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Shortcut through eyelid gives surgeons less-invasive approach to fix brain fluid leaks

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Surgeons at Johns Hopkins have safely and effectively operated inside the brains of a dozen patients by making a small entry incision through the natural creases of an eyelid to reach the skull and deep brain.

They say access to the skull and brain through either lid, formally known as a transpalpebral orbitofrontal craniotomy, sharply contrasts with the more laborious, physically damaging and invasive, traditional means of entry used in brain surgery that requires opening the top half of the skull.

"Going through the eyelid offers a simpler, more direct route to the middle and front regions of the brain than traditional skull-based surgery," says lead study investigator and facial plastic and reconstructive surgeon Kofi Boahene, M.D. "This minimally invasive approach also avoids the major head trauma typically associated with brain surgery."

The new approach eliminates the need for shaving the patient's hair, pulling up the scalp, opening the top half of the skull, and moving aside whole outer sections of the brain in order to operate on the organ's delicate neurological tissue.

Writing in a pair of studies, one published in the June issue of the *Journal of Otolaryngology - Head and Neck Surgery* and another set to appear in the July issue of Skull Base, the Johns Hopkins team describes what are believed to be the first published cases studies of the procedure, documenting how it was successfully used to repair brain fluid leaks,

conduct tissue biopsy and remove tumors. All are common surgeries, but were performed in patients whose complex illnesses made the traditional approach too risky or untenable.

The minicraniotomy through the eyelid requires surgeons to remove only a small, half-inch to one-inch-square section of skull bone right above the eyebrow, which is later replaced, to gain access to the body's nervous system control center.

Once access to the brain is secured, a microscope- and computer-guided endoscope, fitted with a camera, are used to precisely thread other surgical instruments into the soft tissue to perform the operation, using high-tech maps created by advanced CT and MRI scans of the brain.

Boahene says the new approach takes less time to perform, taking on average less than two hours in the operating room as opposed to the traditional four to eight hours; poses less risk of possible infection due to the less-invasive amount of work in opening the skull; and requires less time for recovery in hospital, usually an overnight stay instead of four days or longer in the hospital.

The only noticeable hints of any surgery having been performed, he says, are the dissolvable sutures across the eyelid. By contrast, many brain surgeries require lengthy cuts of the skin (with its subsequent scarring) before the scalp can be pulled up.

"This new technique does not even leave a noticeable scar, as we are deliberately cutting across the natural creases in the eyelid," says Boahene, an assistant professor at the Johns Hopkins University School of Medicine, who has performed 15 such procedures at Johns Hopkins since 2007. Before the procedure, surgeons check by drawing along the eyelid folds with a black marker, making sure the line is not visible when the patient's eyes are open.

The minicraniotomy, Boahene says, does still require an anesthetic, which carries its own risks of complications, and ice packs around the eye to prevent swelling.

Among the scenarios highlighted in the new reports for which eyelid entry proved useful was to mend a common postsurgical complication, a cerebrospinal spinal fluid leak into the sinus cavity that had resulted from a previous, more invasive skull surgery. Surgeons were fearful that further swelling from additional skull trauma would hamper the patient's recovery and instead opted for the less-invasive form of surgery to stem the flow.

In another instance included in the reports, surgeons were able to remove a potentially cancerous tumor in a baby whose skull and head size were deemed too small to endure the physical trauma associated with major brain surgery.

"The transpalpebral approach is a very viable and practical option for thousands of surgeries done each year in the United States that involve problems deeply seated behind the eyes or at the front of the brain," says senior study investigator and neurosurgeon Alfredo Quinones-Hinojosa, M.D.

The minicraniotomy can also be used to correct deformities or skull bones broken by trauma and car accidents, says Quinones-Hinojosa, an associate professor at Johns Hopkins.

The team's next steps, he adds, are to evaluate and expand the list of procedures for which a transpalpebral orbitofrontal craniotomy is best suited. Under consideration by the group are brain aneurysm repair and removal of larger brain tumors that cannot be more easily reached by traditional skull surgery or by going through the nose and sinus cavities.

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