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G.R. Dohle · J.H. van Roijen · F.H. Pierik
J.T.M. Vreeburg · R.F.A. Weber

Subtotal obstruction of the male reproductive tract

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Abstract Bilateral obstruction of the male reproductive tract is suspected in men with azoospermia, normal testicular volume and normal FSH. A testicular biopsy is required to differentiate between an obstruction and a testicular insufficiency. Unilateral or subtotal bilateral obstructions and epididymal dysfunction may cause severe oligozoospermia in men with a normal spermatogenesis. However, information on spermatogenesis in oligozoospermic men is lacking, since testicular biopsy is not routinely performed. Men with a sperm concentration of $< 1 \times 10^6$ spermatozoa/ml were investigated for possible partial obstruction by performing a testicular biopsy under local anaesthesia. Spermatogenesis was determined by the Johnsen scoring method. A testicular biopsy was performed in 78 men with severe oligozoospermia. The medical history showed male accessory gland infection in 12.8%, previous hernia repair in 14.1% and a history of cryptorchidism in 12.8%. A normal or slightly disturbed spermatogenesis (Johnsen score > 8) was present in 39/78 (50%) of the men. Hernia repair occurred more often in men with normal spermatogenesis. A varicocele was predominantly seen in men with a disturbed spermatogenesis. FSH was significantly lower ($P < 0.0001$) in men with normal spermatogenesis. Subtotal obstruction of the male reproductive tract is a frequent cause of severe oligozoospermia in men with a normal testicular volume and a normal FSH. In other cases, an epididymal dysfunction might explain the oligozoospermia in men with a normal testicular biopsy score.

Keywords Subtotal obstruction · Male genital tract · Male infertility · Oligozoospermia

G.R. Dohle · F.H. Pierik · J.T.M. Vreeburg · R.F.A. Weber
Department of Andrology, Erasmus University Medical Centre, Rotterdam, The Netherlands

J.H. van Roijen
Department of Urology, Erasmus University Medical Centre, Rotterdam, Rotterdam

G.R. Dohle (✉)
Department of Urology, University Hospital Dijkzigt, P.O. Box 2040, 3000 CA Rotterdam, The Netherlands
E-mail: g.r.dohle@erasmusmc.nl
Tel.: +31-10-4633132
Fax: +31-10-4635838

Introduction

Partial obstruction of the male reproductive tract is defined as the presence of oligozoospermia with normal or nearly normal spermatogenesis [1]. This diagnosis can be suspected in men with severe oligozoospermia, normal physical findings and normal serum follicle-stimulating hormone (FSH). Indicative of a subtotal obstruction is a history of inguinal or scrotal surgery and recurrent genital infections. Other features that suggest obstruction are low seminal volume, epididymal congestion, enlarged seminal vesicles and cystic lesions of the epididymis and prostate.

For the definite diagnosis of obstruction, a testicular biopsy is required to confirm the presence of mature spermatids and spermatozoa in the seminiferous tubules [5, 10]. Because of the invasive nature of this procedure, the limited results of surgical treatment of obstructions of the seminal path and alternative options like assisted reproductive treatments, testicular biopsies are not routinely performed in men with oligozoospermia.

However, in selective cases the state of spermatogenesis could be assessed, both for the estimation of genetic risk factors specifically related to obstructive male infertility [7] and to determine the possibility of performing a microsurgical vasoepididymostomy together with an epididymal sperm aspiration and cryopreservation.

In men with progressive deterioration of the semen quality and in men with a low semen volume, an obstruction of the ejaculatory ducts can be found on transrectal ultrasound of the prostate [3]. Both surgical incision of cystic lesions in the prostate and aspiration of spermatozoa from the seminal vesicles are treatment

options that may require information on the state of spermatogenesis in advance, since obstructions of the epididymis frequently coincide with obstructions of the ejaculatory ducts [2].

To determine the true incidence of subtotal obstruction of the male reproductive tract in oligozoospermia and to offer the option of surgical exploration and microsurgical reconstruction, we performed a testicular biopsy in 78 patients with $< 1\times10^6$spermatozoa/ml and analysed the results of the testicular histology in relation to the medical history, the physical findings and FSH. In addition, we determined the results of microsurgical repair of the seminal tract in men with normal spermatogenesis and the results of intracytoplasmic sperm injection (ICSI) in these patients.

Patients and methods

All men participating in the study were informed about the scientific goals and therapeutic options related to the performance of the testicular biopsy. Also, alternative treatment modalities like ICSI and donor insemination were discussed and offered where appropriate.

The andrological work-up was performed according to the WHO manual for the investigation and diagnosis of the infertile couple [12]. Semen analysis was performed twice according to WHO laboratory manual for the examination of human semen [11]. FSH was determined at intake. In men with a consistently low seminal volume or a history of male accessory gland infection, a transrectal ultrasound investigation of the prostate and the seminal vesicles was performed. Scrotal ultrasound was performed routinely to detect intrascrotal abnormalities that go undetected during physical examination [9].

A bilateral, excisional testicular biopsy was performed under local anaesthesia. The Johnsen score was determined for the left and right testis [5] and the mean Johnsen score was calculated. In men with a normal biopsy score, scrotal exploration and microsurgical repair was discussed. In men with an obstruction of the ejaculatory ducts, a transurethral incision of the ducts was offered. Alternatively, couples could choose ICSI if motile sperm were present in the ejaculate. The results of these treatments were evaluated from the patients' charts and questionnaires.

Statistical analysis of the data was performed using the non-parametric Student's test, the Wilcoxon rank test and Spearman's correlation procedure, where appropriate. Two-sided P-values < 0.05 were considered significant.

Results

A testicular biopsy was performed in 78 men with less than 1×10^6 spermatozoa/ml in both semen samples. Table 1 shows the results of the clinical and ultrasound investigation. A history of inguinal or scrotal surgery was present in 21 patients (26.9%), including ten men with a history of cryptorchidism and orchidopexia (12.8%). Male accessory gland infection was present in ten men (12.8%), and a previous testicular tumour in four (5.1%). The mean infertility duration was 2.9 years. Transrectal ultrasound was performed in ten patients with low seminal volume and showed abnormal in six. In four of these, a cystic lesion was found in the prostate midline and two showed a dilatation of the seminal vesicles. Scrotal ultrasound was performed 66 men and showed abnormalities in ten, including nine cases of varicocele and one of testicular tumour. In men with a normal spermatogenesis only one varicocele was detected by ultrasound versus eight varicoceles in men with impaired spermatogenesis.

A normal Johnsen score (> 9) was found in 14 men, a slightly disturbed spermatogenesis (Johnsen score 8–9) in another 25 patients. Thus, a total of 39/78 (50%) patients showed complete or nearly complete spermatogenesis. FSH was normal in 57 men of which 38 (66.6%) had normal spermatogenesis. FSH was significantly different in men with an intact spermatogenesis as compared to men with impaired spermatogenesis ($P < 0.0001$, Wilcoxon rank test). Testicular volume was significantly lower in men with an abnormal spermatogenesis (mean 13.6 cc) as compared to the testis volume of men with normal spermatogenesis (mean 16.7 cc, $P = 0.01$).

Transurethral roof resection of the midline prostatic cyst was performed in two patients and resulted in improved semen quality in one, but not in a spontaneous pregnancy (Table 2. A microsurgical repair of the seminal tract (vasoepididymostomy) was performed on nine men and resulted in significantly improved semen quality in four and spontaneous pregnancy in two spouses. Alternatively, iICSI was performed in 24 couples and resulted in four (16.6%) pregnancies.

Discussion

Obstructions of the male reproductive tract are usually associated with azoospermia, normal physical findings and normal FSH. A testicular biopsy is required to confirm the diagnosis of obstruction before scrotal

Table 1 Male infertility associated factors in 78 men with severe oligozoospermia. JS = Johnsen score. JS > 9 = normal spermatogenesis, JS8–9 = slightly disturbed spermatogenesis, JS < 8 = impaired spermatogenesis. Some patients had more than one diagnosis on examination

	JS > 9	JS 8–9	JS < 8	Total (%)
Childhood herniarepair	4	4	3	11 (14.1)
Cryptorchidism/orchidopexia	3	2	5	10 (12.8)
Male accessorygland infection	2	5	5	12 (15.4)
Malignancy	0	3	4	7 (8.9)
Chronic disease	0	0	3	3 (3.8)
Varicocele	1	0	8	9 (11.5)
Total	10	14	28	52/78 (66.6)
No male infertility associated factor	9	6	11	26/78 (33.3)

Table 2 Results of treatment in 78 men with severe oligozoospermia

	No treatment	Vaso-epididymostomy	ICSI	Midline prostatic cyst
No.	43	9	24	2
Obstruction		9		2
No obstruction		0		0
Improved sperm quality		4		1
Pregnancy		2	4	0

exploration is performed. Although obstructions in primary infertile men are commonly present at the epididymal level, other the ejaculatory ducts and the vas deferens can also be involved. In 20% of men with a suspected obstruction, no spermatozoa are found in the epididymis during scrotal exploration, indicating that there is an intra-testicular obstruction. Berardinucci et.al. reported that anatomical abnormalities are often found in men with suspected epididymal obstruction [2]. In a series of 147 men, evaluation of the reproductive tract resulted in 52.7% epididymal obstructions and 47.3% other anatomical abnormalities, such as vasal obstruction and aplasia, epididymal atresia and intra-testicular obstructions. Jarvi et al. detected abnormalities of the ejaculatory ducts in 33% of men with suspected epididymal obstruction [4]. These abnormalities were associated with a poor outcome for vasoepididymostomy.

Different classification systems for testicular biopsies have been proposed to objectively quantify the presence of a ductal obstruction [5, 8, 10]. The mean number of mature spermatids per tubule correlated closely to the diagnosis of obstruction. In men with severe oligozoospermia Silber et al. found that the presence of more than 20 mature spermatids per tubule indicated partial obstruction of the epididymis [10].

Unilateral or partial obstruction of the male genital tract may be the result of childhood hernia repair: Matsuda et al. investigated subfertile men with a history of hernia repair and found a unilateral obstruction to be present in 26.7% [6]. A vasovasostomy procedure was performed in ten men and resulted in the improvement of semen quality in five cases and in pregnancy in two spouses. Obstructive oligozoospermia was present in 61% of 60 patients investigated by testicular biopsy [1]. Normal spermatogenesis was found in 70.2% of men with a history of cryptorchidism. Matsuda et al. concluded that it is necessary to exclude a partial obstruction of the seminal path in all men with oligozoospermia. The most frequent cause for this obstruction was epididymitis, which caused progressive deterioration of the spermiogram.

We examined a subset of infertile men with less than 1×10^6 spermatozoa/ml for possible obstruction of the male genital tract. Normal or nearly normal spermatogenesis appeared to be present in 50% of the patients. A history of inguinal and genital surgery and male accessory gland infection was present in 31/78 (40%) of the men with an obstruction. Furthermore, in six men signs of an obstruction of the ejaculatory ducts were found on transrectal ultrasound investigations. A normal FSH was found in 57/78 men with severe oligozoospermia and 38 (66.6%) showed an intact spermatogenesis. Microsurgical repair of the epididymal obstruction could be performed in nine men and resulted in sperm count improvement in four (44.4%). ICSI was performed primarily for 24 couples and resulted in four (16%) ongoing pregnancies/per cycle. The number of treated patients was, however, to low for statistical analysis, but indicates that microsurgical repair of the obstruction should also be considered in these couples, including cryopreservation of the spermatozoa before and during the operation. In case of surgical failure, cryopreserved spermatozoa can be used for ICSI.

We conclude that obstruction of the male reproductive tract is highly prevalent in men with severe oligozoospermia, normal testis volume and a normal FSH. A testicular biopsy and microsurgical repair of the seminal path should be considered in these men.

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