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Changes in seminal quality following varicocelectomy in infertile Nigerian males

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Summary

Semen analysis in 116 subfertile and infertile patients with varicocele revealed oligospermia (counts less than 20 million/ml) in 66% of patients, asthenospermia (motility of less than 50%) in 59% of patients; and teratospermia (abnormal sperm morphology of greater than 50%) in 65% of patients. The sperm motility and morphology deteriorated with decrease in sperm concentration. After varicocelectomy 53% of all patients showed improvement in the overall semen quality. The best post-operative results were noted in patients who had pre-operative counts over 20 million/ml. Deterioration in semen quality was observed in 6% of all patients. Factors which possibly played a role in the response to varicocelectomy in our environment are discussed.

Résumé

L'analyse du sperme chez 116 malades sous-fertiles et infertiles souffrants de la varicocèle a démontré l'oligospermie (la compte étant moins de 20 millions/ml) chez 66% des cas; l'astheno-spermie (motilité moins de 50%) chez 59% des cas; et la teratospermie (la morphologie spermatique abnormale étant plus grande que 50%) chez 65% des malades. La motilité et la morphologie du sperme a détérioré avec la chute en concentration du sperme. Suite à la varicocèlectomie, on a constaté une amélioration des l'ensemble de la qualité du sperme chez 53% des cas. On a remarqué les meilleurs résultats post-operatoires chez les sujets qui avaient une compte post-operatoire plus grande que 20 million/ml. On a constaté une détérioration dans la qualité du sperme chez 6% de toutes les malades. Les facteurs qui pourraient influencer la réponse à la varicocèlectomie dans notre environnement sont discutés.

Introduction

The importance of varicocele as a major cause of male infertility has been well established (Dubin & Amelar, 1975). The incidence of varicocele is greater in subfertile males than in the general population (Dubin & Amelar, 1971; Steeno *et al.*, 1976; Comhaire, 1977) and racial differences have been observed in varicocele incidence with a low incidence in blacks (Castro, 1982). Varicoceles form a significant aetiologic factor of male infertility in Ibadan, Nigeria; being found in 25% of cases (Awojobi, Nkposong & Lawani, 1983).

Spermatogenesis is depressed by varicoceles and approximately 60% of patients with varicocele show some abnormalities in the seminogram (Johnson, Phol & Rivera-Correa, 1970). Typically a 'stress pattern' consisting of oligospermia, impairment of sperm motility and increased immature and tapering forms is found (Macleod, 1965). It has been suggested that routine empirical ligation of the internal spermatic vein should be performed on all patients with oligospermia and a 'stress pattern' on semen analysis (Silber, 1979). Most authors agree that varicocelectomy results in improved semen quality and pregnancy rate (Dublin & Amelar, 1975). However some authors have expressed contrary views (Nilsson, Edvinsson & Nilsson, 1979).

Little is known about the results of varicocelectomy in African males with varicocele associated with infertility (Amaku & Ntia, 1976). The present study summarizes our experience at the University College Hospital, Ibadan, Nigeria over a 5-year period January 1979 to December 1983.

Materials and methods

The patients were 116 males found to have varicocele in the patient population being investigated for infertility of the couple. As with the other patients seeking clinical evaluation for infertility, a detailed history was obtained. The diagnosis of varicocele was established by clinical detection with the patient in the upright position or demonstration of a positive effect during a valsava manoeuvre. Two semen samples were examined for each patient before surgery and two further samples were examined 3–6 months after surgery.

The semen samples were obtained by either masturbation or coitus interruptus after 3–5 days abstinence at about 2 weeks interval and were examined within 2 h of collection. In these samples, the volume, sperm count, sperm morphology and motility were recorded. For the sperm count, the sodium bicarbonate technique was used to break the mucus and the specimen was diluted as necessary depending on the sperm density. Sperm counts were done in duplicate using an improved Neubauer haemocytometer and motility was recorded as a percentage of spermatozoa demonstrating directional movement (Ntia, Kufeji & Amaku, 1975). Sperm morphology was estimated as a percentage after counting the abnormal forms in 400 spermatozoa seen.

All patients had varicocelectomy via a high approach (Palomo, 1949; Ivanissevich, 1960). No additional therapy was given. The average of the two pre-operative sperm counts, percentage motility and percentage abnormality were compared with the post-operative values.

Results

Age

The patients' ages ranged between 15 and 60 years with a mean of 32 years. The peak age incidence was 30–34 years and 74% of the patients were aged between 25 and 39 years (Fig. 1).

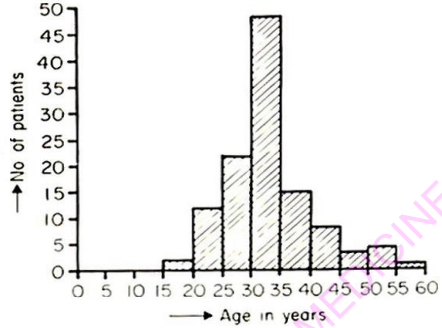

Fig. 1. A bar diagram showing the age distribution of patients with varicocele related infertility at the Urology Clinic, University College Hospital, Ibadan, Nigeria.

Affected side

Of the 116 patients in the study 102 (88%) had left-sided vericocele; four (3%) had right-sided varicocele while ten (9%) had bilateral varicocele.

Sperm counts

Pre-operatively, twenty-eight patients (24%) had sperm counts below 1 million/ml. Three of these patients were azoospermic. Forty-eight patients (41%) had counts ranging between 1 and 19 million/ml. The remaining forty patients (34%) had pre-operative sperm counts of 20 million/ml and above. A direct relationship existed between the sperm concentration and semen quality.

After varicocelectomy, a total of sixteen patients (14%) had counts below 1 million/ml. These included two patients who had pre-operative counts of 8 million/ml and 16 million/ml respectively. All the patients with azoospermia, and one further patient with a pre-operative sperm count of 600,000/ml were azoospermic. Forty-one patients (35%) had counts ranging from 1 to 19 million/ml. Thirteen of these had pre-operative counts below 1 million/ml and four had pre-operative counts over 20 million/ml. A total of fifty-nine patients (51%) had post-operative sperm counts above 20 million/ml. These included one patient with a pre-operative count of 600,000/ml and twenty-two patients with pre-operative counts of 1–19 million/ml.

Improvements in sperm count after vari-

cocelectomy occurred mostly in the patients with higher pre-operative counts (Table 1).

Sperm motility

A sperm motility of 50% and above was found in forty-eight (41%) of the 116 patients studied. This degree of motility was found in 29% of the patients with pre-operative count below 1 million/ml, 42% of those with counts ranging between 1 and 19 million/ml and 50% of those with counts above 20 million/ml. The corresponding figures after varicocelectomy were 18%, 48% and 75% respectively. A total of fifty-eight patients (50%) had post-operative sperm motility of 50% and above.

In general, the sperm motility decreased with decrease in sperm counts and good motility was seldom found in the presence of poor morphology. Motility improvement after varicocelectomy was better in those with higher pre-operative counts (Table 2).

Sperm morphology

Abnormal sperm cell morphology of greater than 50% was found in seventy-five patients (65%). This consisted of 86% of those with pre-operative count below 1 million/ml, 62% of those with counts of 1–19 million/ml and 52% of those with counts over 20 million/ml. The corresponding figures after varicocelectomy were 89%, 56% and 40% respectively. A total of sixty-eight patients (59%) had abnormal sperm cell morphology of greater than 50% post-operatively.

Patients with severe oligospermia more frequently showed high degree of teratospermia. The improvement after varicocelectomy was better in those with higher pre-operative sperm counts (Table 3).

Overall results

Sixty-two of the 116 patients (53%) in the study had improvements in their seminal quality after varicocelectomy. The seminal quality remained unchanged in forty-seven patients (41%) while in seven patients (6%) deterioration was observed. Only seven of the twenty-eight patients (25%) with pre-operative count below 1 million/ml improved. Fifty per cent of those with counts ranging from 1 to 19 million/ml and 78% of those with counts above 20 million/ml improved after varicocelectomy (Table 4).

Although the proportion of patients with improvements was higher in those with higher pre-operative sperm counts, the proportion of patients with deterioration remained between 4 and 8% for the three groups.

Discussion

Semen analysis is a generally accepted technique for assessing male fertilty potential. Macleod & Gold (1951) suggested that men with sperm counts above 20 million/ml or total count above 100 million/ejaculate should be considered fertile. Other workers have however argued that sperm counts above 10 million/ml or 25 million/ejaculate should not be considered a major factor in a couple's infertility unless other parameters are found to be abnormal (Zukerman *et al.*, 1977).

The mean and total sperm counts from male partners with varicoceles have been shown to be significantly lower than those from men without varicocele (Rodriguez-Rigau, Smith & Steinberger, 1978). It has been observed that the deleterious effect of varicocele on testicular function is bilateral (Ibrahim *et al.*, 1977). The mechanism of this effect has not been fully elucidated; but there are several possible theories (Glezerman *et al.*, 1976; Verstoppen & Steeno, 1978; Lewis & Harrison, 1982; Fenster & McLoughlin, 1982). Various clinical grades of varicocele have been described based on its size (Dubin & Amelar, 1970). Grading was however not employed in this study as varicocele suppression of spermatogenesis is independent of the size of the varicocele (Dubin & Amelar, 1970) and no correlation exists between the size of varicocele and treatment results (Stewart, 1974; Greenberg *et al.*, 1977).

Varicoceles start at puberty and both the increased vascularity of the testis and the increased body length contribute to its development (Oster, 1971). The severity of varicocele suppression of spermatogenesis tends to increase steadily during subsequent years (Steeno *et al.*, 1976). The youngest patient in the present series was 15 years old and majority of the patients were in their third and fourth decades of life.

Table 1. Sperm counts in patients with varicocele

Pre-operative sperm count		Sperm count: no. of patients with sperm count (million/ml) of												
		<1	1–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	100+	
<1 million/ml	Before operation	28												3 Azoospermia
	After operation	14	13					1						4 Azoospermia
1–19 million/ml	Before operation		26	22										
	After operation	2	17	8	10	4	1	2	1	2		1		
20+ million/ml	Before operation				21	8	2		1		2	1	5	
	After operation		2	2	2	3	2	3	5	2	3	3	13	

Table 2. Motility (%) in patients with varicocele

Pre-operative sperm count		Motility: no. of patients with motility (%) of										
		0	1–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99
<1 million/ml	Before operation	6		4	6		1	3	4		1	3 Azoospermia
	After operation	1	1	4	5	3	5	1	3	1		4 Azoospermia
1–19 million/ml	Before operation	2	2	7	5	6	6	12	5	3		
	After operation	2		2	6	4	11	10	6	5	2	
20+ million/ml	Before operation	1		4	5	3	7	6	7	5	2	
	After operation	1		2	3	2	2	4	11	10	5	

Table 3. Morphology (%) in patients with varicocele

Pre-operative sperm count		No. of patients with (%) of abnormal and immature forms of											
		0	1–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80–89	90–99	
<1 million/ml	Before operation				1		3	4	5	2	6	4	3 Azoospermia
	After operation				1		2	9	3	1	5	3	4 Azoospermia
1–19 million/ml	Before operation				6	5	7	5	7	6	8	4	
	After operation			8	2	4	7	4	9	4	6	4	
20+ million/ml	Before operation		2	1	4	5	7	7	3	3		8	
	After operation		1	5	6	8	4	3	5	3	2	3	

Table 4. Effect of varicocelectomy on seminal quality

Seminal quality	Pre-operative sperm count (million/ml)			Overall results
	<1 million/ml	1–19 million/ml	20+ million/ml	
Improvements	7 (25%)	24 (50%)	31 (78%)	62 (53%)
Unchanged	20 (71%)	20 (42%)	7 (17%)	47 (41%)
Deteriorations	1 (4%)	4 (8%)	2 (5%)	7 (6%)

Certain aetiologic factors determine the localization of varicocele mainly on the left side (80–98%) but it is occasionally bilaterial (0–20%) or only on the right side (0–6%) (Dubin & Amelar, 1975; Steeno *et al.*, 1976; Verstoppen & Steeno, 1977). Eighty-eight per cent of the patients studied had left-sided varicocele while 9% had bilateral disease. However, a venographic study utilizing transjugular catheterization of the internal spermatic vein has demonstrated bilateral varicocele in 60% of patients, most of the right-sided varicocele being subclinical (Narayan, Amplatz & Gonzalez, 1981).

The most widely practised and the most logical surgical approach to varicocele is high ligation of the spermatic vein (Lewis & Harrison, 1982). With this approach, it has been suggested that the testicular artery can be divided and that the collateral circulation of the testes will prevent ischaemic atrophy (Palomo, 1949). However, while in most patients the collateral circulation may be sufficient, in some it may not be enough to maintain adequate testicular function and ischaemic damage may occur (Harrison, 1966; Silber, 1979). Although no patient in this study developed overt testicular atrophy, the deterioration in seminal quality noted in 6% of the patients and also by other workers (Glezerman *et al.*, 1976), may be due to inadvertent ligation of the testicular artery in patients with tenuous collateral circulation to the testes. In addition, various congenital anomalous venous pathways may be the cause of recurrent varicocele after seemingly complete ligation (Saypol, Lipshultz & Howards, 1983). This may result in progressive varicocele damage and deterioration in seminogram.

Several reports of the results of varicocelectomy have shown improvements in seminal quality in 50–90% of patients (Glezerman *et al.*, 1976; Mehan, 1976). Fifty-three per cent of the patients in this study showed improvement in seminal quality. As previously observed (Stewart, 1974), the best post-operative results were noted in patients who had pre-operative counts over 20 million/ml. Azoospermic patients show much less favourable response following varicocelectomy (Verstoppen & Steeno, 1977); indeed no patient with azoospermia in the present study improved. This fact probably reflects the fibrotic changes which often are observed in conjunction with azoospermia (Verstoppen & Steeno, 1977). However, azoospermia *per se* should not be regarded as a hopeless situation because a few of such patients have shown improvements after varicocelectomy (Stewart, 1974; Mehan, 1976). The use of human chorionic gonadotrophin in patients with severe oligospermia after varicocelectomy may improve the results (Dubin & Amelar, 1975).

The degree of improvement obtained in this study appears less dramatic than some other reports (Dubin & Amelar, 1970; Verstoppen & Steeno, 1977) have shown. In our society, infertile males usually present late in hospital because the woman is held responsible for the infertility of a couple; while potency is equated with fertility in the male (Ntia *et al.*, 1975; Nkposong *et al.*, 1982). Furthermore no selection was done; all males with varicocele amongst those being investigated for infertility of the couple were included. The favourable outlook after varicocelectomy is reduced when other factors like epididymal occlusion coexist with varicocele; a situation not uncommon in our patients (Awojobi *et al.*, 1983). Such patients could not be denied varicocelectomy as

facilities are not at present available for us to offer them such other appropriate surgical management as may be necessary.

The pregnancy rate improves (30–55%) after varicocelectomy (Fenster & McLoughlin, 1982). However, some workers have shown that even in the presence of varicocele, intensive treatment of the wife results in improved pregnancy rate (Smith, Rodriguez-Rigau & Steinberger, 1977). The high default rate at follow-up (a characteristic feature in largely illiterate populations such as ours) made it impossible for us to report on the pregnancy rate after varicocelectomy. Some couples have however reported pregnancy. The improvement in semen quality supports the view that varicocelectomy is effective in the treatment of male infertility.

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