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BACKGROUND

- Cataract is the leading cause of blindness globally, and second leading cause of visual impairment^{1,2}
- As ageing demographics across the globe is set to increase the demand for eye care services, as such improvements in the efficiency and cost-effectiveness of cataract surgery will be necessary, and technological advancements that enhance the surgical experience are increasingly important for surgeons^{3,4}
- Heads-up 3D visualization systems compatible with existing surgical microscopes have been shown to provide advantages in retinal surgery,^{5,6} however, there is a paucity of evidence with respect to other ophthalmic surgical procedures



The NGENUITY® Visualization System, an example of a 3D visualization system

OBJECTIVE

- A literature review was conducted to understand potential benefits of 3D visualization systems in cataract surgery

METHODS

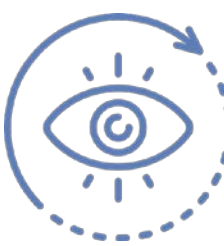
- A targeted search was performed and screened using the following strategy and criteria:

Database:	• MEDLINE
Date range:	• January 1, 2001 – May 26, 2022
Search terms:	• “cataract”, “lens implantation”, “anterior segment” “3D visualization”, “heads-up”, “computer-assisted”, “digitally-assisted” “visual acuity”, “surgery time”, “complication”
Key inclusion criteria (screening):	• Reported outcomes of a 3D visualization system used for cataract surgery • English language

- Reference lists from relevant articles were also scanned

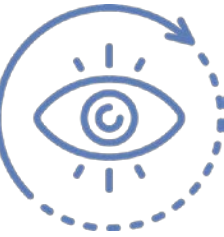
RESULTS

- Out of the 459 sources screened, nine studies compared 3D visualization systems with traditional microscopes in cataract surgery⁷⁻¹⁵



Better visual recovery

Multiple studies reported safety and efficacy outcomes to be similar between 3D visualization systems and traditional microscopes^{7,9,10,13}, one retrospective study reported **faster recovery of vision** with 3D digital visualization (82% vs 54% of eyes; P=0.04)⁷



Faster surgeries

Another **retrospective study reported faster surgeries** when using 3D systems compared to traditional methods (16.44 ± 4.36 vs. 21.44 ± 7.50 minutes; P=0.007)⁸



Improved light-intensity during surgery

Three studies reported 3D displays required less than half the light intensity of optical microscopes (P<0.001), which may **reduce the risk of patient photophobia**^{7,11, 14}



Ergonomic benefits for surgeons

Several ergonomic advantages for 3D systems were noted by anterior-segment surgeons, including **pain reduction, improved posture and comfort, and better visualization** compared with conventional optical microscopes.^{9,10,12} One case study noted that patient installation and surgery performance may be easier with the HUD for cataract patients with spinal deformities¹⁵

CONCLUSION

- Although the current body of evidence is limited, findings demonstrate that 3D visualization systems may provide considerable advantages for cataract surgery when compared with conventional microscopes, including:
 - **Improved light-intensity during surgery**^{7, 11,14}
 - **Better visual recovery for patients**⁷
 - **Potential for faster surgeries**⁸
 - **Ergonomic benefits for surgeons**^{9-10, 12, 15}
- Notably, 3D visualization systems realized these advantages without compromising critical surgical outcomes such as complication rates and post-operative visual acuity, providing benefits for the patient, surgeon, and practice alike^{11-12, 15}
- Future studies assessing surgical time and visual recovery with 3D visualization systems would be useful to support these observed trends

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Financial disclosure

- This study was funded by Alcon Vision, LLC. RG and MAG have received consulting fees from Alcon. DOB and JZ are employees of Alcon.
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