Case Report/Series

Fine-needle aspiration mapping biopsy after failed sperm extraction post-varicocele microligation: a case report

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ABSTRACT

To enhance testicular function and raise the possibility of sperm retrieval, azoospermic men with varicocele frequently undergo varicocele microligation. Fine-needle aspiration (FNA) mapping biopsy can be used to locate remaining foci of spermatogenesis in cases where initial microdissection testicular sperm extraction (mTESE) is unsuccessful. We report a 33-year-old man with persistent azoospermia 1 year after varicocele microligation and failed mTESE. Multiple locations containing sperm were found in both testes using FNA mapping; the majority of the sperm that were recovered were immotile sperm, which were later judged unsuitable for use in an *in vitro* fertilization/intracytoplasmic sperm injection program. This case illustrates that FNA mapping can reveal discrete areas of residual spermatogenesis even after repeated unsuccessful mTESE, although the functional quality of retrieved sperm may limit its clinical utility.

KEYWORDS azoospermia, fine-needle biopsies, male infertility, sperm retrieval

Azoospermia, defined as the absence of spermatozoa in the ejaculate, is classified as obstructive or non-obstructive. Non-obstructive azoospermia (NOA) reflects impaired spermatogenesis due to intrinsic testicular dysfunction and may result from diverse etiologies, including varicocele, a common and potentially reversible cause of male infertility. Varicocelectomy can improve semen parameters and reproductive outcomes; however, azoospermia may persist despite successful repair.[1–3]

Microdissection testicular sperm extraction (mTESE) remains the gold standard for sperm retrieval in men with NOA, offering higher retrieval rates than conventional techniques. Nevertheless, mTESE may fail, particularly in patients with extensive testicular damage or previous unsuccessful retrieval attempts. Fine-needle aspiration (FNA) mapping biopsy, which systematically samples multiple testicular sites to localize focal spermatogenesis, has emerged as a minimally invasive adjunct to guide subsequent sperm retrieval.[4–6]

We report a rare case in which FNA mapping biopsy was performed in a patient with persistent azoospermia following varicocele microligation and a failed mTESE. Although evidence supporting this approach in this setting is limited, FNA mapping identified previously undetected foci of spermatogenesis, underscoring its diagnostic value while also illustrating its limitations when the retrieved sperm are unsuitable for assisted reproduction. This case contributes to the growing

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understanding of the role of FNA mapping in managing challenging cases of NOA.

CASE REPORT

A 33-year-old male presented to our hospital with a history of failed mTESE and varicocele microligation performed 1 year before presentation. Scrotal Doppler ultrasonography (USG) revealed bilateral testicular atrophy with diffuse calcifications, consistent with chronic processes. The right testis measured 3.1 cc and the left 3.4 cc, both showing coarse, homogeneous echotextures with multiple calcifications, whereas the epididymis appeared normal and no increased vascularity was detected. Measurements of the pampiniform plexus were 0.48 cm (no Valsalva) and 0.51 cm (Valsalva) on the right, and 0.28 cm (no Valsalva) and 0.33 cm (Valsalva) on the left, consistent with right grade 4 and left grade 3 varicocele.

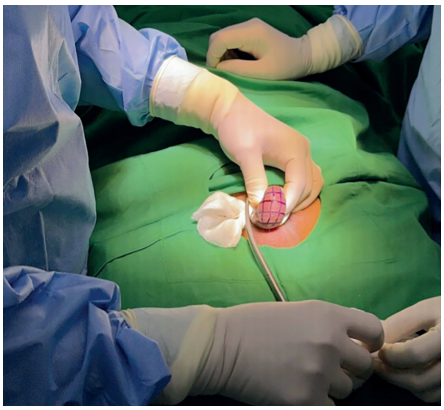


Figure 1. Testes stabilization using gauze and 18 mapping sites were marked on each testis

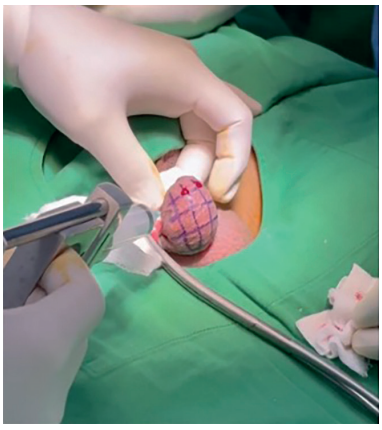


Figure 2. Systemic biopsies conducted in each region marked on each testes

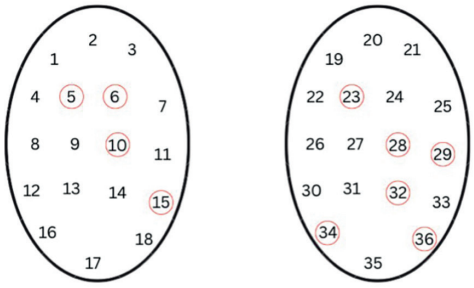


Figure 3. FNA mapping biopsy results showing sperm retrieval regions (circled) in the right and left testes of a patient with azoospermia post-failed mTESE and varicocele microligation. FNA=fine-needle aspiration; mTESE=microdissection testicular sperm extraction

Preoperative tests revealed normal hematology and renal and liver functions. Hormonal evaluation revealed elevated follicle-stimulating hormone (25.66 mIU/ml; reference range: 1.5–12.4 mIU/ml) and luteinizing hormone levels (53.82 mIU/ml; reference range: 1.7–8.6 mIU/ml) with normal total testosterone levels (5.16 ng/ml; reference range: 2.5–8.4 ng/ml), indicating hypergonadotropic hypogonadism with preserved androgen production. No Y chromosome microdeletions were observed. Scrotal USG revealed multiple hyperechoic punctate lesions with posterior acoustic shadowing in both testes, consistent with testicular microlithiasis. Testicular dimensions were approximately 2.1 × 2.9 cm on the right and 1.9 × 2.9 cm on the left, with no peritesticular fluid. Mild bilateral pampiniform plexus dilation without significant reflux was observed, indicating bilateral atrophy with a suspected residual varicocele.

He underwent an FNA mapping biopsy under general anesthesia in the supine position. Eighteen mapping sites were marked on each testis (Figure 1), and systematic biopsies were performed based on predefined regions (Figure 2). Non-motile sperm were identified in regions 5, 6, 10, and 15 of the right testis, whereas both motile and non-motile sperm were found in regions 23, 28, 29, 32, 34, and 36 of the left testis (Figure 3 and Table 1). These spermatozoa were subsequently used for *in vitro* fertilization or intracytoplasmic sperm injection; however, the treatment cycle was unsuccessful. The procedure was completed without complications, with minimal blood loss (2 ml), and a total operative time of 1.5 hours.

This study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Indonesia –

Table 1. Type of sperm found in fine-needle aspiration (FNA) mapping biopsy based on the region

Area	Sperm found	Area	Sperm found
1	-	19	-
2	-	20	-
3	-	21	-
4	-	22	-
5	1 immotile	23	1 immotile
6	3 immotile	24	-
7	-	25	-
8	-	26	-
9	-	27	-
10	2 immotile	28	2 immotile
11	-	29	2 immotile and 1 motile non-progressive
12	-	30	-
13	-	31	-
14	-	32	1 immotile and 1 motile non-progressive
15	1 immotile	33	-
16	-	34	1 immotile
17	-	35	-
18	-	36	1 immotile

Cipto Mangunkusumo Hospital, Jakarta, Indonesia (No: KET-1001/UN2.F1/ETIK/PPM.00.02/2025). Written informed consent was obtained from the patient for the publication of this case report, and the patient agreed to the use of anonymized clinical data for academic and scientific purposes.

DISCUSSION

mTESE remains the preferred procedure for sperm retrieval in NOA, but its invasiveness and variable results can present limitations.[7,8] FNA mapping provides a minimally invasive, systematic approach for precisely identifying sperm-producing foci within the testicular parenchyma. This approach minimizes tissue damage while preserving testicular integrity, which is critical for NOA patients who may require several retrieval attempts.[9,10] Furthermore, FNA mapping can detect areas of spermatogenesis that mTESE may miss, increasing the total retrieval success rate.[9] In the present case, FNA mapping not only facilitated sperm retrieval but also demonstrated how it might be used in conjunction with, or instead of, mTESE. Repeated mTESE attempts are more accurate and successful when sperm-containing areas are identified by FNA mapping.[9] FNA mapping may occasionally eliminate the requirement for repeat mTESE,[9] providing a less invasive retrieval option. According to a study by Kapadia et al,[11] FNA mapping achieved sperm retrieval rates comparable to those of upfront mTESE in men with NOA. Among patients with positive FNA mapping results, guided sperm retrieval was successful in nearly all cases, with pregnancy and live birth rates similar to those achieved using mTESE. These findings suggest that FNA mapping is a reliable tool for localizing sperm-producing areas, potentially reducing unnecessary testicular tissue damage while maintaining favorable reproductive outcomes.[11]

Varicoceles inhibit spermatogenesis by disrupting testicular blood flow and increasing the scrotal temperature. These problems can be resolved using varicocele microligation, which improves the testicular microenvironment. Successful sperm retrieval 1 year after surgery suggests that varicocelectomy may have led to increased spermatogenic activity. This result is consistent with those of previous studies showing that males with NOA who had prior varicocele surgery presented with improved semen parameters and higher sperm retrieval rates.[12–14]

The successful identification of sperm in this case may have been influenced by both the preceding varicocele microligaton and the ability of FNA mapping to detect focal areas of residual spermatogenesis that may not have been sampled during the previous mTESE.[12,14] Although the precise cause of the initial mTESE failure cannot be established, the severe testicular atrophy and focal distribution of spermatogenesis observed on subsequent FNA mapping provide a possible explanation for the negative result of the earlier procedure. The identification of sperm in multiple discrete regions on mapping further suggests that residual spermatogenesis may persist despite severe testicular atrophy and a previous unsuccessful retrieval attempt. However, whether the subsequent detection of sperm reflects recovery of spermatogenesis following varicocele repair, improved localization through FNA mapping, or a combination of both remains uncertain.

Notably, this case differs from that reported by Jarvis et al,[9] who discovered a predominance of peripheral sperms in men with previously failed mTESE. This difference may be attributed to the number

of variables used. To improve the homogeneity of spermatogenesis, including in the core testicular regions, the patient first underwent varicocele microligation. In addition, there may have been less fibrosis and steadier recovery of spermatogenesis due to the shorter time between mTESE and FNA mapping in this instance (1 year as opposed to an average of 2.2 years in the Jarvis trial).[9] Spermatogenic distribution may also be affected by individual variations in testicular microenvironments and hormonal profiles. Further research is required to confirm these findings.

This is a single-case study; thus, the primary limitation is the inability to establish definitive causal relationships or broad generalizations. However, it provides valuable information regarding the possible function of FNA mapping in the treatment of NOA, especially after the failure of sperm retrieval attempts. The combination of varicocele repair and FNA mapping is a potentially useful strategy to enhance these results. By making it possible to precisely identify localized spermatogenesis, FNA mapping may improve the effectiveness of focused therapies and contribute to the success of assisted reproductive technologies.[15] This case illustrates that FNA mapping may detect residual spermatogenesis despite a previous unsuccessful mTESE. Although the recovered sperm were of insufficient quality for assisted reproduction, the mapping results may facilitate future guided sperm retrieval. These findings underscore both the diagnostic value and clinical limitations of FNA mapping in challenging cases of NOA.

The patient approached the FNA mapping biopsy with understandable uncertainty but remained hopeful about gaining clearer information regarding fertility potential. The minimally invasive and targeted nature of the mapping process offers the advantage of avoiding unnecessary tissue damage. Overall, the procedure provided a more confident and optimistic outlook for future fertility options.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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