The Correlation between Ultrasound Testicular Volume and Conventional Semen Parameters in Albanian Subfertile Males

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Abstract

OBJECTIVE: The study is conducted to evaluate the relationship between testicular volume measured by ultrasound and conventional sperm parameters (volume, concentration, total count, motility and morphology) in Albanian subfertile males and to determine a normal limit value of the testicular volume.

MATERIALS AND METHODS: A total of 500 males were observed for this study. The testicular volumes of all subjects were measured by ultrasonography. The semen samples were collected by the process of masturbation after 3-5 days of ejaculatory abstinence and were analyzed according to WHO criteria 2010.

RESULTS: Testicular volume has a strong positive correlation with sperm count, total count and motility and a positive correlation with semen volume.

CONCLUSION: Testicular volume has a direct correlation with semen parameters and the critical total testicular volume indicating normal testicular function is approximately 26.6 ml (the mean testicular volume 13.3 ml). The measurement of testicular volume can be helpful for assessing fertility at the initial physical examination.

Introduction

The examination of the infertile man comprises physical examination, semen analysis, and hormone testing and ultrasound examination. Since the seminiferous tubules comprise 75–85% of the testicular mass, testicular volume is likely to reflect spermatogenesis and semen profiles in infertile men. The testis is composed primarily of seminiferous tubules packed closely together and also interstitial cells. Each tubule is 30–70 cm long and 200-300 microns in diameter. There are approximately 500–600 tubules per testis. The cells within the seminiferous tubules are germ cells that get matured into spermatozoa, and Sertoli cells that serve as supporting cells for developing germ cells. Sertoli cells create a blood-testis barrier and separate the germinall epithelium into basal and luminal compartments. The WHO 2010 criterion for semen are: the lower reference limit for semen volume is 1.5 ml; the lower reference limit for total motility (PR + NP) is 40%; the lower reference limit for sperm concentration is 15 million spermatozoa per ml; the lower reference limit for total sperm number is 39 million spermatozoa per ejaculate; the lower reference limit for sperm morphology is 4 %.

Testicular volume measurement methods involve the use of calipers, orchidometry or ultrasonography. Orchidometry is a conventional method that has been used for many years but the cut off testicular volume that indicates normal testicular function is not established. Some studies have concluded that the ultrasound measurement of testicular volume is more confident that orchidometry [1, 2]. Bahk JY and others have showed that in a...
To estimate the levels of different sperm parameters including testicular volume, mean and standard deviation of the same were worked out. Independent t-test was performed. Pearson correlation coefficient was worked out to assess the linear relationship of testicular volume with different sperm parameters. Data was entered into the computer using Microsoft Excel.

Results and Discussion

The mean age for all participants was 31.48 years with a standard deviation (S.D) of 3.8 years. Among patients, 13 men (2.6 %) failed to give semen (aspermia) even after three attempts. Mean testicular volume in aspermic men was 18.1 ml. Other 79 patients had tests damage post orchitis (29 patients), post herniorraphy (15), post orchipey (15), had criptorchidism (10), had only one testis (8) and in two cases it was malignant tumor testes. For the other 408 patients in the Table 1 is the relationship between total testicular volume (right testicular volume + left testicular volume) and semen volume, sperm count per ml, total sperms per ejaculate, motility and morphology.

Table 1: Correlation between total testicular volume and the variables.

| Variables          | r       | p value |
|--------------------|---------|---------|
| Age                | 0.02    | 0.692   |
| Semen Volume       | 0.247   | <0.0001 |
| Concentration      | 0.499   | <0.0001 |
| Mobility           | 0.484   | <0.0001 |
| Morphology         | 0.392   | <0.0001 |
| Total spermatozoa  | 0.514   | <0.0001 |

*Pearson correlation coefficient.

No correlation is seen between total testicular volume and the age. Significant positive correlation is seen between total testicular volume and semen volume (r = 0.247, p < 0.0001), because the testis contributes only 5 % of the semen volume. Pearson correlation test was strongly significant between testicular volume and total sperm count (r = 0.514, p < 0.0001), between testicular volume and sperm count per ml (r = 0.499, p<0.0001). Highly positive relationship was observed between testicular volume and sperm motility (r=0.484, p < 0.0001).

Table 2: Total count of spermatozoa.

| Variables          | Total count of spermatozoa |
|--------------------|---------------------------|
|                   | Total (n=2023) | Normal (n=185) |
| TTV                | 29.58 ± 9.69 | 36.31 ± 7.44 |
| RTV                | 13.31 ± 4.38 | 18.55 ± 3.83 |
| LTV                | 13.06 ± 4.80 | 17.87 ± 3.71 |

TTV:total testicular volume; RTV, right testes volume; LTV, left testes volume.

Both sperm count per ml and total sperm count per ejaculate were directly related to total testicular volume. One hundred and five men had normal total sperm count per ejaculate (39 million and above) demonstrating the average total testicular volume of 36.31 ml (± 7.44), range (20 ml – 63 ml), the mean testicular volume 18.15 ml (the mean right testis 18.55 ml and the mean left testis 17.87 ml).

Two hundred twenty three men had a normal...
total sperm count (< 39 million) demonstrating the average total testicular volume 26.58 ml (± 9.69).

Table 3: Total count of pathological spermatozoa according testes measurement.

| Testes measurement | Total count of pathological spermatozoa (≥ 39000000) |
|--------------------|----------------------------------------------------|
|                    | Average | SD  | Median | Mode | Minimum | Maximum |
| RTL                | 39.46   | 4.56| 39     | 39   | 29      | 58      |
| RTW                | 26.37   | 2.87| 27     | 27   | 10      | 35      |
| RTH                | 17.91   | 2.93| 18     | 18   | 7       | 25      |
| LTL                | 38.18   | 4.47| 38     | 38   | 16      | 50      |
| LTH                | 25.96   | 4.13| 26     | 27   | 10      | 34      |
| _______            | 17.74   | 2.89| 18     | 18   | 7       | 24      |

The results for testes dimensions are in Table 3 and 4. For a normal sperm count the right testis measures: L = 38.4 mm (± 4.5), W = 26.3 mm (± 4.2), H = 17.9 mm (± 2.9); the left testes measures: L = 38.1 mm (± 4.4), W = 25.9 mm (± 4.1), H = 17.7 mm (± 2.8). For normal sperm count the right testis measures: L = 43.32 mm (± 3.8), W = 29.5 mm (± 1.9), H = 20.19 mm (± 1.37); the left testes measures: L = 42.85 mm (± 3.74), W = 29 mm (± 2), H = 19.97 mm (± 1.4).

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t testis width; RTH, right testis height; LTL, left testis

range (2 ml – 56 ml), and the mean testicular volume 13.29 ml (the right testis 13.31 ml and the left testis 13.06 ml). This difference of the testis volume is statistically significant (p < 0.0001) (Table 2). Figures 1 and 2 represent two small testes; Figures 3 and 4 represent two normal testes.

Table 4: Total count of pathological spermatozoa according testes measurement.

| Testes measurement | Total count of pathological spermatozoa (≥ 39000000) |
|--------------------|----------------------------------------------------|
|                    | Average | SD  | Median | Mode | Minimum | Maximum |
| RTL                | 39.32   | 3.90| 43     | 43   | 33      | 51      |
| RTW                | 25.90   | 1.95| 30     | 30   | 24      | 35      |
| RTH                | 20.19   | 1.37| 20     | 20   | 16      | 25      |
| LTL                | 42.85   | 3.74| 43     | 43   | 35      | 51      |
| LTH                | 29.04   | 2.00| 29     | 29   | 23      | 35      |
| _______            | 19.97   | 1.42| 20     | 20   | 15      | 25      |

Figure 1: Scrotal ultrasound of two small testes.

Between 183 males with normal total count 14 males have the TTV < 27 ml, and from this number 6 men have normal spermogram, the other 8 have asthenospermia or teratospermia. From all 117 men that have TTV < 27 ml, only 6 men (5%) have normal spermogram. We did not find any male that have normal spermogram with total testicular volume under 20 ml.

In conclusion, correlation exists between testicular function and testicular volume measured by ultrasound. Smaller testes have poor semen quality, a lower number of spermatozoa, lower motility. Our study shows that the threshold value of normal total testicular volume is 26.6 ml, testicular volume 13.3 ml with tests measures: 38 x 26 x 18 mm. If the total testicular volume is < 27 ml the semen is abnormal for 95% of patients, and if the volume is <20 ml the semen is abnormal for all patients.

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