UNITED PRESS INTERNATIONAL

Knifeless surgery kills cancer with sound

By Ed Susman
UPI Science News
Published 2/15/2004 12:01 AM
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SEATTLE, Feb. 15 (UPI) -- New, experimental technology allows doctors to kill cancers deep inside the body with high-intensity ultrasound instead of scalpels and other surgical instruments, researchers report.

The procedure promises to give patients too ill to face conventional surgery a chance to fight their disease, and further applications of the technology -- called high-intensity focused ultrasound -- someday could save the lives of accident trauma victims or soldiers on the battlefield.

"We are in the very early days of using this technique to treat liver cancers," said Gail ter Haar, head of therapeutic ultrasound at London's Royal Marsden Hospital in the United Kingdom. "But we are very excited about our results. This is not yet a cure for cancer, but we have shown that we can treat tumors that are deep within the body without surgery."

She and her colleagues are conducting tests with an ultrasound device developed at Oxford University by the Chongqing HAIFU Technology Company, Ltd in China. They also are using their own instrument at Royal Marsden Hospital.

Both systems employ conventional ultrasound to locate a tumor in the liver or other organs. Then, the high-intensity capacity is used to destroy the tumor.

"If you can image the tumor with diagnostic ultrasound, you should be able to treat it," ter Haar told reporters at the annual meeting of the American Association for the Advancement of Science.

"In the same way as a magnifying glass can be used in bright sunlight to set fire to dry tinder, sound energy can be focused and used to raise tissue temperature to the point at which cells die," ter Haar explained.

Basically the tumors are cooked to death quickly. The focused sound energy raises the temperature to around 140 degrees Fahrenheit (60 degrees Celsius), killing the cells in about one second. By targeting cells systematically in this manner, an entire tumor can be destroyed, she said.

In order to perform the procedure, doctors require something called an acoustic window, said Shahram Veazy, research assistant professor of bioengineering at the University of Washington's Applied Physics Laboratory. The ultrasound beam must travel through continuous tissue or fluid to the tumor site because the energy cannot be focused through gas or bone.

Veazy said the subsequent dead tissue is then cleared by normal body functions. "Tissue amounts as much as a small orange can be handled by the body," he explained.

Researchers have treated more than 3,000 patients in China with liver and pancreatic cancers. "The success rates there are astounding," ter Haar said, adding her group is conducting studies in London to bring scientific validity to the treatment.

At present, she said, the research is using focused ultrasound as a palliative -- or pain-relieving -- treatment to attack specific liver tumors in terminal patients with multiple tumors. She said she has seen encouraging results in those patients. She added there is some evidence -- albeit mostly anecdotal -- that killing one liver tumor provokes a kind of "bystander" effect on other tumors in the organ, possibly because the treatment evokes an increased immune response.

Researchers in France and elsewhere in Europe have been using the system to treat prostate cancer and other soft tissue tumors.

"We can say that ultrasound surgery of prostate cancer is safe and effective with low risks," said Jean-Yves Chapelon,

director of research at the Institut National de la Sante et de la Recherche Medicale in Lyon, France.

He said the procedure has shown it can destroy cancerous tissue without harming adjacent healthy organs. It also:

-- does not require radiation;

-- shortens hospital stays;

-- allows for repeat treatments, which often is not possible with radiation or chemotherapy, and

-- can be used in conjunction with other treatments.

Veazy, working with grants from NASA and the U.S. Department of Defense, said studies show the focused ultrasound can be used to staunch blood flow quickly from severed blood vessels though a process called acoustic hemostasis.

He said high-intensity focused ultrasound can target a small area and, in a single second, encourage blood to coagulate. It generates temperatures as high as 212 degrees F. -- the boiling point of water -- which fuses the edges of cuts and tears in the skin.

"The machines we have now are big and bulky," Veazy said, "but with miniaturization they could be taken on ambulances to scenes of accidents and use to treat patients who are in danger of bleeding to death."

In times of war or other conflicts, he noted, the devices could be taken into combat zones and prevent mortalities. About four in 10 deaths on the battlefield are due to the inability to halt bleeding.

Veazy said the future version of focused ultrasound devices might be found in operating rooms, doctors' offices and even at animal clinics for use by veterinarians.

Chapelon cautioned that acceptance of new devices and treatments tend to proceed slowly within the medical community. Nevertheless, he predicted widespread use of

the devices -- some of which are becoming commercially available in Europe, China and elsewhere -- will be seen in 10 to 15 years.

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Ed Susman covers medical research for UPI Science News. E-mail sciencemail@upi.com

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