Effect of hydrocelectomy on testicular size in adult patients with unilateral idiopathic hydrocele (hydrocelectomy & testicular size)

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Abstract

Background: The testes are paired organs that lie within the scrotal sac which is subdivided into two compartments by the scrotal septum, and supported by the tunica vaginalis, which is formed of 2 layers. In most normal subjects, small amount of fluid (1-2mL) can be seen within the leaves of the tunica vaginalis. Hydrocele is exist when an excessive amount of fluid is present. Hydrocele is divided into congenital & acquired. Virtually all hydroceles are congenital in neonates and infants, whereas most of the acquired causes of hydrocele are idiopathic. Other causes of acquired hydrocele include: infection, tumors, trauma, and torsion and trradiation therapy. Hydrocele is the most common cause of painless scrotal swelling.

Objective: to determine whether there is an effect of hydrocelectomy on testicular size in adult patients with unilateral idiopathic hydrocele.

Patients and Methods: This prospective study was done in the ultrasound unit of AL-kadhimyia teaching hospital from the period of July 2006 to November 2007. Thirty three patients with a mean age of 35.8 years who had unilateral idiopathic hydrocele and who underwent unilateral hydrocelectomy were included in the study. The ultrasound examination was done in the supine position & included the preoperative evaluation of the hydrocele, & assessment of the testicular volume of the involved and uninvolved sides before and after surgery. Calculating the testicular volume from the formula: volume = length × width × depth × 0.52

Results: a statistically significant differences in the testicular volumes between the normal side (mean ± SD, 18.42± 2.02 mL) and the side with the hydrocele (23.23± 2.31 mL) before surgery ($p < 0.001$), and in the volumes in the side with the hydrocele before (23.23± 2.31 mL) and after (17.77± 2.22 mL) surgery ($p < 0.001$). No such difference in volume was seen in the normal side before (18.42± 2.02 mL) and after (18.46± 2.05 mL) surgery ($p = 0.200$). Also no significant difference in the testicular volumes of the normal side (18.46± 2.05 mL) and the side with hydrocele (17.77± 2.22 mL) after surgery ($p = 0.150$). The mean reduction in volume in the testis with the hydrocele after hydrocelectomy was 23.22%.

Conclusions: There is an association between the development of an idiopathic hydrocele and testicular size. We believe that the increment in the volume is due to an increase in the impedance to venous and lymphatic flow. Surgeons should be aware that there is a decrease in testicular volume after hydrocelectomy so they do not misdiagnose this change as post-operative trauma or atrophy often in correlation with clinical symptoms, clinical examination & assessment.

Keywords: hydrocelectomy, testicular size, idiopathic hydrocele.

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Introduction

Anatomy:

The testes are paired organs that lie within the scrotal sac which is subdivided into two compartments by fibrous tissue called the scrotal septum.

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Surrounding the testis is an encapsulating layer of peritoneum called the tunica albuginea where it is continuous with the septa that divide the testis into about 250 lobules [(1)].

The testes are supported by the tunica vaginalis [(1)], which is a potential space, formed of 2 layers, an inner visceral layer covers the testis and epididymis, and an outer parietal layer lines the scrotum. The layers join at the postero-lateral aspect of the testis where it attaches to the scrotal wall [(2-4)], preventing each testis from rotation

within the scrotum. The tunica albuginea is a dense white covering of the testis; the visceral layer of the tunica vaginalis covers the tunica albuginea (Figure 1) [1].

The normal adult testicular volume is 15–20 ml [5], with an approximate diameter of 3 to 5 cm, which decreases with age [6]

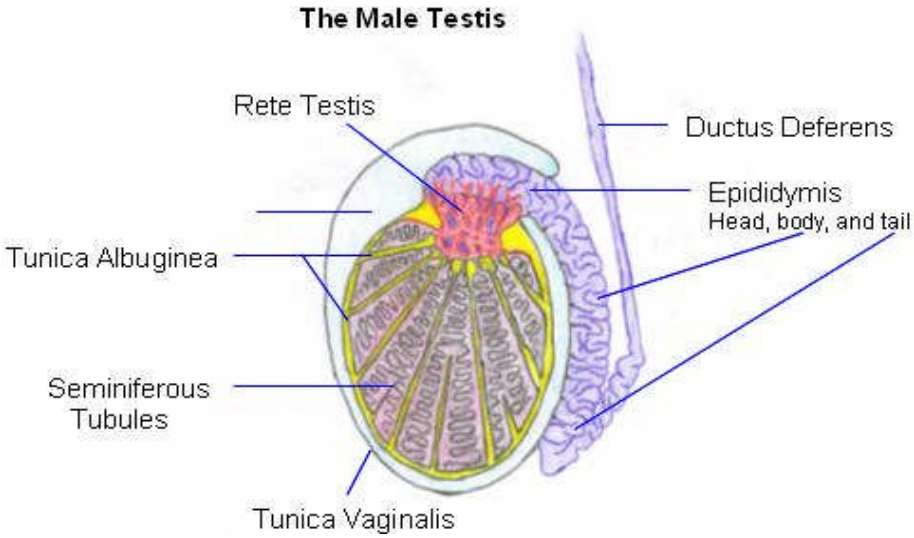

Figure 1: This drawing demonstrates anatomy of the testis. The visceral tunica vaginalis surrounds the testis. The tunica vaginalis is a fluid filled sac surrounding the testis [1].

Ultrasound of the normal testis:

The normal testicle of the adult male is homogenously hypoechoic [7]. It appears homogenous on ultrasound with an echo texture similar to the thyroid gland. The normal testis appears encapsulated owing to the presence of the tunica vaginalis, which can be seen on ultrasound as a dense hypoechoic band surrounding the testis (Figure 2) [1].

Figure 2: This ultrasound image through the middle portion of a testis demonstrates the homogenous appearance of the testis. Note the thin hypoechoic ring of fibrous tissue surrounding the testis giving it an encapsulated appearance. This ring is the tunica vaginalis (white arrow), which contains a small amount of fluid between its layers (visceral and parietal tunica) [1].

Hydrocele:

In most normal subjects, a small amount of fluid (1 to 2 mL) can be seen within the leaves of the tunica vaginalis, this reduces friction caused by movement of the scrotum [1, 3].

Hydrocele is present when an excessive amount of fluid is present [6].

Hydrocele is the most common cause of painless scrotal swelling [8]

[1]The congenital type of hydrocele is communicating type & results from the patency of the processus vaginalis testis, which allows peritoneal fluid to enter the scrotal sac. Virtually all hydroceles are congenital in neonates and infants, whereas most of the acquired hydrocele (Non-communicating) are idiopathic [9, 10]. Other causes of acquired hydroceles include: infection, tumors, trauma, and torsion and radiation therapy [11].

The exact mechanism of idiopathic hydrocele formation is not known. Factors such as increased serous fluid secretion, lack of efferent lymphatics, and inadequate reabsorption of fluid secreted by the mesothelium are possible explanations [9]. It affects approximately 1% of adult men, and the adult type of hydrocele is seen mostly in men older than 40 years. Hydroceles are bilateral in approximately 7-10% of cases [12].

The effect of a hydrocele on the gonads has not been studied widely. A few studies have suggested that hydroceles may be associated with infertility by interfering with spermatogenesis [13-16].

Ultrasonographically, hydrocele is seen as an echo free area partly surrounding the testicle. When infection is the cause, the hydrocele may demonstrate internal echos [17].

Aim of the study

The purpose of the study was to determine whether there is an effect of hydrocelectomy on testicular size in adult patients with unilateral idiopathic hydrocele.

Patients & methods

This prospective study was done on thirty three patients in the ultrasound unit of AL-kadhimyia teaching hospital from the period of July 2006 to November 2007 including the follow up.

The 33 patients have the diagnosis of unilateral idiopathic hydrocele (non-communicating and non-congenital) that underwent hydrocelectomy, the patients being referred to ultrasound unit by the urologist or the general surgeon.

At physical examination, the surgeon was unable to palpate the testis due to the hydrocele. No underlying cause for the hydrocele was found in any of the patients.

All the examinations were performed with a high-resolution sonography system (Sonoline Versa pro, Siemens Medical system) using a 7-10 MHz linear array transducer.

The ultrasound examination was done in the supine position, the affected testes being evaluated in both the saggital & transverse sections, the examination protocol included the preoperative evaluation of the hydrocele which appears as an anechoic dark fluid collection surrounding the testicle, any patient with complex hydrocele which may contain internal echoes with septations and loculations were excluded from the study. The ultrasound examination also include the evaluation of the volume of both testes. The length, width, and antero-posterior diameter of both testes were measured (each one of these parameters are measured 3 times & the average readings was taken), the readings were done by 2 independent radiologists to decreae the inter-observer error.

Calculating the testicular volume from the formula: volume = length × width × depth × 0.52 [5, 18].

Sonography was performed at a mean follow-up period of 4.5 months after surgery (range, 2-7 months). None of the patients had recurrence of their hydrocele during this follow-up period.Postoperative measurements included testicular volume on both sides. All the calculations and measurements were performed by the method that was described earlier.

Statistical analysis using the program SPSS (version 15 for Microsoft Windows). The testicular volumes for the normal side and the side with hydrocele were compared before & after surgery. Testicular volumes for the side with hydrocele were compared after surgery. Statistical significance was indicated by a p value of less than 0.05. The testicular volume measurements of a single testicle before and after hydrocelectomy were calculated and expressed as mean ± SD. The percentage of difference between the testicular volumes for the hydrocele testicle after hydocelectomy was calculated as percentage of change in testicular size.

Results

The 33 patients included in this study ranged in age from 21 to 53 years (mean age, 35.8 ± 10.8 years). Fifteen patients (45.5%) had right-sided and eighteen patients (54.5%) had left-sided hydroceles (Table 1).

All the hydroceles appeared as anechoic fluid collections around the testes. None of the hydroceles appeared complicated on sonography. None of the patients was shown to have a testicular tumor, inflammation, a varicocele, or an inguinal hernia on sonography.

The volume for each testis before and after hydrocelectomy and the percentage of differences in measurements are given in Tables 2.

Table 3 summarizes the means, standard deviation, minimum & maximum values of testicular volume & the mean of percentage of volume difference in pre & post operative state of the normal side & the side with hydrocele

Before surgery, a statistically significant difference was found between the testicular volume on the normal side (18.42± 2.02 mL) & the side with hydrocele (23.23± 2.31 mL) ($p < 0.001$).

After hydrocelectomy, there was a statistically significant difference in the testicular volumes in the side with the hydrocele before (23.23± 2.31 mL) and after (17.77± 2.22 mL) surgery ($p < 0.001$). There was no significant difference in the testicular volumes before (18.42± 2.02 mL) and after (18.46± 2.05 mL) surgery on the normal side ($p = 0.200$). Also no significant difference in the testicular volumes of both sides after surgery (8.46± 2.05 mL & 17.77± 2.22 mL) ($p = 0.150$).

Figures 3 shows an example of the pre- and postoperative changes in the volume of the testicles with unilateral idiopathic hydrocele.

Table 1: Number & percentage of patients having hydrocele according to side:

	No.	%
Rt. Sided hydrocele	15	45.5
Lt. sided hydrocele	18	54.5
Total	33	100

Table 2: Pre & post operative testicular volume (ml) & % of volume difference of the normal side & the side with hydrocele

Patient No.	TESTICULAR VOLUME ON NORMAL SIDE			TESTICULAR VOLUME ON SIDE WITH HYDROCELE		
	Pre-operative (ml)	Post-operative (ml)	% of volume difference	Pre-operative (ml)	Post-operative (ml)	% of volume difference
1	16.50	16.80	+1.8	21.90	16.40	-25
2	15.40	15.80	+2.6	23.70	14.80	-37.5
3	21.30	20.90	-1.9	27.00	19.00	-26
4	16.70	17.00	+1.8	21.50	19.40	-10
5	19.20	19.20	0	23.60	20.40	-13.5
6	20.60	20.10	-2.4	21.20	16.30	-22.4
7	19.10	19.00	-0.5	21.00	15.10	-28.1
8	16.20	16.00	-1.2	18.90	15.40	-18.5
9	16.30	15.90	-2.4	22.60	18.80	-16.8
10	17.70	17.20	-2.8	26.00	22.70	-12.7
11	18.10	17.90	-1.1	23.10	19.20	-16.9
12	21.40	21.10	-1.4	28.20	19.10	-32.3
13	20.70	21.20	+2.4	24.60	18.70	-24
14	18.90	17.80	-5.8	24.70	17.50	-29
15	21.10	21.40	+1.4	21.30	17.50	-17.8
16	19.60	19.10	-2.5	26.10	21.30	-18.4
17	21.00	22.90	+9	19.60	15.30	-22
18	14.70	15.70	+6.8	23.30	16.00	-31.3
19	16.80	17.10	+1.8	22.30	16.80	-24.7
20	18.00	18.60	+3.3	20.40	15.00	-26.5
21	16.30	16.50	+1.2	22.10	16.70	-24.4
22	15.80	15.70	-0.6	24.10	15.00	-37.7
23	21.50	21.20	-1.4	22.90	17.40	-24
24	18.70	18.90	+1.1	22.70	14.00	-38.3
25	20.30	20.40	+0.5	26.00	18.70	-28
26	16.30	16.10	-1.2	22.50	20.10	-10.6
27	17.50	17.60	+0.6	24.60	21.40	-13
28	19.00	19.40	+2.1	22.20	17.00	-23.4
29	15.80	15.50	-1.9	20.30	17.10	-15.8
30	18.40	18.10	-1.6	28.00	19.30	-31
31	18.60	18.80	+1.1	25.40	21.30	-16.1
32	21.00	20.70	-1.4	21.50	17.70	-17.7
33	19.40	19.70	+1.5	23.50	16.20	-31.1

Table 3: means, standard deviation, minimum & maximum values of testicular volume & average of % of volume difference in pre & post operative state of the normal side & the side with hydrocele

	TESTICULAR VOLUME ON NORMAL SIDE		TESTICULAR VOLUME ON SIDE WITH HYDROCELE	
	Pre operative	Post operative	Pre operative	Post operative
Mean	18.42	18.46	23.23	17.77
Std. Deviation	2.02	2.05	2.31	2.22
Minimum	14.70	15.50	18.90	14.00
Maximum	21.50	22.90	28.20	22.70
% of volume difference	+0.27		-23.22	
Total	33	33	33	33

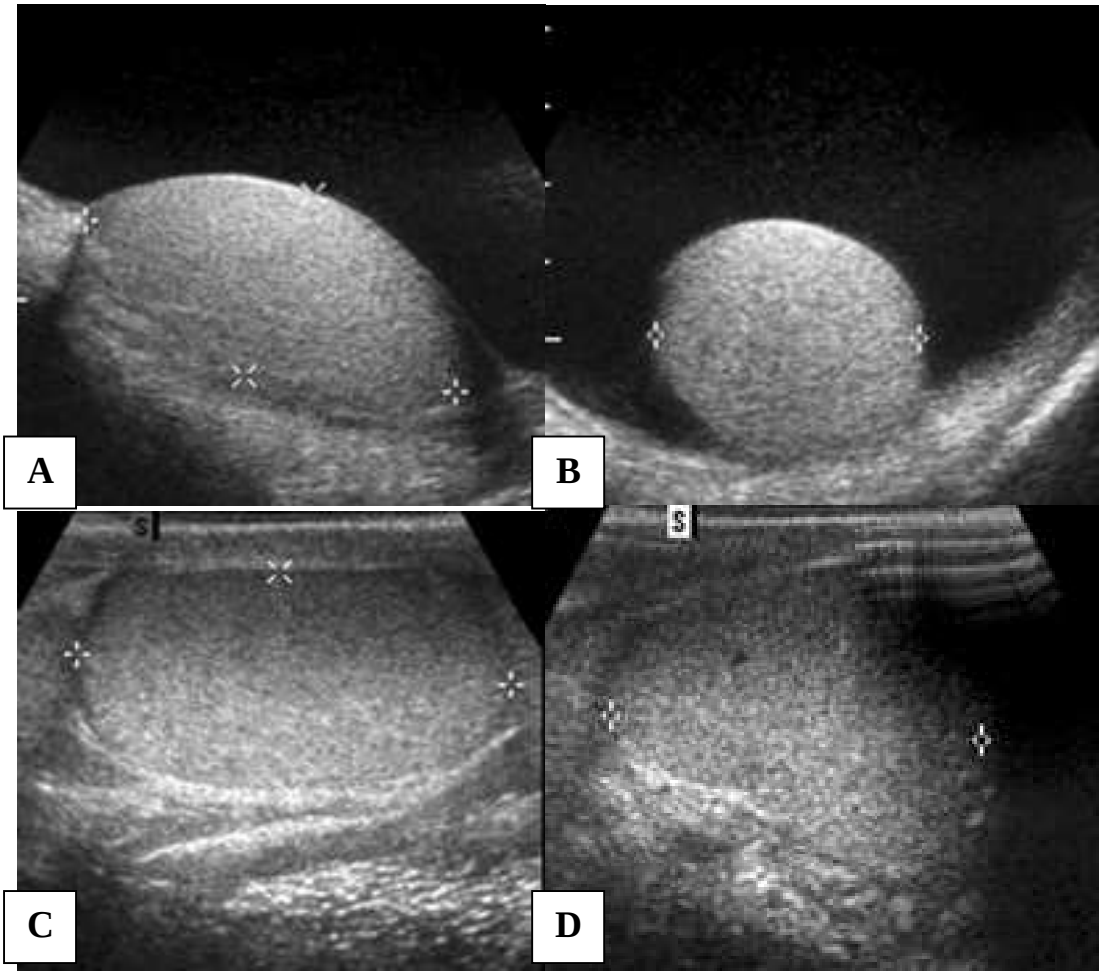

Figure 3: 39-year-old man with 7-months history of painless swelling of Lt. scrotum. On preoperative sagittal (A) and transverse (B) ultrasound of testis on side with hydrocele, testicular volume was measured as 26.1 mL. C & D: same patient in A & B on postoperative sagittal (C) and transverse (D) ultrasound of testis, testicular volume was measured as 21.3 mL.

Discussion

Hydrocele causes physical, psychological, social, and economic distress. Many men with a hydrocele think that they will never be cured, are often embarrassed by the condition, and frequently lose hope of living a normal life [19].Hydroceles are generally painless. However, if pain is present, it may interfere with daily activities, and large hydroceles can even cause patients to have difficulty with sexual intercourse [20].

Few reports have shown that hydroceles may affect spermatogenesis, which may be partially or totally absent [13-16]. The pathophysiologic mechanisms that probably cause decreased spermatogenesis may be the pressure effect of the hydrocele on the testis, the reaction of testicular cells to the highly proteinaceous fluid, or whatever cause led to the formation of the hydrocele. The hydrostatic pressure of a hydrocele has been shown to surpass the pressure of blood vessels within the scrotum[21]. The pressure of fluid as a mechanical factor plays an important role in the malfunction of spermatogenesis. Histopathological changes observed are interstitial fibrosis, thickening of the basement membrane, and disorganization of spermatogenic cells [13-16].

The conventional surgery for an idiopathic hydrocele is an excision and subsequent eversion of the sac and this procedure remains the most popular surgical method [22].

In this study fifteen patients (45.5%) had right-sided and eighteen patients (54.5%) had left-sided hydroceles, so there were no significant differences in the distribution hydrocele according to the side.

We sought to determine the effect of a hydrocele on testicular volume using sonography. We found a statistically significant increase in testicular volume on the affected side (23.23± 2.31 mL) when compared with that on the uninvolved side (18.42± 2.02) before surgery. Also, the postoperative volume of the involved side (17.77± 2.22 mL) was significantly lower than the preoperative volume (23.23± 2.31 mL), similar results were seen by Ismail Mihmanli et al in adult patients with idiopathic hydrocele [23] & by Ibrahim Adaletli. et al in children with congenital hydrocele [24]. Also no significant difference in the testicular volumes of both sides after surgery (8.46± 2.05 mL & 17.77± 2.22 mL) indicating the return of testicular volume of the hydrocele side to normal range taking the normal side as a control, this result is equivalent to the previous reported studies [23, 24].

The difference in volume can be explained by the same pathophysiologic mechanisms that were mentioned earlier [13-16, 21]. We think that the pressure of the hydrocele causes an obstruction in the vessels of the testis, thus creating stasis in the venous and lymphatic outflow. This stasis is in turn reflected as swelling and an increase in the size of the testis. After hydrocelectomy, the mean volume of the testis on the side with hydrocele was measured as 17.77± 2.22 mL. When compared with preoperative values, the postoperative measurements showed a statistically significant decrease ($p < 0.001$) of approximately 23.22%. Ismail Mihmanli et al showed 21% reduction in testicular volume in adult patients with idiopathic hydrocele [23]. Ibrahim Adaletli. et al showed 15% reduction in testicular volume after hydrocelectomy in children with congenital hydrocele [24]. We believe that this decrease is related to the removal of the pressure on the testis

with subsequent improvement in the venous and lymphatic outflow and overall regression of the swelling.

Conclusion

In conclusion, an idiopathic hydrocele is associated with an increased testicular volume. We think that the increase in volume is due to an increase in impedance to venous and lymphatic flow. Surgeons should be aware that there is a decrease in testicular volume after hydrocelectomy so they do not misdiagnose this change as postoperative trauma or testicular atrophy often in correlation with clinical symptoms, clinical examination & assessment.

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