J Neurol Neurosci©
15 (06) 2024 : 001-002 • Perspective

Instruction in augmented reality for intricate craniofacial situations in surgical oncology

Tekiee Luca*
Department of Oral and Maxillofacial Surgery, Radboud University, Nijmegen, Netherlands

INTRODUCTION

Augmented Reality (AR) is transforming the landscape of medical surgery, offering significant advances in precision and outcomes, especially in the domain of craniofacial surgery. As craniofacial structures are intricately designed and their surgical repair often involves delicate, high-risk procedures, the integration of AR into surgical oncology provides significant improvements in the planning, execution, and post-operative care of patients. This technology allows surgeons to visualize complex structures in three dimensions, overlaying virtual data on the real world during surgery. In the context of surgical oncology, where precision is paramount due to the need for tumor removal and tissue conservation, AR aids in navigating complex anatomical regions. This guide provides an overview of how AR can be used in craniofacial oncology, focusing on both preoperative and intraoperative phases, with an emphasis on training and real-time guidance [1].

DISCUSSION

In craniofacial surgery, the preoperative phase is critical for determining the best approach and assessing potential risks. Tumor location, size, and involvement with surrounding vital structures must be meticulously planned. Traditional 2D imaging techniques such as CT scans and MRIs provide vital information, but they often fall short in representing the full complexity of craniofacial anatomy. AR bridges this gap by overlaying three-dimensional representations of the tumor and the surrounding anatomical features onto real-world views of the patient's face and skull. Surgeons can virtually explore the anatomical structures in a 3D environment, gaining a deeper understanding of the spatial relationships between tumors and critical structures such as nerves, blood vessels, and muscles.AR provides a tailored visualization that can be customized based on the specific features of the patient’s anatomy. This allows for a more precise decision-making process in planning the surgical approach, incision points, and strategies for tissue conservation.

Surgeons can rehearse complex procedures in a virtual environment before actual surgery, reducing the risks associated with unanticipated complications. This rehearsal can be particularly useful when approaching difficult or rare craniofacial cancers. In craniofacial oncology, tumors may infiltrate bone, soft tissue, and even extend to critical structures such as the eye or brain. By utilizing AR, surgeons can better anticipate these risks and plan accordingly, significantly improving the success rate of surgery [2].

Address for correspondence:

Tekiee Luca
Department of Oral and Maxillofacial Surgery, Radboud University, Nijmegen, Netherlands
E-mail: tekieeuca@gmail.com

Word count: 725 **Tables:** 03 **Figures:** 06 **References:** 05

Received: 27.11.2024, Manuscript No. ipjnn-25-15491; **Editor assigned:** 29.11.2024, PreQC No. P-15491; **Reviewed:** 13.12.2024, QC No. Q-15491; **Revised:** 18.12.2024, Manuscript No. R-15491; **Published:** 25.12.2024

During the actual surgery, AR offers real-time data and guidance, allowing for more accurate and dynamic decision-making. In craniofacial surgery, where the anatomy is dense, intricate, and sometimes asymmetric, the precision enabled by AR can significantly enhance both the safety and outcome of the surgery. AR enables the overlay of important anatomical structures, such as the location of the tumor, on the surgeon's field of view. By using AR glasses or projectors, the surgical team can visualize the exact location of the tumor and adjacent critical structures during the procedure, allowing for better navigation and sparing of healthy tissues. One of the key challenges in craniofacial oncological surgery is the complete resection of tumors while preserving vital structures. AR enhances the surgeon's ability to track tumor margins and monitor the progression of the resection, ensuring that no cancerous tissue is left behind. Surgeons can also visualize hidden or hard-to-reach areas, such as deep-seated tumors, without additional invasive procedures [3,4].

One of the unique advantages of AR in craniofacial oncology is its potential as a training tool. Surgical education often involves complex simulations to build skill and proficiency. AR provides an immersive and interactive environment for trainees to practice and learn without the risks associated with live surgery. AR facilitates remote mentoring, allowing trainees in remote or underserved areas to learn from top specialists without geographical constraints. AR also has potential applications beyond the operating room. Postoperative monitoring and rehabilitation for craniofacial cancer patients can be enhanced with AR technologies that assist in visualizing recovery and tracking changes over time. For instance, AR can help in assessing wound healing, tracking surgical outcomes, and planning reconstructive interventions [5].

CONCLUSION

The integration of augmented reality into craniofacial surgical oncology offers substantial advancements in both the execution of surgeries and the training of surgeons. By enhancing preoperative planning, providing real-time intraoperative navigation, and offering innovative training tools, AR has the potential to improve the accuracy and outcomes of complex craniofacial cancer surgeries. As AR technology continues to evolve, its impact on the field of surgical oncology will likely expand, fostering more personalized, precise, and successful treatments for patients.

REFERENCES

1. **Ceccariglia F, Cercenelli L, Badiali G, et al.** Application of augmented reality to maxillary resections: A three-dimensional approach to maxillofacial oncologic surgery. *J Pers Med*. 2022; 12(12):2047.
2. **Battaglia S, Badiali G, Cercenelli L, et al.** Combination of cad/cam and augmented reality in free fibula bone harvest. *PRS Global Open*. 2019; 7(11):e2510.
3. **Cercenelli L, Carbone M, Condino S, et al.** The wearable vostars system for augmented reality-guided surgery: Preclinical phantom evaluation for high-precision maxillofacial tasks. *J Clin Med*. 2020; 9(11):3562.
4. **Ejaz A, Wenig BM.** Sinonasal undifferentiated carcinoma: Clinical and pathologic features and a discussion on classification, cellular differentiation, and differential diagnosis. *Adv Anat Pathol.* 2005; 12(3):134-143.
5. **Levine PA, Frierson Jr HF, Stewart FM, et al.** Sinonasal undifferentiated carcinoma: A distinctive and highly aggressive neoplasm. *Laryngoscope*. 1987; 97(8):905-908.