3D images generated from PET/CT scans help surgeons envision tumors

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Researchers at Jefferson Medical College in Philadelphia have developed a hologram-like display of a patient's organs that surgeons can use to plan surgery. This approach uses molecular PET/CT images of a patient to rapidly create a 3D image of that patient, so that surgeons can see the detailed anatomical structure, peel away layers of tissue, and move around in space to see all sides of a tumor, before entering the operating room to excise it.

"Our technology presents PET/CT data in an intuitive manner to help physicians make critical decisions during surgical planning," said first author Matthew Wampole, Ph.D., from the Department of Biochemistry and Molecular Biology at Jefferson. The researchers produced a surgical simulation of human pancreatic cancer reconstructed from a patient's PET scans and contrast-enhanced CT scans. Six Jefferson surgeons evaluated the 3D model for accuracy, usefulness, and applicability of the model to actual surgical experience.

The surgeons reported that the 3D imaging technique would help in planning an operation. Furthermore, the surgeons indicated that the 3D image would be most useful if it were accessible in the operating room during surgery. The 3D image is designed to speed the excision of malignant tissue, avoiding bleeding from unusually placed arteries or veins, according to the report published September 24th in *PLOS ONE*.

Surgery depends on palpating and manipulating tissues in the operating room environment. Currently, surgeons only use flat CT images and their

imagination to envision the anatomy surrounding the lesion to be excised, with the help of their individual experience and judgment. The 3D image promises to eliminate complications frequently presented during surgery due to unexpected anatomical complexity.

A sense of touch and feel will be added with haptic manipulators to the 3D visual image during the next step of development. That will provide a realistic environment to clearly understand an individual patient's anatomy and pathology, and to accurately plan and rehearse that patient's operation.

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