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Video exoscope as a cost-effective alternative to surgical microscope in microsurgical subinguinal varicocelectomy in Indonesia: A case report

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A B S T R A C T

Microsurgical subinguinal varicocelectomy (MSV) is considered the preferred treatment for varicocele. However, its adoption among urologists in Indonesia is limited due to the high cost of acquiring a surgical microscope. Therefore, most varicoceles were managed using loupe-assisted MSV, which is considered a less effective approach. This paper presents a case study of a patient with bilateral grade II varicocele who underwent a successful MSV procedure using a video exoscope. The exoscope provided sufficient magnification and image quality for the safe and efficient performance of MSV on a patient.

1. Introduction

Microsurgical subinguinal varicocelectomy (MSV) was introduced by Marmar et al.[1] in 1985, establishing it as the preferred varicocele treatment method. Recent studies confirm its superiority, showcasing higher pregnancy rates and lower recurrence and hydrocele formation. Traditionally reliant on a surgical microscope, the high costs in Indonesia present a hurdle. Surgeons often resort to optical loupes, though suboptimal.[1,2] The advancement in video technology raises questions about using a video microscope viewed through a television as a cost-effective alternative. Here, we present the successful MSV using a video exoscope (VITOM® 2D video, KARL STORZ SE, Tuttlingen, Germany) for a patient with bilateral grade II varicocele.

2. Case presentation

A 43-year-old male presented at our center, reporting infertility. The patient mentioned no issues with ejaculation and confirmed a non-smoking history. He has been married to his 39-year-old wife for four years. The obstetrician did not have any concerns about the wife, who had undergone an unsuccessful IVF procedure two years ago. Bilateral clinical grade II varicocele was observed during the physical examination and subsequently confirmed using bedside Doppler ultrasonography. The sperm analysis showed severe oligoasthenoteratozoospermia (OAT). The patient was diagnosed with primary infertility, severe OAT, and bilateral varicocele. The patient was scheduled for an exoscope MSV procedure.

The MSV procedure was performed under general anesthesia, resembling a previously described technique,[1] but omitting testicle delivery and gubernaculum examination. The surgical team comprised a surgeon, scrub nurse, and surgical technician. The surgeon was positioned on the patient's left, the scrub nurse on the opposite side, and the surgical technician beside the scrub nurse (see Fig. 1). The VITOM 2D video exoscope system was placed behind the surgeon, securely attached to a holding arm clamped to the operating table at the patient's knee level. This system was connected to a modular FULL HD IMAGE1 S camera platform (KARL STORZ SE, Germany), providing the surgeon a view of the operative field. A duplicate screen (55″ SONY monitor) was set up for the scrub nurse opposite the surgeon (see Fig. 2). The surgeon had direct focus control through the exoscope, with occasional adjustments to achieve suitable zoom levels. Equipment setup took less than 5 minutes, and no further adjustments were made. The surgeon utilized microsurgical instruments throughout the procedure. The exoscope was employed from the procedure's outset, ensuring clear visualization and identification of anatomical structures. Slight zoom adjustments were made, particularly when opening the spermatic cord. The patient was discharged within 24 hours post-operation, and no postoperative complications were recorded. Unfortunately, post-operative sperm analyses

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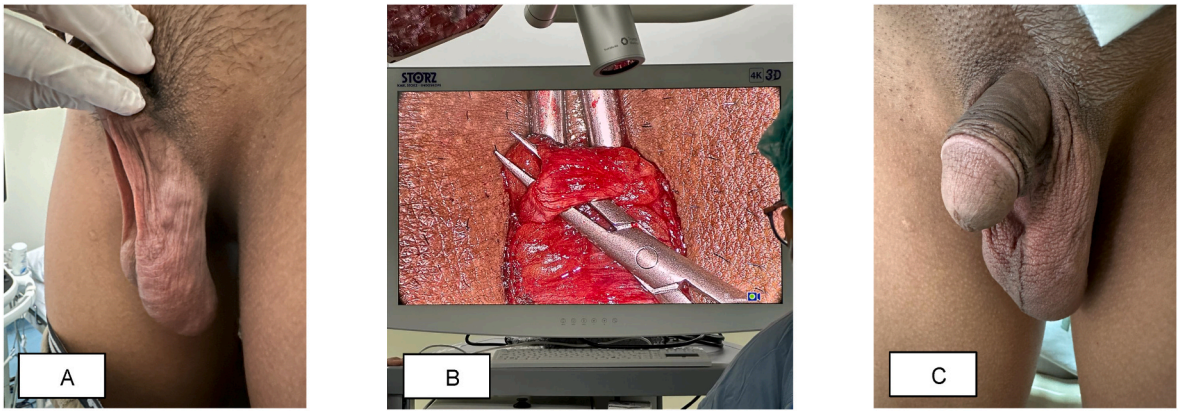

Fig. 1. A: Pre-operative, 1B: intra-operative, and 1C: one-day post-operative documentation.

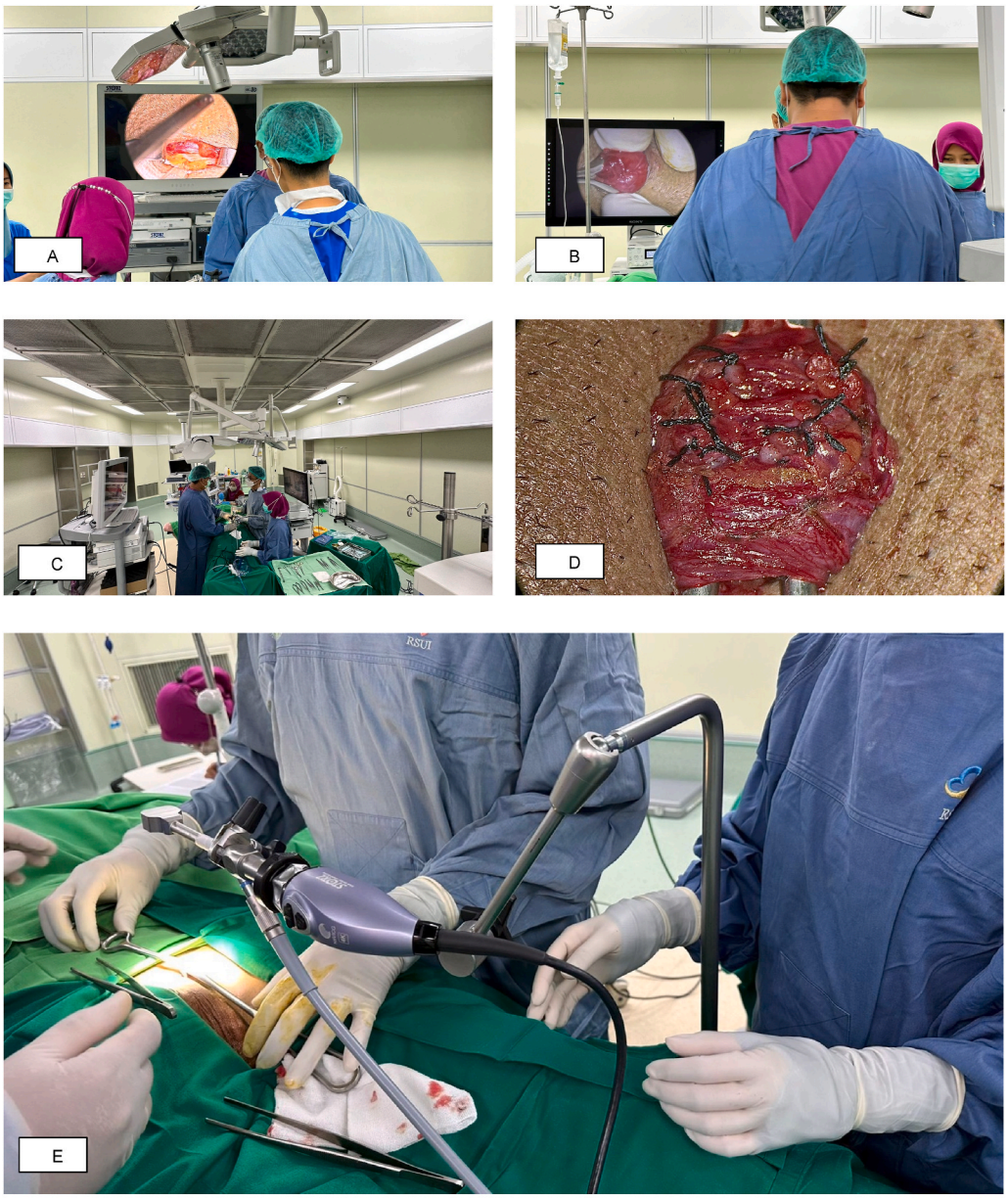

Fig. 2. A: Surgeon view, 2B: scrub nurse view, 2C: overall view of the operative field, 2D: VITOM view, 2E: VITOM ® 2D video exoscope, 2F: Operating room set up.

Table 1
Prices of OM vs. video-microscope (prices and specifications obtained from Indonesian e-catalog).[5]

System	VITOM 2D (KARL STORZ, Germany)	OPMI Sensera (ZEISS, Germany)
Illumination	Xenon	Xenon
Magnification (optical zoom)	x 7	x 10
Image quality	HD or 4K UHD	–
Field of view (mm)	50–150	170
Portability	Portable base - manual setup	Suspension system - floor stand/ceiling mount
Depth of field (mm)	35–100	200–415
Cost (IDR)	301,861,171.00	970,840,000.00
Projected Cost (USD)[a]	19,601	63,041

IDR: Indonesian rupiah, USD: United States dollar.
[a] Rate USD to IDR 1:15,400.00.

were unavailable as the patient was lost to follow-up, residing outside the region and not returning for further assessment.

3. Discussion

Varicocelectomy is crucial in treating infertile men with palpable varicocele and impaired sperm quality, representing the most common surgical approach for male infertility treatment. Since the initial integration of surgical microscopes into surgery in 1921 and their use for varicocele treatment in 1985, their utilization in MSV has become the gold standard. However, the cost associated with optical microscopes, particularly in Indonesia, remains a significant hindrance (Table 1.). Consequently, the majority of urologists in Indonesia opt for loupe-assisted MSV rather than the recommended microscopic MSV, a sub-optimal practice as indicated by the study conducted by Zhang et al.[3] This study highlighted substantial differences in the average count of internal spermatic arteries, internal spermatic veins, and lymphatics identifications between microscopic and loupe-assisted procedures ($P < 0.001$ for all comparisons).[3] Microscopic varicocelectomy displayed the ability to preserve a more significant number of internal spermatic arteries and lymphatics while effectively ligating more veins compared to the loupe-assisted procedure. The study indicated that loupe magnification is inadequate in reliably identifying and dissecting the minute vessels of the spermatic cord, given that most of the overlooked veins adhered to the preserved testicular artery.[3]

Video microscopy emerges as a compelling, cost-effective alternative comparable to surgical microscopy. Pafitanis et al.[4] conducted a non-inferiority study on micro anastomosis, done on fresh ex vivo chicken ischiatic arteries, comparing surgical microscope (OM) and exoscopes, demonstrating that expert-performed anastomoses using exoscopes showed non-inferiority to those using OM. Despite being more time-consuming, exoscopic microvascular anastomosis did not exhibit clinical inferiority in terms of end-product (patency).[4]

The exoscope offers surgical field magnification and illumination through high-definition 2D or 3D screen imaging and presents a viable alternative to OM. It offers high-resolution imaging, precise focusing, and an extensive depth of field. Furthermore, when connected to an ultra-high-definition monitor, the exoscope may have near similar clarity to OM in image quality, although these technical advancements could be applied to a conventional OM.[2,4]

The exoscope, when utilized by a proficient microsurgeon, appears to be safe and effective, potentially enhancing ergonomics, image quality, and surgical field accessibility. The system's easy integration into the operating field through simple adjustment of holding arms is advantageous, especially for surgeons less acquainted with operating microscope setups.[4] Compared to an operating microscope, the video microscope is less cumbersome and provides the surgeon with a broader visual perspective, not confined to eyepieces. This flexibility enables seamless transitions between macroscopic and microscopic procedures. Moreover, it creates a more ergonomic work environment for operators, eliminating the need to confine vision to an eyepiece. While the high-definition image offers precise anatomical details, it still needs to be considered slightly inferior to the clarity achieved with an optical microscope. The compactness of the system facilitates effortless equipment transportation between different theaters.[2,4]

4. Conclusion

The magnification level and image quality offered by an exoscope were deemed satisfactory for performing MSV safely and efficiently on a patient with varicocele. Although the image quality was still not on par with optical microscopy, it surpassed that of loupe-assisted MSV and presented a more cost-effective option than an optical microscope. Additionally, for future research, conducting a satisfaction survey among operators and comparing patient outcomes between those operated on using the VITOM system and a traditional microscope could be beneficial.

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References

1. Lipshultz LI, Thomas Jr AJ, Khera M. Surgical management of male infertility. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, eds. *Campbell-walsh Urology*. ninth ed. Philadelphia: WB Saunders; 2007:654–717.
2. Cho C-L, Chu RW-H. Use of video microsurgery platform in microsurgical subinguinal varicocelectomy with indocyanine green angiography. *Surg Pract*. 2019;23(1):20–24.
3. Zhang H, Liu XP, Yang XJ, et al. Loupe-assisted versus microscopic varicocelectomy: is there an intraoperative anatomic difference? *Asian J Androl*. 2014;16(1):112–114.
4. Pafitanis G, Hadjiandreou M, Alamri A, Uff C, Walsh D, Myers S. The Exoscope versus operating microscope in microvascular surgery: a simulation non-inferiority trial. *Arch Plast Surg*. 2020;47(3):242–249.
5. E-Katalog. https://e-katalog.lkpp.go.id/?lang=en. Accessed September 22, 2023.