ORIGINAL ARTICLE

Comparison of Efficiency of Testicular Sperm Extraction (TESE) with Testicular Sperm Aspiration (TESA) for Sperm Retrieval in Patients having Azoospermia and Iidentification of Relevant Predictive Parameters

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ABSTRACT

Aim: To compare the efficiency of TESE and TESA as a technique of sperm retrieval in men seeking treatment of infertility by assisted reproductive methods & to identify relevant predictive parameters.
Methods:- All men coming to Infertility clinic having azoospermia whether obstructive or non obstructive underwent genital examination fosr testicular size, FSH level and underwent TESA under local anesthesia followed by TESE in all patients under sedation and local anesthesia.
Results: Total Eighty nine (n-89) patients who presented to our infertility clinic having azoospermia underwent the procedure of TESA followed by TESE. Mean age 30.83 years, mean size of testes 09.27 cm^3 and mean FSH level was 20.38 IU. The sperm were retrieved in thirty three (n-33) patients having 37.07 % success rate with TESA. The Sperm retrieval was positive in Forty two (n-42) 47.19% patient with Testicular sperm extraction (TESE). So 10.1% of patients could not be proceeded for ICSI if we just rely on TESA .Similarly 37.07 % patients who are TESA positive have undergone TESE unnecessarily.
Conclusion: It is concluded from the study that TESE is better sperm retrieval technique than TESA.
Key words: Testicular sperm extraction, Testicular sperm aspiration, Azoospermia.

INTRODUCTION

Introduction of intracytoplasmic sperm injection (ICSI) for the treatment of male factor infertility due to severely abnormal semen quality and the extension of ICSI to azoospermic males are the two major achievements of recent past regarding male infertility. More promising was the demonstration that spermatozoa retrieved from either the epididymis or the testis were capable of normal fertilization and pregnancy[1]. Azoospermia, defined as the complete absence of spermatozoa in the ejaculate after centrifugation, is found in 1-3% of the male population and in approximately 10% of the infertile males. Although azoospermia is associated with infertility, it does not necessarily imply sterility because many azoospermic men maintain sperm production at varying levels within the testes[2]. Several sperm retrieval methods have been developed to collect sperm from the epididymis or the testis of azoospermic men seeking fertility treatment[3].

Surgically-retrieved spermatozoa can be used to induce pregnancy through assisted reproductive techniques (ART), i.e., in vitro fertilization associated to ICSI[4]. Alternatively, the retrieved sperm can be cryop reserved for use in future sperm injection attempts[5]. The best sperm retrieval technique for men is yet to be determined. Randomized controlled trials are lacking to compare the efficiency of the available methods and current recommendations are based upon cumulative evidence provided by descriptive, observational and controlled studies[6,7]. After sperm acquisition, intracytoplasmic sperm injection (ICSI) is used instead of standard in vitro fertilization (IVF) because ICSI has been shown to result in a significantly higher fertilization rate[8]. The use of non-ejaculated sperm and ICSI has become an established procedure for couples whose male partner has azoospermia to obtain biological offspring[9].

The method of choice for sperm retrieval is based on the type of azoospermia, which can be obstructive or nonobstructive, and the attending surgeon's preferences and experience. Main features utilized to determine the etiology of azoospermia include presence of vasa deferentia, testicular size and serum FSH level. Azoospermic patients having normal size testes and normal serum FSH are likely to have Obstructive cause. Patients with small testes and serum FSH levels greater than two to three times normal have severe germ cell failure. Obstructive azoospermia (OA) is associated with the inability to detect spermatozoa in the ejaculate and post-ejaculate urine after centrifugation due to the bilateral obstruction of the seminal ducts[10]. Obstruction of the

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male reproductive system can be congenital or acquired. OA affects approximately 1% of all men and 5 to 10% of all subfertile males seeking care[11]. Although the majority of cases are secondary to an impairment of testicular function, a bilateral obstruction of the male genital tract causes azoospermia in up to 20 to 40% of cases.

As the number of ART procedures performed is expected to increase with the anticipated increase in the current 15% incidence of infertility over the next 20 years[12], some questions have emerged regarding the state-of-the-art methods used to perform sperm retrieval for use in IVF/ICSI. Microsurgical ductal reconstruction is generally considered to be a cost-effective treatment that allows for natural conception in selected cases of OA, such as post-vasectomy[13].

Despite being highly successful, ductal recanalization may not be an option for some infertile couple or may be impossible in certain cases of congenital obstructions and post-infectious obstruction or failed vasectomy reversals. Spermatozoa can be retrieved from the epididymis or testicle in almost all cases of OA, irrespective of the technique used for sperm collection and the cause of obstruction. Nonobstructive azoospermia (NOA), on the other hand, is a consequence of spermatogenic failure and is the cause of most cases of azoospermia[14].

NOA has congenital and acquired etiologies other than hypothalamic-pituitary disease and obstruction of the male genital tract. Unlike men with OA, men with NOA have no treatment options other than attempting testicular sperm retrieval. In such cases, spermatogenesis may be focal, which means that spermatozoa can be found and used for ICSI in approximately 30-60% of men with NOA[15].

Three main goals should be accomplished during sperm retrieval: (i) the acquisition of an adequate number of sperm for both immediate use and cryopreservation, (ii) the retrieval of the highest quality of sperm, and (iii) minimizing the damage to the reproductive tract, thus preserving the option of future retrieval attempts and testicular function[16].

MATERIALS AND METHODS

All the patients who presented to our infertility clinic having azoospermia underwent thorough History, Clinical and Genital Examination,Semen Analysis and Harmonal Evaluation. Size of Testes was calculated with methemetical formula for volume of elepsoid (4/3x**π**x{lenth/2}x{width/2}x{depth/2}). Measurements of testes were done with vernier caliper. Serum FSH levels were also collected. Azoospermia was confirmed by standard method. All the patients were explained the procedure of TESA and TESE with advantages and disadvantages of each. All of them underwent TESA first and the results of TESA were assessed immediately. Then all of them were proceeded to TESE and the results were collected and compared . All the patients in which sperms were retrieved were booked for ICSI. Advantages and Disadvantages of two methods of sperm retrieval TESA and TESE are given in Table-2.

RESULTS

Age of patients included in study range 20 t0 48 years with mean age 30.83 years (SD 5.97). A list of patients who may need sperm retrieval for assisted reproduction is given below in Table 1. Size of testes rang from 0.32cm3 to 24.19 cm^3 with mean size of 9,27 cm^3 (SD 3.79). Number of patients having testicular volume less than 15 cm^3 are n-71(Normal volume of testes is considered 15 cm^3) and more than 15 cm^3 are n-18. Sperms are retrieved in ≤15 cm^3 group by both TESA and TESE method in n-18/n-71 (23.9%) P .008 and in >15 cm3 group in n-17/n-18(88.9%). P 1.000 McNemar test (Table-3).

Fig. 1: Testicular Sperm Aspiration (TESA)

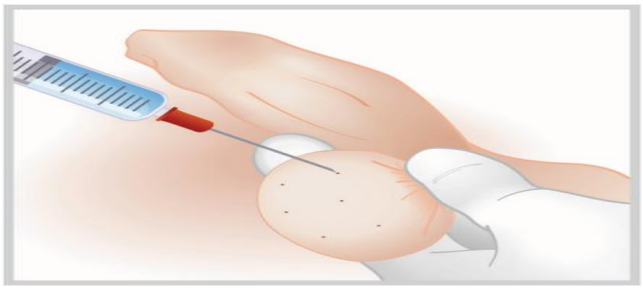
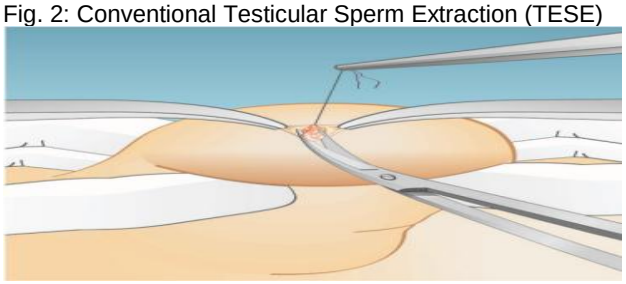


Fig. 2: Conventional Testicular Sperm Extraction (TESE)



FSH level range from 0.8 IU to 99.5 IU mean 20.38 IU.We separated the total 89 patients in 3 groups .Group A <10 IU, Group B 11IU to 20 IU and Group-C >21 IU. Sperms were retrieved in n-27/n-34 in Group -A, n-10/n-19 in group-B and n-5/n-36 in Group-C (Table 4). All the eighty nine patients underwent TESA as first step. The results of TESA were assessed immediately. Those who were positive and sperms were retrieved were booked for ICSI. Seven (n-7) had cryptorchidism on one side. So a total of 171 testes were subjected to TESA. The

sperm were retrieved in thirty three (n-33) patients having 37.1% success rate (Table 5).

Table 1: List of the candidates eligible for sperm retrieval

Obstructive Azoospermia	Non-obstructive Azoospermia (Testicular Failure)
Congenital Ductal Obstructions	Congenital Testicular Failure
Congenital bilateral absence of the vas deferens	Testicular dysgenesis/cryptorchidism
Young's syndrome (clinical triad of chronic sinusitis, bronchiectasis, and obstructive azoospermia	Genetic abnormalities (Klinefelter syndrome,
Stenosis or atresia of the ejaculatory ducts	Y chromosome microdeletions
Midline prostatic cysts (utricular and Mu¨ llerian cysts	Germ cell aplasia (Sertoli cell-only syndrome)
Ejaculatory duct cysts	Spermatogenic (maturation) arres
Seminal vesicle cysts	Acquired Testicular Failure
Acquired Ductal Obstructions	Testicular trauma
Post-infection (epididymitis, prostatitis, seminal vesiculitis)	Testicular torsion
Post-vasectomy	Post-inflammatory (e.g.,mumps orchitis)
Post-surgical (epididymal cysts, hernia repair, scrotal surgery, bladder neck surgery, prostatectomy	Exogenous factors (steroid medications, cytotoxic drugs, irradiation, heat
Iatrogenic (urologic endoscopic instrumentation	Systemic diseases (liver cirrhosis, renal failure)
Idiopathic	Testicular tumor
	Varicocele
	Post-surgical (surgeries that may compromise testicular vascularization, resulting in testicular atrophy)
	Idiopathic

Table 2: Advantages and disadvantages of sperm retrieval techniques**.**

Advantages (TESA)	Disadvantages (TESA)
Fast and low cost; Repeatable No open surgical exploration No microsurgical expertise required Few instruments and materials Minimal/mild postoperative discomfort	Relatively low success rate in NOA cases Limited number of sperm for cryopreservation; Few sperm retrieved in NOA cases Risk of hematoma/testicular atrophy
No microsurgical expertise required; Repeatable	Repeatable Increased cost and time-demanding Open surgical exploration required; Relatively few sperm retrieved in NOA cases Risk of testicular atrophy Risk of testicular androgen production impairment Postoperative discomfort

Table 3: Volume of Testes and Sperm Retrieval

Testicular Volume	n	+ve for sperm	% +ve of each group	% -ve of each group
≤15 cm^3	71	25	35.2	64.8
>15 cm^3	18	17	94.4	5.6

Table 4: Level of FSH and Sperm retrieval

FSH level	n	+ve for Sperm	% +ve for sperm	% -ve for Sperm
1 to 10 IU	34	27	79.4	20.6
11 to 20 IU	19	10	52.6	47.4
>21 IU	36	5	13.8	86.2

Table 5: Comparison of sperm retrieval by testicular sperm aspiration (TESA) and testicular sperm extraction(TESE)

Method of retrieval of sperm	Number of pts in which sperm are retrieved	%age
TESA and TESE	33	37.1
TESA only	0	-
TESE only	9	10.1
Total	42	47.2

Significant difference between RESE and TESA (McNemar's Test) P.004

DISCUSSION

The most important goal of both TESE and TESA is the finding of mature sperm cells suitable for fertility treatment. In the this study, the efficacy of two widely used procedures of sperm retrieval, Open Testicular testicular sperm extraction or Biopsy (TESE) and TESA is compared to conclude which of these is more suitable for men with NOA. Our results demonstrated a significant advantage of Biopsy, as expressed by the sperm recovery rate. In addition, the quantity of sperm cells, quality and motility as measured directly was significantly in favor of Biopsy. In our study the result of sperm retrieval in Biopsy is 47.2% and in TESA is 37.1% which is comparable to the study of Hauser et al wherein the Testicular motile sperm were present in 51.7% of Biopsy evaluations and in 24.1% of TESA evaluations. Abu Khadra et al 2003 in their study of total of 84 men with nonobstructive azoospermia who underwent TESA to recover testicular spermatozoa for ICSI on the day of ova retrieval from the wife and were successful in the recovery of mature spermatozoa in 45 men (53.6%). Of the remaining 39 men (46.4%) requiring open biopsy adequate spermatozoa were recovered in 28 (71.8%).

We used 20 gauge needle for TESA. Regarding the needle diameter for TESA, Rosenlund et al[17] concluded that 19-gauge needles are better than 21-gauge needles. Large needle percutaneous

aspiration biopsy showed good results in a descriptive study (60% sperm retrieval rate (SRR)), irrespective of testicular volume[18]. However, another study showed that TESE yielded a significantly higher SRR compared with FNA, despite the use of an 18-gauge needle (62.1%vs.24.1%)[19].

The literature is rich in studies focusing on different sperm retrieval methods. Both percutaneous and microsurgical methods have high success rates, in the range of 90-100%, for Obstructive Azoospermia[20]. However in case of Non Obstructive Azoospermia success rate of sperm retrieval is comparatively lower but overall successful sperm retrieval rates (SRRs) ranging from 30-60%[21,22], have been reported which means that 30-60% of men with NOA have focal areas of sperm production within the testes. The efficiency of sperm retrieval in NOA males varies depending on the method of sperm collection. The TESA retrieval rates range from 10-30%[23] except in the favorable cases of a previous successful TESA or a testicular histopathology showing hypospermatogenesis. In such cases, the TESA SRRs are greater than 60%[24].

A recent meta-analysis reported a mean TESE SRR of 49.5%[25]. TESE with multiple biopsies has a higher SRR than fine-needle aspiration (TEFNA), especially in cases of Sertoli cell-only (SCO) syndrome and maturation arrest[45]. The reported micro-TESE retrieval rates range from 35-77%[26]. Moreover, tissue removal in micro-TESE is often 50 to 70-fold less than conventional TESE. Micro-TESE has been shown to minimize the damage to testicular tissue and maximize sperm recovery because the seminiferous tubules containing active foci of spermatogenesis can be better identified[27]. Micro-TESE was shown to be particularly more effective than conventional TESE in recovering sperm from men with a testicular volume of less than 10 ml (42% vs. 27%)[28].

Increase in testicular volume significantly increased the success rate of sperm retrieval. Clinically testicular volume is correlated with spermatogenesis. Testicular volume had been found to have poor predictive value for successful TESE, however. This is because topographical variations in testicular pathology, independent of testicular volume, can occur [49]. Indeed, it had been reported that there is no statistically significant difference in testicular volume between patients with retrievable spermatozoa and those without[29]. Furthermore, no lower limit of testicular volume for the absence of spermatozoa has been identified. Spermatozoa are often retrieved from testes with volumes less than 5 ml by microdissection TESE. But other studies as in our study have found a positive relation between the SRR and testis volume[30].

In general, the serum concentration of FSH is inversely correlated with the impairment of spermatogenesis as is in our study. Recent studies using multiple TESE techniques have shown that elevated FSH levels have been associated with a low probability for the retrieval of spermatozoa in men. Therefore, FSH may predict the presence of sperm at random biopsy using conventional TESE techniques[31]. Although FSH reflects the predominant pattern of spermatogenesis, it may not reflect isolated areas of spermatogenesis within the testis. Serum FSH concentration is not related to the more advanced stages of spermatogenesis[32]. The relationship between FSH and the presence of any spermatogenesis is not straightforward in men with NOA. SRRs were maintained even when the FSH value was markedly elevated. A lower FSH level may be a reflection of the larger number of Sertoli cells in a larger testis, providing more control feedback to suppress FSH production. These findings further illustrate that FSH is not able to resolve spermatogenesis on an individual tubule level, and therefore, it should not be used as a predictor of sperm recovery.

Complications of both procedures are relatively rare and the incidence ranges from 0-70%. These include persistent pain, swelling, infection, hydrocele and hematoma[33]. Complication rates vary according to the sperm retrieval technique and to a lesser extent to the type of azoospermia. Testicular damage secondary to surgery is either the consequence of interference with the vascular supply to the seminiferous tubules or increased intratesticular pressure secondary to bleeding within the tunica albuginea[34].

Major postoperative complications, such as acute epididymitis, scrotal hematoma, and testicular hydrocele, were not seen significantly in this study. Only complication that developed was scrotal wall hematoma and it resolved shortly during follow-up. In addition, no patient required hormone replacement therapy for treatment of post-operative hypogonadism. Jungwirth al reported intratesticular bleeding in 29% of cases after TESE and in 7% after FNA[35].

Regarding fibrosis, multiple studies have shown ultrasonographic changes after TESE, which have been attributed to the development of scar tissue. Using ultrasonography, Schlegel and Su reported the incidence of testicular scars, impaired blood flow and devascularisation in subjects with NOA three months after open testicular biopsy. At three months after TESE, 82% of evaluated patients had ultrasonographic abnormalities in the testis, suggesting resolving inflammation or haematoma at the biopsy site[36].

CONCLUSION

It is concluded from the study that TESE is better sperm retrieval technique than TESA. But all the azoospermic patients should not undergo TESE directly.

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