

CONTENTS

Less Can Be More in Diagnostic Imaging

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While minimally invasive techniques are changing the setting of surgery, the same concept is helping doctors detect and diagnose cancer earlier, more efficiently, and with less pain. The use of robotics also creates uniformity with the procedure, relying less on the abilities of the person performing it.

One of the mainstays of cancer screening is the endoscope—a tiny scope with a video camera that is used to probe inside the body for potential tumors. A standard endoscope uses sensors to produce high-quality two-dimensional images inside the body. However, the size of standard endoscopes can sometimes limit their ability to image hard-to-reach areas for malignancies, such as the small intestines, which can extend up to 18 feet.

The camera pill and the three-dimensional miniature endoscope are two of the many advances in minimally invasive diagnostic techniques that have the potential to improve cancer diagnoses.

About the size of a large vitamin, the swallowed camera pill makes its way through the body taking pictures and sending them to a data recorder worn on the patient's belt. The data are then transferred to a computer for processing and analysis.

Camera pills can be used to take pictures of the lining of the small intestine or to image the esophagus, and researchers are investigating its use to detect colorectal cancer. Because too few studies have been conducted on its ability to detect cancer, the camera pill is used in conjunction with other diagnostic tests, such as imaging scans and biopsies, but is not intended to replace them. One reason is that it can't be controlled once consumed, so if the pill locates suspicious areas in the body, it can't slow down and take additional pictures.

The first three-dimensional miniature endoscopy technique is now in the prototype stage. About the diameter of a human hair, the optical fiber is passed through a needle into the body. So far, the prototype device has only been tested in animals, but researchers hope to use it in pediatric patients, fetuses, or in delicate tissues, such as salivary ducts, fallopian tubes, and pancreatic ducts.