An AI-driven image guidance system for minimally invasive endovascular aortic surgery

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Researchers from the School of Biomedical Engineering & Imaging

Sciences department developed a world-first, CE marked, FDA cleared cloud-based, AI-driven technology, Cydar-EV to inform and guide endovascular surgery in real-time.

The image guidance system minimizes exposure to radiation and kidney-toxic contrast and shortens the duration of surgery. The demonstrated success of the technology led to the development of the spinout Cydar Medical in 2012.

The technology fills a clinical gap created by endovascular aortic repair (EVAR), a type of surgery performed inside your aorta using long, thin tubes called catheters to place a stent surrounded with a fabric liner, together called a stent graft, to reinforce the weak spots in the wall.

"Cydar EV is a digital technology using cloud-computing, big-data and artificial intelligence which has the potential to improve the predictability of individual outcomes and the consistency of outcomes of image-guided procedures in the NHS," says Dr. Rachel Clough.

While EVAR is an example of how minimally invasive procedures are revolutionizing the management of cardiovascular disease, there are numerous technical and procedural challenges, including a loss of spatial information during positioning of the device, requiring the surgeon to try to visualize the 3D anatomy using a 2D screen.

Imprecise visualization of the anatomy and positioning of the device leads to high rates of re-intervention and complications, requiring further patient hospital admissions.

The lack of 3D visualization also slows down the procedure and leads to an increase in the amount of ionizing radiation and concern of the volume of kidney toxic contrast agent (used to delineate the blood vessels).

Cydar-EV ensures a significant reduction in the amount of X-rays used, with researchers citing a mean 35 percent reduction in X-ray fluoroscopy screening time, 41 percent reduction in the amount of iodinated kidney toxic contrast, a one-hour reduction in the average operating time. There was also a significant reduction in exposure to radiation for operators.

The technology results in reduced patient exposure to anesthesia and ionizing radiation, lowering surgical site infection and reducing adverse events. Surgeons now have real-time, fully integrated 3D visualization through the EVAR procedure with much greater spatial information than was achieved by previous technology.

Cydar technology will lead to more precise device positioning and enhance procedural success.

"While there are a number of AI companies in the diagnostic imaging space, Cydar is currently the only company in the world with a CE marked, FDA-cleared product using cloud and AI technology to inform and influence surgery in real-time. There are traditional imaging companies that use hardware to achieve less accurate and reliable image fusion but these are not considered competitors as they do not aggregate data and therefore cannot develop the same intelligent insights and channel for new products," says Clough.

Provided by King's College London

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