SURGICAL TREATMENT OF MALE INFERTILITY

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SUMMARY

The male partner is the reason for infertility in about 50% of childless marriages. New surgical and reproductive technologic improvements have expanded the horizon of male infertility surgery. Recent advances in microsurgical techniques applied to male infertility will be discussed.

Key Words : Male infertility, surgery

INTRODUCTION

Approximately 8% to 10% of all couples have impaired fertility. (1,2). The prevalence of infertility increases with age, and the percentage of couples with infertility in 35 to 44 year old group reaches up to 21% (1). Male factor infertility is either the sole cause or a contributing factor in 50% of infertile couples (3).

Most of the recent highlights in the area of male reproductive surgery involve the use of operating microscope. Microsurgery for the correction of duct obstruction became popular after Silber and Owen published their separate reports in the 1970 (4,5). They documented high patency and pregnancy rates achieved through the reapproximation of the ends of the vas deferens in men who had previously undergone vasectomy (4,5). Other than vasectomy reversal, the urologist has found microsurgical techniques useful for vasoepididymostomy, varicocele ligation, epididymal aspiration, placement of alloplastic spermatocele, testicular autotransplantation and various other procedures.

The male factor in infertility can be classified as; (1) pretesticular, relating to the causes of oligoasthenospermia or azoospermia to insufficient endocrine stimulus of a congenital or acquired nature, (2) testicular, regarding to anatomic and histologic abnormalities in the setting of normal hormonal response, (3) posttesticular, obstruction that represents 10 % - 15 % of male infertility problems. In this group, normal spermatogenesis is present, but there is obstruction of ducts from either a congenital or acquired cause. It is this group of men in whom microsurgical intervention is benefical. (6).

EVALUATION OF THE AZOOSPERMIC MAN

In evaluation of the man, at least two semen analysis are required with a 2 to 4 week interval. Each specimen is obtained 3 days after ejaculatory abstinence. If no sperm are found and the semen volume is less than 1.5 ml, a postejaculatory urine analysis is necessary to rule out retrograde ejaculation. Fig. 1 presents an algorithm for evaluation of azoospermia (6).

Ductal obstruction may be due to congenital or acquired etiologies. Congenital mesonephric duct abnormalities may result in obstruction of excurrent ducts. Complete vasal agenesis is the most common abnormality (7) and the most common upper urinary tract abnormality associated with vasal agenesis is renal agenesis (8). Obstruction of excurrent ductal system may also be acquired during adulthood. Inflammatory lesions were the most common cause of the acquired ductal obstruction in the past. Venereal disease and GU Tuberculosis were the leading etiologies of obstructive azoospermia (9). However, modern antibiotic treatment has reduced the incidence of this complication. Today, the most frequent casue of acquired ductal obstruction is iatrogenic (9). Prior inguinal or scrotal surgery may result inadvertent injury to the vas deferens or epididymis. Transurethral endoscopic procedures may result in ejaculatory duct obstruction. The association of chronic sinusitis, bronchiectasis, and azoospermia characterize Young's syndrome (10). The azoospermia in Young's syndrome is due to obstruction of epididymis by inspissated secretions. The exact cause of this disorder is unknown.

When the vasa deferentia or epididymis are obstructed, the patient's semen is alkaline and the volume of fluid normal (1,5 - 5 ml). Fructose is present in the semen in normal quantities. (>150mg/dl). In contrast, if the obstruction is at the level of ejaculatory ducts, the semen volume is small (<1ml), with little or no fructose present, and the ejaculate is acidic from prostate secretions (9).

The surgical treatment of male infertility consists largerly of two types of operations:
1) varicocele repair, 2) treatment of obstructive azoospermia.
It is the latter category which is the subject of this review.

TREATMENT OF OBSTRUCTIVE AZOOSPERMIA

A) Vasectomy reversal
B) Vasoepididymostomy
C) Treatment of obstruction not caused by vasectomy
I) Inguinal disruption of vas deferens after herniorrhaphy
II) Ejaculatory duct obstruction
III) Congenital absence of vas deferens.

A) VASECTOMY REVERSAL (VASOVASOSTOMY)

Vasectomy is the most common cause of obstructive azoospermia in western countries. In 1919 Quinby reported a successful anastomosis of the vas deferens after vasectomy (11). Experienced microsurgeon using operating microscope, achieved consistently higher patency and pregnancy rates when compared to their colleagues who did not utilize this method (Table 1).

These results and other reports show that microsurgical techniques have more promising results. Determination of the level of the obstruction is made at the time of scrotal exploration. Vasography determines patency of the distal vas and the ejaculatory ducts. Microscopic examination of the vasal fluid determines patency of the proximal vas and epididymis by the presence of sperm in the vasal fluid. The presence of intravasal azoospermia indicates epididymal obstruction if the patient has documented sperm production in the testis. The information gained by microscopic characterization of the sperm in the vasal fluid allows extremely accurate prediction of success or failure after properly performed vasovasostomy, and establishes the likelihood of secondary epididymal blockage (13). The absence of sperm in the vasal fluid is usually due to epididymal rupture and secondary blockage. If the level of obstruction is not readily apparent, stepwise transection starting on the convoluted vas should be carried out until the fluid reveals sperm.

The motility of sperm in the obstructed segment has no effect on prognosis (13-15). Therefore, this finding suggests that vasoepididymostomy should be performed at the lowest level in the epididymis at which sperm and good flow are found, regardless of motility (15).

Another consideration in vasectomy reversal is the increased incidence over time of secondary epididymal 'blowout'. Since the sperm production continued by the testis, sperm travels through the obstructed proximal excurrent system, and pressure induced extravasation may occur anywhere in the epididymal tubule. This results in a local inflammatory reaction that blocks the passage of the sperm. If this situation is recognized at the time of vasectomy reversal, vasoepididymostomy is required.

The success rate of vasovasostomy is very high. Without concomitant epididymal obstruction, the result are similar to that of vasectomy reversal. Average patency rates are 70% to 90% and pregnancy rates are 80% to 50% (14). However, duration of obstruction is an important factor for pregnancy rate (10) (Fig. 2).

Technique: Microsurgical anastomosis is better than macrosurgery (6,10). Microsurgical vasovasostomy, whether to reverse a vasectomy or to correct another cause of vasal obstruction, may be performed with equal success using either modified single or double layer anastomosis (6,14). The operating microscope permits more precise apposition of the mucosal edges, and minimizes the possibility of sperm extravasation, a potential cause of operative failure (16). A splint of any kind should never be used, because it results in sperm leakage, inflammation, and increased scarring (13).

Microsurgical Techniques can be utilized by operating microscopes that provide magnification from 6 to 32 times.

B) VASOEPIDIDYMOSTOMY

With the aid of the operating microscope, success rate is high. Silber (17) has described a technique of end-to-end anastomosis of the vas deferens to the open end of a single, patent epididymal tubule. His results were reportedly superior to those previously described in the literature. A modification of this technique has also been described (18-20). This method consists of end-to-side anastomosis of the lumen of the vas deferens to an opening at the side of the epididymal tubule, above the level of obstruction. Patency and pregnancy rates of microsurgical vasoepididymostomies are presented in table II (17,19,20,21).

Although, the epididymis has an important role in achievement of sperm motility and fertilizing capacity, in obstructed systems sperm can acquire motility and fertilizing capacity with little or no exposure to the epididymal environment. Niederberg and Ross showed that the best predictor of successful microsurgical vasoepididymostomy is the presence of sperm in the epididymal fluid (15). Authors found that the presence of motile or non-motile sperm in the epididymal fluid was not a significant predictor of success (15). This important finding suggests that vasoepididymostomy should be performed at the lowest end of the epididymis where good sperm count and flow is found, regardless of motility (15,17,20).

The issue of end-to-end versus end-to-side anastomosis is probably not important.

C) TREATMENT OF OBSTRUCTION NOT CAUSED BY VASECTOMY

I) Inguinal disruption of vas deferens after herniorraphy

Bilateral herniorraphy, specially in infancy, carries a high risk of causing iatrogenic obstruction of vas deferens (13). Such patients generally complain of infertility in young adulthood.

The vasogram shows that vas deferens are obstructed at the level of external or internal inguinal ring on both sides. It can be difficult to anastomose the vas deferens due to long segmental loss. Furthermore, there is usually existing secondary epididymal blockage which requires a vasoepididymostomy (13).

Bilateral infant herniorraphy may probably sterilize about 2 % of children. These unsettling figures argue strongly for using ocular loops more routinely for certain pediatric procedures including herniorraphy (13).

II) Ejaculatory duct obstruction

A rare cause of azoospermia is congenital obstruction of the ejaculatory duct (22,23). This diagnosis is made when the patient has a palpable vas deferens, azoospermia, and a normal testicle biopsy, in the presence of low ejaculate volume with no fructose. Ejaculatory duct obstruction is usually detected by transrectal ultrasonography in patients with low semen volume.

These patients should be treated by transurethral incision of the ejaculatory ducts (22,23). This is performed using Colling's knife or resecting loop with pure cutting current. The posterior aspect of the prostatic urethra is incised just proximal to and

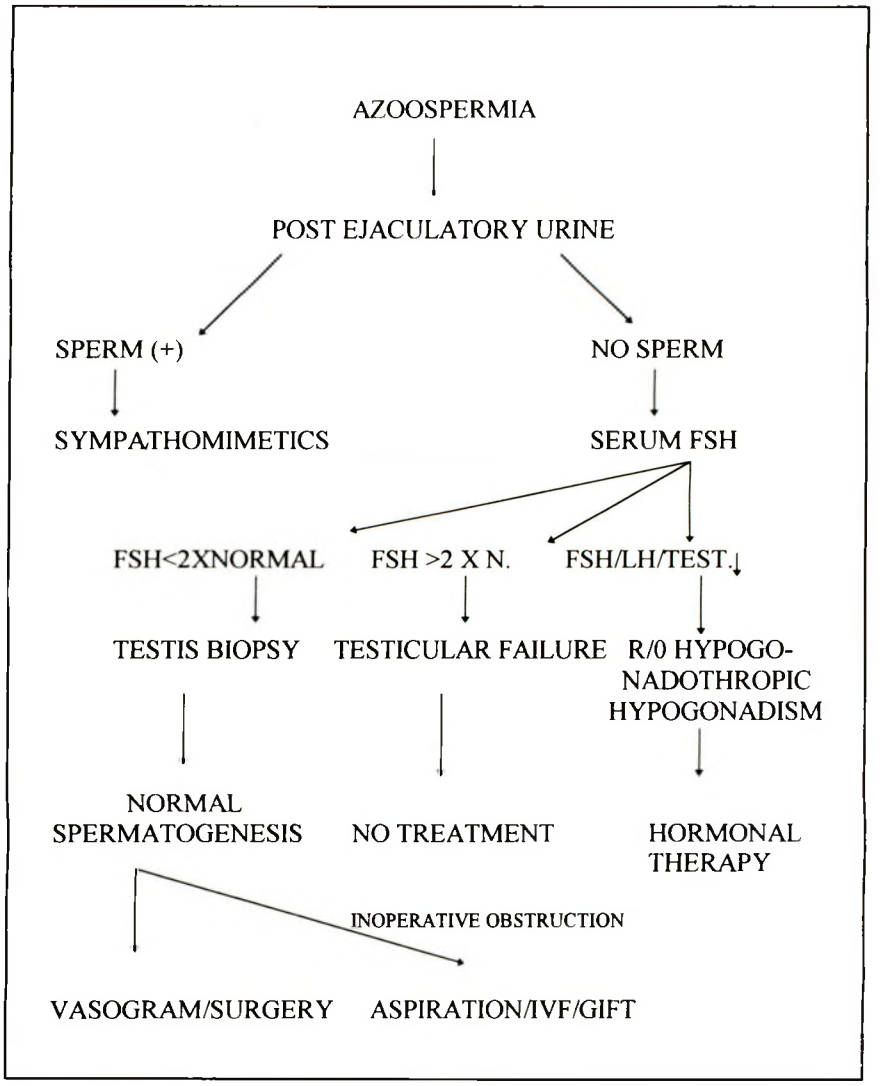

Fig 1. Evaluation of azoospermic patients.

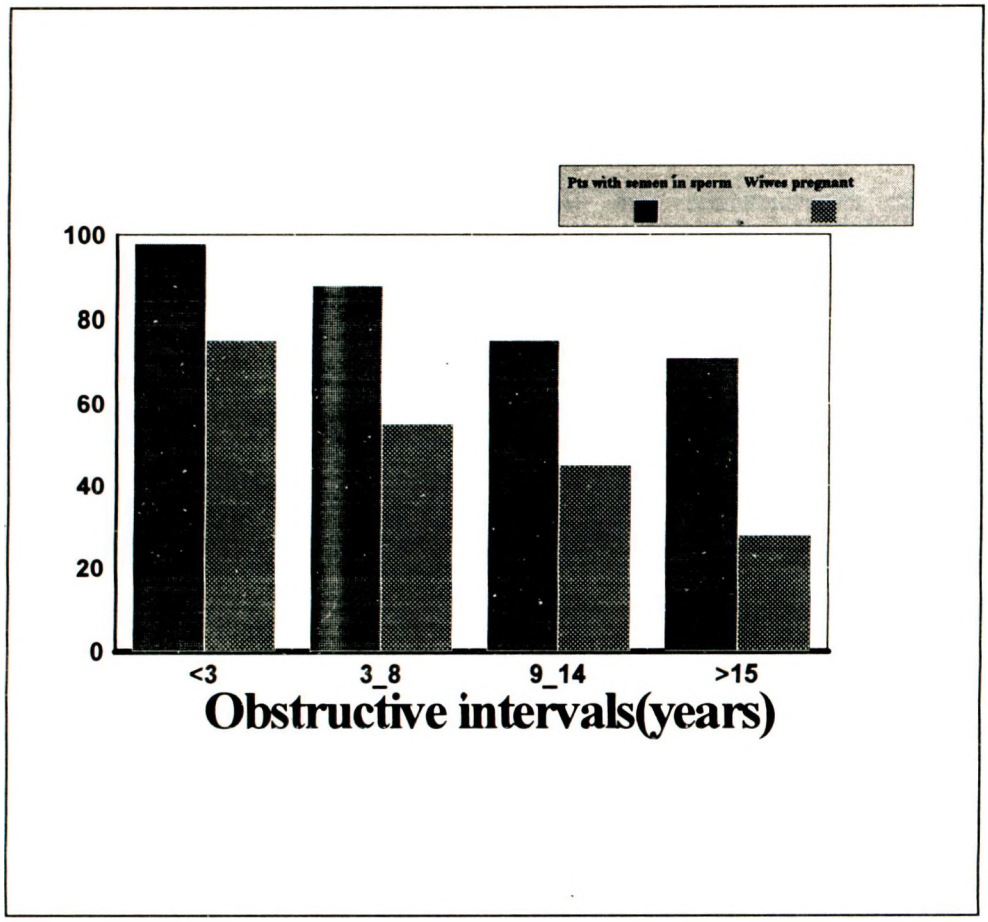

Fig 2. (From Belker A.E. et. al. Results of 1469 microsurgical vasectomy reversals by The Vasovasostomy Study Group. J. Urol. 145:505,1991)

slightly lateral to the veru - montanum (22,23). Incision should not extend up to the bladder neck or distal to the veru. The incision is complete when seminal secretions are visualized. Follow-up in these patients consists of repeated semen analyses. Persistent ejaculatory duct obstruction should be suspected if the seminal volume remains low. However, persistent azoospermia with normalization of ejaculate volume indicates presence of more proximal obstruction usually at the level of the epididymis. Without epididymal obstruction the prognosis for fertility in patients appears to be excellent.

III) Vasal Agenesis

Congenital absence of both vas deferens accounts for approximately 10% of cases of obstructive azoospermia.

Until recently, alloplastic spermatocel is used to treat bilateral vasal agenesis, but this procedure is unsuccessful because of two reasons: There is a high rate of stricture formation at the site of epididymal anastomosis, and the quality of sperm aspirated from his reservoirs is extremely poor (24).

A relatively new technique, epididymal sperm aspiration has more promising results. First human pregnancy resulting from microsurgical aspirations of sperm from the epididymis and in-vitro fertilization was reported by Temple and Smith et. al. in a patient with failed vasoepididymostomy (25). Silber et. al. extended these techniques to men with congenital absence of vas deferens (26).

The operating microscope is required for visualization of the epididymal tubule, and aspiration of sperm directly from the epididymis using a simple cannula. This sperm can then be used for in-vitro fertilization on other reproductive technology protocols and Silber et. al. have reported live birth rates as high as 20% using this technique (26-28).

In conclusion, the application of advanced microsurgical techniques have greatly enhanced the ability of the urologist to treat the azoospermic men who are found to have surgically correctable problems. This new area of technical advances requires, urologists to be aware of the new assisted reproductive techniques, and understand the importance of team work with reproductive endocrinologists.

Table I

MICROSURGERY				
AUTHOR	**YEAR**	**NO OF PATIENTS**	**% WITH SPERM**	**% PREGNANCIES**
OWEN	1977	50	98	72
SILBER	1978	126	90	76
SHARLIP	1978	17	76	47
THOMAS	1981	55	89	55
KAYE ET AL	1983	25	95	–
REQUEDA	1983	47	80	46
MC CLURE	1986	50	90	60
VASOVASOSTO-MY STUDY GROUP	**1991**	**1247**	**86**	**52**
MACROSURGERY				
DERRICK	1973	1,630	38	19
SCHMIDT	1975	45	80 - 90	45
AMELAR	1975	93	84	33
MIDDLETON	1978	72	95	39
LEE	1978	222	82	34
FALLON	1978	41	83	40

Table II. Microsurgical vasoepididymostomy. (tubule - to - tubule anastomosis)

AUTHOR	YEAR	NO. OF PATIENT	NO. WITH SPERM (%)	NO. OF PREGNANCIES
SILBER	1978	14	12 (86)	–
MCLOUGHLIN	1982	23	–	9 (39)
)UBIN AND AMELAI	1984	46	18 (39)	6 (13)
BELGRANO ET AL	1984	4	4 (100)	1 (25)
WAGENKNECT	1985	50	–	12 (23)
FOGDESTAM	1986	41	35 (85)	15 (37)
THOMAS	1988	69	56 (81)	25 (36)
SILBER	1989	139	(78)	(56)

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