RESULTS

Group I: - **Patients complaining of scrotal swelling with chronic scrotal pain increased by standing or sitting and relieved by lying supine and/or infertility, and were diagnosed clinically as having varicocele.**

Table (1): Results of group I

Case	Age	Complaint	Clinical	Supine venous diameter				Reflux on Valsalva		U/S	Associated path
				Left		Right		Left	Right		
				Rest	Valsalva	Rest	Valsalva				
1	26	P & I	Lt	3	4.1	2.8	3.3	+	-	Bil	Lt epididymal cyst
2	30	I	Lt	2.5	3.5	-	-	+	-	Lt	Rt epididymal cyst Rt mild hydrocele
3	31	P	Lt	3.8	4.9	2.8	3.1	+	-	Bil	
4	32	I	Lt	3.9	4.9	2.8	4.4	+	+	Bil	Rt mild hydrocele
5	28	I	Bil	3.5	5.6	3.0	4.7	+	+	Bil	
6	35	I	Bil	2.8	4.5	2.5	4.0	+	+	Bil	Lt epididymal cyst
7	20	P	Lt	2.3	2.7	-	-	+	-	Lt	Lt epididymal cyst
8	30	I	Lt(0p)	-	-	3.6	4.9	-	+	Rt	
9	28	I	Bil	4.0	5.2	3.8	5.0	+	+	Bil	Rt mild hydrocele
10	29	I	Lt(0p)	-	-	2.6	4.2	-	+	Rt	
11	27	I	Bil	3.6	5.2	2.4	3.5	+	+	Bil	Left hypoechoic testis
12	32	I	Lt	3.2	5.3	2.4	3.6	+	-	Bil	Rt mild hydrocele
13	35	P	Lt	2.9	4.0	2.8	4.0	+	-	Bil	
14	32	P & I	Lt	2.9	3.7	2.7	3.7	+	+	Bil	Bil mild hydrocele
15	26	P	Lt	3.5	4.4	-	-	+	-	Lt	
16	20	P	Lt	2.5	3.2	-	-	+	-	Lt	
17	19	P	Lt	5.6	6.7	2.5	3.1	+	-	Bil	
18	37	P & I	Lt	3.9	5.2	2.5	3.3	+	-	Bil	
19	35	I	Lt	2.6	3.7	2.5	2.7	+	-	Bil	
20	42	P	Lt	2.6	3.8	-	-	+	-	Lt	
21	21	P	Lt	2.6	3.9	-	-	+	-	Lt	
22	28	I	Lt	2.7	3.4	-	-	+	-	Lt	Bil mild hydrocele
23	23	P	Lt	4.5	4.8	2.9	3.4	+	+	Bil	
24	27	P	Lt	2.3	2.9	-	-	-	-	Lt	Lt mild hydrocele

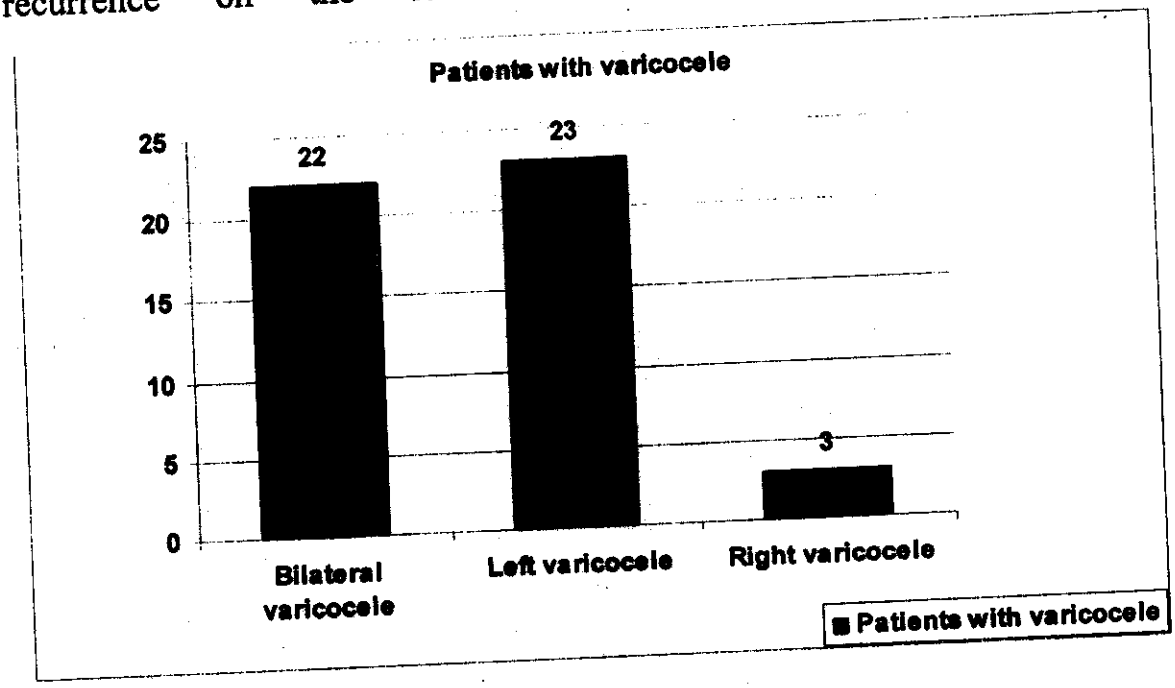
Table (1): Results of group I

Case	Age	Complaint	Clinical	Supine venous diameter				Reflux on Valsalva		U/S	Associated path
				Left		Right		Left	Right		
				Rest	Valsalva	Rest	Valsalva				
25	26	I	Lt	2.5	2.9	-	-	+	-	Lt	
26	27	P	Lt	3.5	4.1	-	-	+	-	Lt	Bil mild hydrocele
27	37	I	Lt	3.9	5.3	-	-	+	-	Lt	Rt mild hydrocele
28	18	P	Lt	2.3	2.5	-	-	+	-	Lt	
29	19	P	Lt	4.2	4.7	-	-	+	-	Lt	
30	23	P	Lt	3.5	4.7	2.4	3.2	+	+	Bil	
31	19	P	Lt	2.9	3.8	2.6	3.4	+	+	Bil	Bil mild hydrocele
32	25	P	Lt	2.7	3.3	2.2	2.7	+	+	Bil	Lt testicular atrophy
33	16	P	Lt	3.6	4.7	3.2	3.9	+	+	Bil	
34	25	P	Lt	2.3	3.6	-	-	+	-	Lt	
35	27	P&I	Lt	3.2	4.4	-	-	+	-	Lt	Rt AVM
36	33	I	Lt(0p)	-	-	2.7	3.9	-	+	Rt	Lt epididymal cyst
37	22	P	Lt	2.4	3.3	-	-	+	-	Lt	
38	29	I	Lt	3.4	4.2	2.9	3.6	+	+	Bil	
39	32	I	Lt	2.8	3.9	2.7	3.5	+	-	Bil	Rt mild hydrocele
40	32	I	Lt	3.1	4.1	2.5	3.3	+	+	Bil	Lt epididymal cyst
41	29	I	Lt	3.4	5	-	-	+	-	Lt	Lt encysted hydrocele of the cord
42	27	P	Lt	2.8	4	-	-	+	-	Lt	
43	18	P	Lt	3.2	4.4	-	-	+	-	Lt	
44	26	P	Lt	2.7	3.4	-	-	+	-	Lt	
45	29	I	Lt	3.8	5	-	-	+	-	Lt	Lt mild hydrocele
46	21	P	Lt	3	4.3	-	-	+	-	Lt	Lt mild hydrocele
47	32	P&I	Lt	2.9	4	-	-	+	-	Lt	Rt hypoechoic testis
48	30	P	Lt	2.6	3.6	2.6	3.4	+	-	Bil	Rt epididymal cyst

P = pain, I = infertility, Lt = left, Rt = right, Bil = bilateral, (Op) = operated, AVM = arterio-venous malformation.

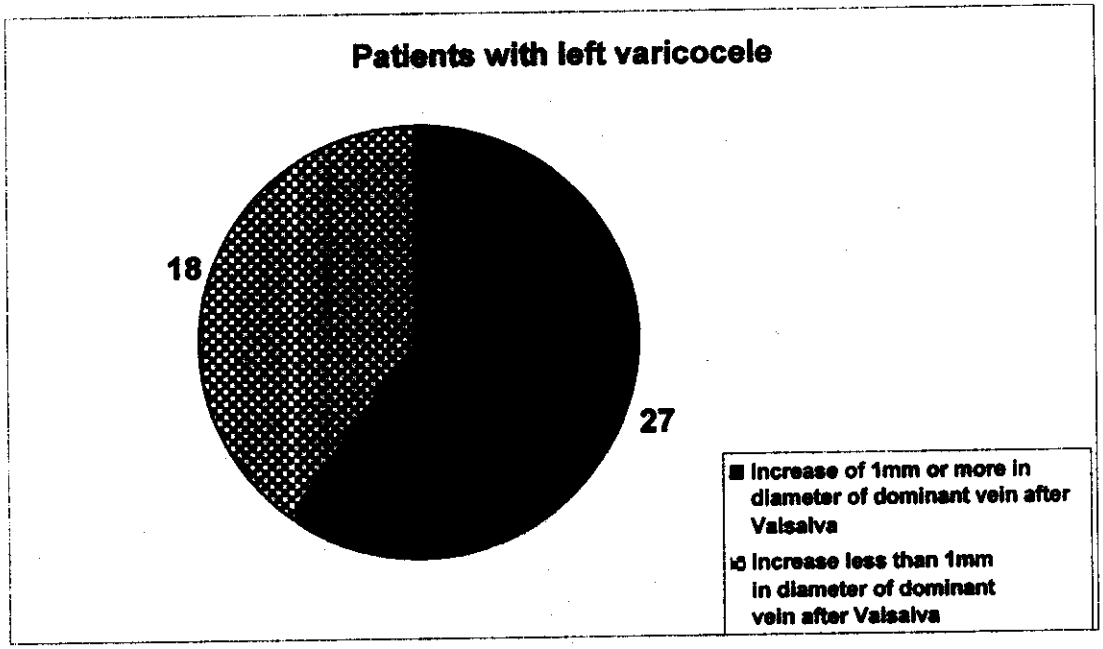
This group includes 48 patients (40% 0f the total). All the patients with clinically palpable left or bilateral varicocele were diagnosed and confirmed by scrotal US. 4 patients had bilateral varicocele clinically diagnosed and confirmed by US. 41 patients were clinically diagnosed as having unilateral left varicocele that was confirmed by sonography. Of these 41 patients, 18 patients (43.9 %) proved by grey scale and CDS to have in addition, right subclinical varicocele.

Three patients had had left varicocelectomy with no improvement of the semen analysis post operatively and no palpable varicocele could be detected clinically. These three patients proved after performing scrotal US to have right subclinical varicocele, with reflux detected on CDS. No recurrence on the left side could be detected (Fig.1).

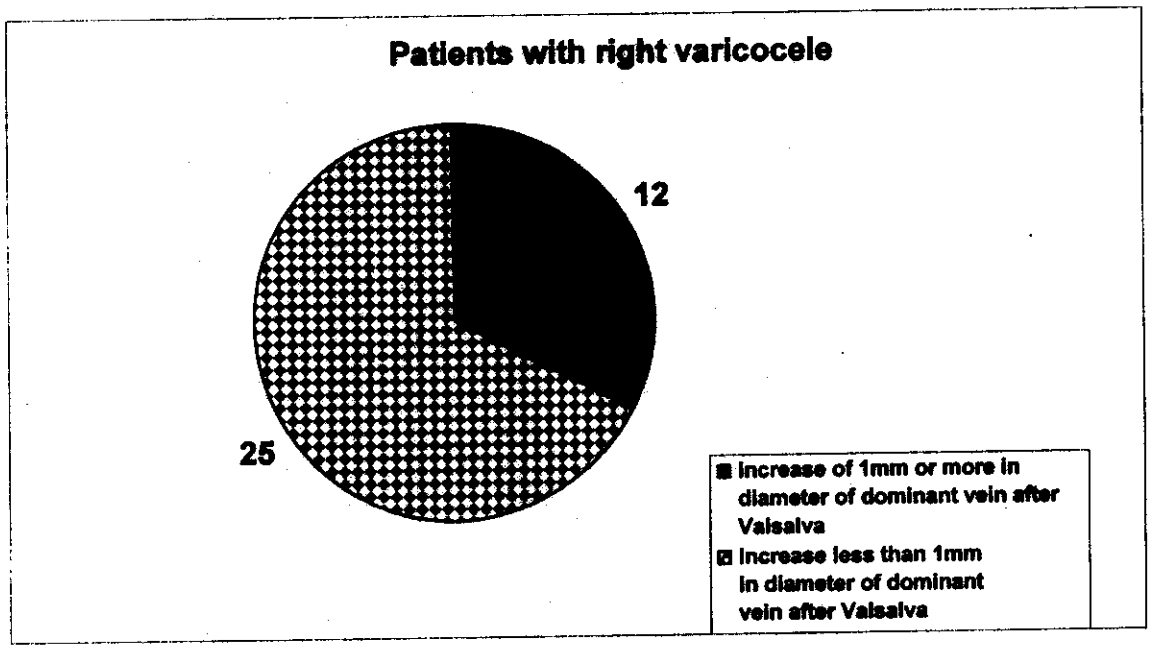


Therefore in our study, the incidence of subclinical varicosities among patients clinically diagnosed as having left varicocele was 43.8%.

The most frequent criterion for the diagnosis of varicocele in our study was a venous diameter of the dominant vein > 2mm, which was encountered in 100 % of patients. An increase of 1mm in diameter after performing Valsalva maneuver was encountered in 27 patients (60 % of patients, sonographically diagnosed as having left varicocele) (Fig.2).



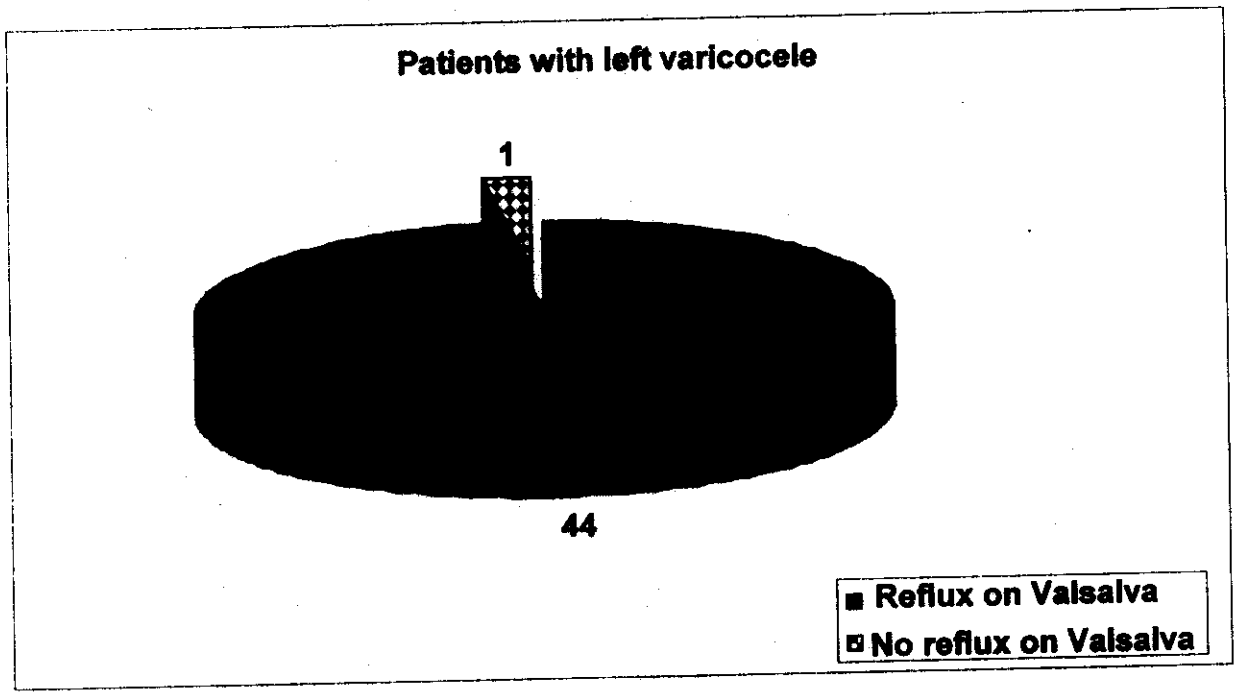
And in 12 patients (48 % of patients, sonographically diagnosed as having right varicocele) (Fig.3).



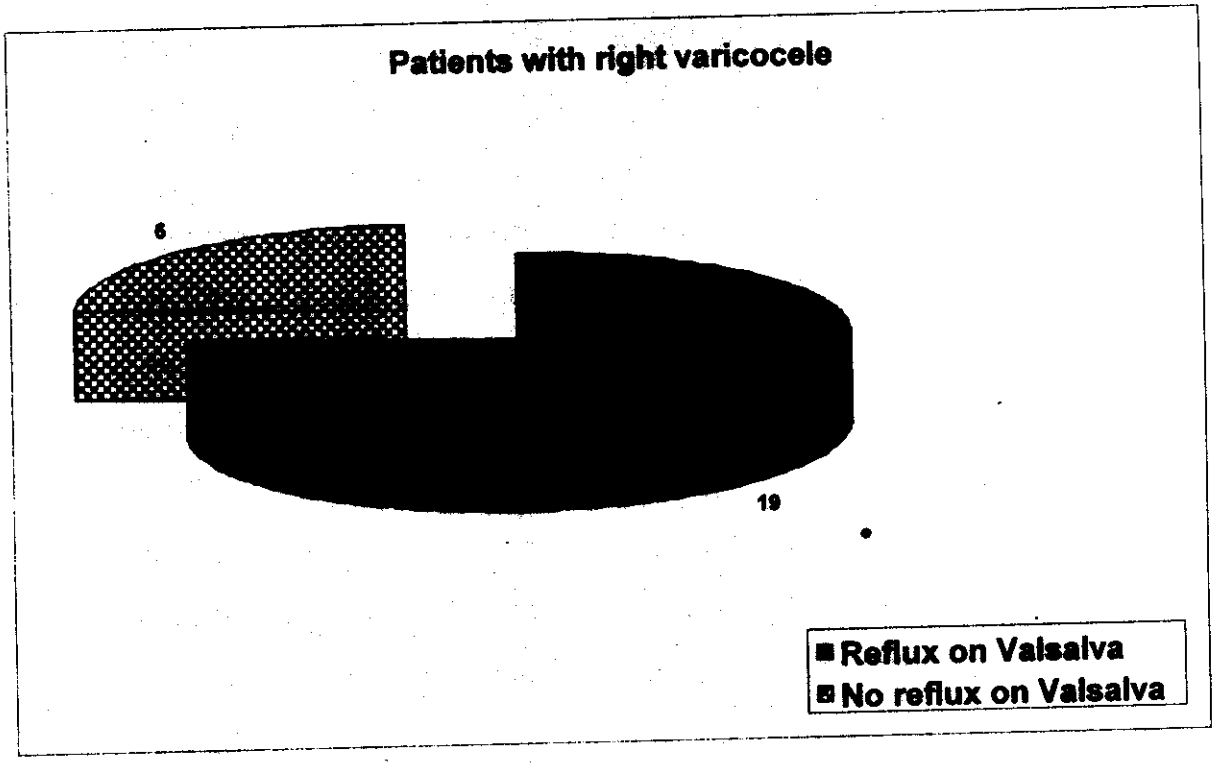
The mean supine venous diameter of the dominant vein on the left side during quiet respiration and on Valsalva maneuver were 2.8 and 3.6 mm respectively, while on the right side they were 2.6 and 3.5 mm respectively. The size of the varicocele could be accurately measured and compared favorably to the clinical classifications of grades 0 to 4.

On CDS no flow could be seen in the veins of the pampiniform plexus during quiet respiration except in two patients in which mild color flow within the veins could be depicted.

Reflux on Valsalva maneuver, depicted by CDS, was detected in 44 patients (97.8%) of the 45 patients in which varicocele was evident sonographically on the left side (Fig.4)



And was found in 19 patients (76%) of the 25 patients in which right varicocele was evident sonographically (Fig.5).



Thus reflux, depicted by CDS, was seen more commonly on the left side. This could be related to the larger mean caliber of the dominant vein on the left side than on the right side. Reflux on the right side never occurred in the absence of reflux on the left side.

No correlation was found between the size of the varicocele and the degree of infertility or the severity of pain. In some patients mild varicocele gave rise to marked pain, while in other patients mild varicocele produced impairment of fertility by the same degree comparable to large varicocele.

The testicular size was normal in all the patients except one patient which showed left testicular atrophy (length was 2.0 and width was 1.4 centimeters).

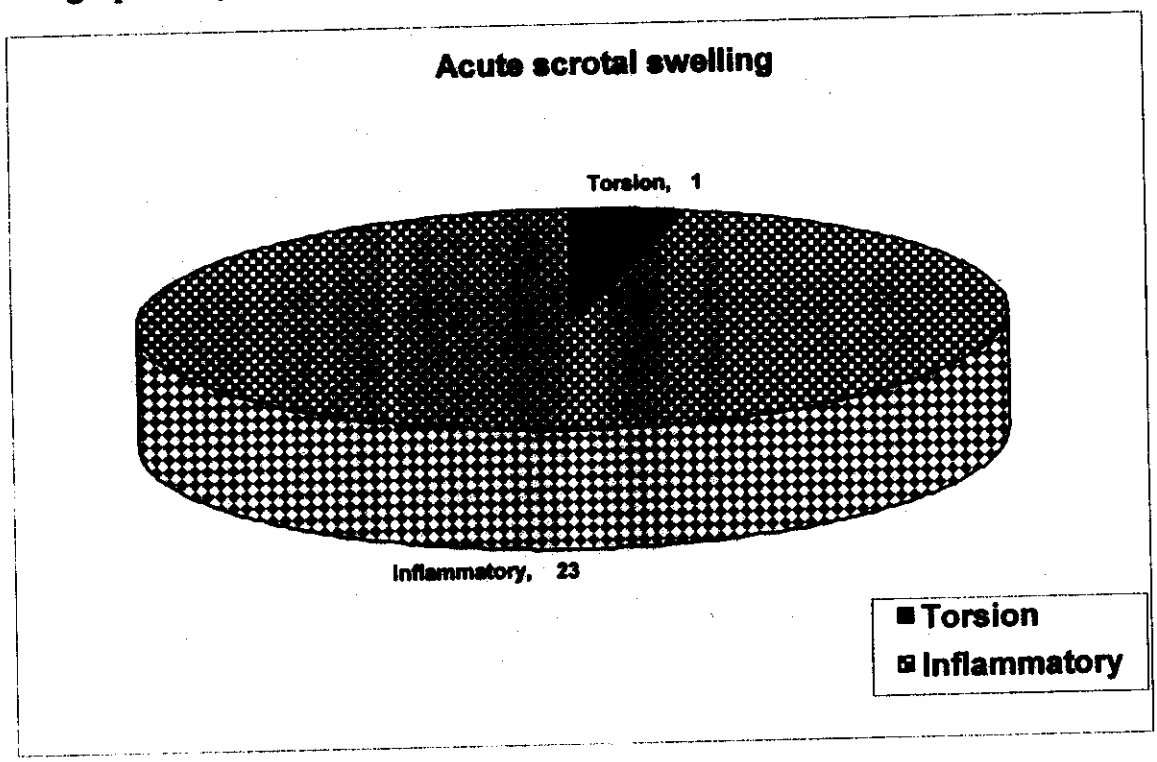
Group II: **- patients complaining of acute scrotal pain with swelling and were clinically diagnosed as having either epididymo-orchitis or torsion of the testis.**

Table (2): Results of group II

Case	Age	Site	Clinical	Echogenicity		Vascularity		US	Associated pathology
				Testis	Epididymis	Testis	Epididymis		
1	26	Rt	EO	IH	IH	I	I	EO	
2	30	Rt	EO	IH	IH	I	I	EO	-Rt epididymal cyst -hydrocele
3	31	Bil	EO	IH	IH	I	I	EO	
4	32	Lt	EO	N	N	I	N	O	Hydrocele
5	28	Bil	EO	N	N	N	I	E	-Rt epididymal cyst -Hydrocele
6	25	Bil	T	N	N	D	N	T	
7	40	Bil	T	IH	IH	I	I	EO	Hydrocele
8	29	Lt	EO	N	IH	I	I	EO	Pyogenic epididymal abscess
9	28	Lt	EO	N	N	I	N	O	Hydrocele
10	25	Rt	EO	N	IH	I	I	EO	Hydrocele
11	33	Rt	EO	N	IH	N	I	E	-T.B. epididymal abscess -hydrocele
12	20	Rt	EO	N	N	N	I	E	Lt epididymal calcific foci
13	32	Rt	T	N	N	I	N	O	
14	30	Rt	EO	N	IH	N	I	E	
15	29	Lt	T	N	IH	N	I	E	Hydrocele
16	27	Bil	EO	N	IH	N	I	E	
17	23	Lt	EO	N	IH	N	I	E	Hydrocele
18	21	Rt	T	N	N	N	I	E	-Rt epididymal cyst
19	22	Lt	T	N	IH	N	I	E	Hydrocele
20	22	Bil	EO	N	IH	N	I	E	Hydrocele
21	24	Lt	EO	N	IH	N	I	E	
22	32	Lt	T	N	IH	N	I	E	
23	28	Bil	EO	N	IH	N	I	E	
24	26	Bil	T	N	IH	N	I	E	-Lt epididymal cyst

E = epididymitis, EO = epididymo-orchitis, O = orchitis, T = torsion, N = normal, IH = inhomogeneous hypoechoic, I = increased, D = decreased, Rt = right, Lt = left, Bil = bilateral.

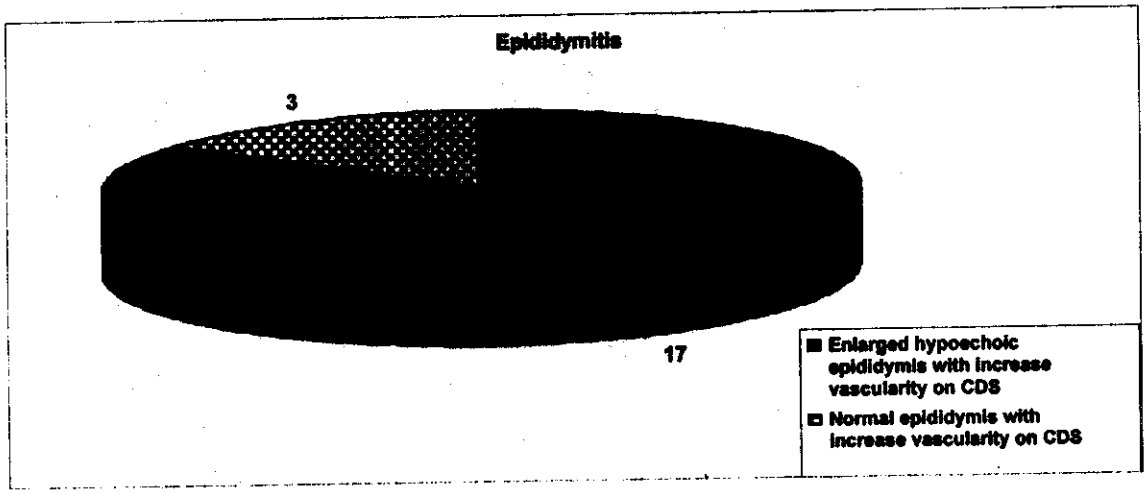
This group includes 24 patients (20% of the total). In this group, 23 patients (95.8%) were sonographically diagnosed as having epididymitis or epididymo-orchitis, while 1 patient (4.2%) in this group were sonographically diagnosed as having testicular torsion (Fig.6).



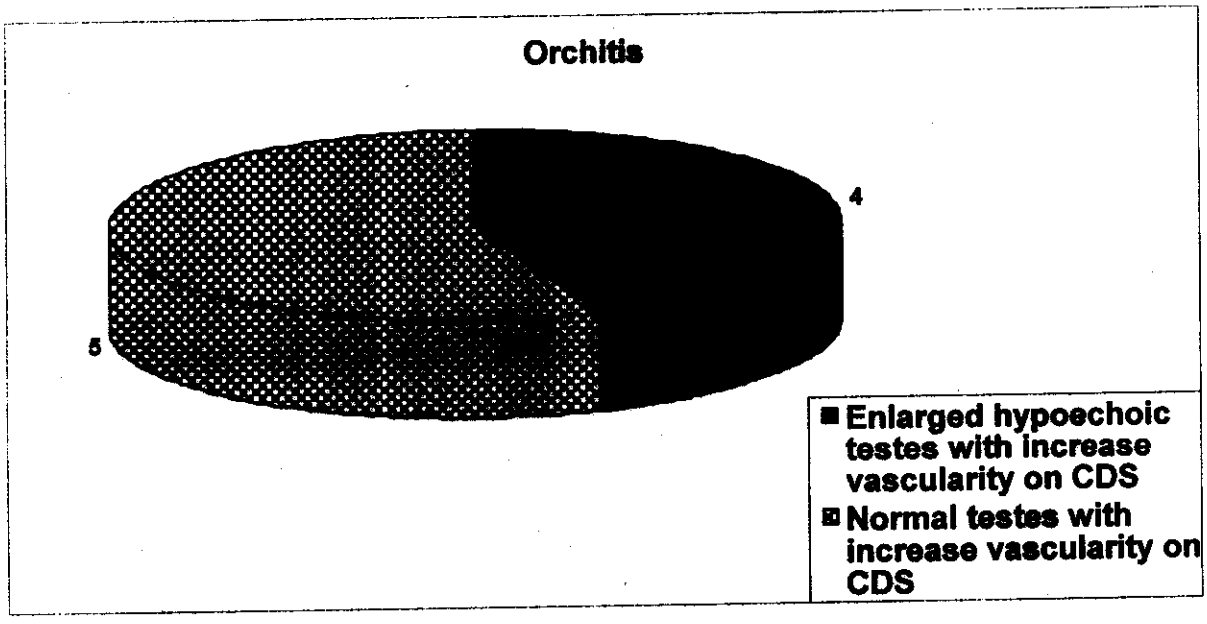
Of the 20 patients who were sonographically diagnosed as having epididymitis, 6 patients (26%) had an associated orchitis. Isolated orchitis was found in 3 patients (13%).

Of the 20 patients that were sonographically diagnosed as having epididymitis, 17 patients (85%) showed enlarged inhomogeneous hypoechoic epididymis with increased vascularity on CDS examination and antegrade diastolic flow suggestive of inflammation, seen on spectral waveform analysis of epididymal vessels. The other 3 patients (15%) had normal appearance of the epididymis on grey scale and the only sign of inflammation was the hypervascularity seen on CDS examination and the

antegrade diastolic flow seen on spectral waveform analysis (Fig.7).



Those diagnosed orchitis by sonography (9 patients) showed normal grey scale findings of the affected testis in 5 patients (55.6%) and showed an enlarged hypoechoic inhomogeneous echogenicity in 4 patients (44.4%). However, all the patients showed increased vascularity of the affected testis together with the epididymis depicted on CDS examination compared to the asymptomatic side (Fig.8).



Two patients showed enlarged inhomogeneous epididymis with a rounded ill-defined, hypoechoic, solid lesion, impressive of severe epididymitis with developing abscess formation. One of them is of acute onset, small size, showing a hyperechoic rim and present at the tail of the epididymis with

associated orchitis and diagnosed as pyogenic abscess. The other patient showed a long duration of symptoms, larger in size and located at the epididymal head with preserved ipsilateral testis proved to be T.B. abscess.

Table (3): Comparison of clinical characteristics of tuberculous and pyogenic epididymal abscesses

characteristic	Tuberculous	Pyogenic
Age (years)	29	33
Duration of symptoms (days)	73	5
Tenderness of scrotum	No	Present
Pus Discharge from draining sinus	Yes	No

Table (4): Comparison of gray-scale sonographic and color Doppler sonographic features of tuberculous and pyogenic epididymal abscesses

Characteristic	Tuberculous	Pyogenic
Size	Large	Small
Echogenicity	Hypoechoic	Hypoechoic
Hyperechoic rim	No	Yes
Testicular involvement	No	Yes
Vascularity of epididymis	Increased	Increased
Vascularity of testis	Normal	Increased

The sonographically diagnosed testicular torsion showed enlarged testis. The testicular echogenicity was normal, and the testis is seen relatively enlarged.

CDS examination of this case that were sonographically diagnosed as testicular torsion revealed total absence of any vascularity of the testis in the symptomatic side with normal vascularity depicted at the asymptomatic one.

Mild to moderate hydrocele was found in 11 patients (47.8%) sonographically diagnosed as inflammatory disease. Ipsilateral hydrocele occurred in 8 patients (72.7%) and bilateral hydrocele in 3 patients (27.3%). No hydrocele was detected in the patient sonographically diagnosed as testicular torsion.

Calcific foci were seen in the left epididymis in one patient. Four patients showed epididymal cyst discovered accidentally at the head.

Group III: **- Patients complaining of painless scrotal swelling.**

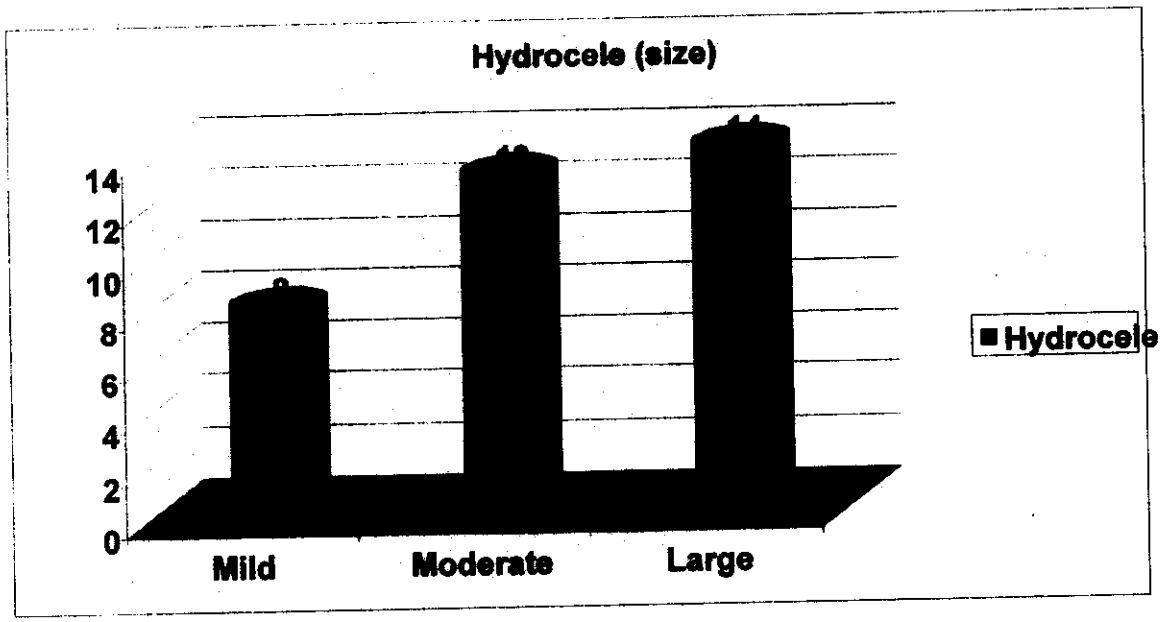
This group includes 43 patients (58% of the total), of which 25 patients (58.1%) were sonographically diagnosed as having hydrocele, 6 patients (14%) as having testicular tumors, 6 patients (14%) as having inguino-scrotal hernia and 6 patients (14%) as having spermatocele.

Table (5): Results of group III (hydrocele)

Case	Age	Clinical	Size		Type	Septations	U/S	Associated pathology
			Left	Right				
1	26	Bil	Mod	Mod	vaginal	-	Bil	
2	30	Rt	-	Large	vaginal	-	Rt	
3	31	Bil	Mod	Mod	vaginal	+	Bil	
4	32	Bil	Mod	Mod	vaginal	-	Bil	
5	28	Rt	Mild	Mod	vaginal	-	Bil	Rt epididymal cyst
6	25	Rt	-	Large	vaginal	-	Rt	
7	20	Rt	Mild	Mod	vaginal	+	Bil	Rt epididymal cyst
8	29	Bil	Large	Large	vaginal	+	Bil	Intratesticular calcification
9	28	Bil	Large	Mod	vaginal	-	Bil	
10	25	Lt	Large	-	vaginal	-	Lt	Varicocele
11	5	Lt	Large	-	vaginal	+	Lt	Rt epididymal cyst
12	70	Bil	Mild	Mild	vaginal	-	Bil (lympho cele)	Scrotal wall thickening with fluid in fascial planes
13	15	Rt	Mild	Mod	vaginal	-	Bil	Varicocele
14	25	Rt	-	Large	vaginal	+	Rt	
15	37	Lt	Mild	-	vaginal	-	Lt	Varicocele
16	42	Rt	-	Large	vaginal	-	Rt	
17	44	Lt	Large	-	vaginal	-	Lt	
18	64	Rt	Mild	Mild	vaginal	-	Bil	
19	22	Lt	Mod	-	vaginal	-	Lt	Varicocele
20	19	Lt	Mod	-	vaginal	-	Lt	Varicocele
21	14	Rt	-	Large	cong	-	Rt	
22	54	Bil	Large	Large	vaginal	+	Bil	
23	45	Lt	Mod	-	vaginal	-	Lt	Rt epididymal cyst
24	36	Lt	Large	-	vaginal	-	Lt	Lt epididymal cyst
25	IU	Bil. Mod. Hydrocele						Abdominal collection

Lt = left, Rt = right, Bil = bilateral, Mod = moderate, Cong = congenital, IU = intra-uterine.

The size of the hydrocele was subjectively graded by sonar into mild, moderate and large hydrocele. 8 patients (22.9%) were diagnosed sonographically as having mild, 13 patients (37.1%) as having moderate and 14 patients (40%) as having large hydrocele (Fig.9).



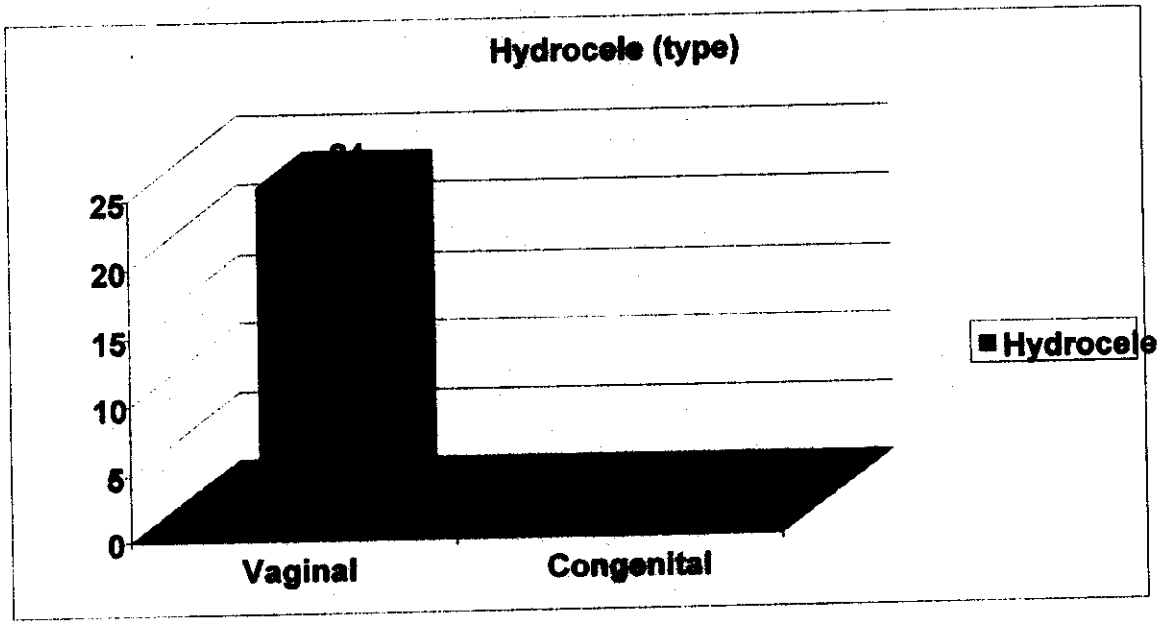
Hydrocele was sonographically diagnosed on the right side only in 8 patients (22.9%), on the left side only in 11 patients (31.4%) and was bilateral in 16 patients (45.7%). Four patients were clinically diagnosed as having unilateral hydrocele, but after performing scrotal sonographically, bilateral hydrocele was depicted being mild on the contralateral side which was not detected clinically. Thus In the current study, clinical examination can detect only 50 % of cases of mild hydrocele.

Six patients (24%) had septations within the hydrocele. In five of these patients the hydrocele fluid within the tunica vaginalis was divided into compartments by these septae. It is to be noted that one patient had history of scrotal operation.

One patient with bilateral mild hydrocele showed scrotal wall thickening associated with fluid separating the fascial planes. This patient under treatment of filariasis and diagnosed as lymphocele confirmed after histopathological examination of fluid.

Accidentally discovered bilateral moderate hydrocele discovered in an intrauterine male fetus, abdominal fluid is seen as well.

In all the patients, the fluid within the tunica vaginalis not extends beyond the scrotal neck, and was diagnosed as vaginal hydrocele. One patient showed connection between fluid in tunica vaginalis and pelvic peritoneum through the inguinal canal, and diagnosed as congenital hydrocele (Fig.10).



Associated scrotal pathology was found in 10 patients (40%). Four patients (16%) had an associated epididymal cyst. Intratesticular macro-calcification was depicted in the right testis in one patient, likely resulting from old granuloma. Five patients had an associated varicocele not causing pain or infertility.

Table (6): Results of group III (tumors)

Case	Age	Echotexture	PS	ED	RI	Histo-pathology	Associated pathology
26	60	Hypoechoic	29	9	0.7	Seminoma	Bilateral hydrocele
27	46	Hypoechoic	18	8	0.56	Seminoma	Ipsilateral hydrocele
28	64	Heterogeneous	23	4	0.8	Mixed germ cell	Ipsilateral hydrocele
29	32	Heterogeneous	30	8	0.7	Mixed germ cell	
30	42	Heterogeneous	27	8	0.63	Lymphoma	
31	57	Heterogeneous	9	5	0.4	Extratesticular fibroma	Contralateral hydrocele and epididymal head cyst

PS = peak systolic velocity, ED = end diastolic velocity, RI = resistive index.

Five patients (11.6%) in this group had sonographic evidence of testicular focal lesion that was diagnosed as testicular tumor, and one patient (2.3%) diagnosed as extra testicular mesenchymal tumor. Tumor cell types include 2 seminomas, 1 lymphoma, 1 malignant mixed germ cell tumor and 1 extratesticular fibroma.

The grey scale findings include two patients with well defined, homogeneously hypoechoic lesion, which proved to be seminoma. One patient showed a heterogeneous ill-defined focal lesion with areas of hypo and hyper echogenicity that proved to be lymphoma. One patient showed a heterogeneous well defined predominantly hypoechoic, solid and cystic lesion with calcification within its solid component that proved to be mixed germ cell tumor, and another patient showed a heterogeneous well defined focal lesion with areas of hypo and hyper echogenicity extra testicular, intrascrotal that proved to be fibroma.

The distribution of the blood vessels within the tumor could be undisturbed, following the normal vascular planes or the distribution could be random and disorganized.

Pulsed Doppler waveform analysis of the tumor vessels was performed in all cases. Peak systolic velocities, end diastolic velocities as well as the resistive indices were calculated in all cases. The peak systolic velocity ranged from 9 to 30 cm/sec with a mean Value of 21.8 cm/sec. The end-diastolic velocity ranged from 4 to 9 cm/sec with a mean value of 6.8 cm/sec. The resistive index ranged from 0.44 to 0.83 with a mean value of 0.65.

Two patients had an ipsilateral hydrocele. One patient had bilateral hydrocele, and one patient had contralateral hydrocele. One patient had associated epididymal cyst.

Table (7): Results of group III (spermatocele)

Case	Age	Site	Internal echoes	Septations	Associated pathology
32	32	Right	+	+	
33	20	Right	+	-	
34	28	Left	-	-	Contralateral epididymal head cyst
35	23	Right	-	-	
36	25	Left	+	+	
37	22	Right	+	+	Contralateral epididymal head cyst

Six patients (14%) in this group had a sonographic diagnosis of spermatocele. The patients were clinically diagnosed as having a supratesticular scrotal swelling. Cystic structure was found at the head of the

epididymis on sonographic examination. Four patients (66.7%) are right sided, and detected in the left side in two patients (33.3%). Associated contralateral epididymal cyst noted in two patients with right spermatocele.

Table (8): Results of group III (hernia)

Case	Age	Clinical	Fluid in hernial sac	Associated pathology
38	7	Left oblique inguinal hernia	-	Left varicocele Hydrocele
39	11	Right oblique inguinal hernia	-	Hydrocele
40	65	Right oblique inguinal hernia	-	
41	12	Supratesticular mass	+	Hydrocele
42	9	Right oblique inguinal hernia	+	
43	12	Left oblique inguinal hernia	-	Left varicocele

Six patient of this group had sonographic evidences of inguino-scrotal hernia, with bowel loops seen in the scrotal sac. Further protrusion of the hernial sac into the scrotum is noted on straining except in one patient proved to be an obstructed hernia. Fluid within the hernial sac is noted in two patients, one of them is the obstructed hernia. Two patients showed left mild varicocele causing no pain or infertility. Three patients have ipsilateral hydrocele ranging from mild to moderate.

Group IV: - patients giving a history of trauma and complaining of a swollen scrotum with or without scrotal pain.

Table (9): Results of group IV

Case	Age	Site	Size of hematoma	Duration	US/D
1	24	Left	Large	7 days	Hematocele
2	29	Left	Large	11 months	Organized hematoma
3	18	Right	Small	4 days	Hematocele with testicular injury
4	66	Left	Large	8 months	Chronic hematoma

This group includes 4 patients. One patient showed thickened heterogeneous scrotal wall surrounding the left testes with large hypo echoic mass related to the lower pole representing testicular hematoma. A diagnosis of old organized hematoma with secondary infection was established.

Another patient showed a diffuse hypoechoic texture of the right testis with hyperechoic areas representing old chronic testicular hematoma.

The last two patients showed a large fluid collection surrounding the testis with internal echoes within. An antero-posterior fracture line is seen in one of them. The diagnosis of hematocele was confirmed after surgical evacuation.

Group V: - Patient with an uncommon complaint of scrotal swelling relived by micturation.

This patient is 45 years old presented by right large scrotal swelling showing marked amount of intra scrotal fluid. On near total bladder evacuation, a curved line is seen separating the right testis, which is surrounded by small amount of clear hydrocele, from another fluid containing sac. IVP was then done for this patient showing herniation of the bladder into the right scrotal compartment.