بسم الله الرحمن الرحيم

Sudan University Of Science And Technology

College Of Graduate Study

Study of Rheumatic Mitral Valve Stenosis using Echo Cardiography

دراسة ضيق الصمام ثنائي الشرفات نتيجة الروماتيزم باستخدام الموجات فوق الصوتيةللقلب

A Thesis Submitted for Partial Fulfillment ofM.Sc Degree Medical Diagnostic Ultrasound

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الأية

بسم الله الرحمن الرحيم

قال تعالى:

(اللَّـهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ مَثَلُ نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ الْمِصْبَاحُ فِي زُجَاجَةٍ الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِن شَجَرَةٍ مُّبَارَكَةٍ زَيْتُونَةٍ لَّا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ لَمْ تَمْسَسْهُ نَارٌ نُّورٌ عَلَىٰ نُورٍ يَهْدِي اللَّـهُ لِنُورِهِ مَن يَشَاءُ وَيَضْرِبُ اللَّـهُ الْأَمْثَالَ لِلنَّاسِ وَاللَّـهُ بِكُلِّ شَيْءٍ عَلِيمٌ) (٣٥)

صدق الله العظيم

سورة النور الأية{35}

Dedication

I dedicate this research to my mother, father and my family whom help me in all my steps.

Acknowledgment

Send thanks to my family and Dr. Babiker and tell them thank you for helping me to finish this project

Abstract

This research amied to know the importance of echocardiography in rheumatic mitral value stenosis total 50 Patients with rheumatic value stenosis were. Selected from alzuytouna hospital and alshaab teaching hospital from July 2016 to January 2017. In many developed countries like Sudan rheumatic heart disease is still prevalent causing significant mortality and pre mature cardiovascular death as well as undesired burden on the health system and the common valve affected is mitral valve .ultra sound is effective toll in diagnosis of rheumatic heart disease. an echocardiography machine my lab seven in ALzuytouna hospital and my lab fifty in alshaab teaching hospital with (phased array 4 MHZ) with ultra sound imaging system with 2 dimension and m.mode capabilities was used and A data collation sheet was used to collect the data and to number the patients . At the end the study mild stenos is was found in 7(14%) patients , moderate stenosis in 18(36%) patients and severe stenos is in 25(50%) patients results of this study reveals that females were more affected by rheumatic mitral valve stenosis as compare to male patients . Also reveals mean pressure gradient and pressure half time was increased when the mitral valve area decreased and pressure half time increased when mean pressure gradient increased.

ملخص البحث

هذا البحث يهدف إلى معرفة أهمية الموجات فوق الصوتية للقلب في ضيق الصمام ثنائي الشرفات نتيجة الروماتيزم . وقد تم اختيار إجمالي 50 مريضا من مستشفى الزيتونة ومستشفى الشعب التعليمي في الفترة من يوليو 2016 إلى يناير 2017.في معظم الدول النامية مثل السودان أمراض القلب نتيجة الروماتيزم لايزال سبب رئسي في كثيرمن الوفيات.واكثر الصمامات تأثراً الصمام ثنائي الشرفات وتلعب الموجات فوق الصوتية للقلب دور أساسي في تشخيص المرض وقد تم استخدام جهاز موجات صوتية للقلب في مستشفى الزيتونة وأخر في مستشفى الشعب التعليمي وورقة لتجميع البيانات وعد المرضى وفي نهاية الدراسة تم العثور على ضيق بسيط في 7 (14٪) من المرضى، ضيق متوسط في 18 (36٪) من المرضى وضيق شديد في25(50٪) من المرضى. نتائج هذه الدراسة كشفت أن الإناث كانت أكثر عرضة للمرض مقارنة بالمرضى من الذكور. كما كشفت زيادة الضغط الذي يمر عبر الصمام وزيادة الزمن الذي يأخذه هذا الضغط ليقل الى النصف عندما يضيق الصمام . كما كشفت زيادة الزمن الذي يأخذه الضغط ليقل الى النصف عندما يزيد الضغط الذي يمر عبر الصمام.

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Chapter Three:Materials and Methods

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List of Abbreviations

2 .D	Two- diminution
A	Aorta
AV	Aortic valve
LA	Left atrium
LAX	Long axis plane
LV	Left ventricle
LVO	Left Ventricle 0utflow
MAC	Mitral annular calcification
MDCT	Mediastinum computed tomography
MGP	Mean Gradient pressure
MR	Mitral regurgitation
MS	Mitral stenosis
MV	Mitral valve
MVA	Mitral valve area
PHT	Pressure half time
RA	Right atrium
RV	Right ventricle
RVO	Right Ventricle Outflow
SAX	Short axis plane
TEE	Transesophageal echocardiography
TTE	Transthoracic echocardiography

Chapter One

1:1 Introduction:

Mitral stenosis is characterized by restriction of blood flow from the left atrium(LA) to the left ventricle (LV) as a result of a narrowed mitral passage .it is an acquired vulvar defect .it is usually aconsequence of rheumatic heart disease, through cases of congenital mitral stenosis are occasionally encountered.

(http://emedicine.medscape.com/article/1878301-overview#a2Nov 06, 2014Author)

Extensive mitral annular calcification (MAC) result in mitral stenosis particularly in the aged .mitral stenosis is seen more often In women than in men and generally develops at an earlier age in developing countries than in western societies.

(http://emedicine.medscape.com/article/1878301-overview#a2Nov 06, 2014Author)

Multiple imaging modalities may be used to diagnose mitral stenosis .echocardiography become the most important diagnostic tool in establishing the diagnosis Doppler echocardiography is used to accurately depict the severity of mitral stenosis .typical 2- dimensional (2D)echocardiographic findings include thickening of mitral valve cups. A diminished EF slope is noted on M-mode image also Doppler studies demonstratean increase in the mean pressure gradient across the mitral orifice.

1-2 Statement ofProblem:

In many developed countries like Sudan Rheumatic, heart disease(RHD) is still prevalent causing significant mortality and premature cardiovascular death as well as undesired burden on the health system and the common valve affected is the mitral valve .ultrasound is effective tool in diagnosis Of RHD.

1-3 Research objectives:

1-3-1 general objectives:

*T*o study the Rheumatic mitral *v*alve stenosis using echocardiography.

1-3-2 Specific objectives:

- To estimate the degrees of the Rheumatic mitral valve stenosis.
- To measure the mean pressure gradient (MPG),
- To measure pressure half time (PHT)
- To evaluate mitral valve area (MVA)
- To correlate between the mean pressure gradient and the degree of mitral valve stenosis.
- To correlate between the pressure half time and the degree of mitral valve stenosis.

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, and previous studies. Chapter three contains the materials and method.Chapter four contains the results presentation.Chapter five contain the discussion, references and appendices.

Chapter two

Literature Review and previous studies

2 – 1 Anatomy of the Mitral valve:

The human heart has four valves. The mitral valve connects the left atrium (LA) and the left ventricle (LV). The mitral valve opens during diastole to allow the blood flow from the LA to the LV. During ventricular systole, the mitral valve closes and prevents backflow to the LA. The normal function of the mitral valve depends on its six components, which are the left atrial wall, the annulus, the leaflets, the chordae tendinae, the papillary muscles, and the left ventricular wall. (www.emedicine.medscape.com – 2015).

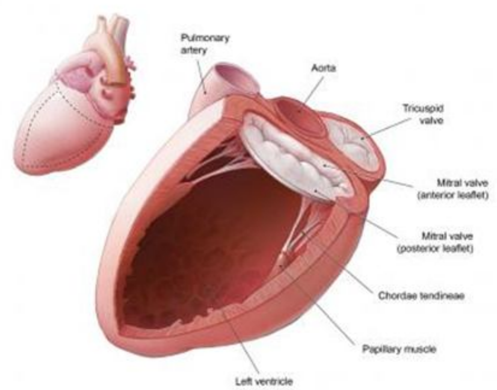


Figure 2.1 Components of the mitral valve apparatus.

(www.emedicine.medscape.com – 2015).

Gross Anatomy**:** The mitral apparatus is composed of the left atrial wall, the annulus, the leaflets, the chordae tendinae, the papillary muscles, and the left ventricular wall.The valve is located obliquely behind the aortic valve. (www.emedicine.medscape.com – 2015).

Left atrial wall: The left atrial myocardium extends over the proximal portion of the posterior leaflet. Thus, left atrial enlargement can result in mitral regurgitation by affecting the posterior leaflet. The _anterior leaflet is not affected, because of its attachment to the root of the aorta.

Mitral annulus: The mitral annulus is a fibrous ring that connects with the leaflets. It is not a continuous ring around the mitral orifice. (www.emedicine.medscape.com – 2015).

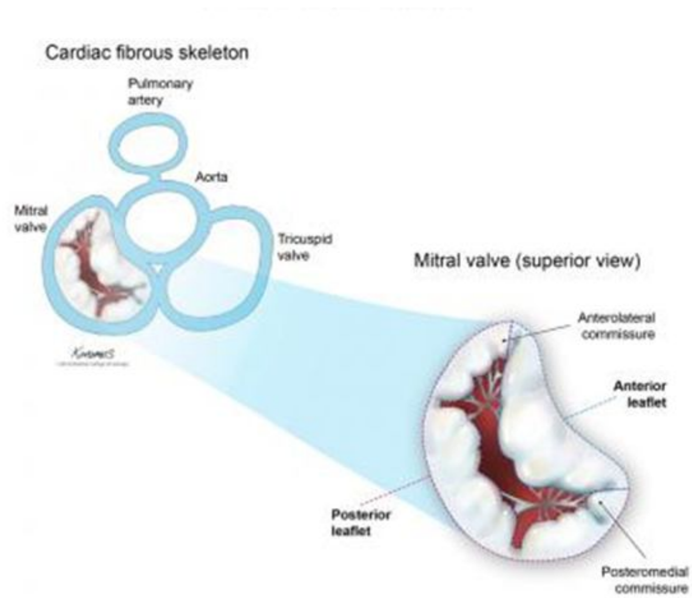
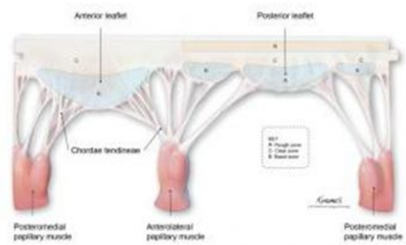


figure2.2 Superior view of the mitral valve and surrounding structures. (www.emedicine.medscape.com – 2015).

Mitral valve leaflet: Harken et al have described the mitral valve as a continuous veil inserted around the circumference of the mitral orifice.The free edges of the leaflets have several indentations. Two of these indentations, the anterolateral and posteromedial commissures, divide the leaflets into anterior and posterior (see the first image below). These commissures can be accurately identified by the insertions of the commissural chordae tendinae into the leaflets (see the second image below). (www.emedicine.medscape.com – 2015).



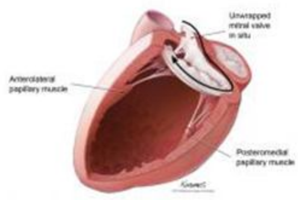


Figure 2.3:1 figure 2.3.2 Components of the mitral valve leaflets. (www.emedicine.medscape.com – 2015).

Anterior leaflet*:* The anterior leaflet is located posterior to the aortic root and is also anchored to the aortic root, unlike the posterior leaflet. Accordingly, it is also known as the aortic, septal, greater, or anteromedial leaflet.The anterior leaflet is large and semicircular in shape. It has a free edge with few or no indentations.(www.emedicine.medscape.com – 2015).

Posterior leaflet: The posterior leaflet isalso known as the ventricular, mural, smaller, or poster-lateral leaflet.The posterior leaflet is the section of the mitral valve that is located posterior to the 2 commissural areas.It has a wider attachment to the annulus than the anterior leaflet. (www.emedicine.medscape.com – 2015).

Chordae tendinae: The chordae tendinae are small fibrous strings that originate either from the apical portion of the papillary muscles or directly from the ventricular wall and insert into the valve leaflets or the muscle.

Commissural chordae*:* Commissural chordae are the chordae that insert into the inter leaflet or commissural areas located at the junction of the anterior and posterior leaflets.(www.emedicine.medscape.com – 2015).

Leaflet chordae*:* The leaflet chordae are the chordae that insert into the anterior or posterior leaflets. Papillary muscles and left ventricular wall:

These 2 structures represent the muscular components of the mitral apparatus. The papillary muscles normally arise from the apex and middle third of the left ventricular wall.The anterolateral papillary muscle is normally larger than the posteromedial papillary muscle and is supplied by the left anterior descending artery or the left circumflex artery. The posteromedial papillary muscle is supplied by the right coronary artery. Extreme fusion of papillary muscle can result into mitral stenosis. On the other hand, rupture of a papillary muscle, usually the complication of acute myocardial infarction, will result in acute mitral regurgitation. (www.emedicine.medscape.com – 2015).

2-2 Physiology:

Pin normal condition the blood flows fromleft(LA) to left ventricle (LV) during ventricular diastole when the valve is open. In addition, during ventricular systole the mitral valve(MV) closes as blood is ejected through the aortic valve (AV.) (Medical physiology - 2006).

2-3 pathology:

2-3-1 Mitral valve stenosis (MS):-

Is obstruction of diastolicblood flow fromLA to LV due to a narrowing of the mitral valve this is all most always due to rheumatic valve disease as consequence of rheumatic fever earlier in life. Causes 0f mitral stenosis: Rheumatic valve disease can affect any of the heart valves (or several in combination) but most commonly affects the mitral valve .The characteristic feature is fusion of the mitral leaflets along their edges, starting from the mitral commissure, restricting their ability to open. The leaflet edges become thickening and or calcification elsewhere too.as the main body of each leaflet usually remains relatively pliable, the leaflet are seen to done during diastole, with the rising LA pressure causing the leaflet body to bow for wards towards the ventricle this gives the leaflets what is described as a hockey stick appearance Rheumatic mitral stenosis also affects the chordae causing fibrosis, shorteningand calcification of the subvalvular apparatus Other causes of mitral stenosis are rare these include congenital mitral stenosis mitral annular calcification, systemic lupus erythematosus, rheumatoid arthritis, carcinoid syndrome and infective endocarditisBeware of conditions that can cause obstruction of the mitral valve orifice and mimic mitral stenosis such as left atrial myxoma, infective endocarditis with a large regetation ball thrombus or cortriatum.

(Making sense of echocardiograph (2009))

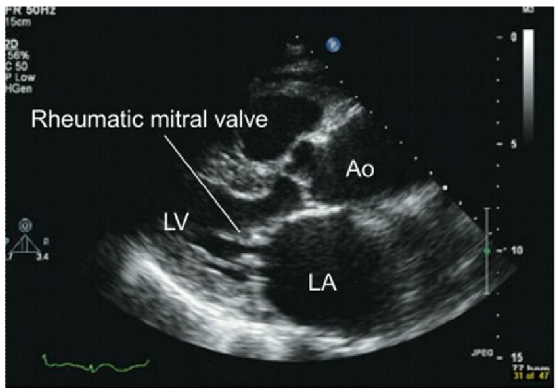


Figure 2:3:1Rheumatic mitral valve

Making sense of Echocardiography (2009)

2:3:2 Mitralregurgitation (MR):

Is the reversal flow of the blood through the MV back into the LA.(Robbins Basic Pathology-2013).

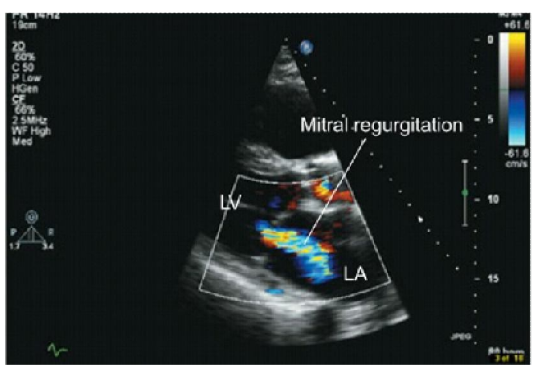


Figure 2:3:2 Mitral regurgitation

Making sense of Echocardiography (2009)

2:4 Imaging Studies:

Chest radiographic findings suggestive of mitral stenosis include left atrial enlargement (e.g., double shadow in the cardiac silhouette, straightening of left cardiac border due to the large left atrial appendage, and upward displacement of the mainstem bronchi), prominent pulmonary vessels, and redistribution of pulmonary vasculature to the upper lobes, mitral valve calcification, and interstitial edema.

(emedicine.medscape.com/article/1878301-overview#a2,2014 Author)

Echocardiography is the most specific and sensitive method of diagnosing and quantifying the severity of mitral stenosis.Using a transthoracic 2-dimensional echocardiogram, Doppler study, and color-flow Doppler imaging, the anatomic abnormalities of the stenosis valve (thickening, mobility, motion, and calcification), involvement of the sub-valvular apparatus and the characteristic fusion of the commissures can be well defined.

With echocardiography, the size of the mitral valve orifice can be precisely quantified. Important information about the ventricular and atrial chamber sizes, the presence of a left atrial thrombus, measurement of Trans-valvular gradient, and pulmonary arterial pressure can also be obtained.

(emedicine.medscape.com/article/1878301-overview#a2,2014 Author)

With the use of Doppler echocardiography, sufficient information can be obtained to develop a therapeutic plan, and, consequently, most patients do not require invasive procedures such as cardiac catheterization.

(emedicine.medscape.com/article/1878301-overview#a2,2014 Author)

Trans-esophageal echocardiography (TEE) provides better quality images than transthoracic echocardiography (TTE) and is more accurate in assessing the anatomic features of the valve and the presence of left atrial appendage thrombus. Recent studies showed that mitral valve area planimetry is feasible in the majority of patients with rheumatic mitral stenosis using 3-

dimensional TEE; also, 3-dimensional TEE allows excellent assessment of commissural fusionand commissural opening after catheter-balloon commissurotomy.

(emedicine.medscape.com/article/1878301-overview#a2,2014 Author)

Electrocardiograph: In patients with moderate-to-severe mitral stenosis, the ECG can show signs of left atrial enlargement (P wave duration in lead II >0.12 seconds, P wave axis of +45 to -30 marked terminal negative component to the P wave in V_1 [1 mm wide and 1 mm deep]) and, commonly, atrial fibrillation. A mean QRS axis in the frontal plane is greater than 80 and an R-to-S ratio of greater than one in lead V_1 indicates the presence of right ventricular hypertrophy. As the severity of the pulmonary hypertension increases, the mean QRS axis in the frontal plane moves toward the right. (emedicine.medscape.com/article/1878301-overview#a2, 2014Author)

Other Tests Laboratory Studies Perform routine baseline tests such as CBC count,electrolyte status, and renal and liver function tests. (emedicine.medscape.com/article/1878301-overview#a2,2014Author)

2:5 Echocardiography:-

is a noninvasiveprocedure which illustrates the anatomy of the heart, including valve and valve, motion chamber size,wall motion and thickness,.doppler echocardiography assesses the severity of valvar regurgitation,gradients across stenotic valves or between cardiacchambersand the detection of intra cardiac shunts echocardiography has seen a rapid evolution from single crystal m-mode to two dimensional echocardiography, Doppler and now color flow imaging clinical us of echocardiography now extends in to the operating room,as its utility in both trans esophageal (TEE) and intraoperativeechocardiography is meeting wide spread acceptanceamong cardiovascular surgeons .Specific imaging planes

to interrogates the heart valve been established order to record all intra cardiac structures in standardized fashion.
(Kaddoura 2002)

2:5:1Echo views of the mitral valve:

The mitral valve is usually assessed in the left parasternal window (parasternal long axis view (LAX), parasternal short axis view (SAX)), Apical window (apical 4-chamber view, apical 3-chamber view, apical 2-chamber view).
(Making sense of Echocardiography – (2009))

fiugre 2:5:1 Patietnt and transducer positioning: parastemal long – axis view (PSAX)(Essential Echocardiography- (2007))

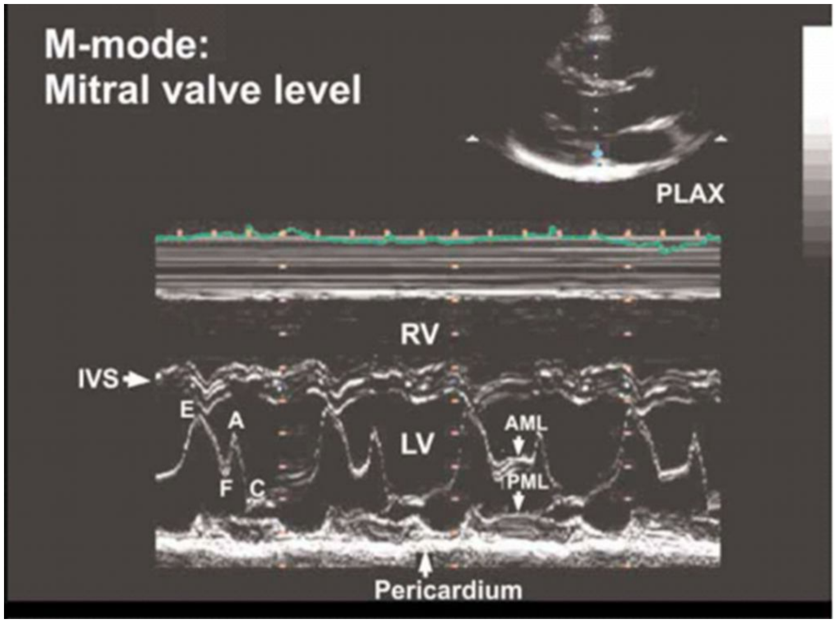
fiugre 2:5:2 Patietnt and transducer positioning: parastemal short – axis view (PSAX)(Essential Echocardiography- (2007))

fiugre 2:5:3 Patietnt and transducer positioning: apical location
(Essential Echocardiography- (2007))

2:6 Technique:

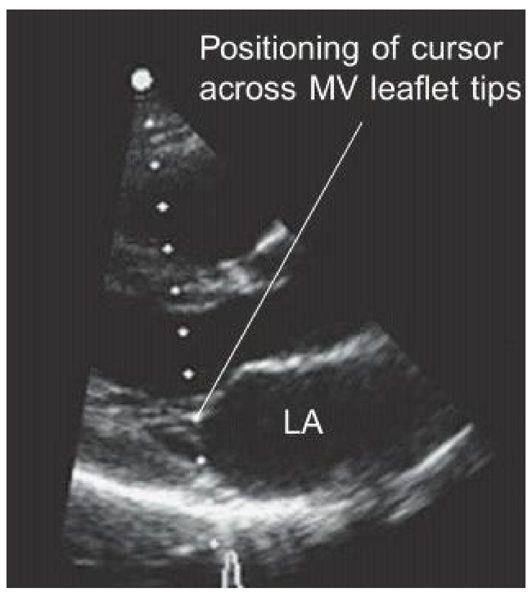
2:6:1 Left parasternalwindow:

located the probe in the thrid or fourth inter costal space, but in some patients you may need to adjust the postion to optimize the image by moving the probe up/down a rib space or further twards \ awy from the sternumfrom this window a number of view can be abtained parasternal long axis view (LAX) to abtain this view ratatethe probe so that the probe`s reference point(sometimes adot) is pointing to wards the patient`s right shoulder to optimal view aim to position the probe so that the view cuts through the centre of the mitral and aortic valves with out fore shortening the left ventricle (LV).Use 2-D and M-mode to assess structure and mobility of the mitral valve.Parasternal short axis (SAX) to abtian this view keep the probe in the left patasternal window and rotate it so that the dot is pointing to wards the patient`s left shouder and tilting the probe at the level of mitral valve. Use2-D and M-mode to assesss structureand mobility of the mitral valve.Use colour doppler to examine mitral valve in flow.(Making sense of Echocardiography – (2009))



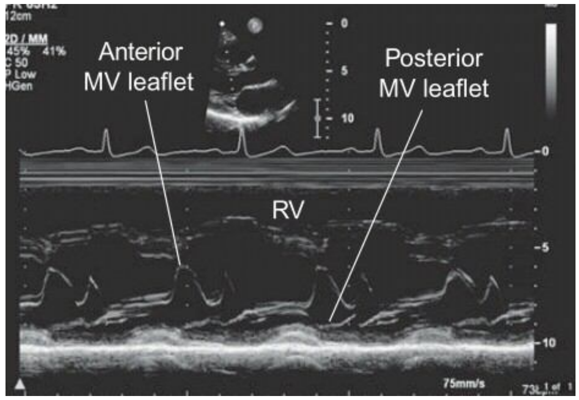
fiugre 2:6:1:1 M-mode mitral valve level

(Essential Echocardiography- 2007)

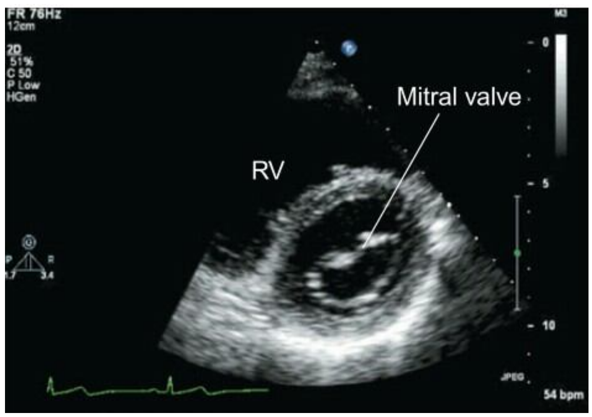


parasternal long axis View (2 –D) with M-mode cursor

Figure 2:6:1:2(A) positioning of the cursor for M-mode study of the mitral valve.



Fiuger 2:6:1:2(B) parasternal long axis view(M-mode)
(Making sense of Echocardiography – (2009))



Fiugre 2:6:1:3 parasteranal short axisview(2-D) (mitral valve level)
(Making sense of Echocardiography – (2009))

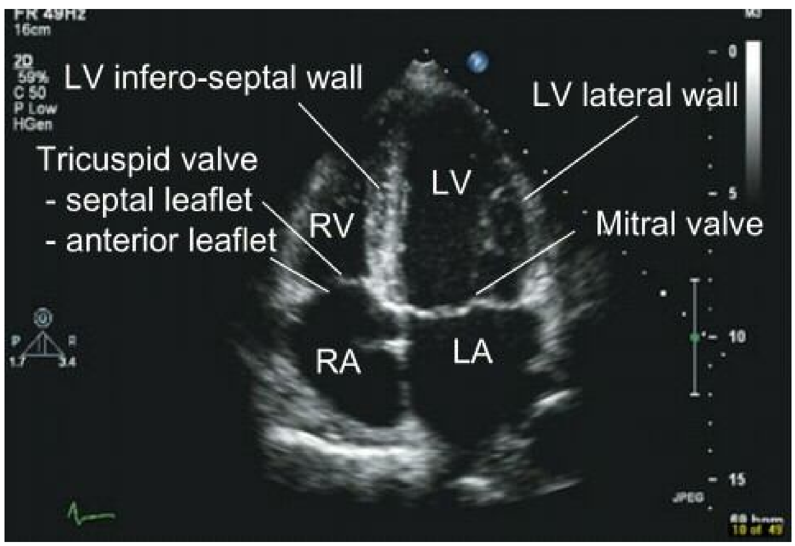
2:6:2 Apical window:

The apical window is located at the LV apex this is normaly in mid calvicular line and the fifth inter costal space from the apical window a number of viwe can be abtained apical 4-chamber to abtain this view place the probe in apical position with the dot pointing towards the patient` left for an optimal view aim to position the probe exactly at the apex to aviod distortion or fore shortening of the cardiac structures.use2-D to assess strutures and mobility of the mitral valve and colour doppler to examine mitral valve inflow.

Apical 2-chamber viwe from apical 4- chamber view rotate the probe about 60° anticlockwise so that the dot points towards the patient`s left shoulder

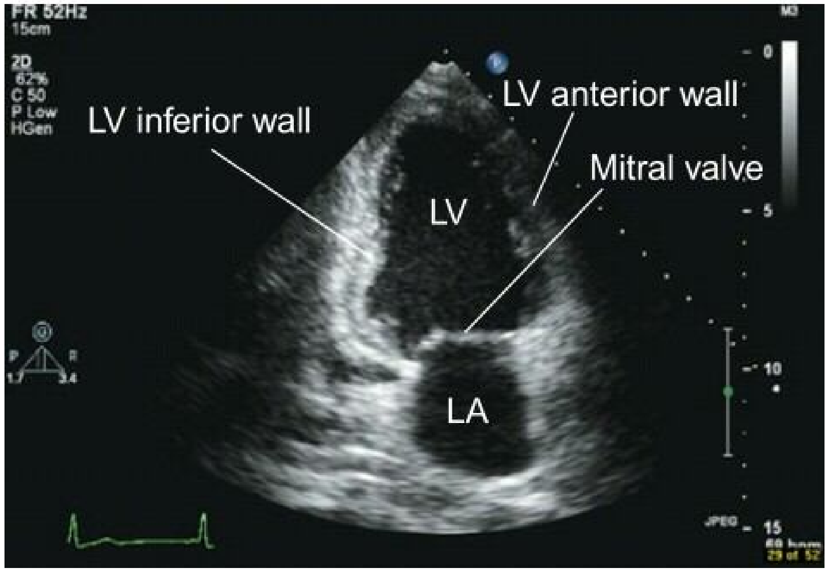
Stop rotating theprobe before the left ventrcle out comes in to view and ensure that the mitral is centred in the image .use2-D to assess structure and mobility of mitral valve, colour doppler to examine mitral valve inflow and contiouse(cw)and power (pw) doppler to assess mitral valve function.

Apical 3-chamber view from apical2-chamber maintian the same window but rotate the afurther 60° anticlockwise so that thedot point to wards the patient`s right shoulder stop ratating the probe once the lvot comes into view and ensure that the mitral and aortic valves are centred use 2-D to assess structure and mobility of mitral valve, colour dopplerto examine mitral valve inflow and cw,pw doppler to assess mitral valve function.



Fiugre 2:6:2:1 Apical 4-chamber view (2-D)

Making sense of Echocardiography (2009)



Fiujre 2:6:2:2Apical 2-chamber view(2-D)

Making sense of Echocardiography (2009)

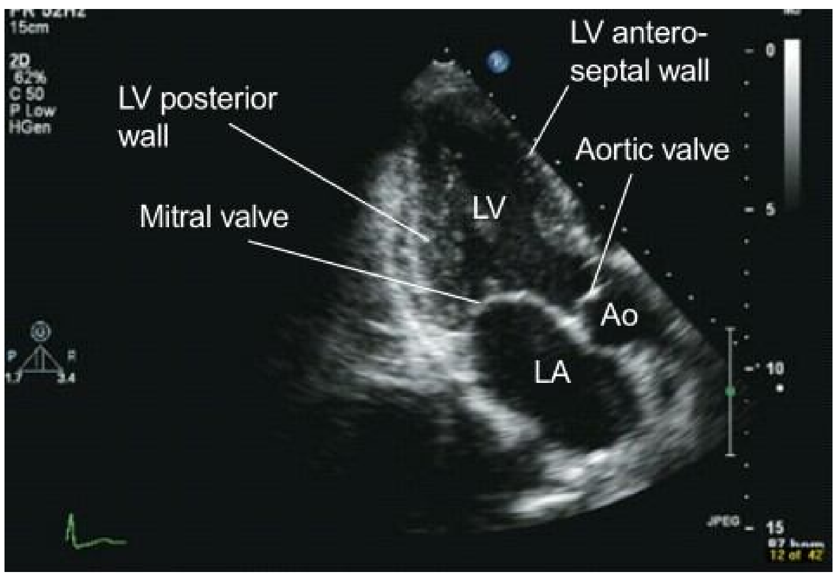


Figure 2:6:2:3Apical 3-chamber view (2-D)

Making sense of Echocardiography (2009)

2:7 previous study:-

Muhammad et al. (2013) aimedto find out the frequency of severity of mitral stenosis by using Two-dimensional (2D) Doppler echocardiography.Total 250 patients with mitral valve stenosis were selected from March 2015 to September 2015 from the Department of Cardiology Nishter Hospital Multan. Mean age of the patients was 37.8±9.45 and duration of symptoms was 7.55±5.67 months. Mild stenosis was found in 40(16%) patients, moderate stenosis in 88(35%) patients and severe stenosis was found in 122(49%) patients. Significant association of age and gender with severity of stenosis was found.Results of this study reveals that most of patients found with severe mitral valve stenosis. Stenosis was common in younger age group as compare to older age group and severity of stenosis significantly associated with age of the patients. Females were more affected by mitral valve stenosis as compare to male patients and significant association between gender and severity of the stenosis was found.

Berlin, et al. (2011)evaluated the precision of helical MDCT for the quantification of mitral valve stenosis (MVS) compared with transthoracic echocardiography (TTE) and cardiac catheterization. 28 patients with MVS of differing severity underwent an ECG-gated contrast-enhanced MDCT scan. The mitral valve area (MVA) was determined plan metrically by MDCT and was compared with Doppler TTE using the pressure half-time method and with cardiac catheterization using the Gorlin formula.

Planimetry of the MVA with MDCT was feasible in all cases. The MVA on MDCT (1.88 ± 0.76 cm^2) was significantly larger than that seen with TTE (1.74 ± 0.75 cm^2; p = 0.039) or cardiac catheterization (1.72 ± 0.67 cm^2; p = 0.037). The correlation between MDCT and TTE (r = 0.90; p< 0.001; limits of agreement, ± 0.65 cm^2) and that between MDCT and cardiac catheterization (r = 0.86; p< 0.001; limits of agreement, ± 0.76 cm^2) were good and similar to the correlation between TTE and cardiac catheterization

($r = 0.88$; $p < 0.001$; limits of agreement, ± 0.71 cm^2). The best cutoff level for detecting moderate-to-severe stenosis at MDCT was an MVA of 1.70 cm^2, resulting in a sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of 73%, 88%, 82%, 80%, and 83%, respectively, with two false-positive and three false-negative results.

The MVA plan metrically determined by MDCT is systematically larger than those calculated by Doppler TTE and cardiac catheterization. However, because of a good correlation between methods and adjustment for the systematic bias, MDCT may allow reliable quantification of MVS and effectual discrimination among severity grades, although discrepancies between methods remain in individual cases.

Chapter Three

3-1 Materials:

3-1-1 Machine used:

An echocardiograph machine my lab seven made in Chain (8-2015) in Alzaytouna hospital and my lab fifty made in Chain (8- 2010) in ALShaab teaching hospital with (phased array 4-MHZ) and ultra sound imaging system with 2 dimension and M mode capabilities was used and ultra sound gel was applied to the transducer to prevent any attenuation or anti-artifact and thermal paper printer was used. A data collection sheet was used to collect thedata and to number the patients.

3-2 Methods:

The study was conducted in (ALshaab teaching hospital and ALzaytouna hospital), Khartoum city, from July 1st, 2016 the end of January 2017.

3-2-1Sample size:

The study population, in selected way a total of fifty patients, age from 20-40 years were selected tobe the sample unit in this *study.*

3-2-2Ethical Approval:

Consent by the patients anyone in the study signed consent to be one of the study objects after had been told about what should be done for him.

3-2-3Data collection:

To collect the suitable data for the study personal information from anypatient is written in the data collection sheet as well as the results this include the following:

Age and sex of patient and what seen in two diminution image in m- mode and by Doppler measure the mean pressure gradient pressure half time and mitral valve area (MVA).

3-2-4 technique:

The patient lying on his left side with left arm under his head the transducer is placed on the fourth left intercostal space near sternal edge various sections may be made long axis plane(LAX), short axis plane (SAX) andapical View (apical four chamber Apical, three chamber Apical and two chamber) .

3-2-5 Image Interpretation:-

In long axis view, I see the left atrium, mitral valve, left ventricle out flow, Aortic valve and Right ventricle out flow.

In the left para sternal short axis view, we see the LV body in cross-section 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 cuts all the four chambers left atrium (LA)left ventricle (LV) right atrium (RA) right ventricle (RV) with mitral valve (MV), Aortic valve (AV) and tri-cuspedvalve (TV) in apical three chamber view we see the left Atrium(LA) left ventricle (LV),mitral valve (MV) and aortic valve (AV).

In apical two-chamber view:

We see the left Atrium (LA), left ventricle (LV), and mitral valve (MV).

3-2-6 Data analysis:

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

Chapter Four

Results

Table (4.1) Frequency distribution of age group

Age group	Frequency	Percent	Valid Percent	Cumulative Percent
20-30 years	20	40.0	40.0	40.0
31-40 years	30	60.0	60.0	100.0
Total	50	100.0	100.0	
Minimum= 20,maximum =40,means= 32.1,std. Deviation= 5.40691				

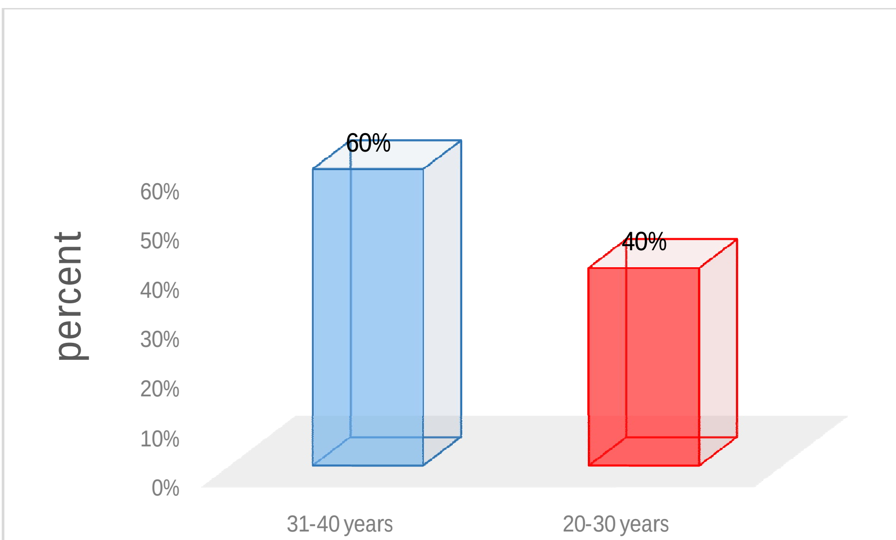


Figure (4.1) Frequency distribution of age group

Table (4.2) Frequency distribution of gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	33	66.0	66.0	66.0
Male	17	34.0	34.0	100.0
Total	50	100.0	100.0	

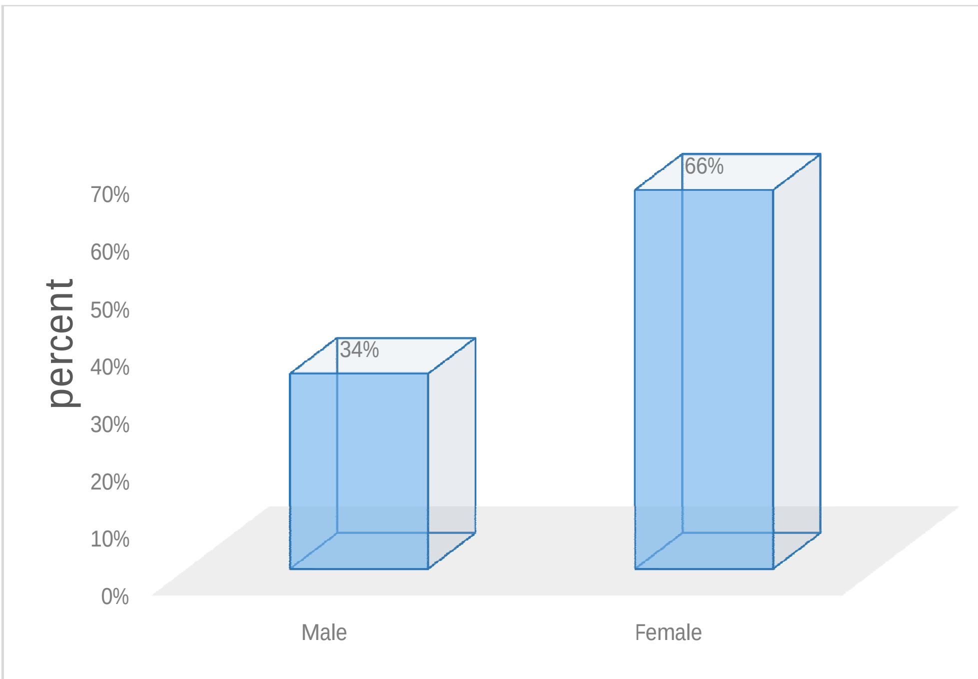


Figure (4.2) Frequency distribution of gender

Table (4.3) Frequency distribution of 2D ultrasound features of mitral valve stenosis patient's

Feature	Frequency	Percent	Valid Percent	Cumulative Percent
thickened and calcifiedone third of mitral leaflets	18	36.0	36.0	36.0
thickened and calcified whole leaflets	25	50.0	50.0	88.0
thickened tip of the leaflets	7	14.0	14.0	100.0
Total	50	100.0	100.0	

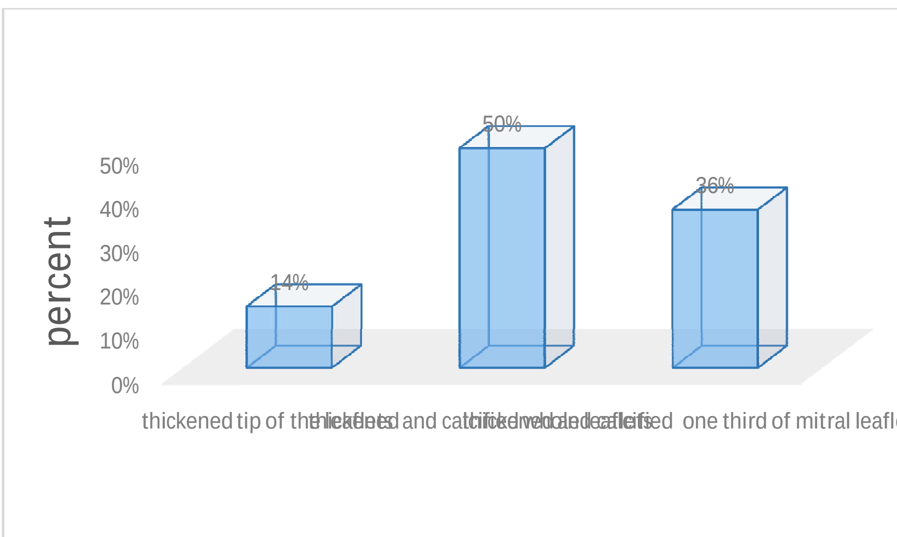


Figure (4.3) Frequency distribution of 2D ultrasound features of mitral valve stenosis patient's

Table (4.4) Frequency distribution of M mode ultrasound features of mitral valve stenosis patient's

M mode features	Frequency	Percent	Valid Percent	Cumulative Percent
decrease of E.F slope	18	36.0	36.0	36.0
more decrease of E.F slope	25	50.0	50.0	86.0
normal E.F slope	7	14.0	14.0	100.0
Total	50	100.0	100.0	

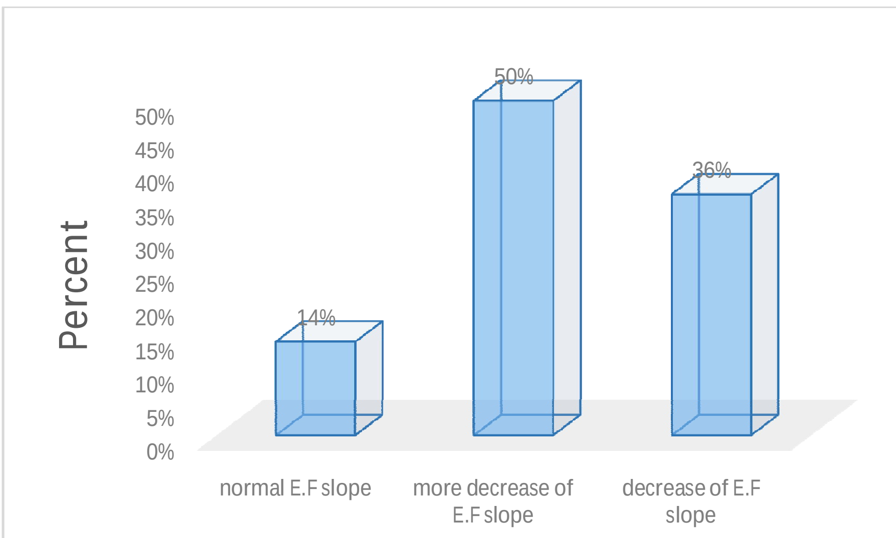


Figure (4.4) Frequency distribution of M mode ultrasound features of mitral valve stenosis patient's

Table (4.5) Frequency distribution of Mean Pressure Gradient of mitral valve stenosis patient's

Mean Pressure Gradient	Frequency	Percent	Valid Percent	Cumulative Percent
less than 5 mm Hg	7	14.0	14.0	14.0
5-10 mm Hg	18	36.0	36.0	50.0
more than 10 mm Hg	25	50.0	50.0	100.0
Total	50	100.0	100.0	
Minimum= 3,maximum =27,means= 15.46,std. Deviation= 8.43271				

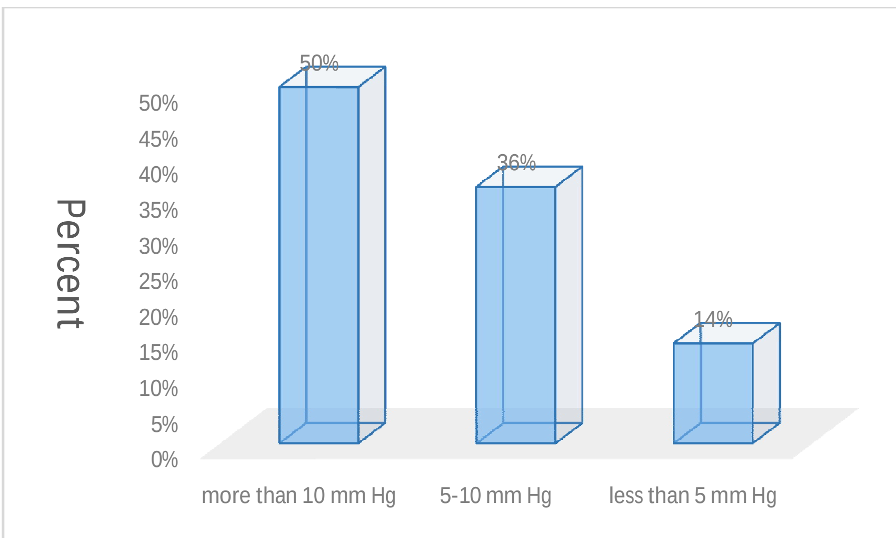


Figure (4.5) Frequency distribution of Mean Pressure Gradient of mitral valve stenosis patient's

Table (4.6) Frequency distribution of Pressure Half Time of mitral valve stenosis patient's

PHT	Frequency	Percent	Valid Percent	Cumulative Percent
less than 150 ms	7	14.0	14.0	14.0
150 -220 ms	18	36.0	36.0	50.0
more than 220 ms	25	50.0	50.0	100.0
Total	50	100.0	100.0	
Minimum= 122.2,maximum =275,means= 201.832,std. Deviation= 51.607				

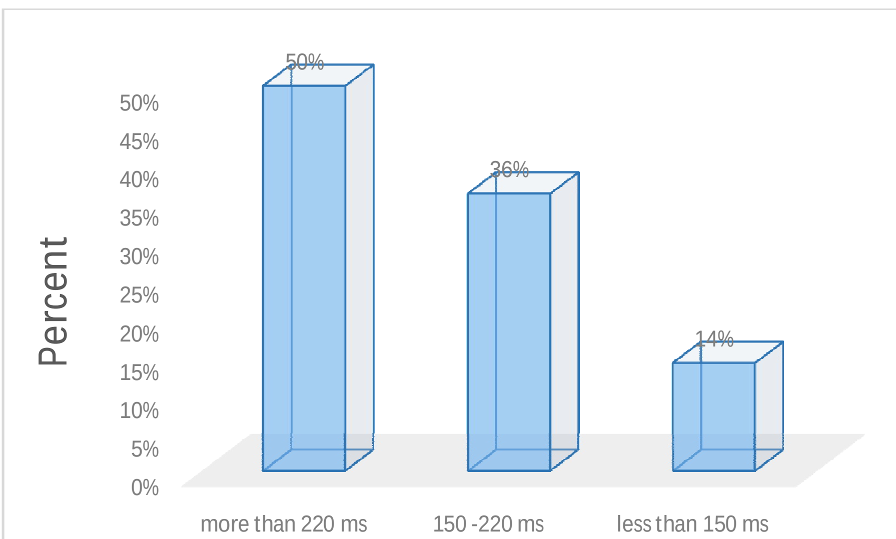


Figure (4.6) Frequency distribution of Pressure Half Time of mitral valve stenosis patient's

Table (4.7) Frequency distribution of MVA in mitral valve stenosis patient's

MVA	Frequency	Percent	Valid Percent	Cumulative Percent
less than 1cm2	25	50.0	50.0	50.0
1.0-1.50cm2	18	36.0	36.0	86.0
more than 1.5 cm2	7	14.0	14.0	100.0
Total	50	100.0	100.0	
Minimum= 0.80,maximum =1.80,means= 1.1730,std. Deviation= 0.31741				

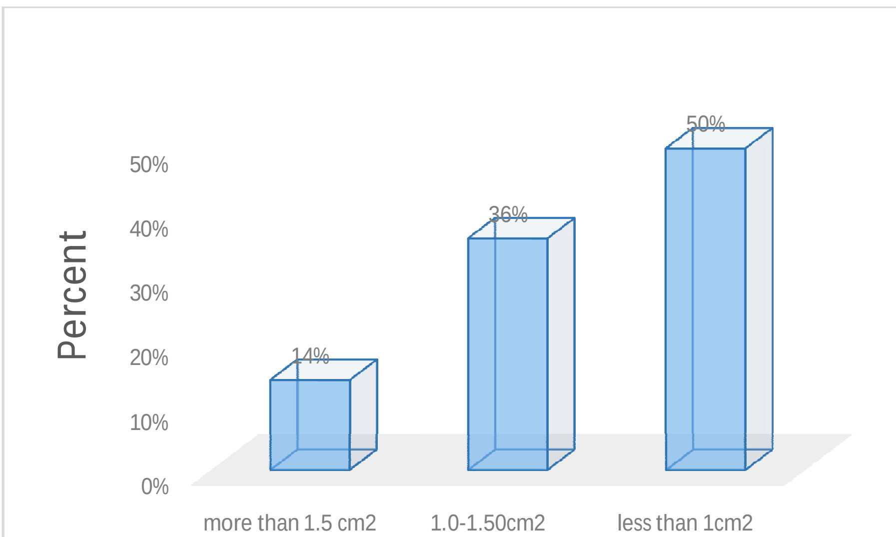


Figure (4.7) Frequency distribution of MVA in mitral valve stenosis patient's

Table (4.8) Frequency distribution of degree of mitral valve stenosis

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Mild stenosis	7	14.0	14.0	14.0
Moderate stenosis	18	36.0	36.0	50.0
Severe stenosis	25	50.0	50.0	100.0
Total	50	100.0	100.0	

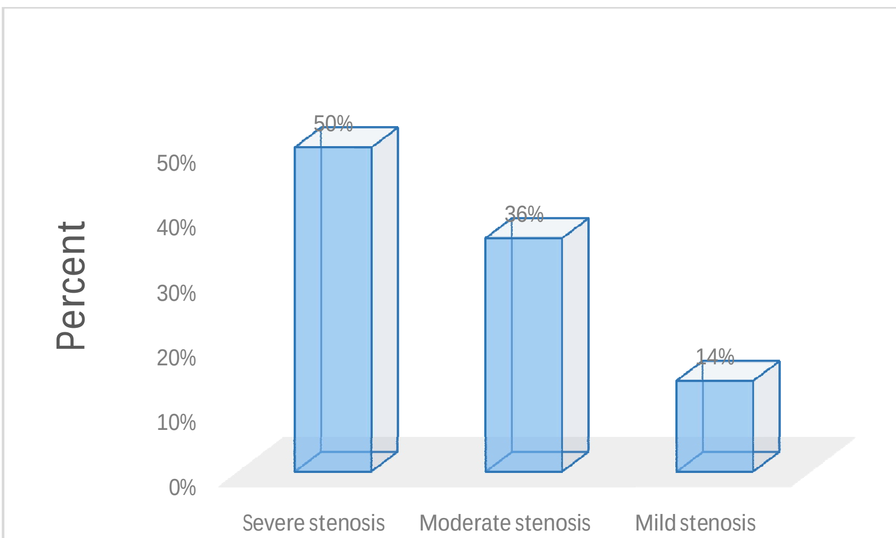


Figure (4.8) Frequency distribution of degree of mitral valve stenosis

Table (4.9) cross tabulation age and degree of mitral valve stenosis

Age group	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
20-30 years	7	9	4	20
31-40 years	0	9	21	30
Total	7	18	25	50
P value =0.000				

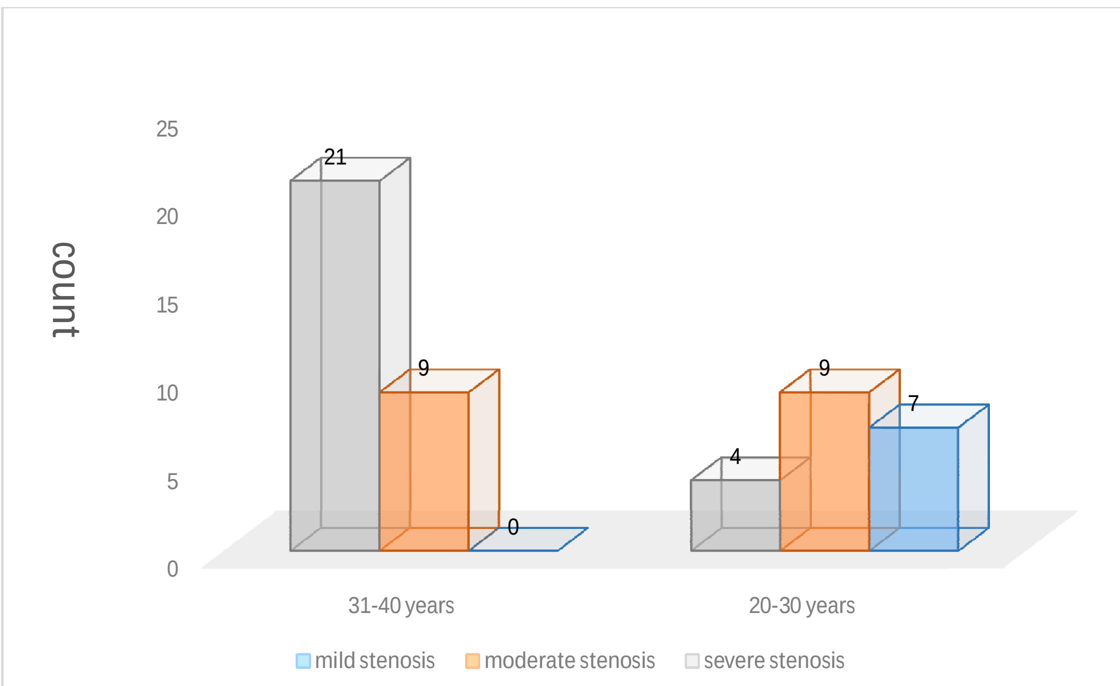


Figure (4.9) cross tabulation age and degree of mitral valve stenosis

Table (4.10) cross tabulation 2D features and degree of mitral valve stenosis

2D features	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
thickened and calcifiedone third of mitral leaflets	0	18	0	18
thickened and calcified whole leaflets	0	0	25	25
thickened tip of the leaflets	7	0	0	7
Total	7	18	25	50
P value =0.000				

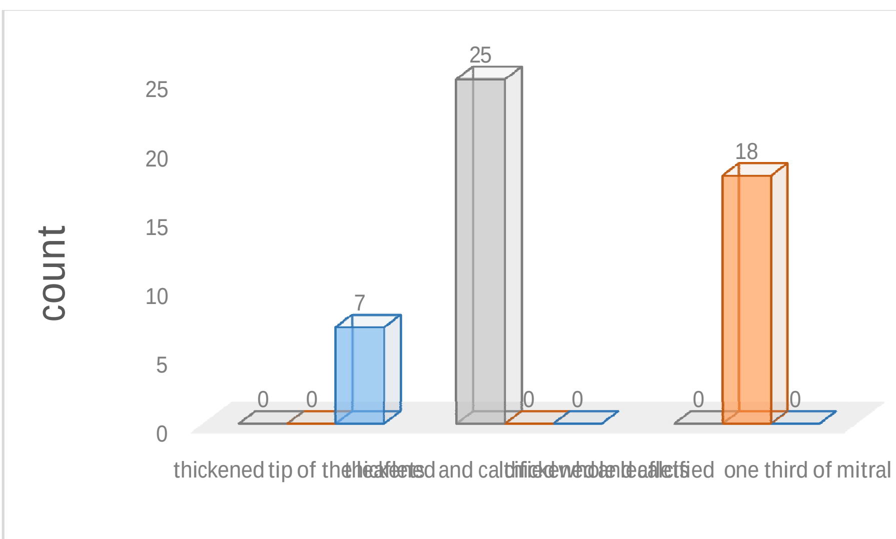


Figure (4.10) cross tabulation 2D features and degree of mitral valve stenosis

Table (4.11) cross tabulation M mode features and degree of mitral valve stenosis

M mode features	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
decrease of E.F slope	0	18	0	18
more decrease of E.F slope	0	0	25	25
normal E.F slope	7	0	0	7
Total	7	18	25	50
P value = 0.000				

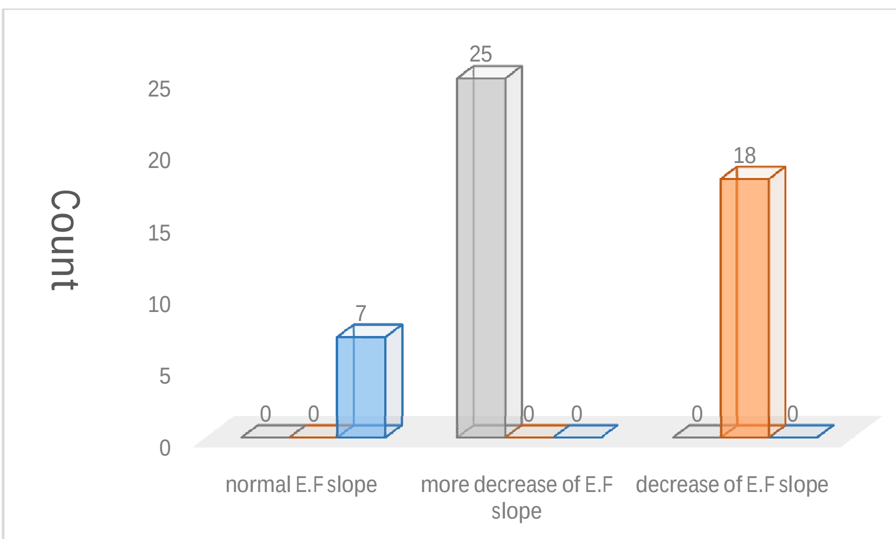


Figure (4.11) cross tabulation M mode features and degree of mitral valve stenosis

Table (4.12) cross tabulation Mean Pressure Gradient and degree of mitral valve stenosis

MPG	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
less than 5 mm Hg	7	0	0	7
5-10 mm Hg	0	18	0	18
more than 10 mm Hg	0	0	25	25
Total	7	18	25	50
P value = 0.000				

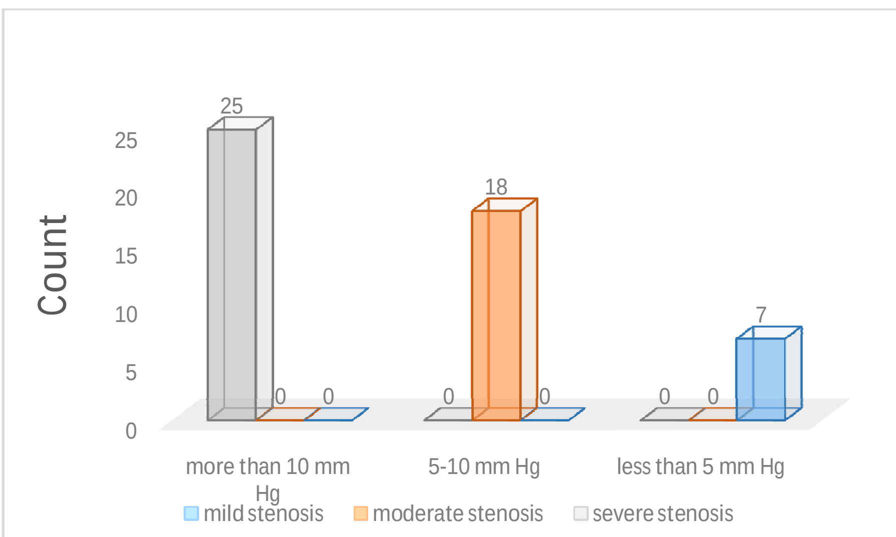


Figure (4.12) cross tabulation Mean Pressure Gradient and degree of mitral valve stenosis

Table (4.13) cross tabulation Pressure half time and degree of mitral valve stenosis

PHT	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
less than 150 MS	7	0	0	7
150 -220 MS	0	18	0	18
more than 220 MS	0	0	25	25
Total	7	18	25	50
P value = 0.000				

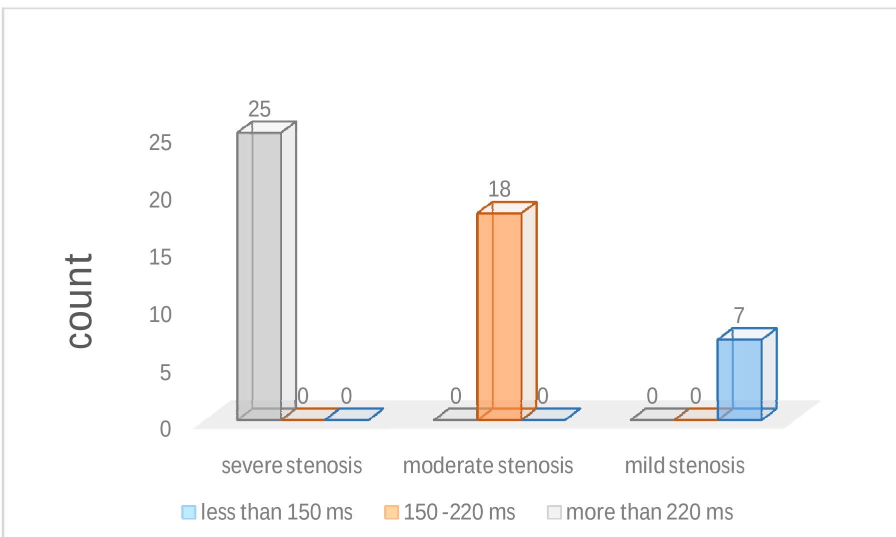


Figure (4.13) cross tabulation Pressure half time and degree of mitral valve stenosis

Table (4.14) cross tabulation mitral valve area and degree of mitral valve stenosis

MVA	Degree of stenosis			Total
	mild stenosis	moderate stenosis	severe stenosis	
less than 1cm2	0	0	25	25
1.0-1.50cm2	0	18	0	18
more than 1.5 cm2	7	0	0	7
Total	7	18	25	50
P value = 0.000				

Figure (4.14) cross tabulation mitral valve area and degree of mitral valve stenos

Table (4.15) correlation between mitral valve area, pressure halve time and mitral valve area

		PHT	MVA	MPG
PHT	Pearson Correlation	1	-.970**	.955**
	Sig. (2-tailed)		.000	.000
	N	50	50	50
MVA	Pearson Correlation	-.970**	1	-.930**
	Sig. (2-tailed)	.000		.000
	N	50	50	50
MPG	Pearson Correlation	.955**	-.930**	1
	Sig. (2-tailed)	.000	.000	
	N	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).				

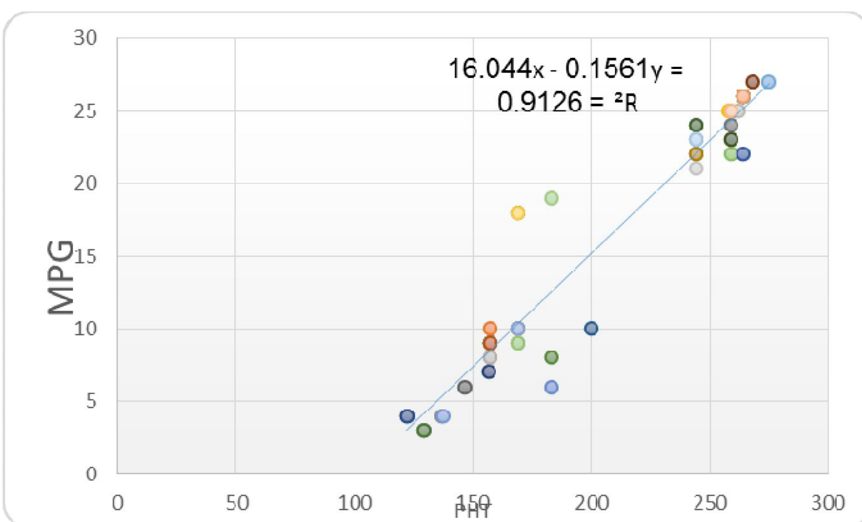


Figure (4.15) scatter plot shows relationship between MPG and PHT

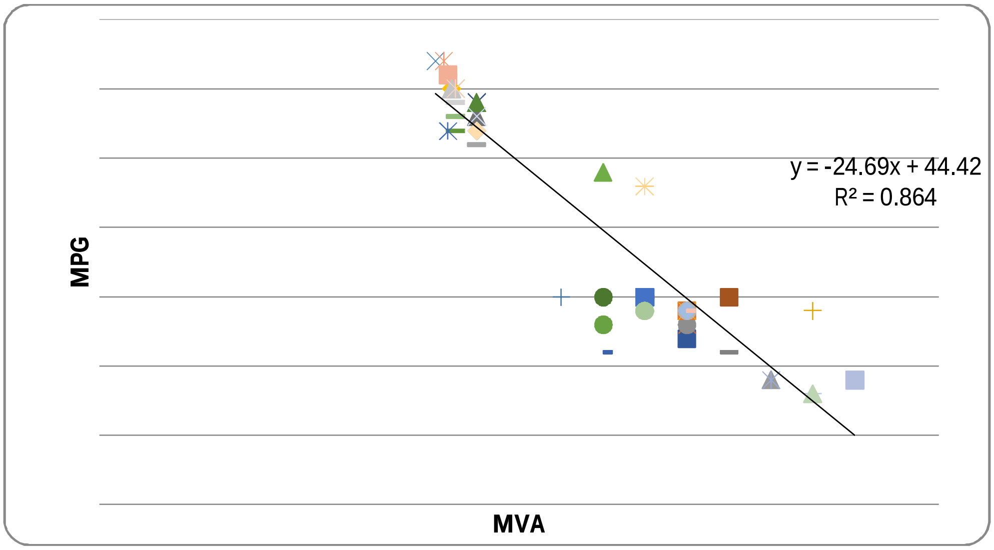


Figure (4.16) scatter plot shows relationship between MPG and Mitral valve area

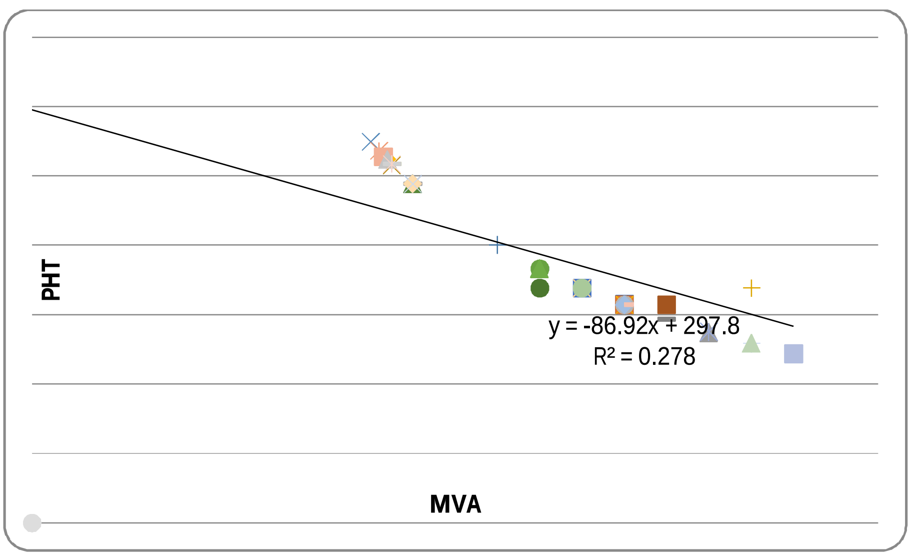


Figure (4.17) scatter plot shows relationship between pressure halve time and Mitral valve area

Chapter Five

5:1 Discussion:

This thesis aimed to study rheumatic mitral valve stenosis using echocardiography .Atotal of 50 subjects were involved in the study aged between (20-40) years the mean of aged was 32.1±5.4 as described in table (4-1).

Age was grouped in to two groups (20-30) years (40%), and(31-40)years (60%) as described in figure (4-1).

The study also described the 2D- ultrasound features of mitral valve stenosis patients these features include 18 patients with thickened and calcified one third of mitral leaflets (36%), 25 patients with thickened and calcified whole leaflets (50%), 7 patients with thickened tip of the leaflets (14%) as described in figure (4-3).

M –mode ultrasound also was done and the features of it include 18 patients with decrease of EF slope (36%), 25 patients with more decrease of EF slope (50%), 7 patients with normal EF slope (14%) as shown in figure (4-4).

This study also includes the mean pressure gradient it was ranged between 3-27mmHg.the mean was 15.8± (8.3) as shown in table (4-5). Seven patients were less than 5 mmHg (14%), 18 patients were ranged between (5-10) mmHg (36%), 25 patients with mean pressure gradient more than 10 mmHg (50%) as shown in figure (4-5).

This study also measured the pressure half time of mitral valve Stenosis, it found that 7 patients were less than 150 MS (14%), 18 patients ranged between (150-220) MS (36%), 25 patients were more than 220 MS (50%) as shown in figure (4-6).

The minimum value 122.2MS, maximum value 275, and the mean was 202± 51.4 as described in table (4-6).

The result of this study showed that the mean of mitral valve area in mitral stenosis patients was 1.17± (0.317) cm2 the minimum value was 0.80cm2 and maximum value 1.80 cm2 (table 4-7).it was found that there were25 patients less than 1cm2 (50%), 18 patients ranged from (1.0-1.5) cm2 (36%), 7 patients more than 1.5 cm2 (14%) as described in figure (4-7).

The study also described the degree of mitral valve stenosis; it was found that there were 7 patients with mild stenosis, 18 patients with moderate stenosis, 25 patients with severe stenosis as described in table (4-8).

This study correlated between the age and degree of stenosis, it was found that 20 patients aged between 20-30 years most of them were with moderate stenosis (9 patients), 4 patients were with severe stenosis, and 7 patients were with mild stenosis .similarly there were 30 patients aged between (31-40) years 21 of them were with severe stenosis and 9 were with moderate stenosis in this age group there were no patients with mild stenosis as described in figure (4-9).

The study also correlated between 2D- ultrasound features and degree of stenosis it was found that all patients with thickened and calcified one third of mitral leafletshad moderate stenosis, and all patients with thickened and calcified whole leaflets had severe stenosis, all patients with thickened tip of leaflets had mild stenosis(figure 4-10).

The study also correlated between M-mode features and the degree of mitral valve stenosis,it was found that all patients(18 patients) with decrease of EF slope had moderate stenosis,all patients with more decrease of EF slope had severe stenosis, and all patients with normal EF slope had mild this stenosis (Figure 4 -11).

This study correlated between mean pressure gradient and the degree of mitral valve stenosis, it was found all patients whose pressure gradient less than 5mmHg,that most of patients whose mean pressure gradient ranged from 5 – 10 mmHg had moderate stenosis, and all patients whose gradient pressure more than 10 mmHg had severe stenosis (figure 4 – 12). Similarly the pressure study correlated between the pressure half time and degree of mitral valve stenosis it was found that all patients who Had mild stenosis were with pressure half time less than 150 MS, all patients who had moderate stenosis were with pressure half time between (150-220) MS, and all patients who had severe stenosis were with pressure half time more than 220 MS (figure4-13).

Figure (4-14) showed that there that was relation between mitral valve area and the degree of mitral valve stenosis,it was found that when the mitral valve more than 1.5 cm2 always mild stenosis, when the MVA between(1.0-1.5) cm2 is moderate stenosis,when the MVA less than 1.0cm2 is severe stenosis .

The study correlated between MVA and PHT, it was found that the correlation was significant using person correlation at 0.01 level (table 4-13).

The result of study showed that there was direct linear relationship between MPG and PHT, it was found the PHT increased by 5.77 MS /each mmHg of MPG as described in figure (4-14).

Also the study showed that there was a revers relationship between the MVA and MPG; it was found that the MVA was decreased by -24.69 cm2/ each mmHg of MPG as shown in figure (4-15).

The study showed that there was a revers relationship between MVA and PHT, it was found that the MVA was decreased by - 157.69 cm2 /each MS of PHT.

5:2 Conclusion:

Echocardiography is primary modality for evaluationof rheumatic mitral valve stenosis.

M-mode and 2D, echo Doppler all to be correlated in estimating the severity of rheumatic mitral valve stenosis.

Rheumatic mitral valve stenosis was found in younger age than older one.

Rheumatic mitral valve stenosis was found more in female than male.

More sever the rheumatic mitral valve stenosis the longer pressure half time.

More sever the rheumatic mitral valve stenosis more increased the mean pressure gradient.

5:3 Recommendations:

Echocardiography could be used as routine checkup follow up to help diagnosis, treatment, and control of rheumatic mitral valve stenosis.

Echocardiography is easy and safe way to diagnose rheumatic valve stenosis.

Echocardiography could be used after surgical intervention.

Further studies should be done to evaluate mitral valve stenosis.

Increase number of patients to give more accurate results.

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Appendix

Images

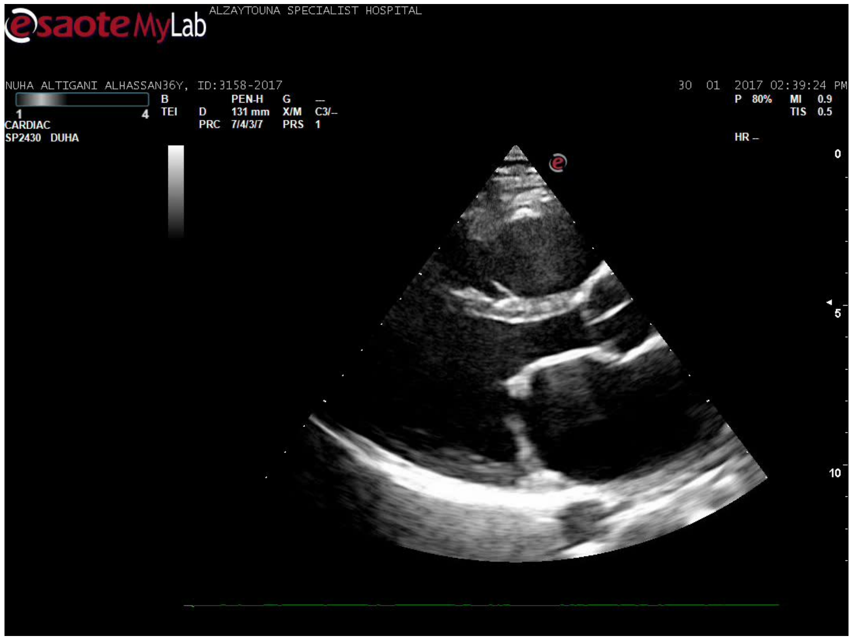
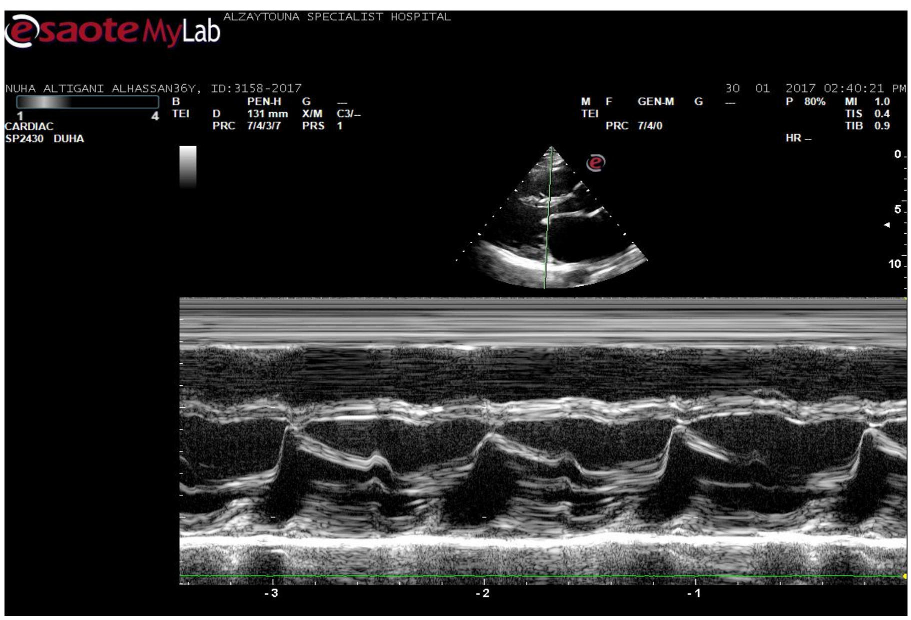
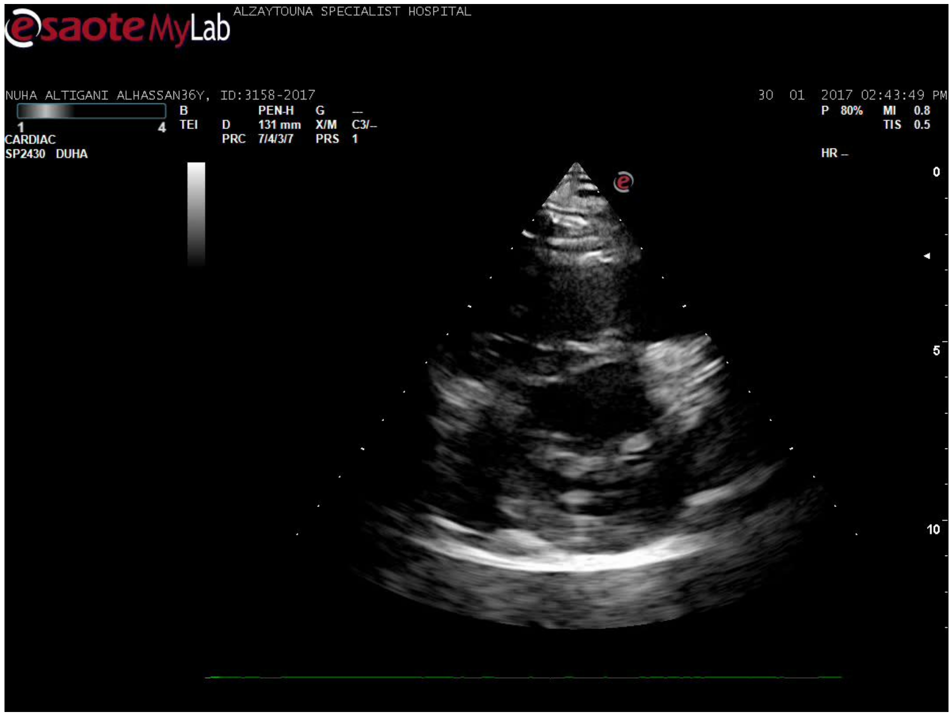


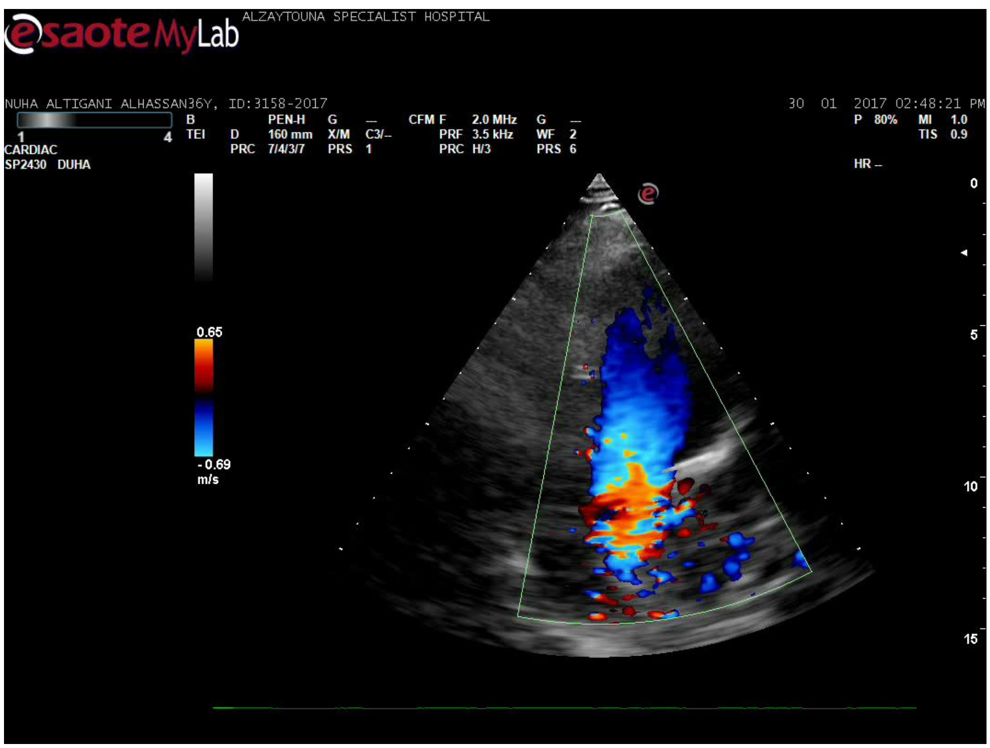
Image (a) parasternal long axis show thickened and calcified one third of leaflets2-D



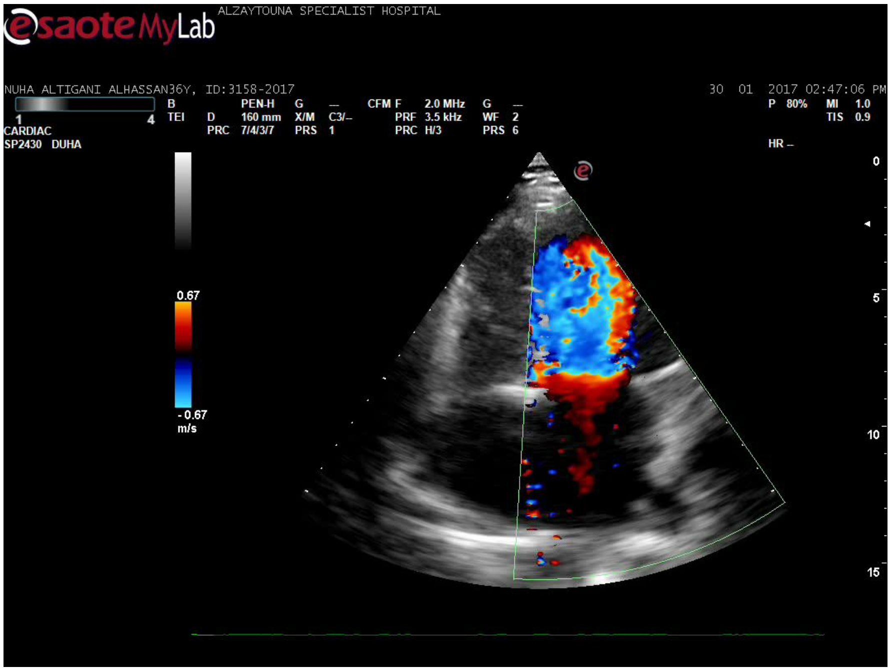
(b)M-mod, Parasternal long axis show decreased of EF slope



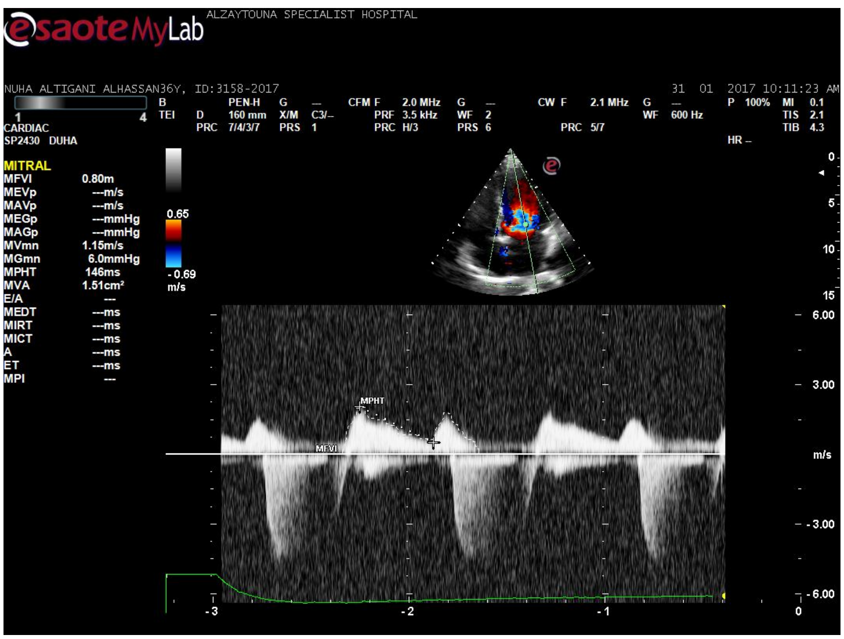
(c) 2-D Parasternal short axisshow thickened and calcified one third of leaflets



(d) Color Doppler-2-chamber show mitral valve in flow



(e) Color Doppler – 4 – chamber view show mitral valve in flow



b(f) Pulsed wave-Doppler- 4 chamber view showed the function of mitral valve

All image above show moderate rheumatic mitral valve stenosis of 26years old –female

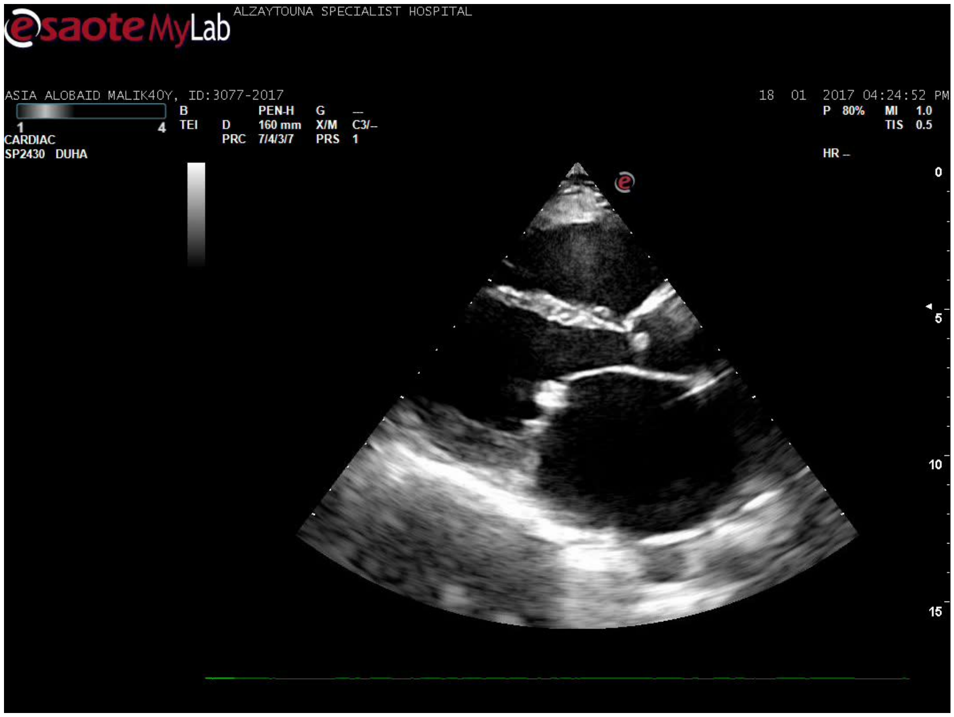
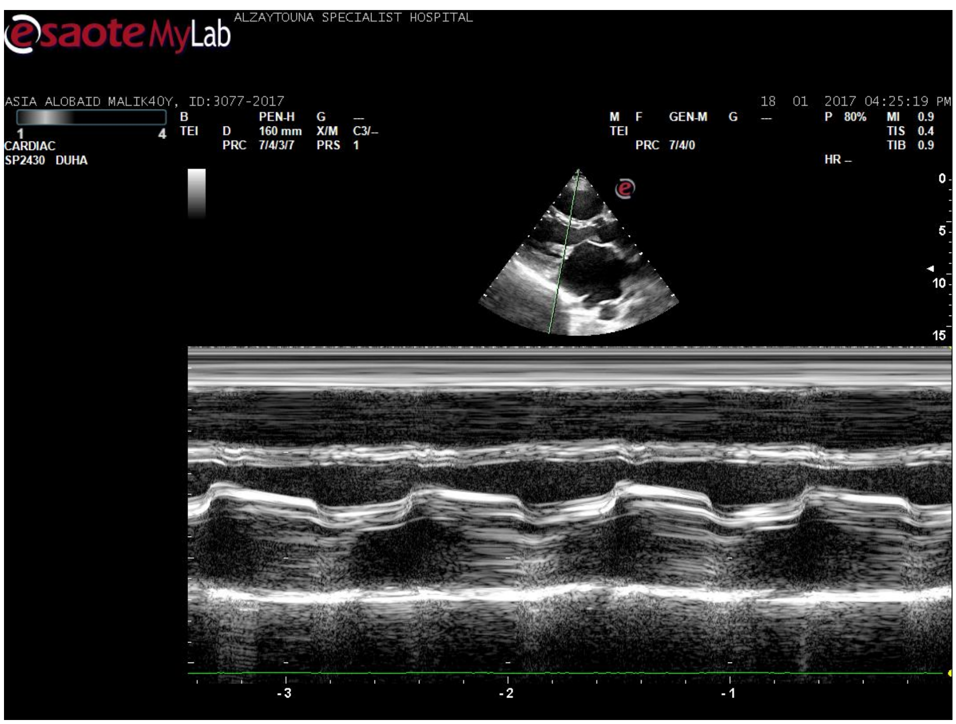
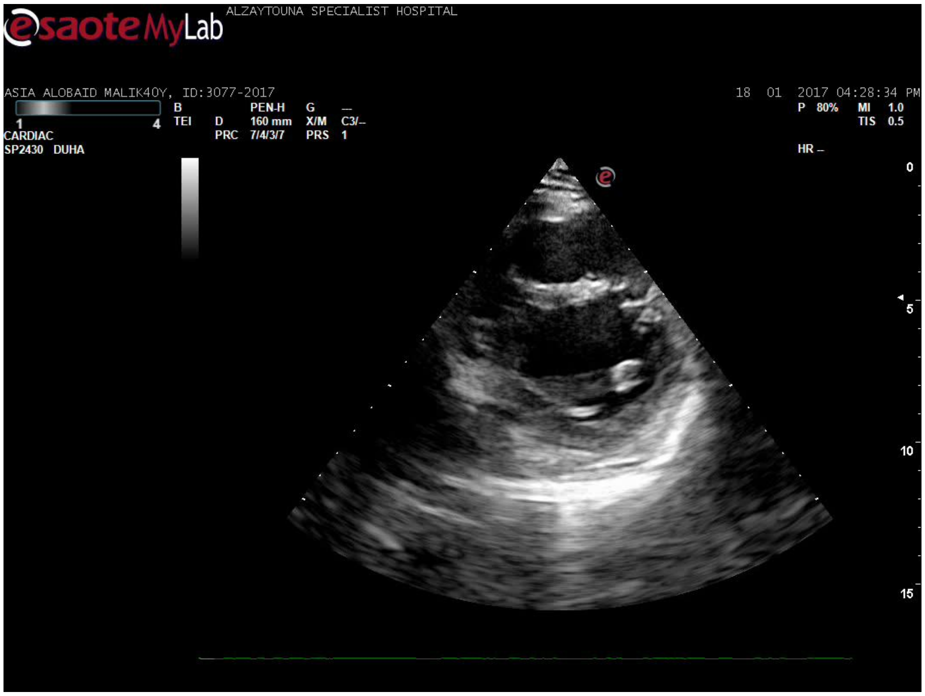


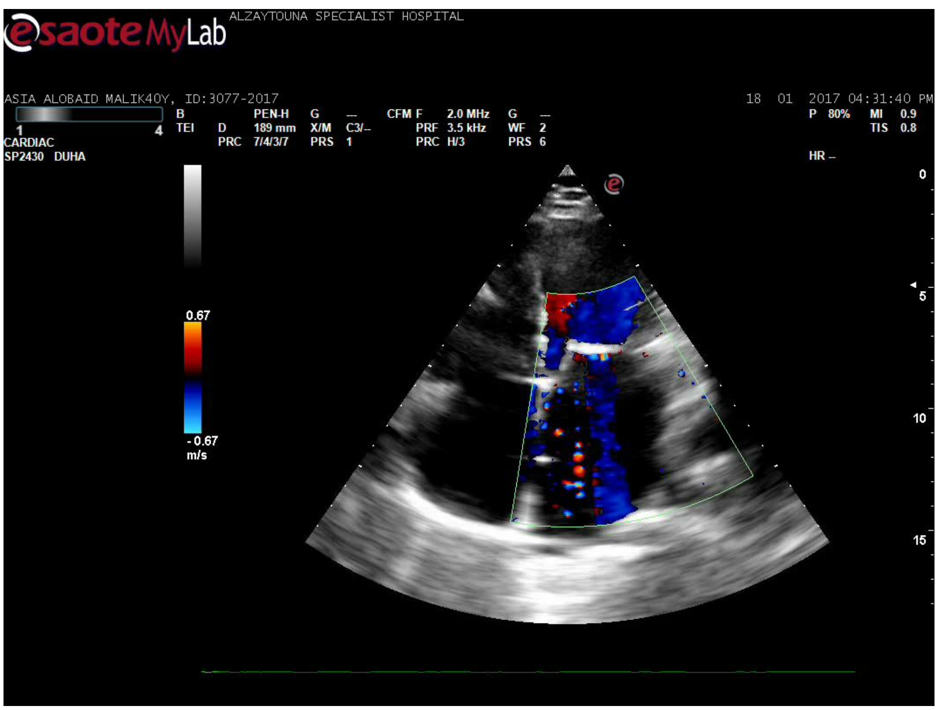
Image (a) D-parasternal long axis view show thicken and calcified whole leaflets



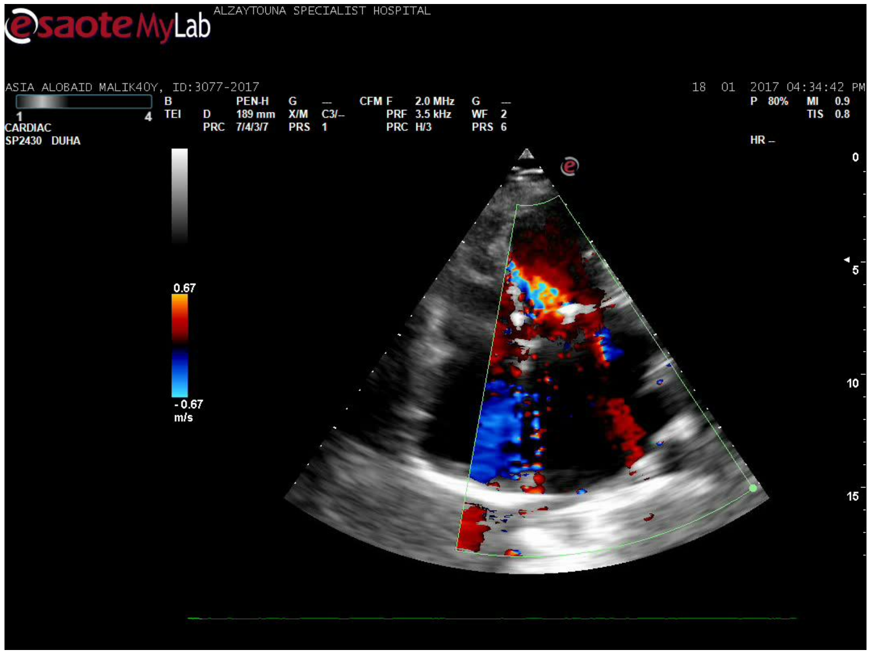
(b)M-mode parasternal long axis view show more decrease EF slope



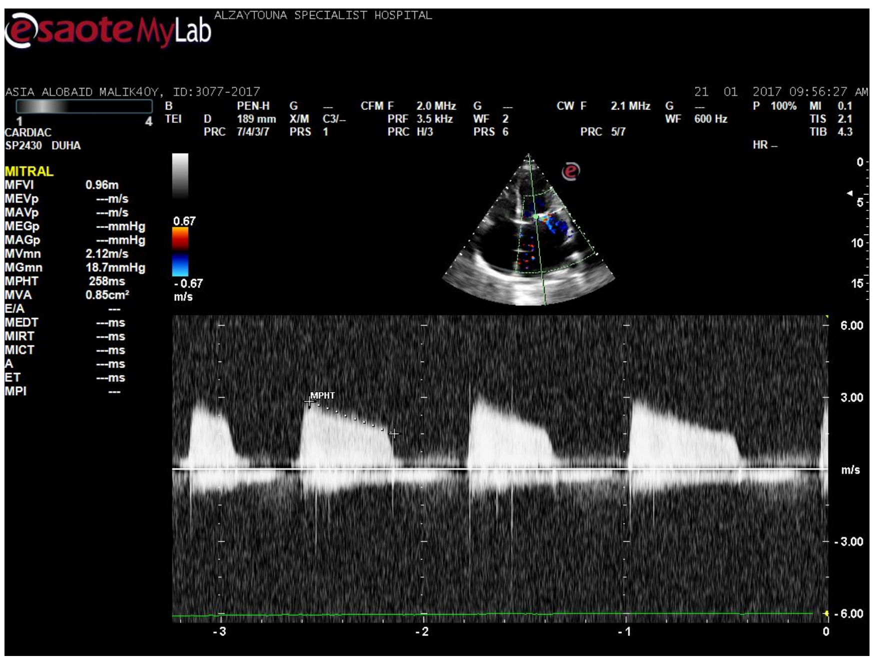
(c) 2D –parasternal short axis view show thickened and calcified whole leaflets



(d) Color Doppler 4-chamber view show mitral valve inflow



(e) Color Doppler -2-chamber view show mitral valve inflow



(f) Pulsed wave Doppler -4chamber view show function of mitral valve

All images above show severe rheumatic mitral valve stenosis (40 years old –female)

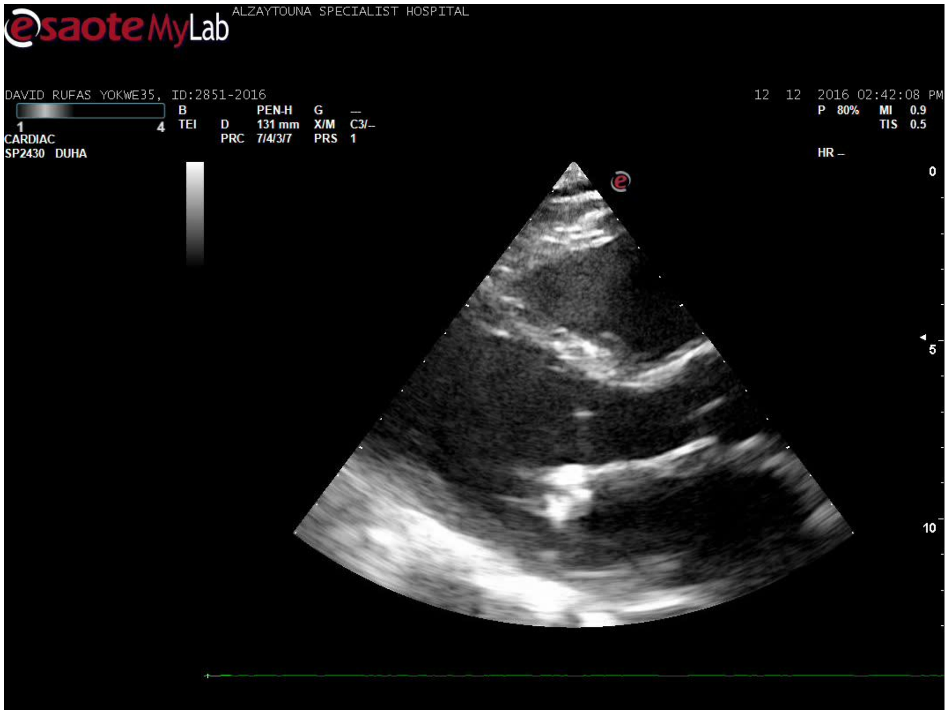
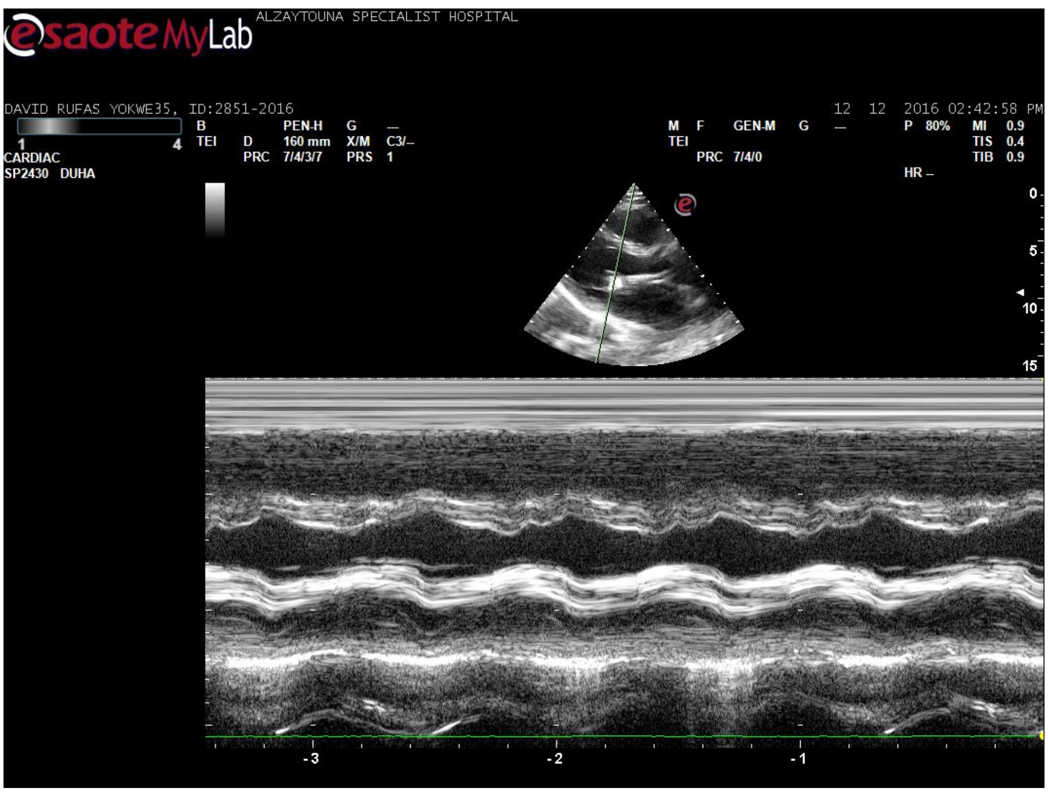
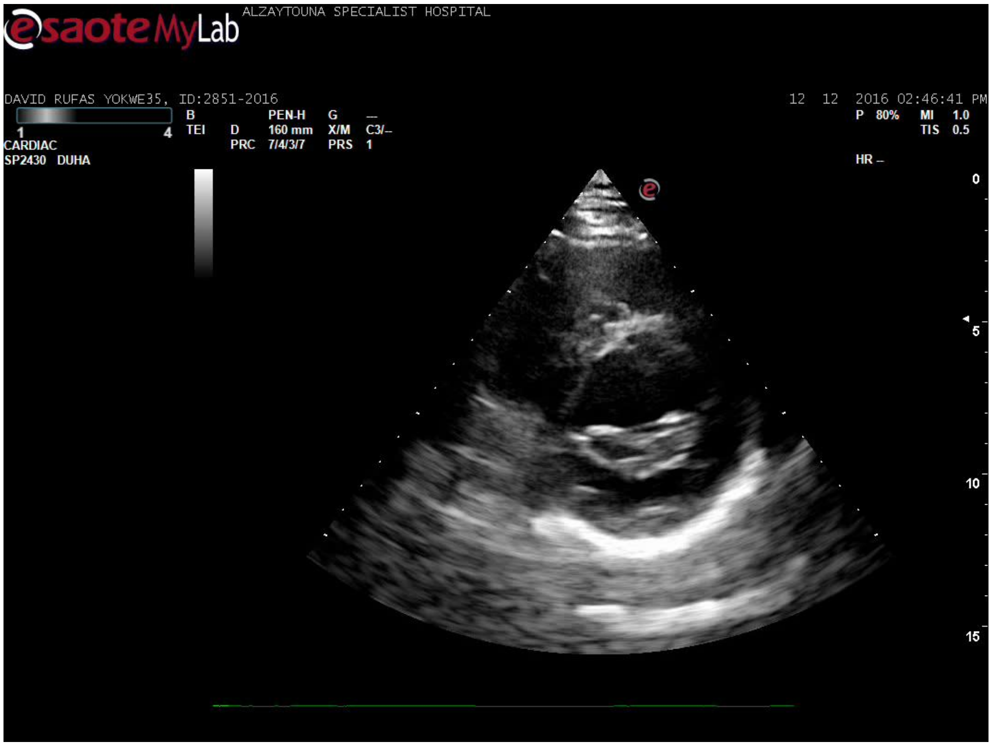


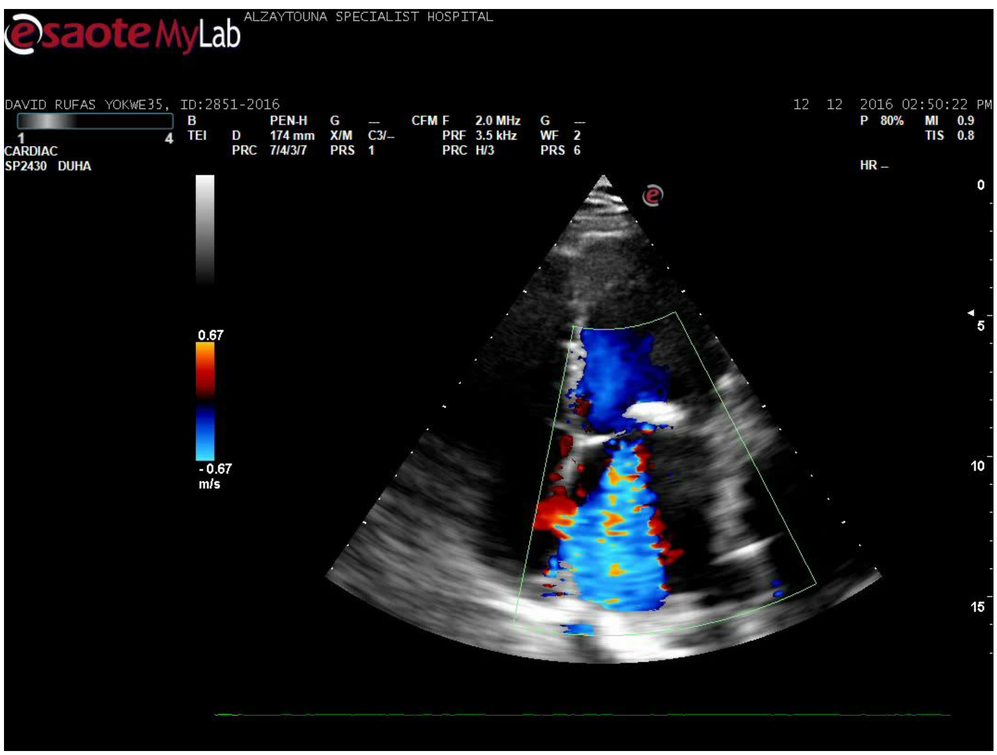
Image (a) 2D-parasternal long axis show thickened and calcified whole leaflets



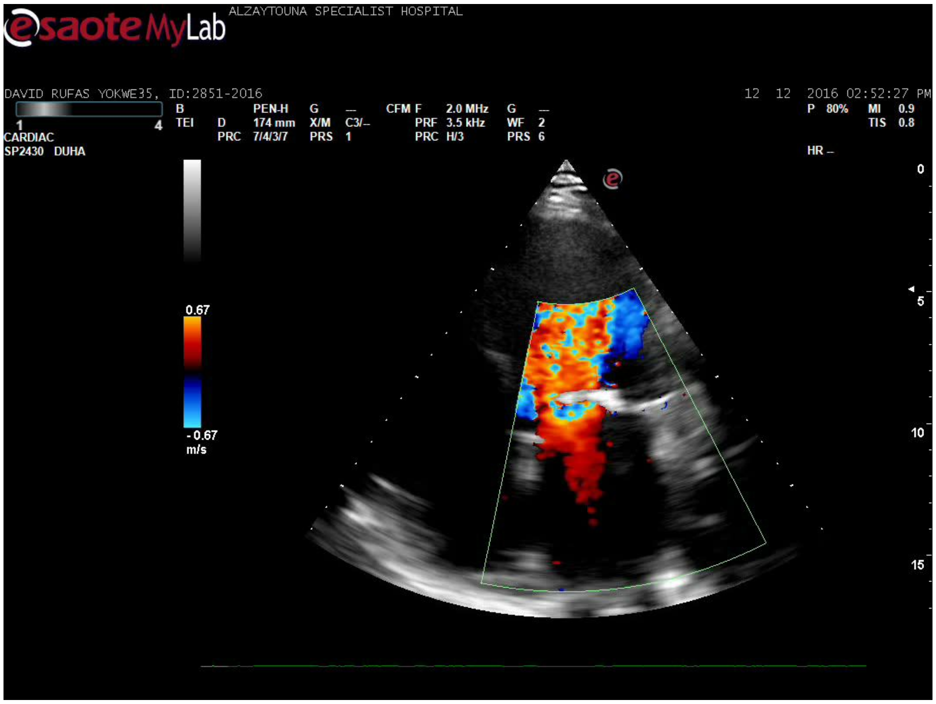
(b) M-mode parasternal long axis show more decrease EF slope



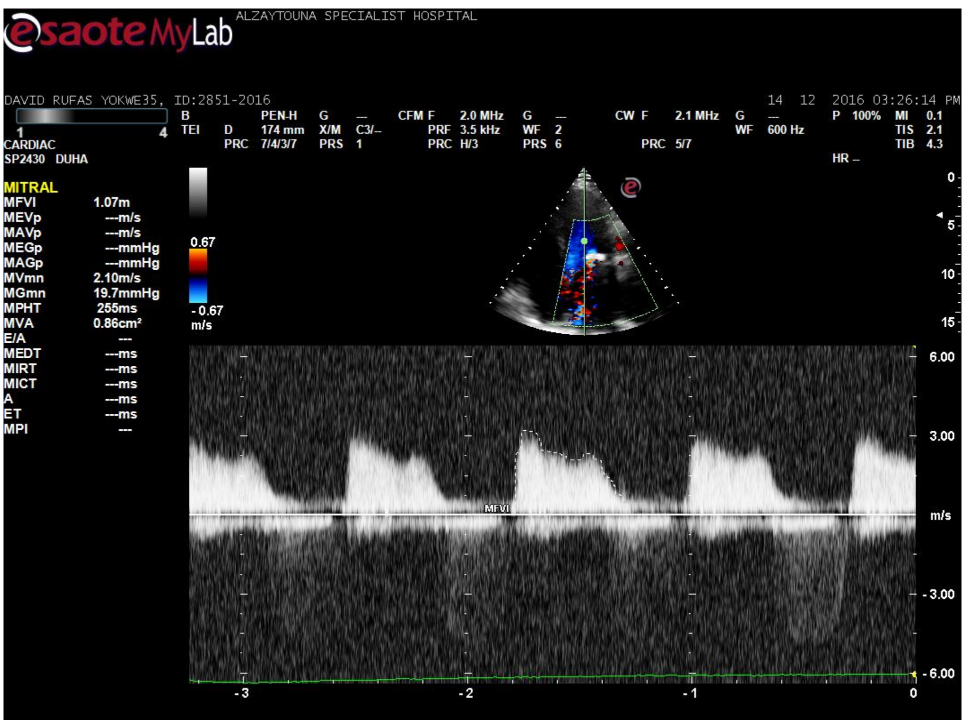
(c) 2D-short axis view show thickened whole leaflets



(d) Color Doppler -4-chamber view show mitral valve inflow



(e) Color Doppler 2 chamber view show mitral inflow



(f) Pulsed wave Doppler 4 chamber show function of mitral valve

All images above show sever rheumatic valve stenosis of 37 years old –male

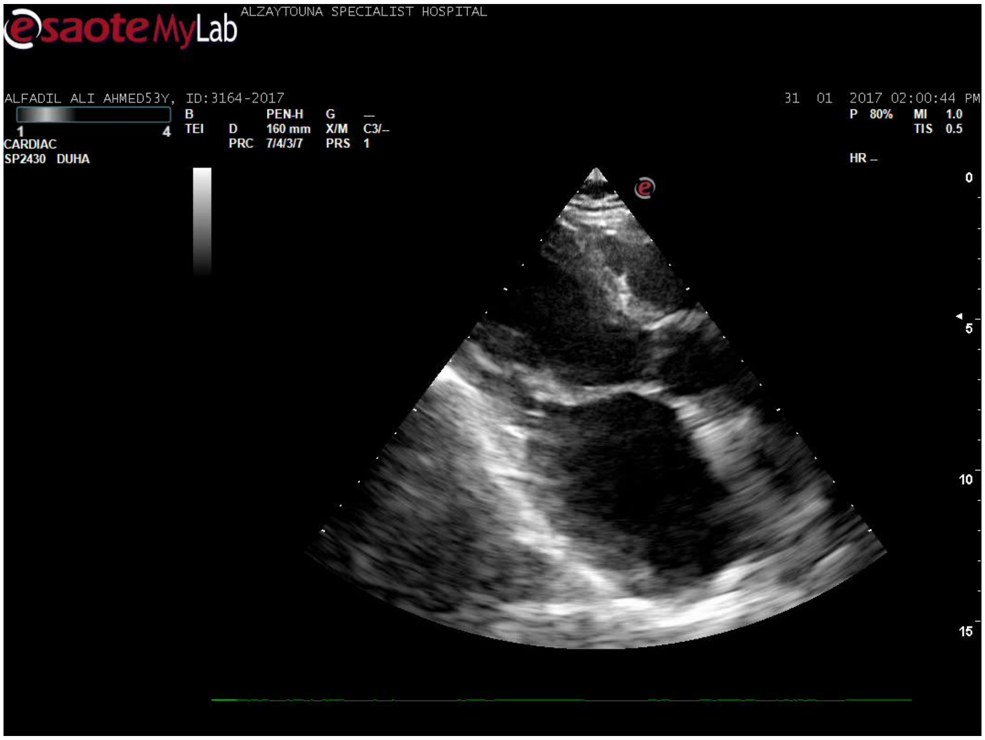
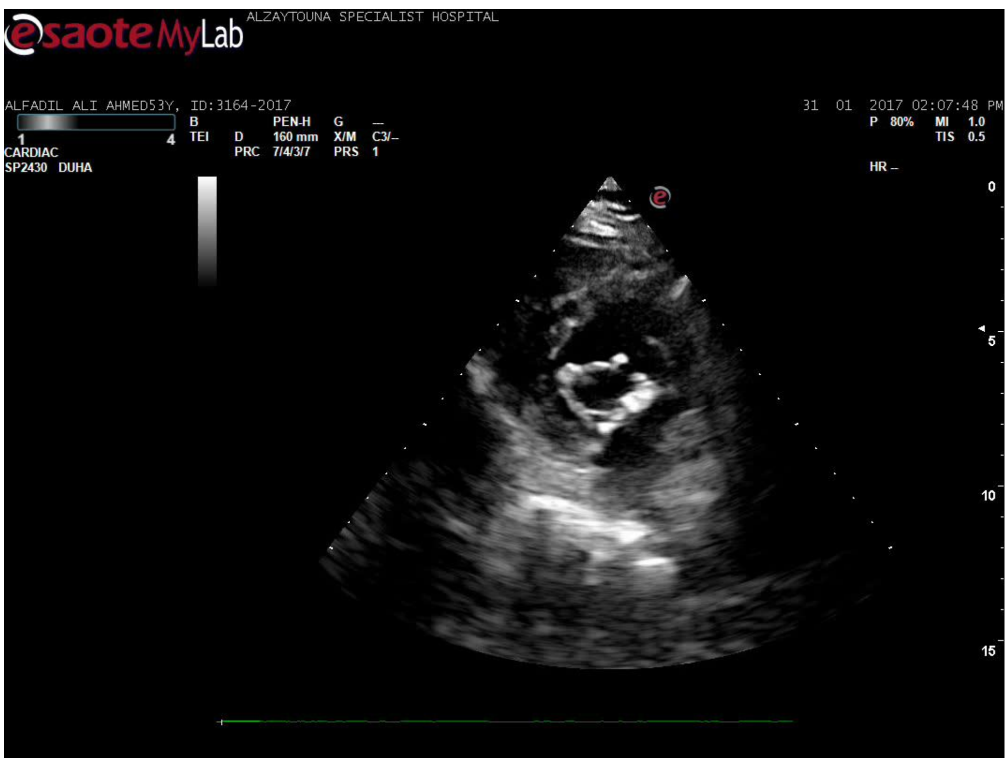
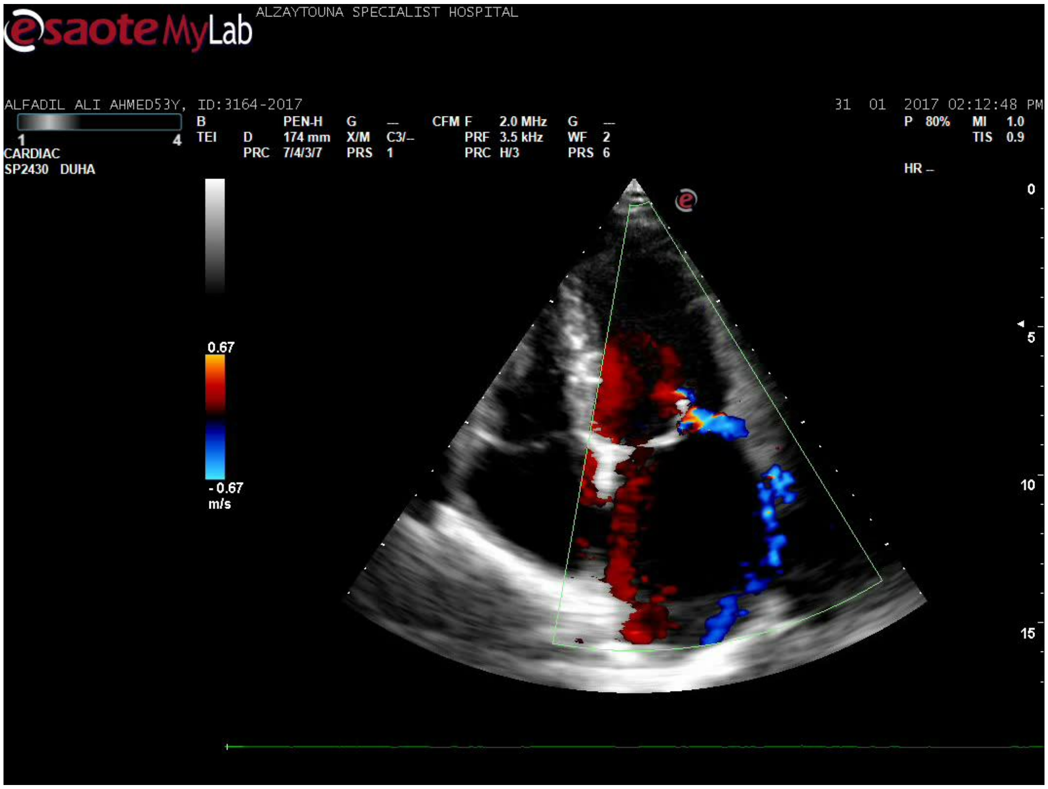


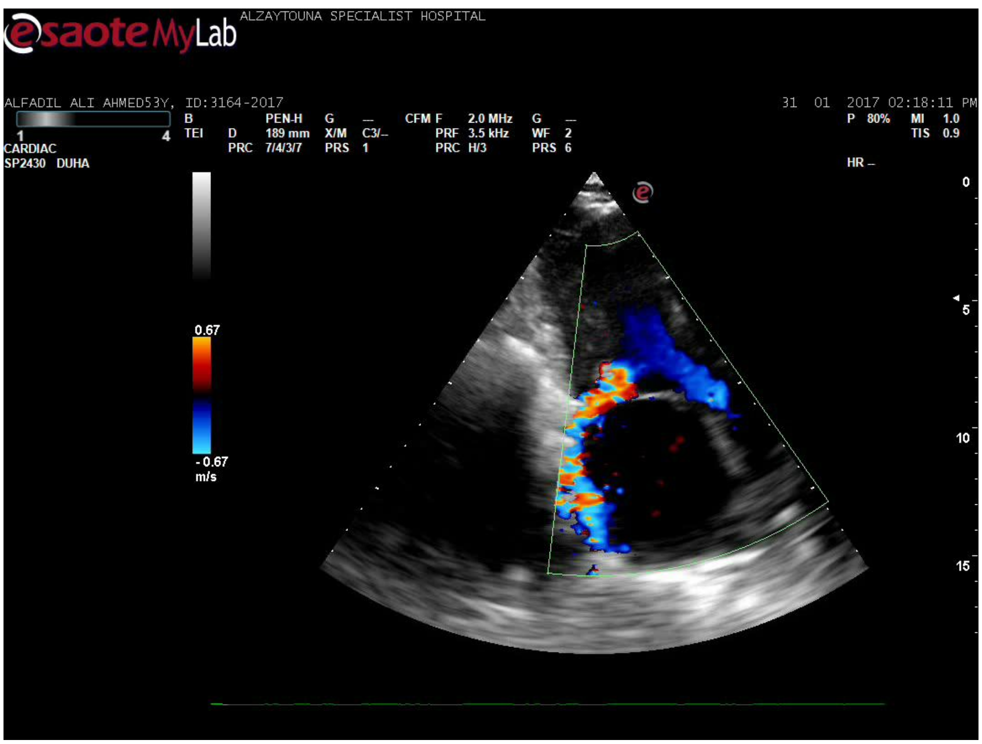
Image (a) 2D parasternal long axis view show thickened tip of leaflets



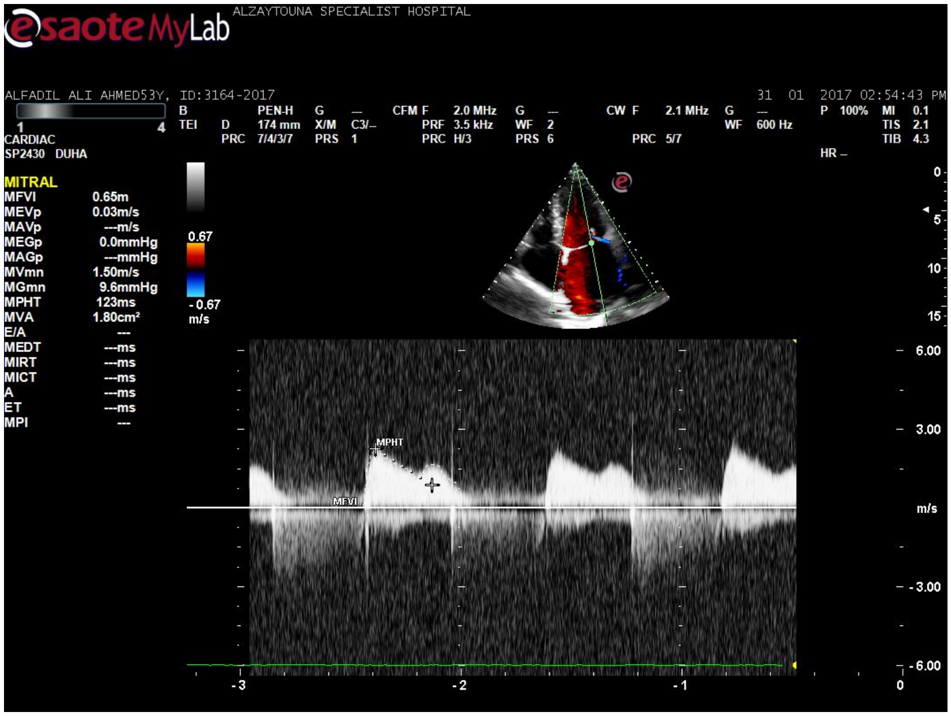
(b) 2D short axis view show thickened tip of leaflets



(c) Color Doppler 4 chamber view show mitral valve inflow



(d) Color Doppler 2 chamber view show mitral valve in flow



(f) Pulsed wave Doppler 4chamber view show mitral valve function

All images above show mild rheumatic valve stenosis of 22 years old –male

Data collection sheet

Age	sex	echo finding		Doppler finding			conclusion
		2 D	M-mode	MPG	PHT	MVA	