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Needle-based Level II temporomandibular joint arthroscopy under local anesthesia

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Case Report

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Abstract

Objective

To describe a novel office-based Level II temporomandibular joint (TMJ) arthroscopy technique performed using only two 16-gauge needle punctures, achieving the same level of invasiveness as conventional arthrocentesis while allowing direct visualization and therapeutic intervention.

Methods

This technical note describes a minimally invasive arthroscopic approach performed under intravenous sedation and local anesthesia using two 16-gauge needle portals. A 0.7-mm diameter fiber-optic endoscope is introduced through one needle for visualization, while a 600-µm optical fiber connected to a 450 nm diode laser (TheraBlue®, DMC, Brazil) is introduced through the second needle for controlled retrodiscal tissue ablation under direct visualization.

Results

This technique enables Level II arthroscopic capabilities while maintaining needle-level invasiveness. The procedure can be performed in an office setting under local anesthesia, reducing the need for hospital-based infrastructure.

Conclusion

Office-based Level II TMJ arthroscopy using 16-gauge needle portals represents a minimally invasive evolution of arthrocentesis, enabling visualization and targeted therapeutic intervention with minimal morbidity.

Introduction

Temporomandibular joint (TMJ) arthroscopy is a well-established minimally invasive procedure for the diagnosis and treatment of intra-articular disorders, including internal derangement, adhesions, synovitis, and degenerative joint disease. Since its introduction, TMJ arthroscopy has evolved from purely diagnostic applications to operative techniques capable of performing lysis, lavage, synovial ablation, and disc repositioning under direct visualization[1–4].

Despite its minimally invasive nature compared to open joint surgery, conventional TMJ arthroscopy still requires specialized instrumentation, operating room infrastructure, and cannula-based access systems, typically ranging from 1.9 mm to 2.4 mm in diameter. Although these portal sizes are relatively small, they nevertheless involve capsular dilation and soft tissue disruption greater than that associated with needle-based procedures. These requirements contribute to increased procedural cost, logistical complexity, and limited accessibility, particularly in office-based settings[5–6].

Arthrocentesis, in contrast, is widely performed in ambulatory settings using two needle punctures, typically 16- to 18-gauge, allowing lavage of the superior joint compartment with minimal tissue disruption. This technique provides clinical benefit primarily through hydraulic distension, lysis of adhesions, and removal of inflammatory mediators. However, arthrocentesis is inherently a blind procedure, lacking direct visualization and therefore limiting the ability to perform targeted diagnostic assessment or therapeutic intervention[5–7].

Recent advances in fiber-optic technology have enabled the development of ultra-small diameter optical systems capable of intra-articular visualization through needle-sized portals. Optical fibers with diameters below 1 mm have demonstrated the feasibility of direct arthroscopic visualization while maintaining needle-level invasiveness, introducing the possibility of combining the minimal access of arthrocentesis with the diagnostic and therapeutic capabilities of operative arthroscopy[8–10].

Building upon these technological advances, it is now possible to integrate needle-based optical visualization with therapeutic energy delivery systems. Diode lasers, delivered through flexible optical fibers, allow controlled and precise ablation of pathological intra-articular tissues, including inflamed retrodiscal tissue and adhesions, under direct visualization. This integration enables operative intervention while preserving minimal portal size and reducing overall procedural invasiveness[8–9].

The development of needle-based operative arthroscopy represents a conceptual transition between conventional arthrocentesis and standard cannula-based arthroscopy. By maintaining portal dimensions equivalent to arthrocentesis while enabling direct visualization and therapeutic intervention, this approach may expand the accessibility of operative arthroscopy and facilitate its use in office-based settings[3].

The purpose of this technical report is to describe a novel office-based Level II TMJ arthroscopy technique performed using only two 16-gauge needle portals. This approach preserves the minimal invasiveness of arthrocentesis while enabling direct optical visualization and laser-assisted therapeutic intervention within the superior joint compartment.

Surgical Technique

A 27 years old female with local pain, MRI confirmation of bilateral anterior disc displacement without reduction and limited mouth opening in 33mm, unresponsive to clinical treatment with splint and physical therapy and without any important systemic condition, underwent an office-based setting intravenous sedation (IV) with Propophol and Midazolam combined with local anesthesia using lidocaine with epinephrine (1:100.000). The first 16-gauge needle was inserted into the posterior recess of the superior joint compartment using anatomical palpation landmarks. A second 16-gauge needle was introduced parallel to the first, positioned approximately 5 mm inferior and 10 mm anterior. A 0.7-mm EvoTouch+ StarScope® (Equip Medikey, Gouda, Netherlands) fiber-optic endoscope was introduced through the first needle for visualization. Arthroscopic inspection was carried along with lavage and the

confirmation of retrodiscal tissue synovitis. A 600-µm optical fiber (TheraBlue®, DMC, Brazil) connected to a 450 nm diode laser operating at 2 W, pulsed mode, 20 Hz, was introduced through the second needle. Continuous irrigation with lactated Ringer's solution was maintained. Controlled laser application was performed to ablate retrodiscal inflammatory tissue (synovitis) under direct visualization, after ablation, Laser fiber was removed and through the same needle 1ml of platlet rich fibrin (i-PRF) was injected. IV sedation was than reversed and patient was discharged after a 40 minutes observation period with oral intake medication.

Figures 1,2,3 and 4.

Discussion

The technique described in this report allows the performance of operative Level II temporomandibular joint arthroscopy while maintaining the same portal size and tissue invasiveness as conventional arthrocentesis. By integrating ultra-thin optical visualization and laser-assisted therapeutic intervention through standard 16-gauge needle portals, this approach enables direct intra-articular visualization and targeted treatment of pathological tissues. This combination preserves the therapeutic capabilities of operative arthroscopy, such as controlled tissue ablation under direct visualization, while maintaining needle-level invasiveness. As a result, the procedure can be safely performed in an office-based setting under intravenous sedation and local anesthesia, eliminating the need for operating room infrastructure and expanding access to operative TMJ arthroscopy.

There is a clear and ongoing trend in TMJ surgery toward progressive reduction of procedural invasiveness, even among techniques already considered minimally invasive. The concept of "needle therapy," recently described by Martin-Granizo et al. 2024, emphasizes the therapeutic potential of needle-based interventions beyond traditional arthrocentesis.[10] In their work, the authors demonstrated the feasibility and versatility of performing targeted therapeutic maneuvers through needle-sized portals as part of single-portal arthroscopy, highlighting the potential of needles not only as access tools but also as therapeutic instruments. The present technique aligns with this conceptual progression by enabling operative arthroscopy with needle-level invasiveness while incorporating both optical visualization and targeted laser-assisted intervention.

Despite the minimal invasiveness of the technique described, it is important to recognize that its implementation still involves specialized equipment, including ultra-small diameter optical fibers, dedicated laser systems, and compatible visualization platforms. These requirements represent an initial technological investment comparable, in part, to that of conventional arthroscopic systems. However, unlike traditional TMJ arthroscopy, which typically requires operating room infrastructure, surgical staff, and hospital-based resources, the needle-based optical–laser approach may be performed in an office setting under intravenous sedation and local anesthesia, potentially reducing overall procedural costs by minimizing operating room utilization and hospital facility fees. Recent clinical and systematic review data support the feasibility and effectiveness of minimally invasive TMJ arthroscopy and its role as an

intermediate step between conservative treatment and open surgery, particularly when performed using optimized minimally invasive approaches.[1,2]

Another important limitation relates to image quality. Ultra-small diameter optical fibers, such as the 0.7-mm fiber-optic system used in this technique, provide lower image resolution and reduced optical clarity compared with conventional rod-lens arthroscopes. This limitation has been previously documented in de Barros & Ono, 2025, demonstrating that although adequate visualization of intra-articular structures is achievable, image definition remains inferior to standard arthroscopic optics.[3] Nevertheless, the ability to obtain direct visualization through needle-sized portals represents a significant technical advancement and may contribute to expanding the clinical indications of office-based operative arthroscopy.

Energy-based intra-articular interventions, including laser-assisted and radiofrequency-based arthroscopic techniques, have been previously described for the management of inflammatory synovial tissue, adhesions, and posterior compartment pathology of the TMJ, demonstrating the feasibility and safety of controlled tissue ablation under arthroscopic visualization.[4–7] The use of diode laser systems at wavelengths in the blue spectrum (445–450 nm) has shown effective soft tissue ablation with controlled thermal penetration and favorable safety profiles in oral surgical applications, supporting its potential use in intra-articular procedures when appropriate irrigation and visualization are maintained.[8,9]

Importantly, techniques such as the one described in this report may stimulate further development and refinement of ultra-thin optical systems, including improvements in image resolution, light transmission efficiency, and overall visualization quality. Continued technological evolution may allow increasingly sophisticated intra-articular interventions to be performed using progressively smaller access systems.

Further clinical studies evaluating safety, clinical outcomes, and long-term effectiveness are necessary to define the precise role of this technique within the spectrum of minimally invasive TMJ surgery.

Declarations

Clinical Trial number: Not applicable

Conflict of Interest Statement: The authors declare no conflicts of interest related to this study.

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Ethical Approval: This study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient.

Author Contributions:

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Romualdo Cardoso Monteiro de Barros, Priscila Takasaki Lee and Helcio Ono. The first draft of the manuscript was written by Romualdo Cardoso Monteiro de Barros and Beatriz

Afonso Chiliti and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

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Figures

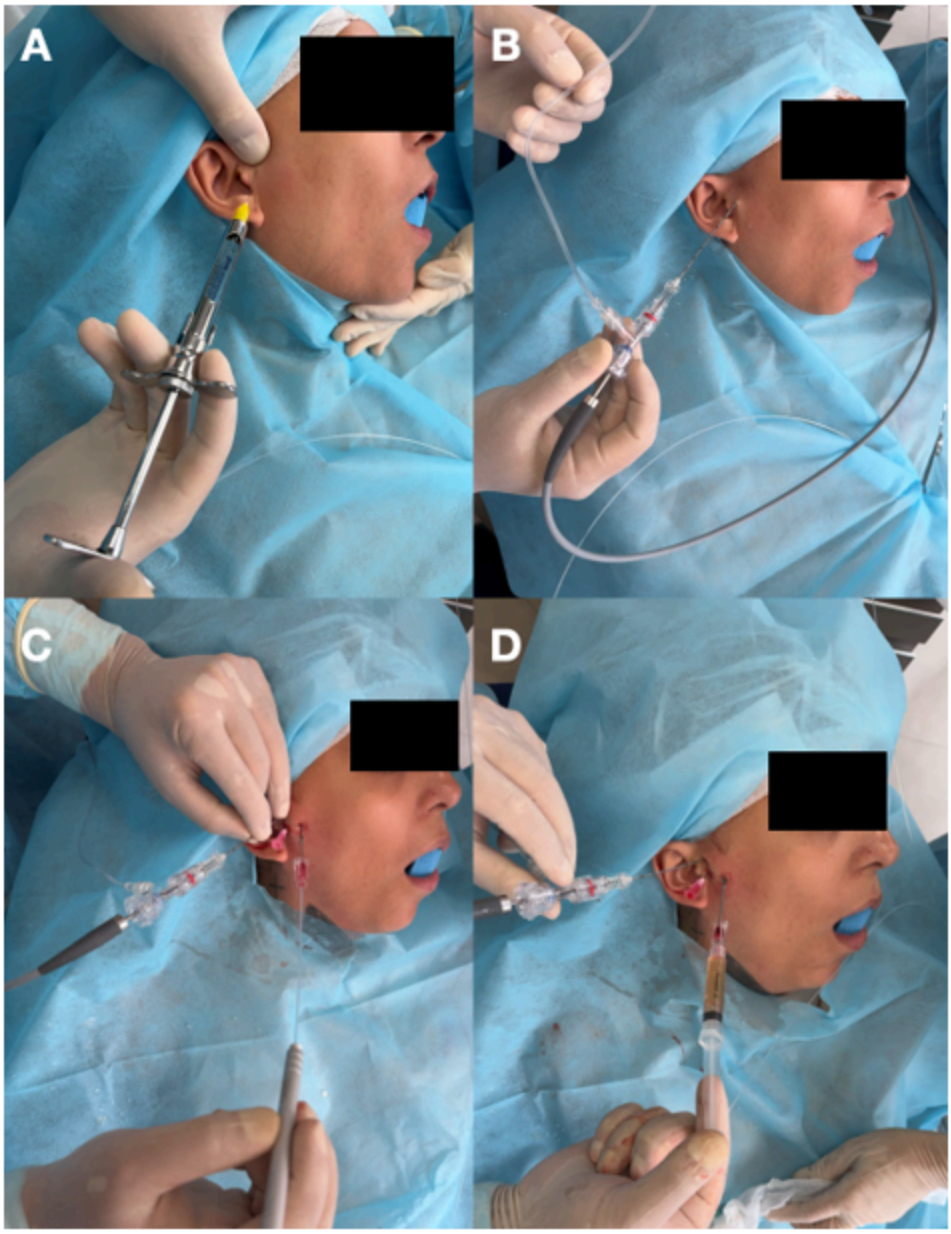


Figure 1

Surgical sequence of needle-based temporomandibular joint arthroscopy. (A) Local anesthesia infiltration. (B) Introduction of the 0.7-mm fiber-optic endoscope through a 16-gauge needle. (C) Placement of the second 16-gauge needle with a 600-μm diode laser fiber for targeted retrodiscal tissue ablation. (D) Platelet-rich fibrin (PRF) injection through the second needle following completion of laser treatment.

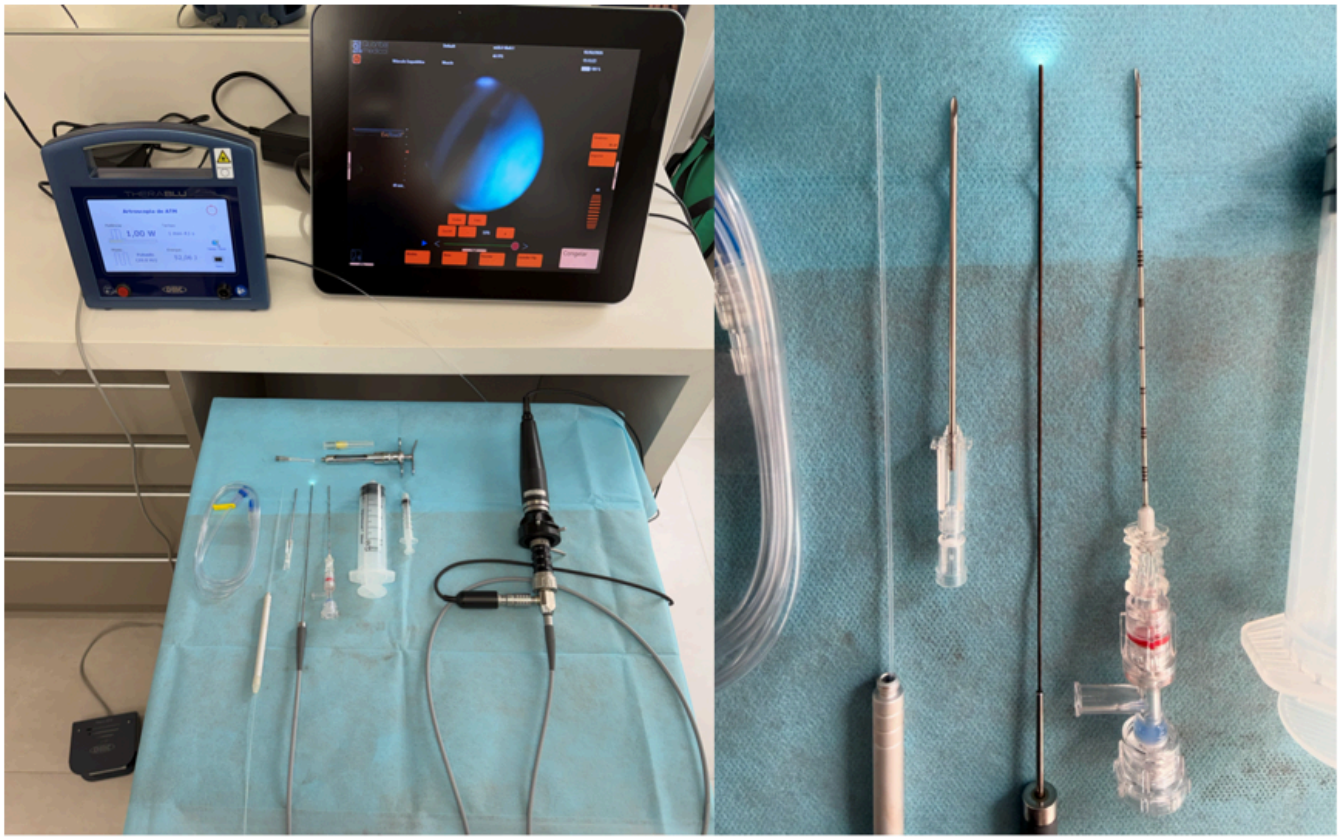


Figure 2

Instruments used for the procedure. From right to left: 600-µm laser fiber, 16-gauge needle, 0.7-mm fiber-optic endoscope, and EvoTouch® 16-gauge optical needle.

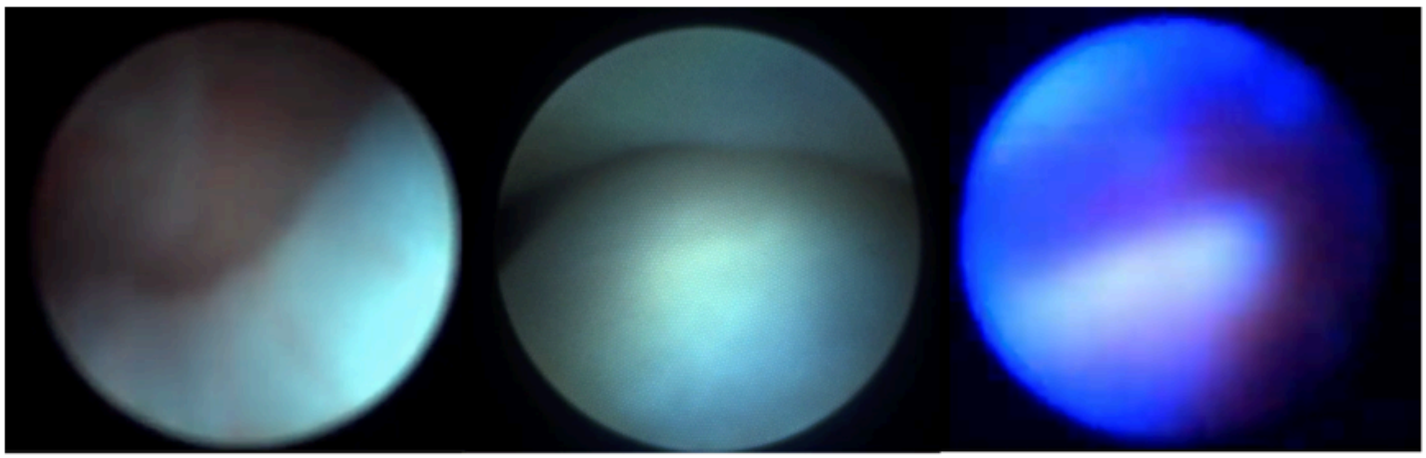


Figure 3

Arthroscopic images of the superior compartment of the right temporomandibular joint. The right panel demonstrates diode laser activation, visible as blue illumination, during targeted retrodiscal tissue ablation under direct visualization.

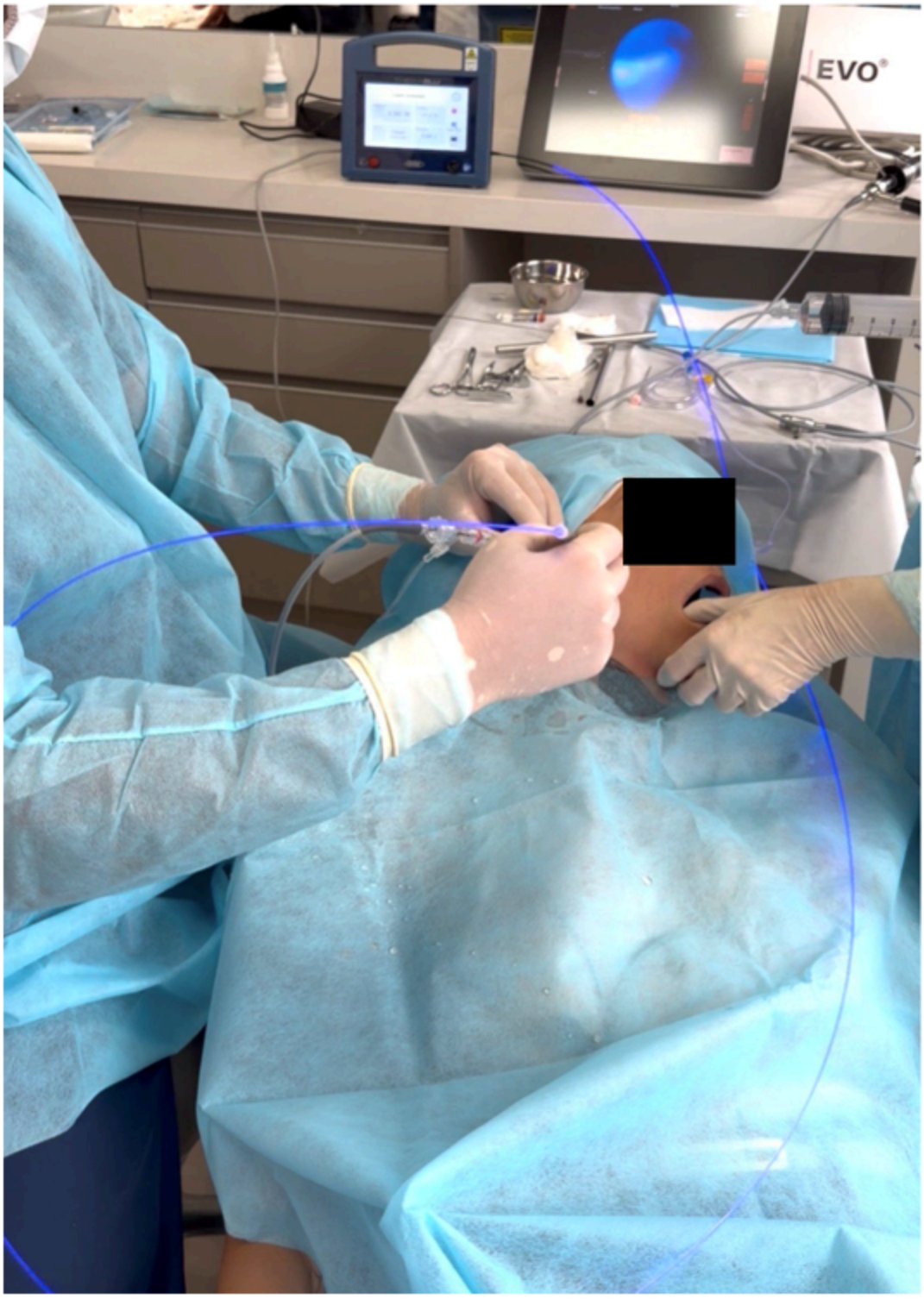


Figure 4

Office-based temporomandibular joint arthroscopy setup demonstrating intra-articular diode laser application through a 16-gauge needle portal under direct fiber-optic visualization.

Supplementary Files

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- suplementaryfigures.pdf