RESULTS

This study includes 20 patients with isolated mitral stenosis. The patients were 12 females and 8 males. Their age ranged from 16 to 50 years with mean of 29.25 ± 11.61.

Ten normal subjects served as a control group, they were 5 female and 5 males. Their age ranged from 20 to 33 years with mean of 26.3 ± 4.21.

(1) AGE AND SEX DISTRIBUTION

Age	No. of Patients
Below 20 years	4 patients
From 20-30 years	10 patients
Above 30 years	6 patients

Cases above 20 years, represents 80 % of the whole cases, 50 % were between 20-30 years and the remainder 30 % were above 30 years.

Cases below 20 years, represents 20 % of the whole cases.

SEX: Age	Females	Males
Below 20 years	1	3
From 20-30 years	8	2
Above 30 years	3	3

Below 20 years, one of the 4 patients was female and the remaining 3 were males, with the female to male ratio is 1 : 3.

Between 20-30 years, 8 of the 10 patients were females and

Between 31-50 years, 3 of the 6 patients were females and 3 were males, with the female to male ratio is 1 : 1.

(2) POSITIVE HISTORY OF RHEUMATIC FEVER

A positive history of rheumatic fever was found in 16 cases (80 %) of the group studied.

TABLE (1)

Age and Sex Distribution, in the 20 Patients with M.S.

Age group	Below 20 years	21 - 30 years	31 - 50 years	Total
Female patients	1	8	3	12
Male patients	3	2	3	8
Total	4	10	6	20

(3) CLINICAL ASSESSMENT OF PATIENTS

a) Symptoms :

Dyspnea :

It was a distinct feature of all patients (100 %), and according to New York Heart Association Classification (NYHA), the patients could be classified as follows :

1. Two patients (10 %) were in class I.
2. Nine patients (45 %) were in class II.
3. Five patients (25 %) were in class III.
4. Four patients (20 %) were in class IV.

Other symptoms:

- 13 patients (65 %) had low cardiac output symptoms in the form of dizziness, blurring of vision and fatigue. 4 were in functional class II, 5 in class III, and 4 in class IV.
- 8 patients (40 %) had haemoptysis.
- 11 patients (55 %) had palpitation.
- 4 patients (20 %) had symptoms of right sided heart failure in the form of pain in the epigastrium, right hypochondrium, and oedema of the lower limbs, they were in functional class IV.

b) Signs :

Rhythm :

6 patients had atrial fibrillation with incidence of 30 %.

Chamber Enlargement :

- 11 cases (55 %) had clinical evidences suggestive of right ventricular enlargement.
- No patient had clinical evidence of left ventricular enlargement.

Auscultation :

- The first heart sound was accentuated in 18 cases (90 %) and not accentuated in the remaining 2 cases.
- An opening snap was heared in 16 cases (80 %).
- The characteristic rumbling diastolic murmur was heared in all cases (100 %).
- Clinical information about pulmonary hypertension was taken by auscultation of accentuated pulmonary component of the second heart sound over pulmonary area and was heared in 16 cases (80 %)
- Tricuspid insufficiency was met with in 5 cases (25 %) which were thought to be functional due to dilatation of the tricuspid annulus, there was pansystolic murmur heared best at left lower sternal edge , and its intensity was increased with inspiration.

TABLE (2)

Incidence of rheumatic fever and grade of dyspnea in the Patients with M. S.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age	45y	25y	25y	22y	18y	21y	50y	23y	50y	16y	23y	26y	45y	22y	17y	29y	40y	19y	44y	25y
Sex	♀	♂	♀	♀	♀	♀	♀	♀	♀	♂	♀	♀	♂	♂	♂	♀	♂	♂	♂	♀
Past. hist. of Rh. fever.	+	+	+	+	+	+	-	+	-	+	+	+	-	+	+	+	+	+	-	+
Grade of dyspnea	III	II	II	I	II	IV	II	II	IV	IV	II	II	IV	III	I	III	III	II	III	II

(4) NON INVASIVE INVESTIGATIONS

I. ELECTROCARDIOGRAPHIC FINDINGS

- 5 patients (25 %) had an electrocardiographic findings within the normal pattern.
- Atrial fibrillation was found in 6 patients (30 %) of whole cases.

Left Atrial Hypertrophy :

It was evidenced by broad, notched "P" wave, more than 0.11 sec. in duration (P-mitrale) in lead II and P-terminal force in V_1 more than 0.04 mm. sec.

9 patients (45 %) had evidence of left atrial hypertrophy.

Right Ventricular Hypertrophy :

It was evidenced by tall "R" wave in V_1 with deep "S" wave in V_6.

10 patients (50 %) had evidence of right ventricular hypertrophy.

TABLE A(3)

Electrocardiographic Findings in the Patients with M.S.

E.C.G. Findings	No. of patients	%
* Within normal	5	25 %
* P-mitrale	9	45 %
* Rt. Vent. hypertrophy	10	50 %
* Atrial fibrillation	6	30 %

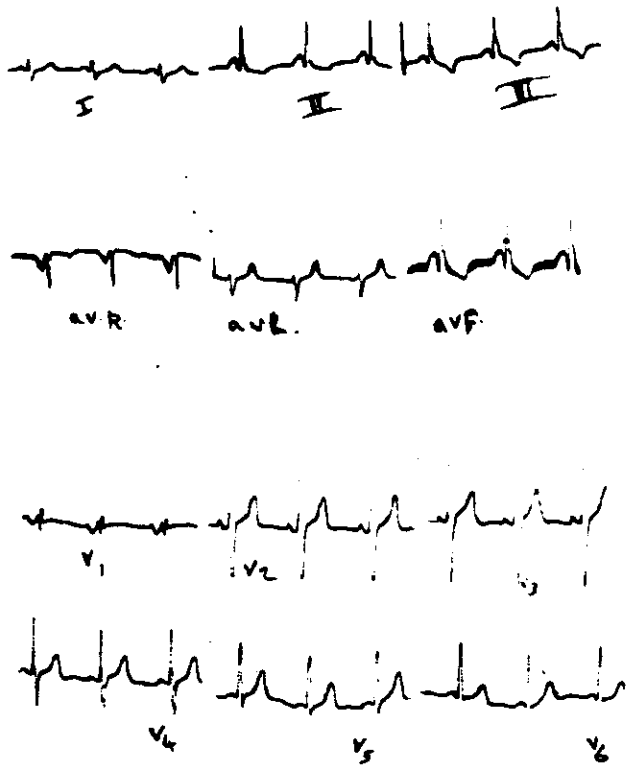

Fig. (6): ECG revealed :
Rhythm : Sinus Rate 77/mm Axis + 100°
LA hypertrophy.

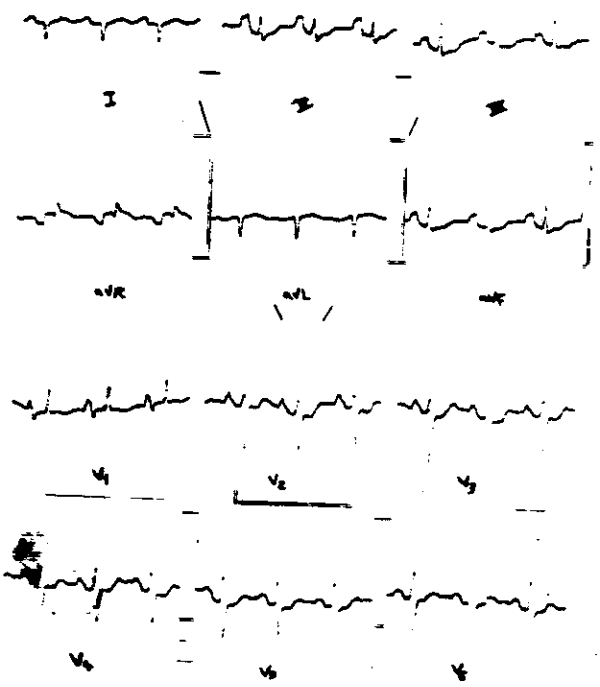

Fig. (7) : ECG revealed:
Rhythm: Sinus Rate 87/mm. Axis + 120°
Biatrial and R. V. hypertrophy.

II. RADIOGRAPHIC FINDINGS

The radiographic findings as analysed from the plain-x-ray of chest both P-A view and left lateral view with filled oesophagus with barium, are:-

-10 Patients (50 %) had within normal sized heart on chest x-ray.

- The cardiothoracic ratio was increased in 10 cases (50 %).

Left Atrial Enlargement:-

It was evidenced by obliteration of cardiac waist, , mitralization of left border of the heart or even mild bulging oudside it, and a smooth concave displacement of barium filled oesophagus.

- 18 cases (90 %) had the evidence of left atrial enlargement.

Right Ventricular Enlargement:

It was evidenced by increased the area of contact between the sternum and the right ventricle in lateral view.

- 10 cases (50 %) had the evidence of right ventricular enlargement.

Pulmonary Venous Hypertension:

It was evidenced from the prominent upper lobes vessels with vascular attenuation in the lower lung lobes.

- 18 cases (90 %) had the evidence of pulmonary venous hypertension.

Pulmonary Arterial Hypertension:

It was evidenced from enlargement of main pulmonary artery and central right and left main branches.

- 13 cases (65 %) had the evidence of pulmonary arterial hypertension.

TABLE (4)

Radiographic Findings in the Patients with M. S.

X-Ray Findings	No. of cases	%
* Within normal ht. size	10	50 %
* Increased cardiothoracic ratio.	10	50 %
* Lt. atrial enlargement	18	90 %
* Rt. ventricular elargement.	10	50 %
* Pul. Venous hypertension.	18	90 %
* Pul. arterial hypertension.	13	65 %

Fig. (8) : Plain x-ray chest P. A. & Lt. Lat. views revealed Increased C. T. ratio, Lt. atrial and Rt ventricular enlargement, dilatation of main pul. a., and its main branches and pulmonary venous congestion.

III - ECHOCARDIOGRAPHIC FINDINGS

Echocardiography (M-mode) had been done for all our patients and controls. It revealed the following data:

1) The E-F slope of the anterior mitral leaflet:

In the ten control persons, it ranged between 70 and 95. 71 mm/sec. (Mean 82. 01 SD ± 8. 41 SEM ± 2. 66) (Table 5).

The values for the 20 patients with mitral stenosis ranged between 8 and 40 mm/sec. (Mean 18. 7 SD ± 8. 90 SEM ± 1. 99) (Table 6).

According to the E-F slope, the patients were calssified into 3 groups : (Table 7).

Group I Mild mitral stenosis with E-F slope above 25 mm/sec. (3 patients).

Group II Moderate mitral stenosis with E-F slope between 15 and 25 mm/sec. (10 patients).

GroupIII Severe mitral stenosis with E-F slope below 15 mm/ sec. (7 patients).

2) The anterior mitral leaflet excursion (Ex.):

In the ten control persons. it ranged between 18. 24 and 28. 57 mm. (Mean 22. 61 SD ± 3. 16 SEM ± 0. 81). (Table 5).

The values for the 20 patients with mitral stenosis ranged between 6 and 20 mm. (Mean 14. 5 SD ± 3. 01 SEM ± 0. 67) (Table 6).

3) Thickening of mitral valve:

Thickening of mitral valve echoes was found in all patients with mitral stenosis.

4) Calcification of mitral valve:

4 patients (20 %) showed calcification, they belong to the group III (Severe M. S.).

5) Left atrial dimension:

In the ten control persons, it ranged between 21. 44 and 39. 11 mm. (Mean 31. 7 SD ± 5. 85 SEM ± 1. 85) (Table 5).

In the 20 patients with mitral stenosis, it ranged between 20 and 74 mm. (Mean 51. 85 SD ± 12. 77 SEM ± 2. 85) (Table 6).

6) Right ventricular dimension:

In the ten control persons, it ranged between 7. 5 and 20 mm. (Mean 14. 15 SD ± 5. 08 SEM ± 1. 60)(Table 5).

In the 20 patients with mitral stenosis, it ranged between 7 and 38 mm (Mean 21. 3 SD ± 8. 35 SEM ± 1. 86)(Table 6).

7) Percentage shortening:

The left ventricular function was assessed by echocardiographic percentage shortening, that was reported to be good (more than 25 %) in the 18 cases (90 %), fair (between 20 -25 %) in one case (5 %) and poor (below 20 %) in one case (5 %) of whole cases.

8) Left ventricular dimension:

Echocardiography revealed normal left ventricular end diastolic dimension in all cases that was ranging between 37-56 mm.

9) Pulmonary hypertension:

The pulmonary valve echogram could only be recorded in 10 patients. It showed a normal pattern in 3 cases, while in the remaining 7 cases, the pattern conformed with that described in pulmonary hypertension.

An indirect evidence of pulmonary hypertension, echocardiographic sign of right ventricular dilatation were evident in another 5 patients.

10) Left atrial thrombus :

No atrial thrombi could be recorded by echocardiography for all our patients.

11) Other valvular affection:

All cases had isolated mitral valve affection with no other valve affection.

TABLE (5)

The Echocardiographic Findings in the 10 Control Persons.

Case No.	Age	E-F slope in mm/sec.	Ex. in mm	LA in mm	R.V in mm
1	22	80.00	22.80	31.21	15.00
2	28	85.71	20.10	36.43	12.00
3	27	70.00	21.20	32.51	21.00
4	23	75.71	18.24	28.01	19.00
5	30	71.42	19.41	39.11	20.00
6	24	95.71	28.57	21.44	7.50
7	20	87.14	21.42	24.56	9.50
8	33	82.91	25.67	35.91	11.00
9	31	79.41	24.31	29.82	18.00
10	25	92.12	24.40	38.00	8.50
M	26.30	82.01	22.61	31.70	14.15
SD ±	4.21	8.41	3.16	5.85	5.08
SEM±		2.66	0.81	1.85	1.60

TABLE (6)

The Echocardiographic Findings in the 20 Patients with M.S.

Case No.	Age	E-F slope in mm/sec	Ex. in mm	LA. in mm	R.V. in mm
1	45	20	12	48	25
2	25	18	16	61	12
3	25	24	18	42	15
4	22	40	18	20	7
5	18	20	16	42	25
6	21	8	12	48	38
7	50	24	13	60	25
8	23	26	14	45	18
9	50	10	12	48	24
10	16	10	16	55	30
11	23	18	15	49	12
12	26	16	12	56	13
13	45	14	15	62	32
14	22	16	16	70	20
15	17	38	20	32	7
16	29	10	15	55	25
17	40	12	13	74	30
18	19	18	17	45	24
19	44	8	6	65	24
20	25	24	14	60	20
M	29.25	18.70	14.50	51.85	21.30
SD ±	11.61	8.90	3.01	12.77	8.35
SEM±		1.99	0.67	2.85	1.86
P		< 0.001	< 0.01	< 0.01	< 0.05

TABLE (7)

Classification of the Patients According to the Severity of M.S. as Estimated by E-F. Slope.

Case No.	E-F Slope	Grading of Severity
4	40	
8	26	
15	38	Group I
Mean	34.66	
SD ±	7.62	(Mild)
SEM ±	4.40	
1	20	
2	18	
3	24	
5	20	
7	24	Group II
11	18	
12	16	(Moderate)
14	16	
18	18	
20	24	
Mean	19.80	
SD ±	3.19	
SEM ±	1.009	
6	8	
9	10	
10	10	
13	14	
16	10	Group III
17	12	
19	8	(Severe)
Mean	10.28	
SD ±	2.13	
SEM ±	0.80	

TABLE (8)

The Echocardiographic Data in Patients with Mild Mitral Stenosis.

Case No.	Age	E-F slope in mm/sec.	Ex. in mm	LA. in mm	R. V. in mm
4	22	40	18	20	7
8	23	26	14	45	18
15	17	38	20	32	7
M	20.66	34.66	17.33	32.33	10.66
SD ±	3.21	7.62	3.05	12.50	6.35
SEM±		4.40	1.76	7.22	3.67

TABLE (9)

The Echocardiographic Data in Patients with Moderate Mitral Stenosis

Case No.	Age	E-F slope in mm/sec	Ex. in mm	LA. in mm	R. V. in mm
1	45	20	12	48	25
2	25	18	16	61	12
3	25	24	18	42	15
5	18	20	16	42	25
7	50	24	13	60	25
11	23	18	15	49	12
12	26	16	12	56	13
14	22	16	16	70	20
18	19	18	17	45	24
20	25	24	14	60	20
M	27.80	19.80	14.90	53.30	19.10
SD±	10.77	3.19	2.07	9.46	5.62
SEM±		1.009	0.65	2.99	1.77

TABLE (10)

The Echocardiographic Data in Patients with Severe Mitral Stenosis.

Case No.	Age	E-F slope in mm/sec	Ex. in mm	LA. in mm	R.V. in mm
6	21	8	12	48	38
9	50	10	12	48	24
10	16	10	16	55	30
13	45	14	15	62	32
16	29	10	15	55	25
17	40	12	13	74	30
19	44	8	6	65	24
M	35.00	10.28	12.71	58.14	29.00
SD ±	13.06	2.13	3.35	9.47	5.13
SEM±		0.80	1.26	3.58	1.94
P		< 0.01	> 0.05	> 0.05	< 0.01

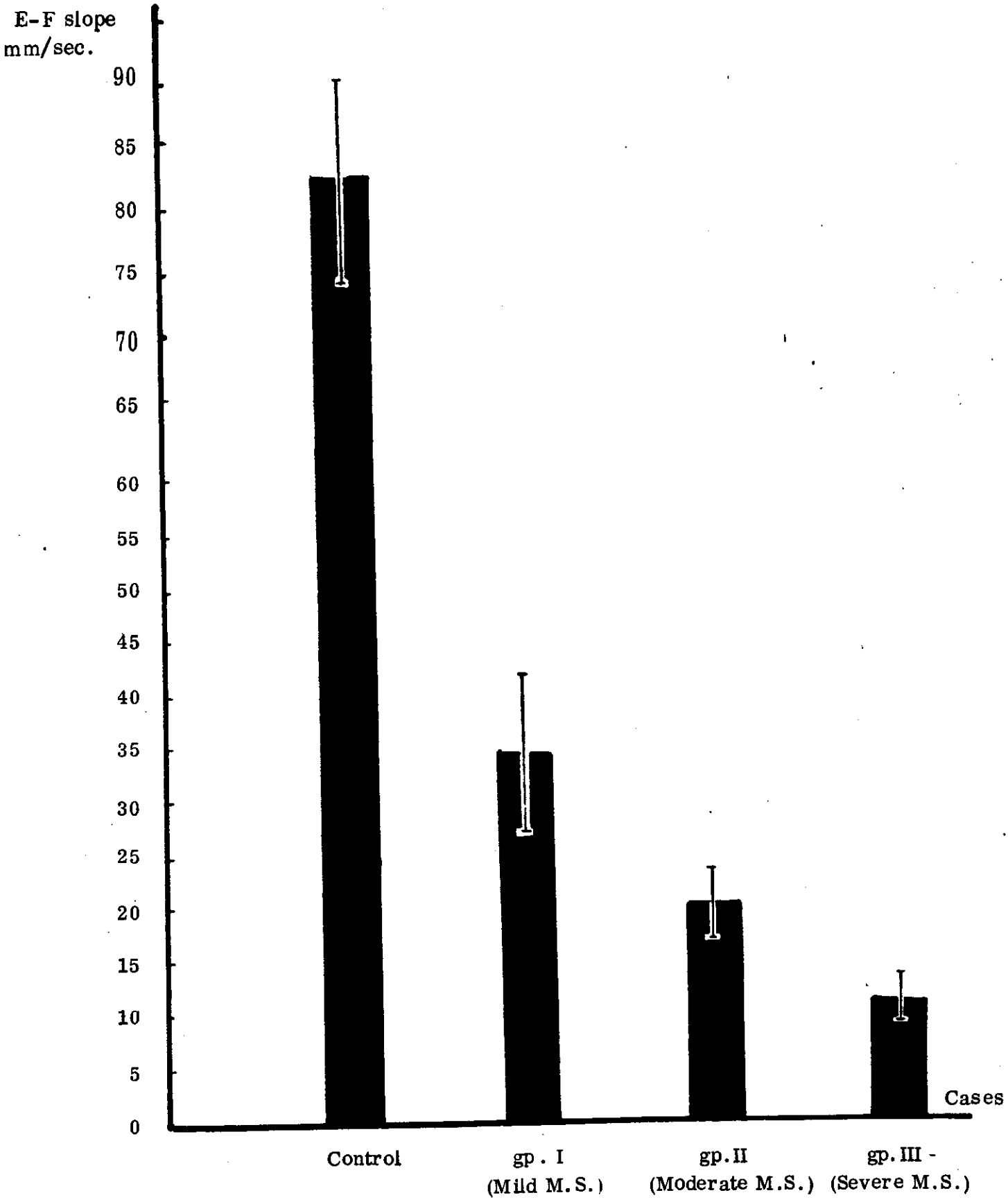

Fig. (9) : Shows the mean and S.D, of E-F slope in the different groups.

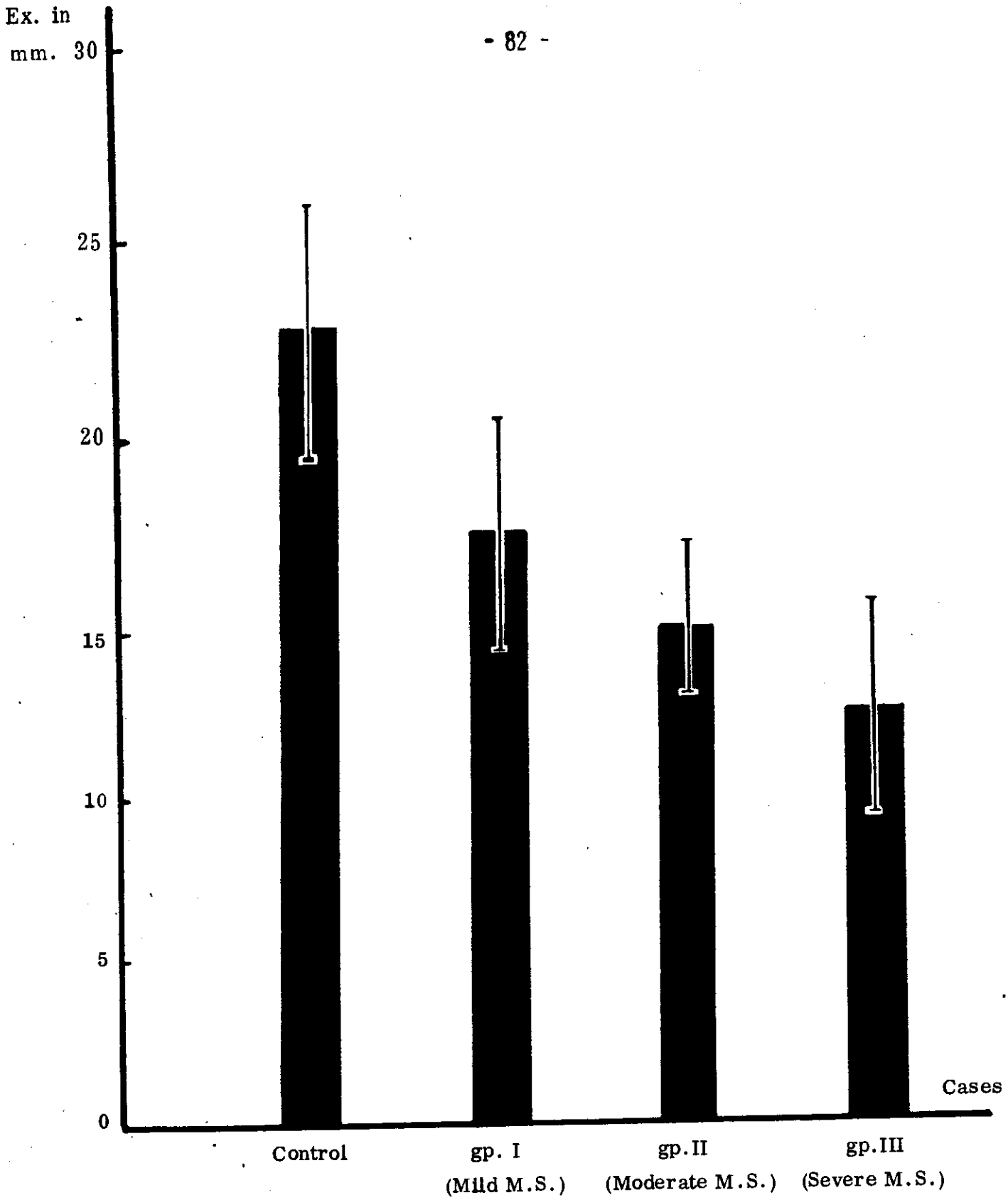

Fig. (10): Shows the mean and S. D. of anterior mitral leaflet excursion (Ex.) in the different groups.

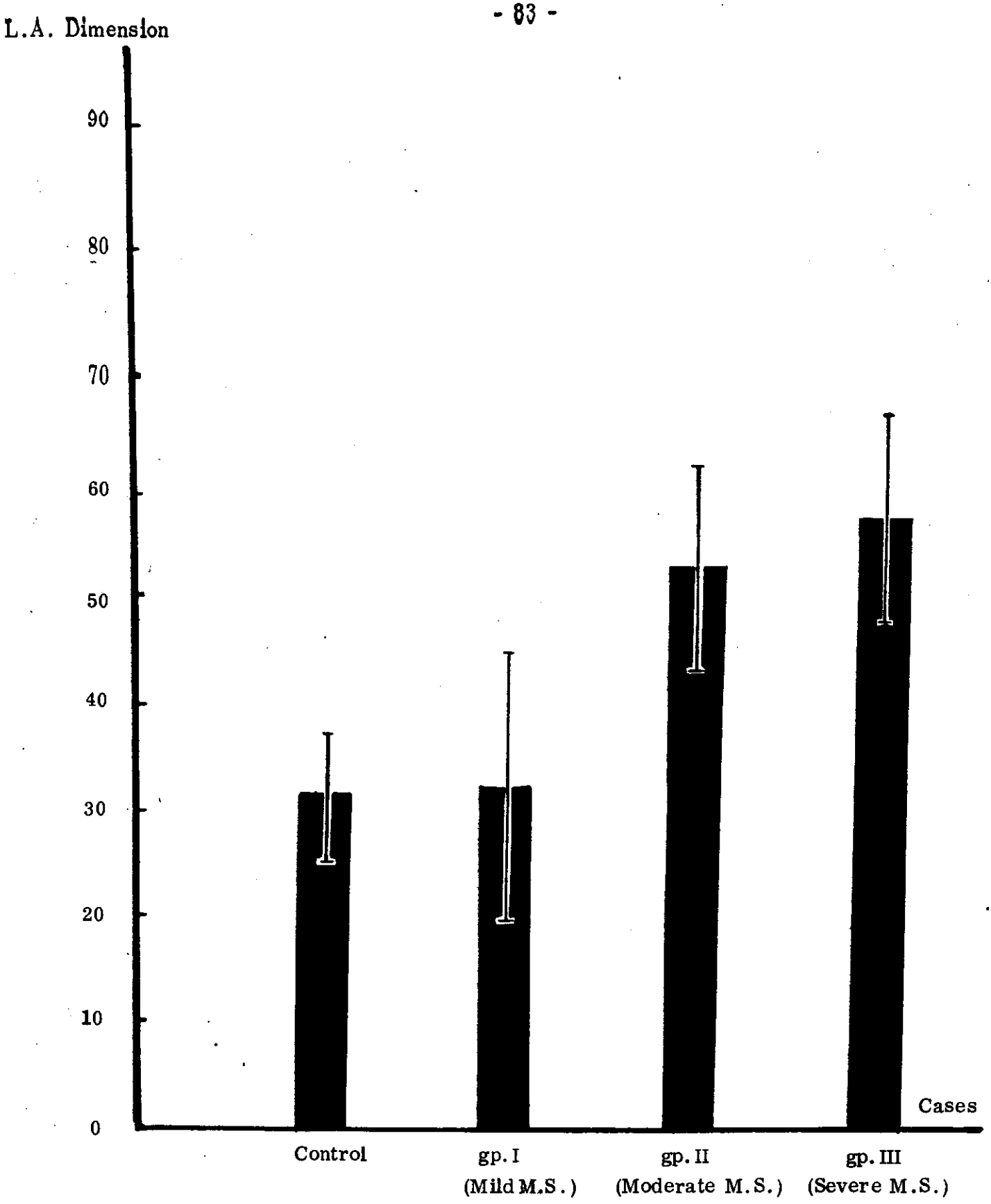

Fig. (11) : Shows the mean and S.D. of left atrial dimension in the different groups.

TABLE (11)

Echocardiographic results in the 20 Patients with M. S.

Echo. Findings	No. of cases	%
* Mitral stenosis pattern	20	100 %
* Calcification of mitral valve	4	20 %
* Lt. atrial enlargement	18	90 %
* Rt. ventricular enlargement	11	55 %
* Pulmonary hypertension	12	60 %
* Lt. atrial thrombosis	--	0 %
* % shortening :-		
good	18	90 %
Fair	1	5 %
Poor	1	5 %
* Grading of severity :-		
Mild	3	15 %
Moderate	10	50 %
Severe	7	35 %

TABLE (12)

Electrocardiographic, Echocardiographic, Radiographic Findings in the Patients with M.S.

	Case No.	ELECTRPCARDIOGRAPHY			ECHOCARDIOGRAPHY					RADIOGRAPHY		
		Duration of "p" wave in L_{II}	Terminal -ve "p" wave in V_1	R.V.H.	L.A. Dimension	R.V. Dimension	Pul. hypert. pattern	Evidence of calc.	% Shortening	Evidence of LA^{++}	Evidence of RV^{++}	Evide... pul... hype...
GROUP I	4	0.10 sec.	-	-	20 mm.	7 mm.	-	-	46 %	-	-	-
	8	0.10 sec.	-	-	45 mm.	18 mm.	couldn't record	-	28 %	+	-	-
	15	0.10 sec.	-	-	32 mm.	7 mm.	-	-	30 %	-	-	-
GROUP II	1	0.10 sec.	-	-	48 mm.	25 mm.	couldn't record	-	27 %	+	+	+
	2	0.12 sec.	+	-	61 mm.	12 mm.	+	-	27 %	+	-	+
	3	0.10 sec,	-	-	42 mm.	15 mm.	couldn't record	-	37 %	+	-	-
	5	0.12 sec.	+	+	42 mm.	25 mm.	couldn't record	-	35 %	+	+	+
	7	A.F.	A.F.	+	60 mm.	25 mm.	couldn't record	-	34 %	+	+	+
	11	0.12 sec.	+	-	49 mm.	12 mm.	-	-	32 %	+	-	-
	12	A.F.	A.F.	-	56 mm.	13 mm.	couldn't	-	37 %	+	-	-
	14	0.12 sec.	+	-	70 mm.	20 mm.	+	-	32 %	+	-	+
	18	0.12 sec.	+	+	45 mm.	24 mm.	couldn't record	-	26 %	+	-	+
	20	0.12 sec.	+	-	60 mm.	20 mm.	couldn't record	-	24 %	+	-	-
GROUP III	6	0.12 sec.	+	+	48 mm.	38 mm.	couldn't record	-	18 %	+	+	+
	9	A.F.	A.F.	+	48 mm.	24 mm.	+	+	42 %	+	+	+
	10	0.12 sec.	+	+	55 mm.	30 mm.	+	-	25 %	+	+	+
	13	A.F.	A.F.	+	62 mm.	32 mm.	+	-	29 %	+	+	+
	16	0.12 sec.	+	+	55 mm.	25 mm.	+	+	33 %	+	+	+
	17	A.F.	A.F.	+	74 mm.	30 mm.	+	+	40 %	+	+	+
	19	A.F.	A.F.	+	65 mm.	24 mm.	couldn't record	+	33 %	+	+	+

TABLE (12)

Electrocardiographic, Echocardiographic , Radiographic Findings in the Patients with M.S.

	Case No.	ELECTRPCARDIOGRAPHY			ECHOCARDIOGRAPHY					RADIOGRAPHY		
		Duration of "p" wave in L_{II}	Terminal -ve "p" wave in V_I	R.V.H.	L.A. Dimension	R.V. Dimension	Pul. hypert. pattern	Evidence of calc.	% Shortening	Evidence of LA^{++}	Evidence of RV^{++}	Evidence of pul. hypert.
GROUP I	4	0.10 sec.	-	-	20 mm.	7 mm.	-	-	46 %	-	-	-
	8	0.10 sec.	-	-	45 mm.	18 mm.	couldn't record	-	28 %	+	-	-
	15	0.10 sec.	-	-	32 mm.	7 mm.	-	-	30 %	-	-	-
GROUP II	1	0.10 sec.	-	-	48 mm.	25 mm.	couldn't record	-	27 %	+	+	+
	2	0.12 sec.	+	-	61 mm.	12 mm.	+	-	27 %	+	-	+
	3	0.10 sec,	-	-	42 mm.	15 mm.	couldn't record	-	37 %	+	-	-
	5	0.12 sec.	+	+	42 mm.	25 mm.	couldn't record	-	35 %	+	+	+
	7	A.F.	A.F.	+	60 mm.	25 mm.	couldn't record	-	34 %	+	+	+
	11	0.12 sec.	+	-	49 mm.	12 mm.	-	-	32 %	+	-	-
	12	A.F.	A.F.	-	56 mm.	13 mm.	couldn't	-	37 %	+	-	-
	14	0.12 sec.	+	-	70 mm.	20 mm.	+	-	32 %	+	-	+
	18	0.12 sec.	+	+	45 mm.	24 mm.	couldn't record	-	26 %	+	-	+
	20	0.12 sec.	+	-	60 mm.	20 mm.	couldn't record	-	24 %	+	-	-
GROUP III	6	0.12 sec.	+	+	48 mm.	38 mm.	couldn't record	-	18 %	+	+	+
	9	A.F.	A.F.	+	48 mm.	24 mm.	+	+	42 %	+	+	+
	10	0.12 sec.	+	+	55 mm.	30 mm.	+	-	25 %	+	+	+
	13	A.F.	A.F.	+	62 mm.	32 mm.	+	-	29 %	+	+	+
	16	0.12 sec.	+	+	55 mm.	25 mm.	+	+	33 %	+	+	+
	17	A.F.	A.F.	+	74 mm.	30 mm.	+	+	40 %	+	+	+
	19	A.F.	A.F.	+	65 mm.	24 mm.	couldn't record	+	33 %	+	+	+

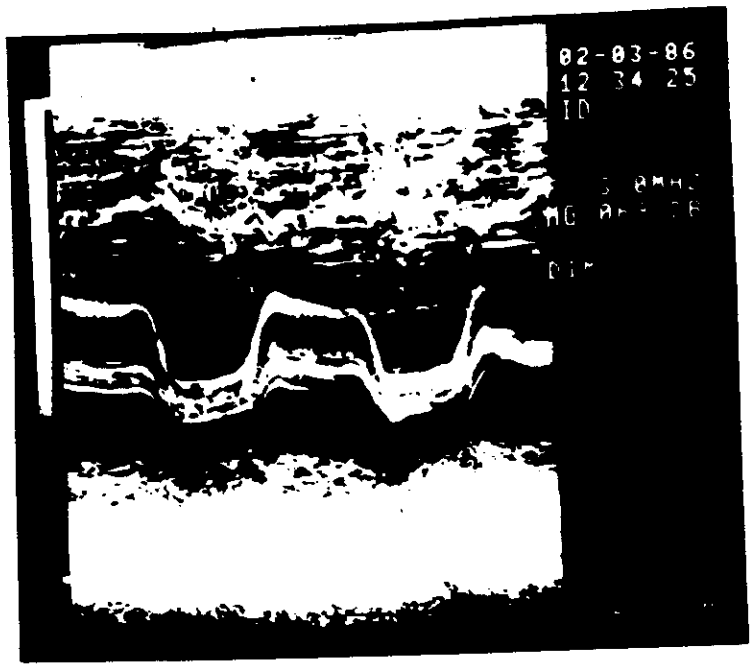

Fig. (13) Moderate mitral stenosis.

M-mode echo, revealed :-

- Increased mitral valve thickeness, with parallel motion of both leaflets.
- E-F slope 18 mm/sec.
- D-E amplitude 16 mm.

Fig. (14) Moderate mitral stenosis with backward movement of post- leaflet.

M-mode echo, revealed :

- Increased mitral valve thickeness, with backward movement of post. leaflet.
- E-F slope 24 mm/sec.
- D-E amplitude 13 mm.

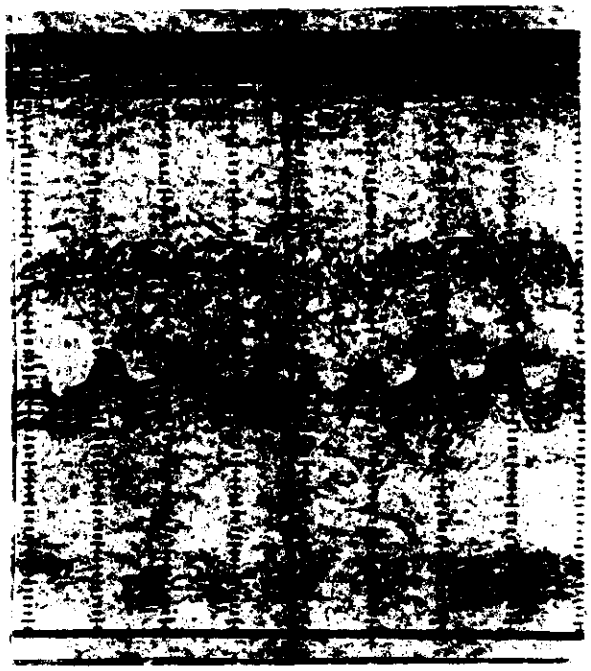

Fig. (16) Severe mitral stenosis with calcification.

M-mode echo, revealed :-

- Thickened calcific mitral valve, with parallel motion of both leaflets.
- E-F slope 8 mm/sec.
- D-E amplitude 6 mm.