ABSTRACT
Azoospermia is defined as the absence of mature spermatozoa in semen analysis after centrifugation. The causes of azoospermia may be related to spermatogenesis defects and classified as non-obstructive azoospermia, or to the obstruction of the efferent ducts of the genital tract and classified as obstructive azoospermia. Before the development of intracytoplasmic sperm injection, in 1992, men with non-treatable obstructive azoospermia or non-obstructive azoospermia could not become biologic fathers. Intracytoplasmic sperm injection has dramatically changed this scenario, as it allows obtaining an embryo using a single sperm cell. Since then, sperm obtained from different sources have been used for intracytoplasmic sperm injection, and the techniques used for sperm retrieval are microsurgical epididymal sperm aspiration (MESA) or percutaneous epididymal sperm aspiration (PESA) for patients with obstructive azoospermia, and testicular sperm aspiration (TESA), testicular sperm extraction (TESE) or testicular microdissection for non-obstructive azoospermia patients. This article discusses these techniques, and their indications and results.

Keywords: Azoospermia/therapy; Sperm, injections, intracytoplasmic/methods; Infertility, male/therapy; Sperm retrieval

INTRODUCTION
Azoospermia is defined as absence of spermatozoa in the ejaculated semen after centrifugation. It is classified as obstructive (OA) or excretory when there is normal sperm production, but the efferent ducts (epididymis, vas deferens or ejaculatory duct) are obstructed, and vasectomy is the main example. It is considered as non-obstructive (NOA) or secretory when there is testicular failure, leading to suppression or significant reduction of the production of spermatozoa. The incidence of azoospermia in infertile men is approximately 10%, and it is usually non-obstructive\(^{(1-2)}\).

The development of assisted reproduction techniques, particularly the intracytoplasmic sperm injection (ICSI), where a single sperm is injected in the oocyte cytoplasm, allowed azoospermic men to become biological fathers, provided spermatozoa can be retrieved from the epididymis or testicles. This article aims to discuss sperm retrieval procedures and their indications.

Sperm retrieval in OA is a simple procedure, as there is sperm production, and the epididymis functions...
as a reservoir that can be accessed through open surgery or percutaneous aspiration.

In NOA patients, the procedures are more complex, and performed after a diagnostic routine that includes hormonal and genetic evaluations. The objective of urologists, in these cases, is to diagnose treatable and rare – but possible – causes, such as hypogonadotropic hypogonadism, genetic causes, and to establish the sperm retrieval procedure.

Microsurgical epididymal sperm aspiration (MESA)

This procedure was first described by Temple-Smith et al. in 1985, in obstructive azoospermia cases for the retrieval of sperm to be used in in vitro fertilization (IVF). With the introduction of ICSI and the improvement of fertilization and pregnancy rates, the technique started to be routinely used\(^3\).

It is indicated in cases of men who do not want to be submitted to vasectomy reversal, in vas deferens agenesis, and in epididymal obstructions\(^4\).

The technique consists in opening of the scrotum, exposure of the cephalic portion of the epididymis, identification of dilated seminiferous tubules through a surgical microscope, individual opening of the tubules, aspiration of their content, and suturing the tubule walls with 10-0 nylon suture. The procedure can be performed under local or general anesthesia in a clinical setting, and allows the retrieval of a large number of spermatozoa with minimal erythrocyte contamination. Sperm can then be cryopreserved and a single retrieval procedure can be performed for several ICSI cycles. The disadvantages are the costs associated with the use of microsurgery suture, long operative time, and the use of surgical microscope\(^(4)\).}

Percutaneous epididymal sperm aspiration (PESA)

Having the same indications as MESA, Craft and Shrivastav called PESA the aspiration of the epididymis head using a fine needle\(^5\). Spermatic cord blocking is performed through one or more punctures in the epididymis head until a satisfactory sample to be used in ICSI is obtained. PESA can be performed more than once in the same epididymis, and also allows sperm cryopreservation. Its advantages include performance in a clinical setting with minimal resources; however, the disadvantage is the potential contamination of the sample with blood, as percutaneous puncture may damage blood vessels, as well as the epididymal tubule, precluding vasectomy reversal, for instance\(^(3,5)\).

Testicular sperm aspiration (TESA)

The technique described in 1996 by Lewin et al. is indicated in OA when there are no spermatozoa in the epididymides, or in NOA\(^6\). It consists of aspiration of sperm with a wide-bore needle (19G) and a 20-ml syringe directly from the testicular parenchyma. The collected segments of seminiferous tubules are immediately submitted to the laboratory to check for the presence of spermatozoa. The procedure is performed under local anesthesia in a clinical setting. However, it yields widely variable results, which depend on the testicular histological pattern – less severe lesions yield higher retrieval rates, which range between 11 and 58%, according to literature. The best results are obtained with TESA in OA and in NOA cases, with hypospermatogenesis as the predominant testicular pattern\(^(1,5)\).

Testicular sperm extraction (TESE)

After ICSI, Devroey et al. described in 1995 the successful fertilization of an oocyte with a single testicular sperm cell\(^7\). Since then, that technique started to be used for treatment. It initially consisted of an open testicular biopsy. Sperm retrieval rate is also related to the testicular histological pattern; however, it is better when compared to TESA, since it allows the removal of a larger amount of parenchyma and from different sites of the testicle. The procedure can be performed in a clinical setting under local anesthesia. The most severe complication is testicular atrophy due to vascular damage and ischemia; however, its incidence is lower than 1%, according to Schlegel and Su\(^(3,7-8)\).

The major challenge is to predict which patients have the highest probability of having spermatozoa in their testicles. This elicited studies on the clinical and analytical factors that can be used for prognosis. The most commonly used and available test is the determination of follicle-stimulating hormone (FSH) levels, which, however, has shown to be not very specific. Other spermatogenesis markers, such as inhibin, present limitations as to their clinical use. Currently, the best negative prognostic factor as to sperm presence is the detection of AZFa or AZFb microdeletion during genetic evaluation. This defect determines sperm retrieval rate of 0\(^%\)\(^\((1,3)\).

Based on that first technique, variations aiming to reduce lesions in the testis parenchyma and increasing the chances of gamete retrieval were proposed. In 1999, Schlegel described the testicular microdissection procedure, which adds to the typical technique the wide opening of the tunica albuginea and the use of surgical microscope for the direct examination of the tubules to try to find areas where the testicular tubules are more dilated, and therefore, there is a higher probability of presenting complete spermatogenesis\(^(9)\). Although the original study showed that this technique was better
than TESE, in their review on the methods and studies published until 2008, Harris and Sandlow concluded that there are not enough evidences that a single method is better than the others\(^{(1,9)}\).

**REFERENCES**


**Erratum**

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