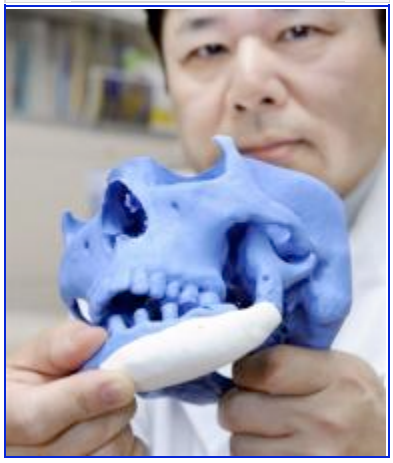
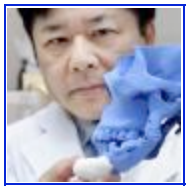
Photo 1 of 2



Tsuyoshi Takado, professor of the University of Tokyo Graduate School of Medicine displays an artificial bone



Japan scientists eye made-to-order bones

1 day ago

TOKYO (AFP) — Japanese hospitals are running a clinical trial on the world's first custom-made bones which would fit neatly into patients' skulls and eventually give way to real bones.

If successful, the Japanese method could open the way for doctors to create new bones within hours of an accident so long as the patient has electronic data on file.

Doctors usually mend defective bones by transplanting real bones or ceramic substitutes. The Japanese implants use a powder of calcium phosphate, the substance that makes up real bones.

The new implants are called CT Bone as they are crafted using the patient's computer tomography (CT) data, a form of medical imaging.

It can match the complicated structures of the jaw, cheek and other parts of the skull down to one millimetre (0.039 of an inch), a level significant enough to make a difference in human faces, researchers told AFP.

"It can also be replaced by your own bone, which wasn't possible before" with conventional sintered ceramic bones, said Tsuyoshi Takato, an orthopedic surgeon and professor at the University of Tokyo's Graduate School of Medicine.

The implants are currently limited to use in the skull because, unlike limbs, they do not have to carry the body weight.

The custom-made bones are created from the calcium phosphate powder and a solidifying liquid which is more than 80 percent distilled water, using computer-assisted design.

In the same way that an ink-jet printer propels droplets onto a piece of paper, a device squirts the liquid on a 0.1-millimetre-thick layer of the powder to form a desired shape.

The device, which was developed with Tokyo-based firm Next 21, repeats the process and builds up layers that have different shapes. For example, 100 layers create a one-centimetre thick implant.

Theoretically, a laboratory in Tokyo could one day use CT data to create a custom-made bone within hours for someone hurt in a car accident halfway across the world.

The clinical tests will last for some two years, covering a total of 70 adults at 10 hospitals. Prior to the current project, the University of Tokyo Hospital implanted CT Bone in 10 adults, who showed promising results.

The researchers expect to put it into practical use in three to four years.

The same technology has been used to make prototypes of industrial products.

"But it is the first time in the world to use materials that can and were implanted into the human body," said Chung Ung-il, a University of Tokyo bioengineering professor who is also part of the project.

Chung said previous studies showed the implants are replaced with regenerated real bone after one or two years, depending on the extent of the defects.

Takato said the host bone serves as "an incubator" that helps replace artificial bone as cells invade the implant in what could be called "in-body tissue engineering".

As ceramic implants are brittle, surgeons often have to scrape the patient's host bone instead to help conventional implants fit better, Takato said.

Doctors also often take bone from elsewhere in the body, particularly the hip, for conventional transplants.

"Nearly half of it is often wasted in the process of making an implant that fits. It is very good to be able to reconstruct bone without taking a piece from elsewhere," Takato said.

Takato hopes to use CT Bone for children if the clinical tests go well.

"Even if I want to treat their skeletal damage or development abnormality, I can't take bone from children for grafts. This technology should benefit children," Takato said.

Children usually have excellent bone growth. "Implants would be quickly replaced with their own bone, which would grow as the child grows," he said.

The technology also has narrow holes running through the artificial bones, inviting blood vessels and cells to come and help regenerate bone.

The research team is also working on a second-generation CT Bone, which contains materials that facilitate bridging between the artificial and real bone.

Experiments with implanting it in the skulls of Beagle dogs are underway with good results, he said.

The ultimate goal is to be able to construct bone from the living cells of patients, allowing them to take in larger pieces.
