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'Virtual' Colonoscopy Wins Patent

By SABRA CHARTRAND

IT'S not hard to figure out why a majority of people over 50 put off going to the doctor for a colonoscopy.

First, on the day before the procedure, patients must drink large amounts of a distinctly unpleasant liquid to flush the body. Solid foods are restricted. During the procedure, most patients are sedated, so often someone must be enlisted to help them get home afterward. Finally, the procedure itself is uncomfortable —a long, flexible, finger-width tube is eased into the rectum and along the length of the colon. The tube has a fiber optic light and a tiny video camera, and is snaked around the twists in the colon in search of abnormal growths called polyps. The exam can take up to an hour.

Evidently, even doctors who routinely recommend the life-saving scan don't get it themselves in great numbers.

Among doctors "who get to age 50, the compliance is low," said Arie E. Kaufman, a professor and chairman of computer sciences at the State University of New York at Stony Brook. He and a research team have won a patent for a new way to scan for colon polyps without the gallon of cleansing liquid, the sedative or the snaky tube.

Colorectal cancer is the second leading cause of cancer deaths in the United States, but most people may not even become ill if polyps are removed early. Only about 20 percent of the population over age 50 have polyps, and those are noncancerous at first.

"They grow about a millimeter a year," Professor Kaufman said, "and once they get to 10 millimeters, or a centimeter, they have a higher chance of becoming malignant. You really want to catch them at five, six, seven or eight millimeters."

Traditional colon screening has drawbacks other than patient discomfort, he said. There is always a slight chance the fiber optic tube will perforate the colon. Worse, in the traditional test, only about 80 percent of the colon is routinely examined because the video camera cannot see under folds, behind bends in the colon or in cavities.

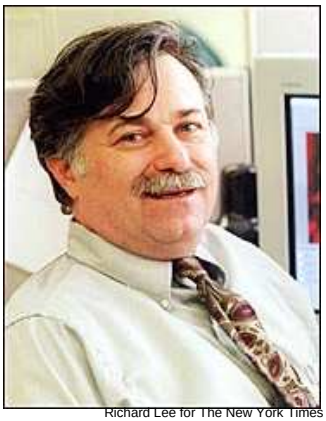
"Colon cancer could be eradicated if we had proper screening," Professor Kaufman said. To that end, he and a team of four researchers at SUNY created what he calls a virtual colonoscopy.

"Virtual colonoscopy is a nice combination of CT scanning technology and computer graphics, or computer technology," he said.

Patients undergoing the procedure receive a box of food to eat the day before the test —things like apples, crackers, soup and, he said, a "banana smoothie with barium in it that tags everything in the colon."

At the beginning of the exam, a half-inch-long tube is inserted at the opening of the rectum, and the colon is inflated with carbon dioxide so there will be no collapsed areas where polyps might hide. No sedative is necessary, Dr. Kaufman said.

CT scans are taken of the patient lying on his stomach and then on his back. Those are followed by two more back and front scans taken while the patient holds his breath for as long as possible.



Richard Lee for The New York Times

Dr. Arie Kaufman with a protoype of a non-invasive virtual colonoscopy at SUNY Stony Brook.

"In 10 or 15 minutes, the patient is out of there," Dr. Kaufman added. "We then take this entire data set, which is huge, since we typically get 500 megabytes, and put it in a computer."

The computer separates images of the colon from the rest of the pictures from the CT scan.

"We segment it and build a 3-D model of the colon in the computer," Professor Kaufman said. It takes about 15 minutes to build the model once the data are transferred from a CT machine, he said. After the model is complete, a doctor uses another computer program to "navigate" through the colon.

"We call it navigation because the doctor or radiologist can actually fly through the colon very much like in the movie 'Fantastic Voyage,' " he said. "It's a beautiful interactive view of the inside of the colon. The doctor can move around, get closer to the colon wall, examine things from different directions.

"If you're looking for something as small as five millimeters, that's a very difficult task," he said. "We use computer graphics to change the lighting, to add colors and different intensities."

It takes a trained doctor about four and a half minutes to "fly" up the colon and another four and a half to make a sweep back down, Professor Kaufman said.

"We even paint the surface walls we haven't seen on the way up," he added. "Then when we fly back down we can focus on the areas that were not seen before."

He said the view up the colon covered about 80 percent of the organ, and the view on the return trip added 15 percent more.

"The last 5 percent is deep cavities and sharp bends, and our system lets the physician step through these areas and examine each one until he's seen 100 percent of the entire colon," Professor Kaufman said.

The technology is licensed to Viatronix Inc., a company that makes medical imaging products. Professor Kaufman said "three or four Army hospitals are doing very extensive clinical studies comparing virtual colonoscopy to the conventional method."

He and the four other researchers, Zhengrong Lian, Mark Wax, Ming Wan and Donquing Chen, received patent 6,514,082.