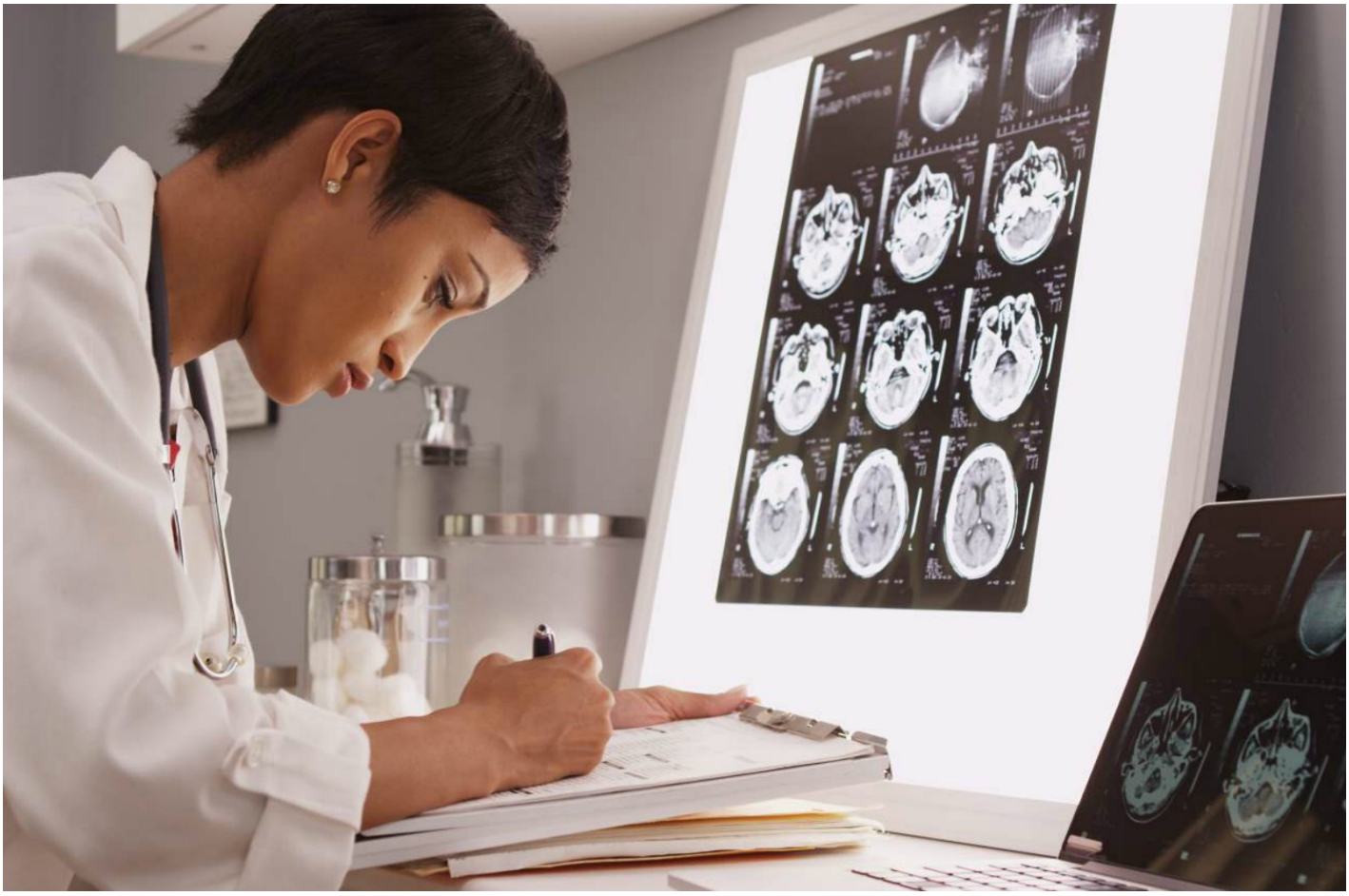
3D Bone Implants Developed To Improve Skull Repair

National University of Singapore



"Brain injury occurs more frequently than breast cancer, AIDS, multiple sclerosis and spinal cord injury," remarks Allan I. Bergman, president and chief executive officer of the Brain Injury Association.

Standard treatment to prevent brain injury caused by pressure on the brain following stroke or trauma involves drilling burr holes into the skull to relieve pressure. Typically the holes are closed with a titanium plate or bone grafts. These approaches each have drawbacks. The use of a titanium in either mesh or plate form can be expensive, and bone grafts are difficult to perform, painful and prone to infection. Each of these techniques can lead to deformity of the skull curvature.

A team of doctors and engineers from the National University of Singapore (NUS) and the National University Hospital, collaborating with Temasek Polytechnic, saw the need for something better. Inventors Swee Hin Teoh, Dietmar Hutmacher, Kim Cheng Tan, Kock Fye Tam and Iwan Ziein developed a biocompatible polycapolactone polymer-based implant for the burr holes that provides a base for the bone of the skull to regenerate after repair at half the cost of a titanium mesh or plate. The invention is currently licensed to Osteopore International Pte Ltd., a NUS spinoff.

> *This approach is not only economical but minimizes infection.*

The technology works by rapid prototyping and design of a 3D patient-specific burr plug. It uses fused deposition modeling and enables the fabrication of the exact shape needed for the patient without a mold. This invention has received support from various organizations, including the Ministry of Education, the National Medical Research Council and the Tote Board.

One of the first patients treated was a 23-year-old man who suffered an injury on the job. The engineering team fashioned a precise scaffold infusing some of his living bone cells into the scaffold to "seed" the growth process. The bone plug has achieved wonderful results, and two years later the scaffold has fused with the surrounding tissue, with no trace of the original hole. His hair has even grown back.

Teoh indicated in the Far Eastern Economic Review (Oct. 21, 2004) that this new technology might be used in developing countries, where medical imaging equipment is scarce, causing doctors to drill multiple holes in a patient's skull before they may find the correct entry point. Other anticipated applications for this technology include treatment of patients with facial injuries and uses in cardiovascular, orthopedic and dental treatment.

To see available technologies from research institutions, click here to visit the AUTM Innovation Marketplace.