	50	50	50	50	50	50
Left Ventricular Diameter (Diastole) (mm)	Pearson Correlation	-.191	.532**	.119	1	.510**	.013	-.063
	Sig. (2-tailed)	.184	.000	.411		.000	.927	.662
	N	50	50	50	50	50	50	50

Posterior wall diameter of left ventricle (mm)	Pearson Correlation	.117	.012	-.719**	.510**	1	-.11
	Sig. (2-tailed)	.418	.932	.000	.000		.426
	N	50	50	50	50	50	50
Inter ventricle septum thickness (mm)	Pearson Correlation	.073	-.034	.100	.013	-.115	1
	Sig. (2-tailed)	.616	.813	.491	.927	.426	
	N	50	50	50	50	50	50
Ejection Fraction%	Pearson Correlation	.085	-.328*	-.376**	-.063	.246	.214
	Sig. (2-tailed)	.558	.020	.007	.662	.085	.135
	N	50	50	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Chapter five

Discussion ,Conclusion
&
Recommendations

Chapter five

Discussion ,Conclusion , Recommendations

5.1 Discussion ,Conclusion , Recommendations

A total of 50 subjects where involved in the study aged between (30-89) years.Sex was grouped into males (52%) , and females (48%) as described in fig(4.1).Age was grouped into five classes (30-41) years (8%) , (42-53) years (26%) , (54-65) years (38%) , (66-77) years (24%) , (77) years(4%)table (4.1)

The study also included the risk factors of the disease in the total population and found the highest percent is the none of the risk factors (26%)table(4-2). The M-mode ultrasound was done to measure the heart dimensions and found that the LA diameterMean , STDV as described in table(4-3).The study also classified the Mean , STDV of the heart dimensions and age according to the risk factors and found significant relation betweenthe measured variable(LA , LVD , LVS , , EF%) , and the risk factors T ($p<0.05$) . Table (4.4)

The LA diameter enlarge and range from 38mm in diabetic patients and 55mm in patients with all of the risk factors and the researcher found significant correlation ($p<0.05$)

The study also found positive correlation between LVSD ,LVDDand the risk factor at significant value (0.056) (0.049)respectifly

The researcher also studied EF% and found that it range (23%-65%) and significantly correlated with the risk factors ($p<0.020$) .

Group of the patients with all the risk factor has normal value of EF% (65%) and this was due to narrow range of population and researcher do not studied duration of diseases.

Diabetes , hypertension , coronary artery disease and alcohol abuse are affect in diastolic dysfunction by: decreased relaxation , decreased elastic recoil , and increased stiffness of the ventricle , also affect systolic dysfunctionby decreased cardiac output (Stephen , 2010)

The study also found that posterior ventricular wall was negative correlated with the risk factors ($p<0.09$) ,also inter ventricular septum was positive correlated ($p<0.038$)

Wall thickness in dilated cardiomyopathy is usually within normal limits but may be increased or decreased (Solomon ,2007)

The study found negative relation between ejection fraction(EF)%and left atrium diameter(LAD) ,as the left atrium diameter increases the ejection fraction decreases starting from 47.69%(The reduction was found to be 0.45% for each 10 mm of the diameter).Figer(4.)

Negative relation between ejection fraction (EF)% and left ventricle diameter at systolic (LVSD) ,as the LV diameter (systole) increases theEF%decreases starting from 43.9% (The reduction was found to be 0.27% for each 20mm of the diameter)

Also there was negativerelation between EF% and LVD at diastole .As theLV diameter increases the EF decreases starting from 31 ,9% (The reduction was found to be 0.06% for each 20mm of the diameter

(Mamatha et al ,2012) found the prevalence of diastolic dysfunction increased with longer duration of diabetes; there was alinear progression of diastolic dysfunction with the increase age group which is in the contrary to what we found in our research.

The study also found that the patients with DCM had large LA dimensions and large LV dimension in systole and diastole and they were significantly correlated with each other (.000)

Posterior left ventricular wall thickness positive correlated with left ventricular dimension in diastole (.000)

The patients with DCM had enlarged LA dimensions and large LV with poor contraction ,the LV ejection fraction (EF) reduced .(M. Bryhn et al. , 1986)

5.2 Conclusion:

Dilated cardiomyopathy is an intrinsic cardiomyopathy that is characterized an enlarged heart and damage to the myocardium causing the heart to pump blood inefficiently.

Echocardiography was found to be the modality of choice ,safe and efficient method to assess cardiac function and anatomy.

LA diameter ,LV diameter in systole &diastole , inter ventricular septum and ejection fraction had significant correlation with risk factors.

Posterior left ventricular wall was no significant correlation with risk factors

5.3 Recommendation:

Much progress has been made in our ability to know about DCM. However ,much additional research is needed in this field. Areas of research to be highlighted over the next include. Better understanding of DCM as a disease progress. Increased clinical trials ,which lead to effective therapies.

Increase the sample size and for further studies correlate the cardiac measurement with duration of disease .We will hopefully ,improve the ongoing care and prognosis of patient a fflicated with this heart muscle disease.

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American Heart Association (www.americanheart. Com)

Appendix

NO	Sex	Age	Risk factor	Left Atrium	Left Ventricle	Posterior Wall	Inter Ventricle Septum	Ejection Fraction	Mitral Valve	Tricuspid Valve	Aortic Valve	Echo Finding