

Burr Hole Surgery: Types, Technique and Review of Literature

Rohit Namdev ¹, Manish Swarnkar ²,
Dhirendra Wagh ³, SP Singh ⁴

ABSTRACT

This article provides a basic overview of burr hole surgery and its applications, such as emergency burr hole evacuation for extra-axial cerebral haemorrhage or for different types of craniotomies. To perform fronto-orbito-zygomatic craniotomy, fronto-temporal, supra-orbital, or fronto-temporal-parietal decompressive craniectomies, among other procedures, a key bur-hole at the fronto-zygomatic-temporal region is usually utilized. However, the term "key hole," or "key burr hole," is frequently used to describe any burr hole in this region (fronto-zygomatic-temporal region anterior to pterional region).(1,2)

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INTRODUCTION AND HISTORY

When the Gigli saw was first used to open the skull for a craniotomy, the term "keyhole" was created. Because the Gigli saw guide must be inserted from this hole either anteriorly, posteriorly, superiorly, or inferiorly, it is a keyhole. Immediate specialized neurosurgical care is the best course of action. Numerous accounts exist of emergency burr holes being successfully completed by non-neurosurgical doctors. (3,4)

This article outlines a basic method and comprehension of burr hole surgery, as well as its applications in emergency or elective procedures for extra-axial intracranial hemorrhage evacuation or for other types of craniotomies. Fronto-orbito-zygomatic craniotomy, fronto-temporal, supra-orbital, or fronto-temporal-parietal decompressive craniectomies, among other procedures, are commonly performed using this crucial bur-hole at the fronto-zygomatic-temporal region.

However, the term "key hole," or "key-bur-hole," is frequently used to describe any burr hole in this region (fronto-zygomatic-temporal region anterior to pterional region).(1,2) In the past, these were frequently carried out using homemade drills and other instruments, and when they were successful, they attracted media attention [5].

Since the days of "exploratory" burr holes, there have been substantial technological advancements in the treatment's safety, but at the same time, fewer surgeons have either performed or are prepared to do the procedure. Even though they might not have any more training than general surgeons who practice near neurosurgical centers, some general surgeons in distant parts of the world are more comfortable doing basic neurosurgery procedures [6].



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Ironically, this might lead to better management in more isolated areas. Non-neurosurgeons can perform burr hole drainage of acute extradural haemorrhages in emergency situations if they have had the necessary training and have maintained their skills [7].

Nevertheless, the treating physician or surgeon should emphasize that this treatment should only be carried out if a patient cannot be transferred to a more suitable facility in a timely way and that it should not cause a delay in the transfer. According to a prior study, local, unskilled staff members' attempts may cause delays and worse results [8]. The essay also discusses the clinical, surgical, and technical significance of a straightforward method for placing burr holes at different sites. Targeting the burr hole is one of the crucial factors in this situation. The transfer of the patient, who typically still needs high-end neurology care and high-end neurosurgical intervention, shouldn't be excessively delayed if they are at a primary or non-neurosurgical center. Perneczky et al refers in his article to a supraorbital craniotomy as a "frontobasal burr hole." One frontobasal burr hole is adequate for a high-speed drill-performed supra-orbital craniotomy, and it should be positioned posterior to the temporal line for aesthetic reasons. (9)

The location of this bur hole requires special consideration, especially in light of its proximity to the orbit and the frontal cranial base. However, the orbital contents should not be revealed for a pure fronto-temporal or supra-orbital craniotomy. Even with proper positioning, if the drilling process is done in the wrong direction, the orbit rather than the anterior fossa may be penetrated.

According to Michael Salzman et al, during a pure fronto-temporal craniotomy, the "crucial" bur hole is located on the "external orbital process" antero-superior to the pterion. To prevent the drill tip from entering the orbital contents, the drilling angle is set so that it points slightly more postero-superiorly.(10)The Maccarty's keyhole, on the other hand, is a particular object that is drilled at an angle that points the drill tip more antero-inferiorly. Additionally, the burr-hole is separated into an inferior (orbital content) and superior (anterior cranial fossa) compartment by the orbital roof. As the writer correctly noted, this makes it possible to remove the zygomatic component and the orbital rim.(1)

EMERGENCY "BURR HOLE" METHOD

INDICATION

1. Plan for craniotomy/ craniectomies
2. Plan for drainage of chronic subdural hematoma / other hematoma
3. Plan for endoscopic minimal invasive surgery
4. Plan for Stereotactic neurological surgery

USE OF CRANIAL RADIOLOGY: - Minimum brain computed tomography scan or MRI scan should always be performed and according to scan localization of burr hole get done.

BASIC EQUIPMENTS FOR BURR HOLE PROCEDURE: - The surgical equipment like knife, self-retaining retractor, cotton, cranial drill set, cranial hand drill set, dissectors, monopolar and bipolar diathermy should be available and checked for procedure.

PROCEDURE

Make sure the patient is supine and that all physiological procedures, such as sedation, scalp blocking, blood pressure monitoring, intubation, oxygen delivery, arterial blood gas mapping, etc., are carried out as efficiently as possible. Verify the haematoma's location on the CT scan and have access to pictures while the procedure is being carried out. Mark the side of the patient's shoulder that has the hematoma. The temporal, frontal, and parietal regions are where haemorrhages most frequently occur; posterior fossa haemorrhages are less common. For each of these scenarios, the typical location of burr holes may vary. Depending on the scan, these positions can be somewhat adjusted. It is crucial that the burr hole is situated above the hematoma's center.

To determine how many centimetres the burr hole should be below the vertex, count the number of cuts from the top to the center of the haemorrhage. The size of the hair removal should be roughly 5 by 5 cm. Use an antiseptic solution, such as betadine, to clean the area. Cut 3-4 cm all the way down to the bone. Direct pressure can be used to stop bleeding while the surgery is still on-going. Apply a self-retaining retractor and use a periosteal dissector to push the periosteum off the bone. With the cranial drill firmly pressed down, begin drilling while maintaining the drill's perpendicular alignment with the skull. As you drill, make sure someone is keeping the head motionless and, if possible, use saline wash. Continue drilling until the matter is resolved.

Drill until the drill bit automatically stops spinning. Take out the drill. To remove any leftover bone fragments, use a blunt hook. Blood from the extradural should now come out. In the event that the blood is subdural, carefully open the dura by tenting it with a sharp hook and incising it with a fresh, sharp knife. Compared to extradural, subdural blood is probably more clotted and challenging to expel. Although manual clot removal might be an option, it is unlikely to remove enough haemorrhage and could harm the brain. Stop, inspect the side, and look for the hole if there is no extra or sub-dural blood.

Avoid pressing the spot if there is still blood oozing from the cut. The bleeding might stop if the self-retainer is left in place. If bipolar diathermy of the skin edges is not possible, apply direct pressure to the edges of the wounds and suture continuously.

DISCUSSION

Due to their ability to handle surgical problems, neurosurgeons are now the only specialists qualified to perform the cranial procedure of burr-hole implantation. Consequently, the procedure is no longer known to non-neurosurgeons. For patients who are far from specialized treatment and fit the requirements for urgent burr-hole drainage, this generates a therapeutic vacuum. The invention of clutch drill bits is essential to non-neurosurgeons' capacity to execute burr holes successfully.

These reduce the chance of "plunging" and make the procedure

much safer by causing the drill to disengage upon entering the inner table of the skull. If a haemorrhage is not alleviated, the patient shouldn't have suffered any more injuries as long as the transfer to a neurosurgical facility doesn't take too long.

Results are satisfactory when such neurosurgical procedures are carried out by non-neurosurgeons in remote regions of different nations [11]. Emergency craniotomies have long been performed by non-neurosurgeons in district general hospitals in affluent nations, even in less remote circumstances [12]. When an extra-axial collection may be eliminated, it has long been known that earlier surgical intervention is beneficial in the therapy of head trauma [13]. Extra-axial collections may eventually be able to be found in far-off places thanks to technologies like transportable MRI scans, intraoperative CT, near infrared probes, and ultrasound equipment. Unless the time to surgically relieve elevated intracranial pressure is likewise reduced, this will not be helpful.

We stress the significance of avoiding incorrect intervention while working to dispel the mystery and fear surrounding emergency burr hole implantation. However, even in the hands of non-specialists, a straightforward technique with the right tools can be reliable, secure, and life-saving when mortality is at its highest.

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AUTHORS

- 1) **Rohit Namdev**
MS Dept of Surgery, CMCH,
Bhopal, MP
- 2) **Manish Swarnkar**
Dept of Surgery, DMIMSU,
Wardha, MS
- 3) **Dhirendra Wagh**
MS, Dept of Surgery, JNMC,
Sawangi, MS
- 4) **SP Singh, MCh**
Dept of Surgery, Chirayu Medical College
and Hospital, Bhopal, MP

