

## The influence of antegrade scrotal sclerotherapy on the diameter of the spermatic cord veins in men with varicocele

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**Key words:** varicocele, spermatic cord vein diameter, antegrade scrotal sclerotherapy.

**Summary.** *Objective.* To assess the influence of antegrade scrotal sclerotherapy on diameter of veins of the pampiniform plexus of the spermatic cord by comparison of the vein diameter before and after the operation in patients with varicocele; to evaluate the rate of recurrence of the disorder after antegrade scrotal sclerotherapy and significance of color Doppler ultrasonography in the diagnosis of varicocele; and to estimate the efficacy of the treatment.

*Material and methods.* Forty-one patients with various degrees of varicocele treated by antegrade scrotal sclerotherapy were included in the study. The size of the pampiniform plexus of veins of the patients was evaluated clinically during physical examination, and its diameter was measured by color Doppler ultrasonography before and after the operation in the upright and the supine positions during the Valsalva maneuver and without it.

*Results.* After antegrade scrotal sclerotherapy, the diameter of the studied veins was found reliably decreased while examined in all four patient's examining positions, independently of the degree of the preoperative varicocele and recurrence of the disorder. The postoperative decrease of diameter of veins was inversely proportional to the degree of varicocele, i. e. the diameter of veins in the third degree varicocele became most reduced. The recurrence of varicocele after antegrade scrotal sclerotherapy was revealed in 21.9% of the operated patients. The diameter of veins in the recurrent varicocele, assessed by physical examination, and venous blood reflux, detected by ultrasound, reliably decreased in the upright position of patients ( $p < 0.005$ ), whereas in the supine position, diameter of the studied veins remained almost the same as it was before the operation ( $p = 0.9$ ).

*Conclusions.* After antegrade scrotal sclerotherapy, the diameter of the varicocele vein decrease was statistically significant. It was mostly expressed after the operation in the cases of the third degree varicocele. The postoperative diameter of veins in the recurrent varicocele of the examined patients in the upright position was also reliably smaller than before the operation, but it practically did not differ from the preoperative diameter when the patients were examined in the supine position.

### Introduction

Varicocele is dilatation of the veins of the pampiniform plexus and the internal spermatic vein. It appears as a painless serpentine mass of dilated veins in the scrotum. The dilatation of these veins and retrograde venous flow (1, 2) may cause the increase in scrotal temperature and the temperature of the testicle (3, 4), hypotrophy of the testis (5), and impairment of sperm quality (6). The incidence of varicocele is about 15% in the general male population, about 35% in men with primary infertility, and about 81% in men with secondary infertility (7). Not all

the men with varicocele consult a doctor. Main reasons for consulting are: 1) pain in the testicles or groin, 2) very big dilatation of the spermatic cord veins (cosmetic defect), and 3) infertility.

After successful sclerosing operation, the diameter of the pampiniform plexus veins reduces, the testicular venous flow improves, and the temperature of the testicle becomes lower (8–10).

The clinical diagnosis of varicocele and its recurrence based on physical examination is rather subjective, especially in a low-grade varicocele, whereas ul-

trasonic examination is still rather often ignored. The actual rate of subclinical varicocele remains unclear. There are very scarce data in the literature concerning the changes in the spermatic cord vein diameter after antegrade scrotal sclerotherapy.

Therefore, the aim of our study was to evaluate the influence of antegrade scrotal sclerotherapy (ASS) on the diameters of the spermatic cord veins, comparing the diameters of veins before and after ASS in patients with varicocele, evaluating the rate of recurrence after ASS and importance of ultrasonic examination in varicocele diagnosis and in evaluation of the efficacy of surgical treatment.

### Patients and methods

Patients, who underwent ASS using Johnsen and Tauber method (11) of the air block technique, i.e. 1 ml of air followed by 3 ml of sclerosing agent (Aethoxysklerol 3%, Kreussler) in 1995-2000 were examined by ultrasound before the operation, afterwards they were invited for reexamination. Examination was performed after patients stood some minutes in warm room; the scrotum was inspected and palpated in the upright position, and clinical diagnosis of varicocele was made according to the Dubin-Amelar classification:

- I° – palpable only during the Valsalva maneuver;
- II° – palpable at rest without the Valsalva maneuver;
- III° – visible at rest without the Valsalva maneuver.

Clinical varicocele is visible or/and palpable as a mass of the dilated spermatic cord veins. Subclinical varicocele is not palpable as a scrotal mass, yet with a presence of venous reflux in the pampiniform plexus, determined by venography, ultrasound and other non-invasive methods (9).

The diameter of the spermatic cord veins was measured by color Doppler ultrasound device Toshiba SSH-140A on patients in the upright position a) at rest and b) during the Valsalva maneuver, and in the supine position c) at rest and d) during the Valsalva maneuver at the



**Fig. 1. Black and white view of varicocele**

level of 2 cm below the external inguinal ring. I° venous reflux was estimated when it was seen only at the beginning of the Valsalva maneuver; II° venous reflux was determined when it was seen during the whole Valsalva maneuver; and III° venous reflux was established, when it was seen during deep breathing (Fig. 1).

The diameter of the veins in some patients before operation was measured only in the upright position, since the methodology of the examination has not been settled completely. The results were analyzed using Statistica package and compared using Student t-criteria for dependent values. The correlation between the preoperative varicocele grade and the postoperative vein diameter was evaluated using the Pearson correlation coefficient and regressive line.

### Results

Forty-one patients underwent ASS. The average of the patients' age was 23.4 years (range 16–40 years) before the operation and 25.9 years (range 18–42 years)

**Table 1. Diameters of spermatic cord veins after ASS in 41 patients**

Position	Diameter of veins±SD (mm) before ASS	Diameter of veins±SD (mm) after ASS	p (value)
Upright at rest	3.3±0.957	1.4±0.903	0.000000
Upright during the Valsalva maneuver	4.0±1.140	1.9±1.055	0.000000
Supine at rest	3.0±0.982	1.3±1.032	0.000000
Supine during the Valsalva maneuver	3.7±1.087	1.8±1.160	0.000000

*Note.* Diameter of veins was measured in supine position at rest and during the Valsalva maneuver in 27 patients.

after the operation. Before ASS, four patients had I° varicocele; 25 patients – II°; and 12 patients – III°.

The diameter of the spermatic cord veins decreased significantly in all tested positions, irrespective of the determined varicocele grade before the operation or the postoperative recurrence (Table 1).

The grade of varicocele and postoperative recurrences were estimated according to Dubin-Amelar varicocele classification (12).

No recurrences after ASS were revealed in the patients with preoperative varicocele I° (4 patients). In 25 patient group with preoperative varicocele II°, six patients developed postoperative recurrent varicocele I° and 1 patient – recurrent varicocele II°. Out of 12 patients with preoperative varicocele III°, two patients developed recurrent varicocele I°. The overall number of the determined cases of the recurrent varicocele I° was 8, whereas of the varicocele II° – just in 1 patient. Total varicocele recurrence rate was 21.9%.

Ultrasonically detected postoperative venous blood flow reflux I° was present in 8 patients; II°, in 1; and III° also in 1 (in this patient, the diameter of veins did not change).

The diameters of the veins in the patients with recurrent clinical varicocele and ultrasonically confirmed venous blood flow reflux are shown in Table 2. The diameter of veins in the clinical recurrent varicocele decreased significantly when the patients assumed the upright position ( $p < 0.005$ ), and did not change in the supine position ( $p = 0.9$ ). In the patients with the ultrasonically confirmed venous blood reflux into the internal spermatic cord vein, the diameter of the spermatic

cord veins decreased significantly when the patients assumed upright position ( $p = 0.005$ ) and practically did not change in supine position ( $p = 0.1$ ).

Fig. 2 shows inverse dependence of the extent of the postoperative decrease in the diameter of veins on the preoperative varicocele grade in all testing positions, i.e. the higher preoperative varicocele grade, the narrower the postoperative diameter of the sclerosed veins.

Recurrent varicoceles determined by physical examination and ultrasonically were found in 5 patients. In 4 patients, they were diagnosed just by physical examination, whereas in 5, only ultrasonically. Neither by physical examination nor ultrasonically the recurrence of varicocele was found in 27 patients (Table 3). Out of 5 cases, when recurrence of varicocele was diagnosed both by physical examination and ultrasonically, in 3 cases varicocele was I°. In 1 case varicocele was graded as I° by physical examination, but ultrasonically II° was determined. In 1 case of varicocele II° was estimated by physical examination, and ultrasonically varicocele III° was determined.

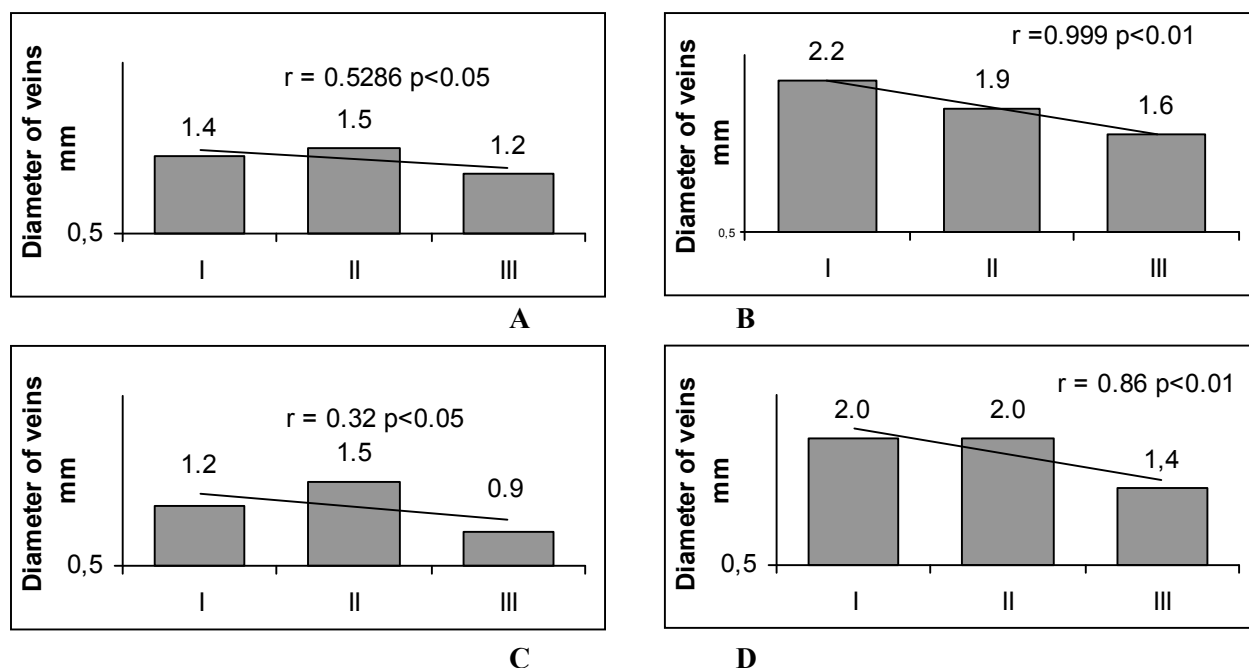
### Discussion

Dilatation of the spermatic cord veins may cause certain complications (2, 10). Retrograde venous blood flow into the internal spermatic vein may cause changes in the testicles because of hyperthermia, hypoxia, reflux of renal or perirenal metabolites (13). Varicocele is rather common disorder in men, but it is still not quite clear how it correlates with infertility (14). Maybe there is correlation between dilatation of the spermatic cord veins and varicocele complication rate? Also evidence-

**Table 2. Diameters of veins after ASS in patients with clinical varicocele recurrence and ultrasonic venous blood reflux**

Position	Cases determined by physical examination				Cases detected ultrasonically			
	Average diameters of veins±SD (mm) before ASS	Average diameters of veins±SD (mm) after ASS	p value	n	Average diameters of veins±SD (mm) before ASS	Average diameters of veins±SD (mm) after ASS	p value	n
Upright at rest	3.1±1.02	2.2±1.46	0.00478	9	3.8±0.98	2.1±1.42	0.003	10
Upright during the Valsalva maneuver	4.0±1.42	2.7±1.72	0.00123	9	4.6±1.02	2.7±1.53	0.0008	10
Supine at rest	2.9±0.72	3.0±1.68	0.90094	4	3.8±0.69	2.0±1.84	0.1	6
Supine during the Valsalva maneuver	3.9±0.97	3.7±1.81	0.82611	4	4.8±0.65	2.7±1.99	0.07	6

*Note.* Diameter of veins in lying position at rest and during the Valsalva maneuver was not measured in 5 patients with clinical varicocele recurrence and in 4 patients with ultrasonically detected venous blood reflux.



**Fig. 2. Dependence of diameter of the spermatic cord veins on preoperative varicocele grade**

A - upright at rest, B - upright during the Valsalva maneuver, C - supine at rest, D - supine during the Valsalva maneuver.

**Table 3. Relation between clinically detected varicocele recurrence and ultrasonically detected venous blood reflux**

Cases detected by color Doppler ultrasound	Cases detected by physical examination		
	Yes	No	Total
Yes	5	5	10
No	4	27	31
Total	9	32	41

based efficacy of various varicocele treatment modalities is not clearly defined. There are many discussions on indications of varicocele diagnosis and treatment. In some studies, major grade varicocele treatment has been reported to have a beneficial effect on sperm quality (15, 16). K. Shiraishi et al have not revealed evident correlation between the clinical grade of varicocele, diameter of the most dilated vein (determined intraoperatively) and sperm quality improvement (17). To estimate the efficacy of varicocele treatment, it is indispensable to standardize the technique of varicocele evaluation, degree of vein dilatation, and venous blood reflux before and after the operation.

There are established varicocele diagnostic methods: physical examination (inspection and palpation), routine ultrasound and color Doppler sonography, venography, thermography, and others. Venography is a very

sensitive, but invasive method requiring much time and resources. Color Doppler ultrasonography is not invasive, does not take much time, and as demonstrated by recent study its sensitivity (97%) and specificity (94%) are very close to those of venography (18). Definitely, color Doppler ultrasound becomes a method of first choice after clinical investigation in varicocele detection before and after the treatment (19).

Venous blood reflux usually disappears after successful varicocele treatment. In our study, after ASS the diameter of veins decreased significantly and became normal in the patients who developed no recurrent varicocele (data not shown).

Unfortunately, there are still observed recurrences of the disorder after employment of different varicocele treatment modalities, and various recurrence rates (from 1.6 to 25%) are reported in literature (20). In accordance with the literature data, antegrade scrotal sclerotherapy is a simple, cost-effective operation, after which 2-3 hours later the patient may be discharged from hospital. Short recovery time, very few complications and fast restoration of the working capacity are also advantages of ASS. However, varicocele recurrence rate after ASS exceeds the corresponding rate observed after employment of most other varicocele treatment modalities. In our study, the recurrence rate amounted to 21.9%.

We would like to attract the attention to the fact that only one case of varicocele (II°) did not change after ASS. In all other varicocele recurrence cases, the varicocele grade decreased to I°. There is an opin-

ion that patient with varicocele I° should not be treated, but just followed-up (21). In our study, all the patients with varicocele I° were carefully investigated and successfully treated.

We also revealed some noteworthy data concerning clinical and ultrasonic postoperative varicocele estimation. Varicocele recurrence was confirmed by physical examination in 8 patients, whereas venous blood reflux was confirmed in 10 patients. The diagnosis of varicocele recurrence determined by clinical examination and ultrasonically coincided in 5 patients. Such discrepancy may be a result of: a) different intensity of the Valsalva maneuvers that patient had to perform in a clinician and in radiologist room, b) because of different specificity and sensitivity of the methods of physical and ultrasonic examinations of the spermatic cord veins (5–6-mm veins are palpable in 100% of patients; 3–4 mm veins – in about 50%; whereas 1–2 mm veins – only in about 16% of patients) (22).

In the varicocele recurrence determined both by physical examination and ultrasonically, we found that the diameter of veins significantly decreased in patients examined in the upright position, but remained practically the same as before ASS while examined in the supine position. It was difficult to explain why the diameter of veins in the recurrent varicocele after ASS in the patients examined in the supine position was greater than in patients studied in the upright position. The diameters of veins remained the same after the operation in the patients with ultrasonically diagnosed venous blood reflux III°.

There are some reports showing that results of varicocele treatment do not depend on varicocele grade (23, 24). Our data show that the diameter of the spermatic cord veins decreased in the greatest extent in patients with varicocele III°. It is possible to suppose that in such cases, the antegrade scrotal sclerotherapy should have the best beneficial effect on the function of the testicle. To reveal this effect further investigations are needed.

Up till this time, it is not clear when the sclerosing therapy should be performed in case of recurrent vari-

cocoele. It is likely that the surgeon should take into consideration the indications to previous operative treatment and sperm parameters, and maybe the diameter of the veins. The data of pre- and postoperative color Doppler ultrasonography could be important arguments in reasoning the necessity of the repeated operation.

Thus, our data confirm the evidence that the diameter of the spermatic cord veins is decreased significantly after ASS, and that the reflux disappears in a major part of the operated patients. Consequently, ASS is to be considered as an effective method of treatment for any grade varicocele. Even in case of recurrent varicocele, the grade of varicocele decreased in absolute majority part of patients, except one patient in whom varicocele remained of the same grade.

A standardized and objective diagnosis of varicocele is the first step in solving the complicated problem of varicocele diagnosis and treatment both in clinical practice and in comparing various treatment methods. There is still a lack of the objectified diagnostics methods in the literature, therefore, in spite of relatively small number of patients presented in this study, our investigation could stimulate and encourage the urologists to use color Doppler ultrasound for improved varicocele diagnosis.

### **Conclusions**

After antegrade scrotal sclerotherapy, the diameter of the spermatic cord veins, measured by color Doppler ultrasound, decrease significantly in patients examined in the upright and supine positions during performance of the Valsalva maneuver and without it. Due to antegrade scrotal sclerotherapy, the diameter of the veins decreased in greatest extent in the patients with varicocele III°. Recurrence rate in our patients after antegrade scrotal sclerotherapy was 21.9%, but almost all the cases of treated varicocele became of I°. After antegrade scrotal sclerotherapy, the diameter of the veins became significantly smaller in patients examined in the upright position, but it remained practically unchanged in the patients examined in the supine position.

## **Antegradinės skrotalinės skleroterapijos įtaka sėklinio virželio venų spindžiui sergant varikocеле**

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**Raktažodžiai:** varikocelė, sėklinio virželio venų spindis, antegradinė skrotalinė skleroterapija.



**Santrauka.** Darbo tikslas. Objektvizuoti antegradinės skrotalinės skleroterapijos įtaką sėklidžių venų spindžiui, palyginti venų spindį iki operacijos ir po jos sergantiems varikocelė, įvertinti ligos atkryčių dažnį po skleroterapijos, taip pat ultragarsinio tyrimo reikšmę diagnozuojant varikocelę bei chirurginio gydymo efektyvumą.

Pacientai ir metodai. Ištirtas 41 pacientas, kuriam įvairaus laipsnio varikocelės gydymui daryta antegradinė skrotalinė skleroterapija. Sėklinio virželio venų spindis vertintas kliniškai ir matuotas ultragarsiniu spalvotu dopleriu prieš operaciją ir po jos (pacientui stovint, gulint, ramybės būklės ir Valsalva mėginio metu).

Rezultatai. Venų spindis po antegradinės skrotalinės skleroterapijos reikšmingai sumažėjo, nepriklausomai nuo ikioperacinio varikocelės laipsnio arba pooperacinio ligos atkryčio. Pooperacinis venų susiaurėjimas buvo atvirkščiai proporcingas ikioperaciniam varikocelės laipsniui, t. y. trečiojo laipsnio varikocelės venos po operacijos susiaurėjo labiausiai. Varikocelė po operacijos atsinaujino 21,9 proc. operuotų ligonių. Tik vienam pacientui venų spindis po operacijos nesumažėjo. Venų spindis, kai buvo kliniškai nustatytas varikocelės atsinaujinimas, o, ištyrus echoskopu, rastas veninio kraujo refluksas, reikšmingai sumažėjo tiriant stovinčius pacientus ( $p < 0,005$ ) ir išliko toks pats kaip ir iki operacijos ( $p = 0,9$ ) tiriant gulinčius pacientus.

Išvados. Pacientams po antegradinės skrotalinės skleroterapijos reikšmingai sumažėjo sėklinio virželio venų spindis. Po trečiojo laipsnio varikocelės operacijos sėklinio virželio venų spindis susiaurėjo labiausiai. Tiriant stovinčius pacientus, kuriems buvo diagnozuotas varikocelės atsinaujinimas, pooperacinis venų spindis buvo reikšmingai mažesnis negu iki operacijos, tačiau jis nesiskyrė nuo ikioperacinio, kai tyrimas buvo atliekamas gulinčiam pacientui.

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## References

- Schlegel PN, Goldstein M. Anatomical approach to varicocele. *Semin Urol* 1992;10:242-7.
- Barbalias GA, Liatsikos EN, Nikiforidis G, et al. Treatment of varicocele for male infertility: a comparative study evaluating currently used approaches. *Eur Urol* 1998;34:393-8.
- Gazvani MR, Wood SJ, Thomson AJ, Kingsland CR, Lewis-Jones DI. Assessment of testicular core temperatures using microwave thermography. *Hum Reprod* 2000;15(8):1723-6.
- Wright EJ, Young GP, Goldstein M. Reduction in testicular temperature after varicocelelectomy in infertile men. *Urology* 1997;50(2):257-9.
- Atassi O, Kass EJ, Steinert BW. Testicular growth after successful varicocele correction in adolescents: comparison of artery sparing techniques with the Palomo procedure. *J Urol* 1995;153(2):482-3.
- Steen O, Knops J, Declerck L, Adimoelja A, Van de Vorde H. Prevention of fertility disorders by detection and treatment of varicocele at school and college age. *Andrologia* 1976;8:47-53.
- Goldstein M, Gilbert BR, Dicker AP, et al. Microsurgical inguinal varicocelelectomy with delivery of the testis: an artery and lymphatic sparing technic. *J Urol* 1992;148:1808-11.
- Takahara M, Sakatoku J, Cockett ATK. The pathophysiology of varicocele in male fertility. *Fertil Steril* 1991;55:861-8.
- Marsmann JW, Schats R. The subclinical varicocele debate. *Hum Reprod* 1994;9:1-8.
- Akbay E, Cayan S, Doruk E, et al. The prevalence of varicocele and varicocele-related testicular atrophy in Turkish children and adolescents. *BJU International* 2000;86:490-3.
- Johnsen N, Tauber R. Financial analysis of antegrade scrotal sclerotherapy for men with varicoceles. *Br J Urol* 1996;77(1):129-32.
- Dubin L, Ameral RD. Varicocelelectomy: 986 cases in a 12-year study. *Urology* 1977;10:446-9.
- Takahara H, Sakatoku J, Cockett ATK. The pathophysiology of varicocele in male infertility. *Fertil Steril* 1991;55:861-8.
- Redmon JB, Carey P, Pryor JL. Varicocele – the most common cause of male factor infertility? *Hum Reprod* 2002;8:53-8.
- Steckel J, Dicker AP, Goldstein M. Relationship between varicocele size and response to varicocelelectomy. *J Urol* 1993;149:769-71.
- Takahara M, Ichikawa T, Shiseki Y, Nakamura T, Shimazaki J. Relationship between grade of varicocele and the response to varicocelelectomy. *Int J Urol* 1996;3:282-5.
- Shiraishi K, Takihara H, Naito K. Internal spermatic vein diameter and age at operation reflect the response to varicocelelectomy. *Andrologia* 2001;33:351-5.
- Trum JW, Gubler FM, Laan R, van der Veen F. The value of palpation, varicoscreen contact, thermography and color Doppler ultrasound in the diagnosis of varicocele. *Hum Reprod* 1996;11:1232-5.
- Lund L, Roebuck DJ, Lee KH, Sørensen HT, Yeung CK. Clinical assesment after varicocelelectomy. *Scand J Urol Nephrol* 2000;34:119-22.
- Kass EJ. Adolescent varicocele. *Pediatr Clin North Am* 2001;48(6):1559-69.
- Lenk S, Fahlenkamp D, Glied V, Lindeke A. Comparison of different methods of treating varicocele. *J Androl* 1994; 15S:34-7.
- Metin A, Bulut O, Temizkan M. Relationship between the left spermatic vein diameter measured by ultrasound and palpated varicocele and Doppler ultrasound findings. *Int Urol Nephrol* 1991;23(1):65-8.
- McClure RD, Khoo D, Jarvi K, Hricak H. Subclinical varicocele: the effectiveness of varicocelelectomy. *J Urol* 1991;145:789-91.
- Dhabuwala CB, Hamid S, Moghissi KS. Clinical versus sub-clinical varicocele: improvement in fertility after varicocelelectomy. *Fertil Steril* 1992;57:854-7.

*Received 14 July 2003, accepted 12 March 2004*