



Super Eyes in Surgery

When it comes to surgery, patients understandably want the best care, but the top surgeons are often overbooked with long wait times for individuals without the right connections. How can we democratize access to top-tier surgical care and ensure that every patient receives the best possible treatment? The answer lies, in part, in technology—specifically in hyperspectral cameras.

One of the biggest challenges in surgery is achieving accurate and precise visualization of the field. Operating microscopes have been used since the early 20th century to extend human vision, but the human eye's limitations make it less than ideal for surgical procedures. Our eyes are optimized for detecting food and danger, not for operating on patients. For example, we struggle to distinguish between subtle shades of color—a critical skill in surgery. Technology can help.

The earliest prototypes of hyperspectral cameras date back to the 1970s. The devices were not suitable for use in the OR because they had to be assembled and calibrated by hand with many components, including heavy precision optics in glass. This made the cameras prohibitively expensive (> €100,000). Researchers continued to explore the potential of hyperspectral cameras for surgical applications nevertheless.

Recent advances have made the price of these cameras much more accessible. Researchers have successfully integrated hyperspectral filters into image sensor chips, which can be mass-produced at a cost comparable to that of ordinary computer chips. The resulting cameras are compact and can be easily incorporated into microscopes, giving surgeons access to detailed information in real time.

Researchers at the University of Leuven in Belgium are testing these new hyperspectral cameras and reporting promising results.¹

Hyperspectral cameras provide super vision; they can allow surgeons to see the material composition of objects in their field of view at the pixel level.² This makes it possible to distinguish between ocular structures based on their oxygen content, enabling surgeons to operate with greater precision and less impact on healthy tissue. Customized cameras can be tailored to meet each surgeon's unique needs, which is a significant improvement over traditional operating microscopes.

I view hyperspectral surgery as just the beginning of a new era in surgical care. As technology advances—including robotic arms, sensors, and AI—I predict that surgical procedures will become less invasive, more precise, and more efficient. This could give every patient access to top-quality surgical care, regardless of their connections or location. ■

1. IMV Europe. Hyperspectral imaging: microsurgery's next big thing. *Imaging and Machine Vision Europe*. March 17, 2021. Accessed May 5, 2023. <https://www.imveurope.com/analysis-opinion/hyperspectral-imaging-microsurgery-s-next-big-thing>
2. Barberio M, Benedicenti S, Pizzicannella M, et al. Intraoperative guidance using hyperspectral imaging: a review for surgeons. *Diagnostics (Basel)*. 2021;11(11):2066.

A handwritten signature in black ink, appearing to read 'Erik L. Mertens', with a horizontal line underneath.

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