THE FUTURE

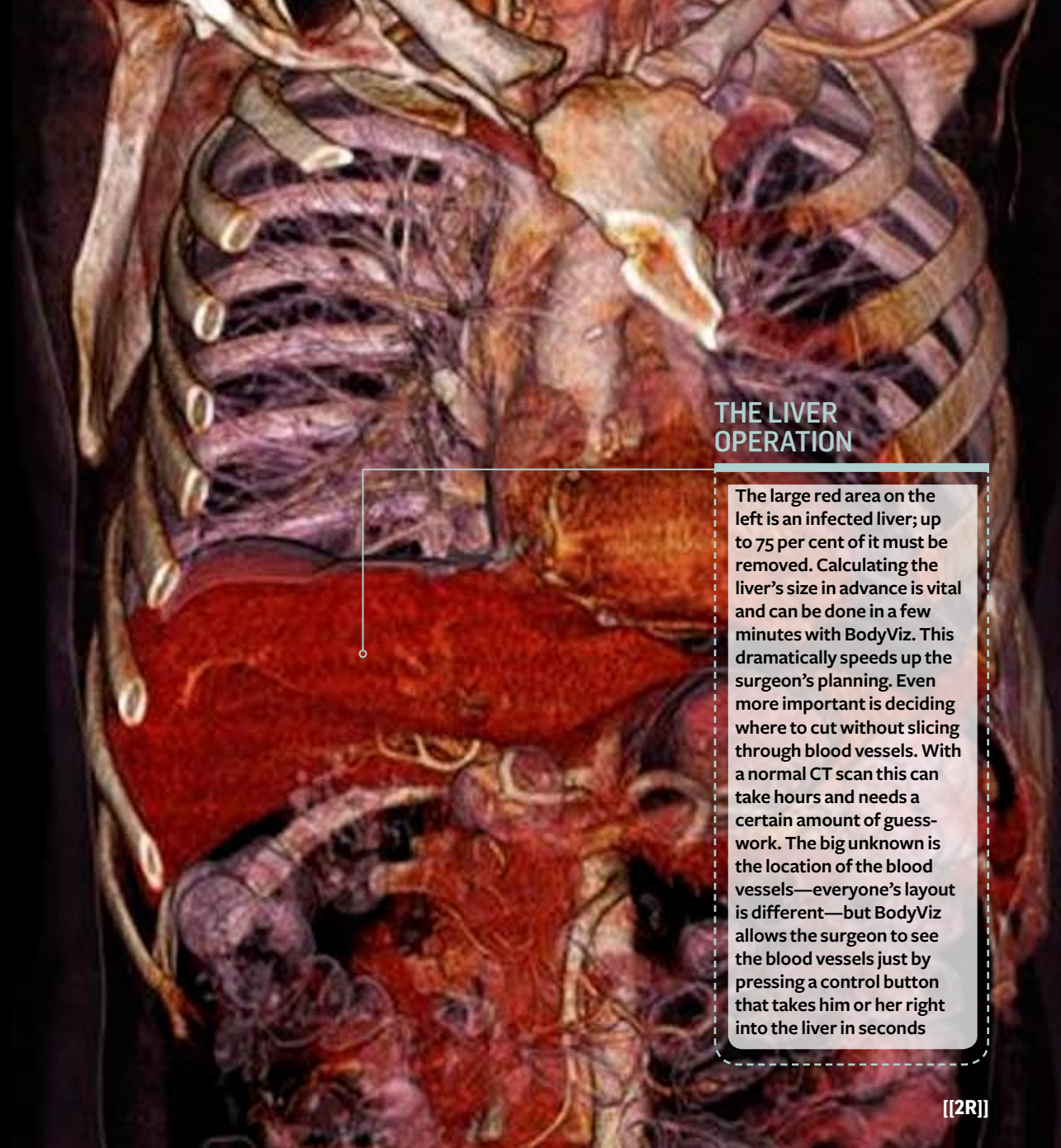
# X-RAYS GO XBOX

There's a new way of scanning the body—and it's nothing like the fuzzy black-and-white images you're used to

By Jerome Burne

**Soon all medical scans will look like this.** And, incredibly, they could be done by your GP using just a laptop and an Xbox controller. These pictures contain basically the same information as a murky black-and-white photo from a CT or MRI scan. But they look a world away. What makes these so incredibly clear and detailed is that they've been fed through a new piece of software wizardry called Body-Viz, which owes far more to computer games than conventional medical imaging.

Instead of the flat 2D image usually seen when you are scanned, the BodyViz process uses the information to produce images in full-colour 3D. And while some

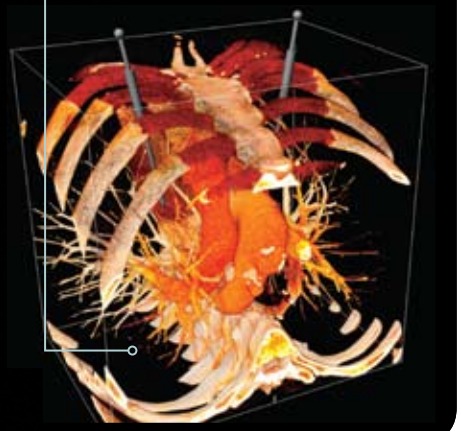


## THE LIVER OPERATION

The large red area on the left is an infected liver; up to 75 per cent of it must be removed. Calculating the liver's size in advance is vital and can be done in a few minutes with BodyViz. This dramatically speeds up the surgeon's planning. Even more important is deciding where to cut without slicing through blood vessels. With a normal CT scan this can take hours and needs a certain amount of guess-work. The big unknown is the location of the blood vessels—everyone's layout is different—but BodyViz allows the surgeon to see the blood vessels just by pressing a control button that takes him or her right into the liver in seconds

## THE HEART OPERATION

This patient—who is lying on his back with ribs top and bottom—is waiting for a "keyhole" operation to use a blood vessel in the chest wall for a heart bypass. The two orange and red "sausages" at the front are major blood vessels leaving and entering the heart, and the twig-like branches are arteries in the lungs. While 2D scans give information on the whereabouts of arteries, muscles and bone, the BodyViz program makes them instantly visible. First, trocars (surgical tools) are inserted—you can see them poking out at the top. Then the surgeon slides lights and other tools down, which have to be very precisely placed: close enough to remove the blood vessel but leaving enough room to manoeuvre



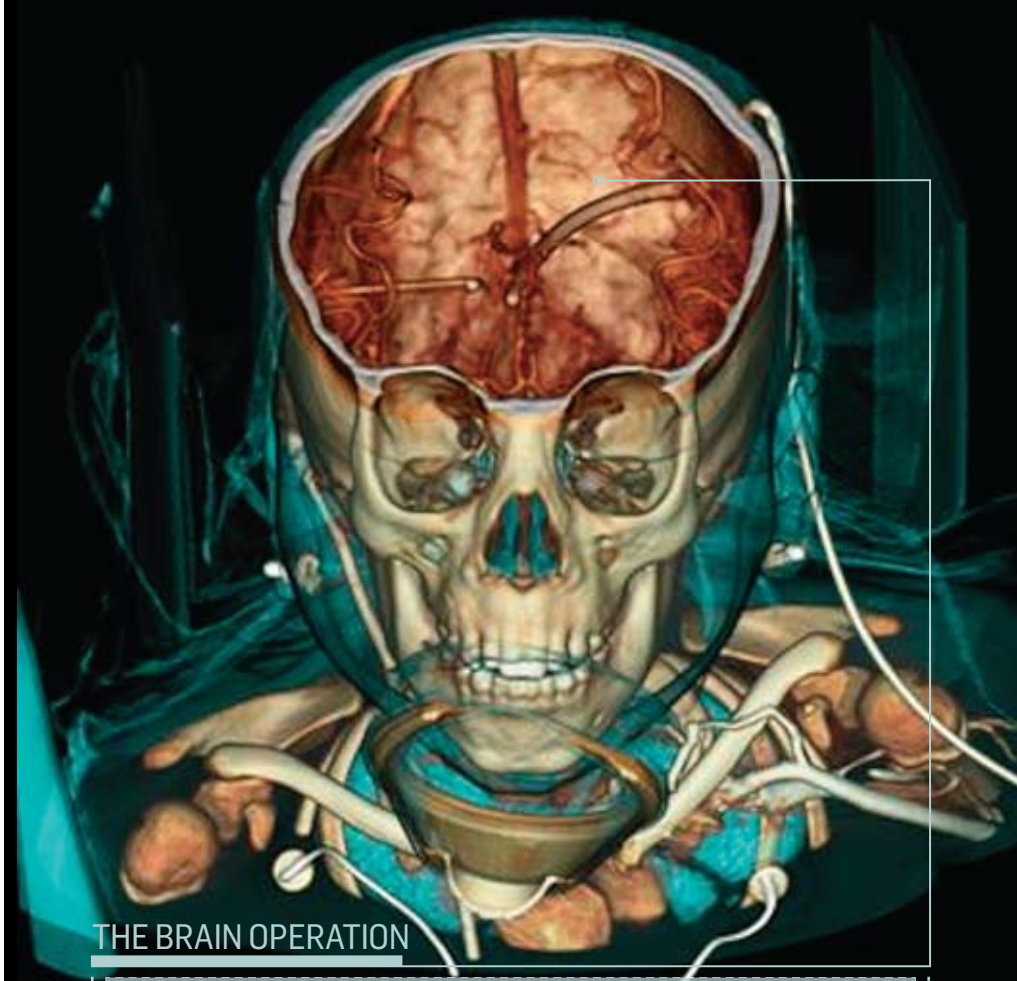
CT scans do produce vivid colour pictures of organs, BodyViz lets surgeons, at the touch of a button, look at different aspects of your body to show only veins, or bones, for example, or to turn the image through 360 degrees.

**The program was developed at the** Virtual Reality Applications Centre at Iowa State University, one of the most advanced computer research centres in the US. Using it, surgeons can in minutes make preparations for an operation that previously would have taken hours. Working out the safest way into the body is easier, more accurate and therefore less invasive.

"This system allows surgeons to perform virtual operations before doing the real thing," says Curt Carlson, CEO of Ames, which markets BodyViz. "It lets you swoop through any part of the body as though on a fly-by mission." So you can travel through organs, and check for, say, early signs of cancer in the colon or blockages in the arteries. And because BodyViz relies on computer gaming technology that's already widely used, it only costs about £4,000, and could be available to GPs in a few years.

BodyViz is already transforming the way doctors work. "In the past, I'd go over the scans with the radiologist, but I'd still have to plan, draw pictures, imagine and finally guess at the best approach," says Dr Thom Lobe, paediatric surgeon at Blank Children's Hospital, Des Moines, Iowa. "This means that when we open a patient up we're not entirely sure what we'll find; sometimes

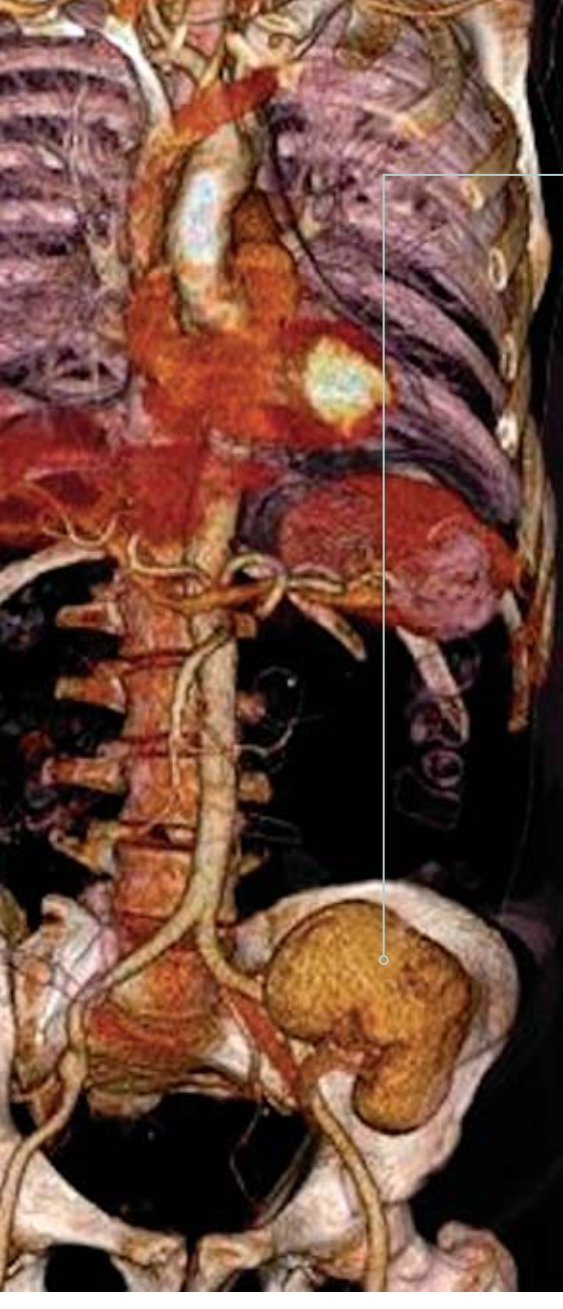




## THE BRAIN OPERATION

This is inside the brain of a nine-year-old girl born with a defect that allows a dangerous build-up of cerebrospinal fluid. Without an operation her skull will gradually expand and she may have convulsions. You can see that two thin tubes have been inserted. On the right is a shunt to remove excess fluid; on the left a sensor that's triggered when the pressure gets too high. Here, BodyViz is being used as a fast check that the shunt is in exactly the right position and there are no leaks or blockages. The success of most operations depends on precise measurement. Existing systems for measuring from scans are accurate but complex, and can take time to learn. BodyViz allows the surgeon to take measurements quickly and easily

PAUL SOVELIUS, PLATO'S CAVE (ABOVE AND OPENING SPREAD)



## THE KIDNEY TRANSPLANT

If you know your anatomy you'll notice the kidney in this scan is in the wrong place. Normally, the kidneys are either side of the spine, just below the ribs. Here, the brown object nestling in the pelvic bone on the right is a transplanted kidney; the red area directly above is the spleen, and the soft red lines to the left the liver. Kidneys are initially transplanted into the pelvis because the area is easily accessed and avoids more complicated surgery in the abdominal cavity. BodyViz speeds up pre-transplant checks on the blood supply from the body's main artery (the thick brown tube). But in this post-operation scan the transplanted kidney looks too pale; it should appear redder, like the spleen. This could suggest a blood clot, which may mean another operation to remove it

» Do you have 3D specs? If so, go to readersdigest.co.uk/magazine to see these amazing pictures in 3D

This is the same patient viewed from a different angle and with all the bones digitally removed. The purplish lobes are the lungs; below the top left one the liver shows deep red. Being able to shift points of view fast makes it easier to maintain a good blood supply—delivered by the body's main artery running down the middle—to the new kidney before operating and to check progress afterwards. Shifting viewpoints is also a boon for radiation therapy. Although specialised machines help to safely target beams at tumours, BodyViz makes it easier

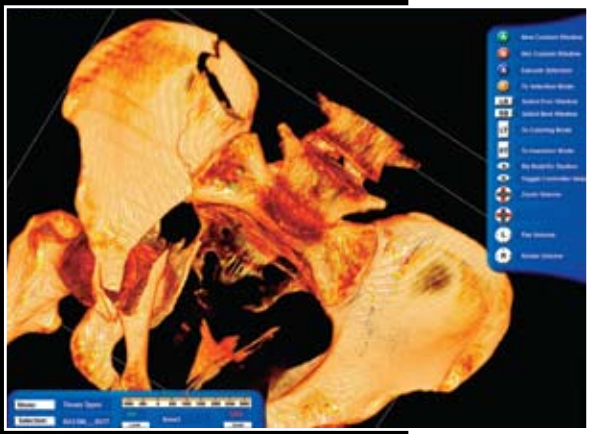
PAUL SOVELIUS, PLATO'S CAVE

there are unexpected obstructions and you find you're flying by the seat of your pants. BodyViz cuts that out and speeds things up. I can see instantly what's happening from the scan. It means there's less chance of any surprises during surgery."

**But it's when surgeons practise** on the patient before operating that the link with computer games is most obvious. At the click of a button on the handheld controller—identical to those used for playing games on an Xbox—up pops an equipment list. But instead of swords or laser blasters there are scalpels and other surgical tools. The surgeons can plot how they intend to cut or probe on the body with incredible accuracy. Clear pictures allow the small incisions used in keyhole surgery to be made in exactly the right place, and possible obstructions can be seen in advance.

The first hospital to install BodyViz was The Methodist Hospital in Houston, Texas, last February. Dr Brian Butler, head of the Radiation Oncology Department, explains that working with people outside your field brings a whole new perspective.

"Computer gamers immediately understand the idea of wanting to blast one area but protect others nearby," he says. "And that's what we have to do with radiotherapy: get the



## FRACTURE OF THE PELVIS

**This patient has had a serious accident. Top left is a fracture, and there's more damage where the hip bone joins the pelvis. Blood vessels (not seen) can be shown in a second with a touch on the Xbox controller. If they're damaged too that will compound the seriousness of the injury. The surrounding organs can also be easily checked. This is much harder to see on X-rays, and with CT scans the surgeon needs the radiologist to interpret, losing precious time in an emergency. Scans such as this are already in certain hospitals and, as the software is relatively cheap, surgeons can run it on their laptops without having to wait to access a central computer**

➔ maximum dose to the target and the minimum everywhere else." Doing that with a 2D image from a conventional scan is tricky. "3D lets us see exactly where each beam goes through the body."

Already, other hospitals are referring patients to The Methodist for a second opinion before an operation. The scans are projected onto a huge screen. "The graphics are unbelievable," says Dr Gregory Kolbinger, clinical director of the Iowa Simulation Centre at Des Moines University. "It's like walking inside the body." This hyperreal image allows experts from different specialisms to agree on what they're looking at—not always the case with 2D scans.

BodyViz could also give patients a valuable new insight. "Regular CT scans don't give cancer patients any idea of what's going on," says Dr Brian Butler. "But now doctor and patient can get a sense of what's happening, and that's less scary."

So will BodyViz be used in the UK? "We've had systems for presenting 3D scans for some years," says Richard Evans of the British Society of Radiographers. "But BodyViz's more sophisticated software results in wonderful, high-quality images. It could play a very useful part in training and in dry runs for operations." ●

BODYVIZ.COM