ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY

Editorial

Artificial Intelligence in Oculoplastic Surgery - Bridging Vision and Precision

Niraj Kumar Yadav*

Ophthalmic Plastic and Facial Aesthetic Surgeon, President: WAOPRS, WAOS, WOTA, IAO, IMO, Dr KNS Memorial Institute of Medical Sciences, Barabanki, India

***Corresponding Author:** Niraj Kumar Yadav, Ophthalmic Plastic and Facial Aesthetic Surgeon, President: WAOPRS, WAOS, WOTA, IAO, IMO, Dr KNS Memorial Institute of Medical Sciences, Barabanki, India.

Received: January 29, 2026; **Published:** September 28, 2026

Artificial intelligence (AI) is no longer a speculative technology at the periphery of medicine, it is the driving force redefining diagnostics, prognostics, and therapeutics across disciplines. In ophthalmology, and specifically oculoplastic surgery, AI has evolved from a data-driven curiosity to a clinical companion, enhancing every aspect from patient triage to complex surgical decision-making. This editorial explores how AI transforms oculoplastic surgery, assesses its practical applications, and calls for a careful yet enthusiastic embrace of this digital co-surgeon.

From data to diagnosis: AI's first footprint

The earliest inroads of AI into oculoplastics were in imaging diagnostics, especially in diseases such as thyroid-associated orbitopathy (TAO), orbital fractures, and eyelid tumors. AI-based algorithms, particularly convolutional neural networks (CNNs), have shown superior accuracy in identifying pathologies on CT and MRI scans compared to human readers alone [1]. For instance, Gernandt., *et al*. demonstrated that AI models could accurately identify orbital fractures and suggest surgical interventions with remarkable precision, often matching or exceeding the clinical decisions of experienced surgeons [2]. This capacity to rapidly parse large imaging datasets allows clinicians to detect subtle abnormalities, improve diagnostic timelines, and reduce human error. Moreover, AI has proven effective in quantifying anatomical changes, such as measuring proptosis or eyelid positions, critical for both diagnosis and postoperative monitoring. Fu., *et al*. developed an automated AI system that measures proptosis in pediatric orbital abscesses, providing crucial insights for early surgical intervention [3].

Clinical decision-making in surgery: A new era

While diagnostics was a logical first step, AI's true potential lies in augmenting clinical decision-making. AI models now integrate multimodal data, imaging, electronic health records (EHRs), and genetic profiles, to offer evidence-based surgical recommendations [4]. Sun Y and colleagues outlined how AI tools can assist in planning blepharoptosis surgery by evaluating levator function, eyelid height, and patient-specific risk factors [5]. This level of personalized surgical planning was previously reliant on subjective interpretation but now stands on objective, reproducible AI metrics. AI has also found its way into intraoperative decision-making. Tools like augmented intelligence platforms can analyze real-time surgical videos, offering guidance during complex reconstructions [6]. These tools may soon serve as surgical copilots, suggesting suture placements, flagging errors, and even forecasting outcomes.

Evidence from recent literature

The systematic review by Yadav., *et al*. offers a sweeping perspective on AI's role in oculoplastic surgery. Their analysis found that over 75% of AI models in the field were designed for diagnostic imaging, with only a fraction currently used in live surgical settings, highlighting both progress and opportunity [1]. In another study, Cai., *et al*. emphasized the role of AI in assisting surgical planning in lacrimal surgeries and orbital decompressions [7]. Their work shows how AI platforms can simulate outcomes, enabling better informed consent and preoperative preparation. Complementing this, Ing and Bondok analyzed how AI applications in TAO, blepharoplasty, and ptosis correction are redefining what it means to plan surgeries, transforming subjective artistry into data-backed precision [8]. Meanwhile, Anton., *et al*. reviewed AI's integration across ophthalmology and underscored the underutilization of AI in oculoplastics compared to anterior segment diseases like glaucoma or corneal dystrophies [9]. This discrepancy should prompt a strategic reallocation of research efforts.

Challenges and ethical considerations

Despite AI's promise, caution must temper enthusiasm. Bias in training data, lack of generalizability, and the "black box" nature of deep learning models raise serious concerns. For instance, an AI model trained predominantly on Caucasian patients may underperform in diverse populations, potentially perpetuating health disparities [10]. Moreover, as AI assumes a greater role in surgical planning, the question arises: who is accountable for errors, the surgeon or the algorithm? Loftus., *et al*. emphasized the need for clear ethical and legal frameworks to define the role of AI in surgical decision-making [11].

Future Directions and Vision

For AI to fulfill its potential in oculoplastics, three key steps are necessary:

1. **Integration with EHRs and PACS**: Seamless flow of information will allow AI systems to access and synthesize data across platforms, enhancing both diagnosis and longitudinal care.
2. **Regulatory and validation frameworks**: As noted by Meer., *et al*. the path from innovation to implementation is stifled by regulatory uncertainty. Robust clinical trials and FDA approval processes tailored for surgical AI are urgently needed [12].
3. **Human-AI collaboration**: AI should not replace but augment surgeons. The goal is a collaborative intelligence, where human intuition and machine precision coalesce into superior patient care.

Conclusion

Artificial intelligence is redefining the landscape of oculoplastic surgery, from being a diagnostic assistant to becoming an integral part of surgical planning and execution. As we navigate this transformative journey, it is crucial to foster interdisciplinary collaboration, ethical vigilance, and continuous validation. The future of oculoplastics is not just in the surgeon's hands but increasingly in the silicon mind of artificial intelligence.

Bibliography

1. Yadav NK., *et al*. "Artificial intelligence in oculoplastic surgery: A systematic review". *Journal of Ophthalmology and Eye Disorders* 14.1 (2025): 01-10.

2. Gernandt S., *et al*. "Assessing the accuracy of artificial intelligence in the diagnosis and management of orbital fractures: Is this the future of surgical decision-making?" *JPRAS Open* 42 (2024): 275-283.

3. Fu R., *et al*. "Artificial intelligence automation of proptosis measurement: an indicator for pediatric orbital abscess surgery". *Ophthalmology and Therapy* 12.5 (2023): 2479-2491.

4. Labib KM., *et al*. "Applications of artificial intelligence in ophthalmology: glaucoma, cornea, and oculoplastics". *Cureus* 16.11 (2024): e73522.

5. Sun Y., *et al*. "A fully automatic postoperative appearance prediction system for blepharoptosis surgery with image-based deep learning". *Ophthalmology Science* 2.3 (2022): 100169.

6. Garcia Nespolo R., *et al*. "Evaluation of artificial intelligence-based intraoperative guidance tools for phacoemulsification cataract surgery". *JAMA Ophthalmology* 140.2 (2022): 170-177.

7. Cai Y., *et al*. "Application of artificial intelligence in oculoplastics". *Clinics in Dermatology* 42.3 (2024): 259-267.

8. Ing E and Bondok M. "Oculoplastics and augmented intelligence: A literature review". *Journal of Clinical Medicine* 14.19 (2025): 6875.

9. Anton N., *et al*. "Comprehensive review on the use of artificial intelligence in ophthalmology and future research directions". *Diagnostics (Basel)* 13.1 (2022): 100.

10. Qurban Q and Cassidy L. "Artificial intelligence and machine learning a new frontier in the diagnosis of ocular adnexal tumors: A review". *SAGE Open Medicine* 12 (2024): 20503121241274197.

11. Loftus TJ., *et al*. "Artificial intelligence and surgical decision-making". *JAMA Surgery* 155.2 (2020): 148-158.

12. Meer E., *et al*. "Artificial intelligence in oculoplastics: A review. *Ophthalmic Plastic and Reconstructive Surgery* 41.4 (2025): 372-387.

Volume 17 Issue 6 September 2026