Swedish doctor, Anders Persson, is a champion of a new and amazing medical imaging system BY LISA FITTERMAN

Our Body's Secrets Revealed

unretouche

Dr. Persson in the Virtual Reality Theatre. Behind him is a scan from one the CMIV computers.

The man lies there,

unmoving. He is middle-aged, with wispy strands of brown hair and a small potbelly. His hands are drawn behind his back and there is something piled at his left side, coiled like a snake.

"What's that?" I ask.

"His guts," Dr. Anders Persson bluntly replies.

Welcome to real life and death gone virtual. We are in the main corridor of the Centre for Medical Image Science and Visualization at University Hospital (CMIV) in Linköping, Sweden, standing over what is called a "visualization table." On it the high-resolution image of a murder victim is rendered with the same kind of software used in complicated computer games. It is part of an imaging system that is changing the way doctors conduct autopsies and diagnose everything from wonky knees to blocked arteries, all without a single slice of the scalpel.

The table, mounted on casters, looks like a cross between a pool table, a smart phone and a 46 inch flat-screen TV lying on its back. When it is switched on, I realize that for all intents and purposes it is an operating table, albeit one that can process up to 20,000 images a minute, rotating, shrinking, enlarging and slicing into the body for different views.

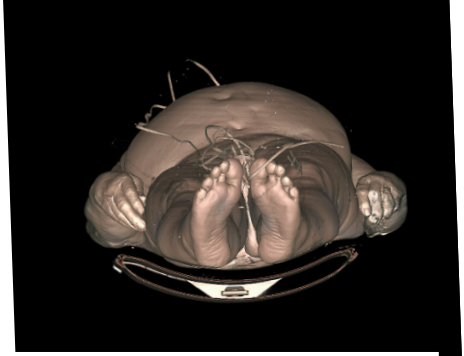
To show me what it can do, Persson begins a whirlwind tour of the man's body, from the tips of his toes to the top of his skull. In the time it takes to flick a finger, he is stripped of his clothes—and then, his skin. We are looking at his insides, at bone, muscle, fatty tissue, organs, arteries and veins, a graphic, three-dimensional portrait in shades of red, white, blue and beige that is as real as if the body was lying before us. Even a layperson like me can interpret at least parts of the picture without much prompting.

Like those guts coiled beside the body.

Like the knife wound that caused them to spill out.

Like the leather belt that sticks out from behind the man's back and was used to tie his hands together as he was cut open and bled out.

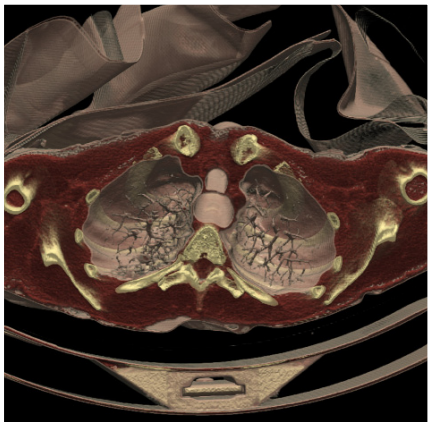
Persson, a bespectacled radiologist who heads the multidisciplinary team



here, calls this imaging system one of the most important developments in recent medical history. For the past eight years, specialists at the centre have conducted hundreds of virtual autopsies in Swedish murder cases, from gangland hits to suspected child abuse and so-called "honour" killings in ethnic communities. There was the girl who was stabbed 50 times by family members when she balked at an arranged marriage, the boy who had hot oil poured down his throat before he was forced to swallow a sword and a man who was found with a large knife in his ribs.

"You'd think it was murder but we were able to prove it was suicide by the trajectory of the blade and how it entered the body," Persson explains.

One of the goals here is to streamline autopsies, for virtual ones may take days as opposed to weeks. Like an accomplished gamer, Persson's hands fly over the table, directing the touch-sensitive control as he shows me how they are done. With another flick of a finger, he slices the man in half width-wise and then puts him back together. He does the same down the length of the body, and he double-checks that there are no broken bones before getting of rid of the



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skeleton so he can zoom in for close-ups of each organ, studying them from different perspectives.

All sorts of questions are swirling in my head. What was the man's story? Who would kill someone like this, so cruelly and painfully?

"All I know is that disemboweling was definitely the cause of death," Persson finally says, a detached scientist to the core. "The investigators deal with the facts of the case."

Then, he swipes his hand like Harry Potter doing a spell and the man whose body has been bared before me is wearing clothes again. In the end, there is virtual dignity for the dead.

The machines are state-of-the-art. The 128,000 -Euro table is the showstopper -- at once an educational tool as well as a diagnostic one

In 1895, German physicist Wilhelm Röntgen used radiation to photograph his wife's left hand, a ghostly image with rings on the fingers that reportedly so unsettled her, she exclaimed: "I have seen my death!" I think of her reaction when I walk into a heavily curtained room at the CMIV and look at the framed scans on the walls. On matte black backgrounds, they glow in the dark—a woman's skull with a silver clip that clamps an artery in her brain to stop an aneurysm from bursting, a heart with all the arteries and veins magnified more than ten times.

These images are proof of how far medical science has come since Rontgen's breakthrough nearly 120 years ago. It was only in 1971 that the manufacturing arm of the EMI Group introduced the first CT scanner. Until the mid-1970s, interpreting X-rays was a laborious process that involved guesswork and intuition, Persson says. Images couldn't be turned around and looked at from various angles. Nor could they be fragmented like a jigsaw puzzle, the pieces easily removed and put back together.

No longer. The visualization table—manufactured by Sectra, a Linköping company that works with the CMIV—now makes it all possible, part of a system that includes two MRI machines and a CT scanner; CMIV's own scanner has the capacity to scan a medium-sized bear in one go. Although the machines are state of the art, the $170,000 table (128,000 Euros) is the showstopper—at once an educational and diagnostic tool. It is used to trace things such as the trajectory of a bullet through a body, to teach medical students what life-threatening conditions look like and to help physicians determine in a non-invasive way what is wrong with their patients.

Dr. Persson at the Spectra Visualization Table . A large multi-touch display, it allows work with life-size 3D images generated by CT and MRI scans, giving students and doctors a deeper understanding of anatomy, as well as functions and processes inside

Persson shows me the picture of a heart of a patient who nearly died that is marked up in varying shades of blue and red. It looks like a weather map, with a deep, dangerous crimson highlighting the most volatile area of all. "Just look at this," he says, pointing at the aorta, the heart's major artery. "It's an aneurysm. And we found it without having to sticking a catheter through the arteries."

The table is already in use in hospitals throughout Western Europe and along the eastern seaboard of the U.S. In New York it has proved invaluable in cases where physical autopsies are proscribed, as with Orthodox Jews and Muslims. And the US military has used a version of it over the past ten years for all fallen soldiers who are returned home, both out of respect and because it is efficient.

Specialists are impressed. "For non-radiologists, two-dimensional black and white images can be really hard to read," says Mark Levental, the head of radiology at the Jewish General Hospital in Montreal. "Outside of our specialty, this is a huge thing."

Persson says the table and the imag-

CPersson and Petter Quick, a Radiology Nurse and clinical applications specialist in CT and Imaging Post Processing, opearting the CT scan.

ing system are the vanguard in the kinds of tools needed to solve problems in the health sector: "An aging populace coupled with a lack of money means we need to be smart. We need to learn to use technology in the right way."

Besides the autopsies, these tools are already helping patients with a whole range of conditions. They include Karl Eklöf, the scion of a Scandinavian sporting goods chain. Only 38, he was referred to the CMIV last summer because he had been hobbled for months by back pain and his doctors couldn't figure out why. He wondered if he, an avid runner and rower, would ever do sports again. Even worse was that he could not pick up his three young sons. The scans showed the beginnings of spinal degenerative disease, with the fluid in several discs starting to dry out. All he had to do was lay off running for about two months, strengthen his core with exercises and temporarily avoid hoisting anything heavy. "Now I have to concentrate on getting better because otherwise, my wife will kill me!" he laughs.

Back in the corridor at the CMIV, Persson keeps up a patter as he works. The visualization system is meant to complement, not supplant, real-life pathologists, he says; it cannot actually cut a piece out of a body, scrape off samples to be cultured or conduct

tests on a stomach's contents.

At the same time, he predicts that the future of medical imaging will be straight out of science fiction: four and five-dimensional pictures that can predict changes in a body over time and space, thus helping physicians more accurately foresee how conditions will develop in individual patients.

In a way, this is simpler than it seems. Just think of a dimension as a direction along which you can organize information in a logical way. Left and right, up and down, before and after, small and big—it doesn't matter. More dimensions simply mean adding lots more information to an image, and until now, the main barrier to that has been developing the computer capacity to process it all.

"In 2040, what we're doing today will seem quaint and outdated," Persson promises. "Think of it: 75 per cent of procedures performed by doctors in 1995 didn't exist in 1970. There were no MRIs or CT scans. People didn't think such things were possible.

"Twenty years ago, when I began to use 3-D and colour, people said I was crazy. But I told them, 'Just you wait and see!'"