Ultrasound 'invisible knife' could destroy cancer tumours

By John von Radowitz
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An invisible knife that uses high-intensity sound waves to penetrate the body and destroy tumours is set to revolutionise cancer treatment, it is claimed.

In five to 10 years ultrasound could replace conventional surgery and radiotherapy for patients with many different types of cancer, scientists said.

The technique is undergoing early trials for liver and kidney cancer in the UK while a French team using a different system has already achieved disease-free results treating men with prostate cancer.

In China, where the technology has been pioneered, anecdotal evidence from studies of thousands of patients is said to be "astounding".

Ultrasound surgery focuses bursts of high energy sound waves on the tumour, heating it to a temperature of 60 degrees Celsius. The tumour cells are destroyed while surrounding tissue is left unharmed.

Professor Gail ter Haar, who is leading trials of an experimental system at the Royal Marsden Hospital in Sutton, Surrey, England, said the technique could treat tumours up to the size of

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At this stage the trials are confined to testing the safety of the technique, but Prof ter Haar said they had already yielded "really exciting results".

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She told the American Association for the Advancement of Science's annual meeting in Seattle yesterday: "I think there will be cancers for which it will revolutionise treatment, but we're a long way from knowing which they will be, and exactly how it should be employed".

Patients with liver and kidney cancer are taking part in the Royal Marsden studies.

Treatment consists of two-second long bursts of ultrasound delivered to the surface of the body by a machine mounted on a gantry.

A number of bursts are needed to clear an organ of cancer.

At a different centre in Oxford, England, Prof ter Haar has been using a commercial device developed in China to treat a similar group of patients.

She has worked with Chinese physicians who have already treated about 3,000 cancer patients with ultrasound.

Although the Chinese trials were not as scientifically rigorous as those in the UK, the anecdotal evidence was impressive.

"The results in China are really quite astounding," said Prof ter Haar.

"There are patients who are disease free with tumours for which there are no other

treatments, particularly in the pancreas."

She said that theoretically, ultrasound should be suitable for a wide range of solid tumours.

"If you can image a tumour with diagnostic ultrasound you should be able to treat it," she told the meeting.

However, since the sound beam could not travel through bone or air, certain cancers would be difficult to treat.

Brain tumours and lung cancers deep behind the rib cage fell into this category.

Scientists in the UK and United States were working on the problem of getting ultrasound into the brain.

"Its very appealing for the brain because it's a trackless form of damage," said Prof ter Haar.

"You only get damage at the focus so you don't damage the rest of the brain through which you've got to travel. If we could solve that problem it would be very exciting."

Dr Jean-Yves Chapelon from the French research institute Inserm in Lyon described a different ultrasound system now at an advanced stage of development which he had used to treat 242 men with prostate cancer.

The results were due to be published in the next few months.

Dr Chapelon said the treatment was as effective as conventional surgery or radiotherapy, and safer.

In this case the ultrasound beam was delivered through the rectum. After five years of followup, 80 per cent of low-risk patients were found to be disease-free and effectively cured.

For medium-risk patients the success rate was 60 per cent and for patients with high-risk aggressive cancers, 50 per cent. The men had an average age of 71.

Traditional treatments for older men with prostate cancer carry a high risk of impotence and urinary incontinence, but 40 per cent of the patients recovered their potency and only eight per cent were unable to control their urine flow.

Not one patient had died of cancer although the first was treated as long as 11 years ago.

"We believe that this therapy challenges other therapies," said Dr Chapelon.

However, he said that at present it was still difficult to convince specialists that ultrasound therapy could be as good as conventional treatment.

Prof ter Haar said there was still much work to do before ultrasound became universally available as a cancer treatment.

She expected the process of patient trials, publication of data, and introduction into hospitals to take between five and 10 years.

Another possible application of ultrasound might be on the battlefield, according to Dr Shahram Vaezy, from the University of Washington in Seattle.

His team was working on miniaturising ultrasound equipment that could be used to treat wounded soldiers, or accident victims.

A big advantage of ultrasound was that it had the ability to stop bleeding by sealing broken blood vessels, he said.

Dr Vaezy told the meeting: "The application we

are pursuing is treating internal bleeding, to develop a non-invasive method of treating patients at the scene of an accident, for example".

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