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SURGICAL MANAGEMENT OF EJACULATORY DUCT OBSTRUCTION

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Objective: The aim of this work is to evaluate the efficiency of transurethral resection (unroofing) of the obstructed ejaculatory ducts (TURED) as a treatment alternative for cases of obstructive ductal azoo-/ oligozoospermia.

Patients and Methods: Thirty-two patients, aged 26 to 45 (mean age 34 years) with varying degrees of ejaculatory duct obstruction (EDO) were selected from a large pool of infertile patients with low semen volume presenting to the outpatient clinic of the Andrology Department of Kasr el Aini Hospital, Cairo, Egypt. The patients (24 with complete and 8 with partial EDO) were then transferred to the Urology Department of the same hospital for surgical treatment performed by one surgeon. The treated patients were sent back to the Andrology Department for follow-up lasting 6 to 30 months (mean 18 months). Follow-up included history taking, physical examination and repeated semen analysis.

Results: There was a statistically significant improvement in all "mean" semen parameters following TURED. Furthermore, 42% of the azoospermic (bilateral complete EDO) and 63% of the oligozoospermic patients (partial EDO) showed improvement in their semen parameters after TURED yielding an overall improvement rate of 47% among treated patients. Pregnancy was achieved in about 17% of the azoospermic and in 25% of the oligozoospermic patients. The overall pregnancy rate was 19%. Prolonged hematuria was the only complication, encountered in only 2 patients, and was managed conservatively.

Conclusion: TURED is an effective line of treatment for cases of EDO. Used judiciously, this technique can yield satisfactory results with limited morbidity in this challenging patient population. The better response of partial EDO as compared to TURED warrants further studies involving a larger number of patients.

Key words: ejaculatory duct obstruction, infertility, TUR

INTRODUCTION

The ejaculatory ducts develop as the termination of the Wolffian duct. They enter the prostate in an oblique fashion, traveling medially and anteriorly through the substance of the gland and entering the prostatic urethra at the level of the verumontanum. The prostatic utricle is located in the region of the verumontanum between the ejaculatory ducts. The utricle is a remnant of the Mullerian duct, is of endodermal origin, and is not believed to communicate with any other structure.[1] Sperms pass from the epididymis into the ampulla of the vas, partly by muscular activity of the vas. At the time of ejaculation, they are actively passed through the ejaculatory ducts into the prostatic urethra, accompanied by the stored secretions from the contracting seminal vesicles.[2]

Etiologically, ejaculatory duct obstruction (EDO) may be congenital or acquired. Congenital causes include congenital ejaculatory duct atresia, in addition to Wolffian, Mullerian or prostatic utricular cysts. Acquired obstruction may be traumatic (as following endoscopic surgery) or inflammatory (non-specific inflammation, schistosomiasis).

Pathologically, EDO may be partial or complete, unilateral or bilateral.[1,2] The diagnosis rests on keeping a high index of suspicion

while examining an infertile male with normal secondary sex characteristics, normal testes and spermatic cords and normal hormonal profile. The ejaculate in bilateral complete EDO typically will be small in volume, azoospermic, lacking coagulation and negative for fructose test.[1-3] Partial EDO is a more difficult diagnosis because aberrations in semen analysis are evidently more subtle, apart from persistently impaired sperm motility (less than 30%).[4]

The advent of transrectal ultrasonography (TRUS) has greatly facilitated the accurate diagnosis of EDO. [5-11]

Transurethral resection of the ejaculatory ducts (TURED) is an effective method of treatment of ejaculatory duct obstruction, especially in central cystic lesions[12]. In selected cases, TURED has resulted in a marked improvement of semen parameters, and pregnancies have been achieved[12-20].

In the following we present a retrospective analysis of 32 cases of male infertility secondary to ejaculatory duct obstruction (complete and partial) treated by transurethral surgery.

PATIENTS AND METHODS

From July 2000 to October 2002, 32 infertile men (aged 26 to 45; mean 34 years) with ejaculatory duct obstruction were selected from a large pool of infertile patients with a low semen volume seen at the outpatient clinic of the Andrology Department of Kasr el Aini Hospital, Cairo, Egypt.

Physical examination of these patients was unremarkable, i.e. normal sized testes and spermatic cords, no varicocele and well developed secondary sexual characteristics. All patients had normal hormonal profiles (normal serum testosterone, FSH, LH and Prolactin).They all had a low semen volume (in at least three analyses) in addition to azoospermia (or oligozoospermia in partial and unilateral cases of EDO). Semen fructose was absent / lowered and sperm motility was consistently reduced. No sperms were detected in their postejaculatory urine analysis.

TRUS was performed in all patients, using a 7–MHz endocavitary probe, and established the definitive diagnosis of EDO. Sonographic findings included dilatation of the ejaculatory ducts (more than 2 millimeters), dilatation of the seminal vesicles (more than 1.5 centimeters in width) with or without cystic dilatation or the characteristic honeycomb appearance. Patients showing intraprostatic cysts were subjected to cyst aspiration under sonographic guidance, and the aspirate was examined for sperms (present only when cysts were of Wolffian origin).

TRUS was combined with seminal vesiculography when the vesicles were markedly distended. The needle puncture was performed under sonograhic guidance, fluid was aspirated for analysis and contrast was instilled. Absence of dye efflux into the urethra with demonstration of dilated / cystic seminal vesicles and ejaculatory ducts confirmed the diagnosis, particularly in unilateral cases. Intraoperative vasography was performed in earlier cases (also in unilateral cases when seminal vesicular dilatation was not marked) using a mixture of methylene blue and radiocontrast. The latter demonstrated the blockade and proximal dilation under image intensifier, whereas absence of methylene blue in the prostatic urethra during urethrocystoscopy prior to resection confirmed the diagnosis of EDO. Resection proceeded to the point where free flow of methylene blue into the prostatic urethra was obtained.

Hence, our 32 patients were divided into two major groups:

Group A: The azoospermic group (24 patients), including patients with bilateral complete ejaculatory duct obstruction.

It was subdivided into two subgroups:

A1: Azoospermic patients with intraprostatic cyst of Wolffian / Mullerian origin (10 patients).

A2: Azoospermic patients without intraprostatic cysts (14 patients).

Group B: Oligozoospermic group (8 patients), which was also subdivided into 2 subgroups:

B1: Unilateral complete EDO (4 patients, 3 had Wolffian cysts in the prostate and 1 had no prostatic cysts).

B2: Bilateral partial EDO (4 patients, all had no cysts).

Table 1: Comparison of the "Mean" Semen Parameters Before and After TUR in All Patients with Ejaculatory Duct Obstruction (Complete and Partial)

Semen Parameters	Before TUR (mean ± SD)	After TUR (mean ± SD)	p-value
Volume (ml)	0.52 ± 0.32	1.7 ± 1.05	0.00
Sperm concentration (million/ml)	2.34 ± 5.5	12.7 ± 15.7	0.001
Total count (million/ejaculate)	0.97 ± 2.2	29.5 ± 37.8	0.00
Total motile count (million/ejaculate)	0.3 ± 0.7	15.2 ± 20.7	0.00
Fructose (mg/dl)	86.7 ± 55.7	206.4 ± 104.6	0.00

Table 2: Comparison Between Groups A and B with Regard to the Number of Patients with Improved Semen Parameters after TUR (p-value: 0.42)

	Improved		Not Improved		
Group	No. of Patients	%	No. of Patients	%	Total
Group A (azoospermic)	10	41.7%	14	58.3%	24
Group B (oligospermic)	5	62.5%	3	37.5%	8
Total	15	46.9%	17	53.1%	32

All patients were then sent to the Urology Department to undergo the surgical procedure which was performed by one surgeon.

Surgical technique:

Following urethrocystoscopy and dilatation, transurethral "unroofing" of the obstructed ejaculatory ducts was performed via transurethral resection of the verumontanum itself. If an intraprostatic cyst was present, it was entered less than 1 cm deep to the resected verumontanum. Care was taken to avoid damage to the rectum, bladder neck or external sphincter during resection. A gloved finger was inserted into the rectum during the procedure in order to guard against resecting too deeply. Adequate unroofing / resection would be confirmed by digitally compressing the prostate and seminal vesicles and observing the flow of milky fluid into the prostatic urethra during this maneuver. Hemostasis by coagulation was kept to a minimum in the area of the resected ducts in order to avoid scarring and recurrence of obstruction. An 18 or 20 F urinary catheter was left in place for 24 to 48 hours to facilitate the management of postoperative hematuria. Patients were then sent back to the Andrology Department for follow-up.

Follow-up:

The patients were followed up monthly for a period of 6 to 30 months postoperatively (mean 18 months). They were checked for any morbidity (e.g. hematuria, retrograde ejaculation) and for pregnancy of their wives. Semen analysis was done monthly throughout the entire follow-up period.

Statistical analysis:

The arithmetic mean, standard deviation and p-value were used for the comparison of the data before and after TUR. The paired t-test was used in the larger group (azoospermic group), while the Wilcoxon signed Rank test was used in the smaller group (oligozoospermic group).

The Mann-Whitney test was used for descriptive comparisons between the different

Table 3: Comparison between Groups A and B with Regard to Pregnancy Outcome (p-Value: 0.62)

	Pregnancy		No Pregnancy		
Group	No. of Patients	%	No. of Patients	%	Total
Group A (azoospermic)	4	16.7%	20	83.3%	24
Group B (oligospermic)	2	25.0%	6	75.0%	8
Total	6	18.8%	26	81.2%	32

Table 4: Comparison between Patients with Cystic vs. Non-Cystic Lesions with Regard to Improved Semen Parameters (p-value: 0.07)

	Improved		Not Improved		
Group	No. of Patients	%	No. of Patients	%	Total
Cystic EDO	9	69.2%	4	30.8%	13
Non-cystic EDO	6	31.6%	13	68.4%	19
Total	15	46.9%	17	53.1%	32

EDO = ejaculatory duct obstruction

groups of improved / non-improved patients after TUR by frequencies and percentages. Chi-square and Fisher exact tests were used for the comparison of the data of the different groups.

RESULTS

In all patients with EDO (azoospermic and oligozoospermic), there was a highly significant improvement in all mean semen parameters following endoscopic resection (Table1).

Fifteen out of 32 (46.9%) patients demonstrated improvement in semen parameters after TUR. There were more patients with improved semen parameters in Group B (oligozoospermic) than in Group A (azoospermic), however, the difference between the groups was statistically insignificant (p-value: 0.42) (Table 2).

The wives of 6 out of 32 patients (18.8%) were able to conceive within the follow-up period (6-30 months). Two of these patients (25%) belonged to the oligozoospermic group, while four of them (16.7%) belonged to the azoospermic group. However, the difference between both groups was statistically insignificant (p-value: 0.62) (Table 3).

Cystoscopic evidence of prior schistosomal infestation (sandy patches and bilharzial polyps) was detected in 7 patients (5 azoospermic and 2 oligozoospermic). Only one of them (azoospermic) had a prostatic (Mullerian) cyst. We postulated that urinary bilharziasis might be responsible, at least in part, for EDO in those patients. They did not demonstrate significant improvement in semen parameters after the unroofing procedure. Moreover, no pregnancy was recorded in any of those "bilharzial" patients.

A total of 13 patients had prostatic cysts (9 Wolffian and 4 Mullerian, probably all were congenital). Nine patients of this group (69.2%) showed an improvement in all semen parameters following resection compared to 6 of 19 patients (31.6%) without prostatic cysts. However, the difference between both groups (cystic and non cystic) was statistically insignificant (P value: 0.07) (Table 4).

Table 5: Comparison of Patients with Prostatic Wolffian vs. Mullerian Cysts with Regard to Improved Semen Parameters (p-value: 0.052)

	Improved		Not Improved		
Group	No. of Patients	%	No. of Patients	%	Total
Wolffian cysts (sperms in aspirate)	8	88.9%	1	11.1%	9
Mullerian cysts (no sperms in aspirate)	1	25.0%	3	75.0%	4
Total	9	69.2%	4	30.8%	13

Table 6: Pregnancy Rates after TUR in Patients with Wolffian and Mullerian Cysts (p-value: 0.00)

	Pregnancy		No Pregnancy		
Group	No. of Patients	%	No. of Patients	%	Total
Wolffian cysts	5	55.6%	4	44.4%	9
Mullerian cysts	0	0%	4	100%	4
Total	5	38.5%	8	61.5%	13

When comparing patients with Wolffian cysts (aspirate containing sperm) to those with Mullerian cysts (no sperm in aspirate), more patients of the former group showed improvement in all semen parameters after TUR than in the latter one. Once more the difference between the groups (Wolffian and Mullerian) was statistically insignificant (p-value: 0.052) (Table 5). However, when these two groups (Wolffian / Mullerian) were compared with regard to pregnancy outcome, a highly significant difference was observed in favor of patients with Wolffian cysts. Five out of 9 patients with Wolffian cysts fathered a child (55.6%), whereas no pregnancy was recorded among those with Mullerian cysts (Table 6).

In the remaining 12 patients (9 azoospermic and 3 oligozoospermic), who had neither prostatic cysts nor cystoscopic evidence of schistosomal infestation, EDO could be the result of a combination of congenital, inflammatory and idiopathic factors since none of our patients had had any previous surgical or endoscopic procedures. Pregnancy was recorded in only one of them (azoospermic before unroofing) as opposed to 5 out of the 13 cystic patients (all 5 were of Wolffian origin) and none out of the 7 "bilharzial" patients.

Hematuria persisting for 4 days and managed conservatively was the only complication encountered and occurred in two patients only (6.2%).

DISCUSSION

Ejaculatory duct obstruction as a cause of male infertility remains a challenging problem for urologists to diagnose and treat. Even in the era of assisted reproductive procedures it is important to diagnose obstructive azoospermia/oligozoospermia because of the fact that it can be corrected surgically and because of its potential reversibility.[1-4] Male infertility

secondary to ejaculatory duct obstruction (EDO) was believed to be uncommon. The introduction of transrectal ultrasonography has resulted in an apparent increase in the number of diagnosed cases.[5] EDO as a diagnostic entity is encountered in at least 5% of azoospermic men.[1-3] Furthermore, the incidence of infertile men presenting with EDO may exceed 4%.[4,7]

Our study was conducted on 32 infertile men with varying degrees of EDO. To limit potential bias, patient selection and follow-up were performed by an independent group of examiners (in the Andrology Department) separated from the treating surgeon (in the Urology Department).

Overall, there was a highly significant improvement in mean semen parameters after the resection procedure (Table 1). A total of 15 patients improved after TUR, yielding an overall percentage of improvement of 46.9% (Table 2). Furthermore, the wives of 6 patients (4 from Group A and 2 from Group B) became pregnant naturally, i.e. without any assisted reproductive technique such as in-vitro fertilization or intracytoplasmic sperm injection, within the study period, thus yielding an 18.8% overall pregnancy rate (Table 3). This can be compared to a study done by Aggour and coworkers[13] involving 11 azoospermic men who underwent resection of the verumontanum and were followed up for two years. In that study, improvement in semen parameters occurred in 7 patients (64%), but the pregnancy rate was, as in our study, 18%. Ozgok and colleagues[14] treated 24 infertile patients presenting with azoospermia or oligozoospermia with TURED. As in our study, they found a highly significant improvement in the mean semen parameters following the procedure. However, they reported more cases of pregnancy during follow-up (6 cases, 25%).[14] On the other hand, in an earlier study done by Pryor and Hendry involving 87 infertile men, also treated by TUR, pregnancy was achieved in only 10 patients yielding a percentage of 11.5%.[15]

In our study, TUR resulted in an improvement in the semen parameters in 10 out of 24 azoospermic patients (41.7%) versus 5 out of 8 oligozoospermic patients (62.5%). The difference is, however, statistically not significant (P value: 0.42) (Table 2).

As far as pregnancy (always spontaneous in our study) is concerned, 4 out of 24 patients (16.7%) with complete EDO were able to father a child during follow-up as opposed to 2 out of 8 patients with partial EDO (25%). Again, the difference was statistically non-significant (p-value: 0.62) (Table 3).This is comparable to an earlier study done by Meacham and coworkers who treated 24 infertile men, 11 oligozoospermic and 13 azoospermic, with a 29-month follow-up period. As in our study, the oligozoospermic group enjoyed a more successful outcome than the azoospermic one: 9 of 11 patients of the former group showed improvement in sperm density and motility (81.8%) versus only 3 of 13 patients of the latter one (23%). Pregnancy was more frequent in the oligozoospermic group of that study: 6 out of the 11 patients with partial EDO (54.5%) were able to father a child following endoscopic unroofing as opposed to only one out of 13 azoospermic (7.7%) patients subjected to the same procedure.[16]

A better response of the oligozoospermic group was also reported in a study carried out by Turek and associates who followed 46 infertile patients, 22 azoospermic (complete EDO) and 24 oligozoospermic (partial EDO). Improvement in the semen parameters after TUR occurred in 13 of 22 azoospermic patients (60%) versus 17of 24 oligozoospermic patients (70%).[17]

Schroeder-Printzen and co-workers studied 16 infertile men, 14 of whom were azoospermic, while the remaining two were oligozoospermic. All were subjected to transurethral resection of the verumontanum. Improvement in the semen parameters occurred in 9 patients (56.2%), whereas pregnancy was achieved in only 2 (12.5%).[18] This relatively low pregnancy rate (compared to our 18.8% overall rate) might be due to the fact that most patients enrolled in that study had complete EDO and, thus, apparently responded less favorably to the procedure than patients with partial EDO.

More recently, Kadioglu and colleagues confirmed the better response of oligozoospermic patients to unroofing procedures as compared to azoospermic patients. In their study of 38 infertile patients, the improvement in semen variables was significantly better (p-value: 0.04) in patients with partial ductal obstruction (94%) than in those with complete obstruction (59%). They also reported strikingly elevated pregnancy rates following TURED: 32% for the azoospermic versus 81% for the oligozoospermic patients. But they mentioned

that pregnancy was "either spontaneous or with the aid of intrauterine insemination". Finally they affirmed that patients with cystic obstruction, especially midline and eccentric prostatic cysts, responded best to TURED[19]. We found similar outcomes regarding patients with prostatic cysts: the best response to unroofing procedures occurred in patients with prostatic cysts of Wolffian origin (cysts whose aspirate contains sperms). In fact, 8 out of 9 patients with Wolffian cysts showed an improvement in the semen parameters following unroofing procedures (88.9%). As for pregnancy, the wives of 5 out of 9 patients (55.5%) with Wolffian cysts were able to conceive during the follow-up period (mean 18 months), while none of the four patients with Mullerian cyst reported a pregnancy within the same time interval. Consequently, the difference between patients with Wolffian and those with Mullerian cysts with regard to the pregnancy outcome following TURED was found to be statistically highly significant (p-value: 0.00) (Table 6). Moreover, taking into account that 5 of the 6 patients in our study who were able to achieve a pregnancy had Wolffian prostatic cysts underlines the importance of detecting this subgroup of infertile patients preoperatively by TRUS, aspiration and sperm analysis. Again, this is in accordance with the results published by Paick and colleagues where 8 of 26 treated patients (16 with prostatic cysts detected by TRUS preoperatively and 10 without prostatic cysts) were able to father a child; 7 of these patients had prostatic cysts. This resulted in a pregnancy rate of 43.7% among cystic patients as opposed to an overall pregnancy rate of 31% in that study.[20]

In our study, as in the literature, the exact etiological factor responsible for obstruction of the ejaculatory ducts is very difficult to identify. Many researchers tried to establish classifications of EDO in terms of complete or partial obstruction, presence or absence of prostatic cysts, whether the cysts were of Wolffian or Mullerian origin, but all have failed to specify the causative agent responsible for ductal narrowing / occlusion in their patients. In most instances, a variety of risk factors would be blamed, depending on the patients' clinical condition. Congenital, traumatic, iatrogenic (e.g. due to prior endoscopy) and idiopathic factors are all mentioned as "probable" causes of EDO[12-20]. When stratifying our surgical outcome by etiologic risk factors, an interesting spectrum of results emerges, presenting on the most favorable extreme those patients where the problem was likely to result from congenital lesions (Wolffian prostatic cysts); on the opposite extreme were obstructions bearing evidence of concomitant bilharzial infestation and midway were those patients with undetermined etiology.

The only complication encountered in our study was hematuria which occurred in two patients (6.2%) and persisted for 4 days after the procedure. It was managed conservatively, no blood transfusion was required. Again, this is in accordance with the study published by Ozgok and associates[14] on their analysis of 24 treated patients where the only morbidity associated with the procedure was prolonged hematuria occurring in only one patient (4.2%) and managed expectantly. Rectal, external and genital sphincter injury can be easily avoided by a meticulous technique and strict adherence to safety precautions, namely keeping a gloved finger in the rectum for judging the depth of resection and limiting the latter to the area distal to the bladder neck and proximal to the external sphincter.

We conclude that transurethral resection of the ejaculatory ducts (TURED) is an effective line of treatment in properly selected cases of EDO. Used judiciously, the technique yields satisfactory results with limited morbidity. Partial EDO apparently is an underdiagnosed entity because changes in semen parameters are often less evident than in patients with complete EDO. The diagnosis rests on keeping a high index of suspicion when sperm motility is consistently diminished without any explanation. The better response of cases of partial EDO to TURED warrants further studies involving a larger number of patients. Cases of EDO secondary to Wolffian prostatic cysts respond best to TURED in terms of improvement of semen parameters and pregnancy outcome after the procedure. TRUS-guided cyst aspiration and checking for sperms in the aspirate should be offered to any infertile male when prostatic cysts are detected sonographically.

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RESUME

Le traitement chirurgical de l'obstruction des voies éjaculatoires

Objectifs: Le but de ce travail est d'évaluer l'efficacité de la résection transuréthrale (unroofing) des conduits éjaculatoires obstrués (TURED) comme une alternative thérapeutique des cas d'azoo / oligozoospermie d'origine obstructive. **Patients et Méthodes:** Trente-deux patients, âgés de 26 à 45 (âge moyen de 34 années), présentant des degrés variables d'obstruction du conduit éjaculatoire (EDO) ont été sélectionnés parmi une grande population de patients consultant pour stérilité avec un volume éjaculatoire bas à la consultation externe du Département d'Andrologie de l'Hôpital Kasr El Aini. Les patients (24 EDO complète et 8 EDO partielle) ont été transférés au Département d'Urologie du même hôpital pour traitement chirurgical réalisé par un urologue. Les malades traités ont été renvoyés au Département d'Andrologie pour suivi qui a duré 6 à 30 mois (moyenne 18 mois). Le suivi a inclu un intérrogatoire, un examen physique et une analyse du sperme répétée. **Résultats:** Il y avait une amélioration statistiquement significative de tous les paramètres du spermogramme en moyenne. En outre, 42% des patients azoospermiques (EDO complet bilatéral) et 63% d'oligozoospermiques (EDO partiel) ont présenté une amélioration dans leurs paramètres du spermogramme après TURED avec un taux d'amélioration total de 47% parmi les patients traités. La grossesse a été obtenue dans approximativement 17% des couples avec azoospermie et dans 25% des couples avec oligozoospermie. Le taux de grossesses total était de 19%. Une hématurie prolongée était la seule complication ren-

contrée dans seulement 2 cas et a été traitée d'une manière conservatrice. **Conclusion:** TURED est une alternative efficace dans le traitement des cas d'EDO. Utilisé judicieusement, cette technique peut donner de bons résultats avec une morbidité limitée dans cette population de patients. La meilleure réponse est notée dans les cas d'EDO partiel.

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