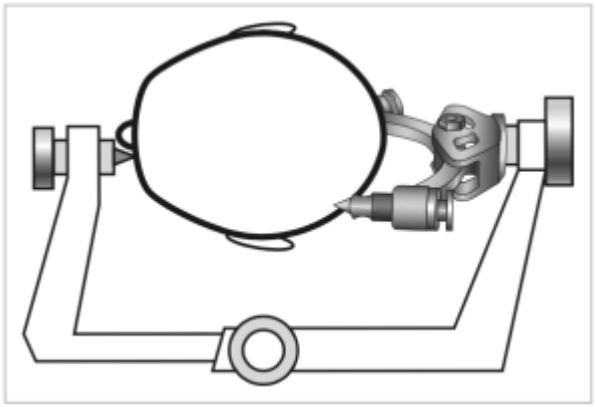
Hemicraniectomy surgical technique

1. Some prefer the use of a Mayfield skull clamp placed low



to give greater access [1)]

(not feasible with severely comminuted skull fractures)

2. AP axis of the head is placed horizontal to floor (unless C-spine not cleared or if neck too immobile one may compensate for this by rotating table)

Skin incision

Hemicraniectomy skin incision.

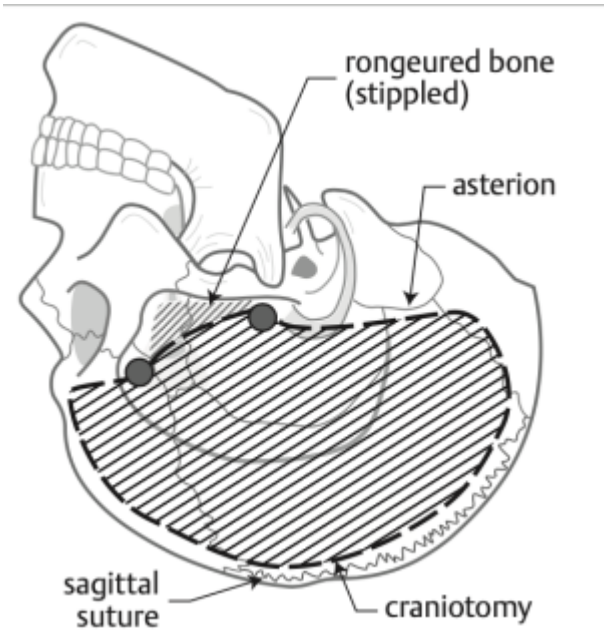
Burr holes

A burr hole is made just above the posterior root of the zygomatic arch, a second one may be made just behind the frontal insertion of the zygomatic arch, inferior to the superior temporal line

Bone flap: proceed posteriorly from the posterior zygomatic arch using the foot plated craniotome. Posteriorly, stay ≈ 1 cm superior to asterion to avoid the transverse sinus. The flap is taken 1 cm

beyond the lambdoid suture, and then up towards the sagittal suture, crossing the lambdoid suture again (this leaves a small amount of bone posteriorly on which the head can rest post-op). An anterior turn is made 1 cm short of the sagittal suture to avoid the superior sagittal sinus, and the sagittal suture is paralleled. The coronal suture is crossed and the drill is taken as low as possible in the anterior cranial fossa near the midline. Staying as low as possible, the orbital roof is followed posteriorly towards the second burr hole. The burr holes are then connected

e) some bone may need to be rongeured to expose the floor of the middle fossa



Dural opening

Based on inferiorly, taken to 1 cm short of the craniotomy edge. Dural releasing incisions may be made at intervals up to the bone margin to avoid strangulation of the brain on the dural edge

The surgical technique of performance of decompressive hemicraniectomy involves removal of an extensive bone flap in the fronto-temporo-parieto-occipital zone with resection of the temporal squama and of the greater wing of the sphenoid bone to visualize the level of entrance of the middle meningeal artery to the cranial cavity, which, in its turn, allows resection of the upright margin of the middle cranial fossa. Decompressive hemicraniectomy is supplemented with resection of the temporal pole and tentoriotomy. Performance of decompressive hemicraniectomy in combination with resection of the resection of the temporal pole and tentoriotomy is an effective surgical method of treatment of malignant ischemic stroke in the territory supplied by the middle cerebral artery, capable of reducing the lethality rate during the postoperative period [2)].

Duraplasty

● Onlay: 2 cm wide strips of dural substitute can then be placed partway under the dural edge around the periphery to isolate the brain from the undersurface of the skin flap where there will be a gap in the dura

● some authors suture a dural graft in place the dural flap is then replaced on top of the brain and dural substitute strips, and is not sutured.

Wound closure

Although decompressive hemicraniectomy with dural expansion and bone flap removal is a potentially life-saving procedure, concerns remain regarding the morbidity associated with this approach. Sughrue et al. noted the high rate of wound complications resulting from this technique, often associated with cerebrospinal fluid (CSF) absorption problems. They present the experience with an improved technique for wound closure after unilateral decompressive hemicraniectomy with a wide cruciate durotomy. Data for all patients who underwent a decompressive hemicraniectomy from October 2005 to October 2009 were gathered prospectively. Starting in mid-2008, they adopted an alternate approach to operative wound closure, which involved skin closure with a running Monocryl absorbable stitch, and prolonged subgaleal drainage. They compared the rates of wound complication using this approach with those obtained with earlier conventional closure techniques. Over a 1 year period, they dramatically reduced the rate of wound complications in patients undergoing hemicraniectomy using this (Monocryl technique, 0% (n=29) compared to other techniques, 35% (n=98), chi-squared [$\chi(2)$] $p<0.001$). Patients closed using this technique experienced markedly reduced rates of wound infection ($p<0.01$), and CSF leak ($p<0.05$), compared to other, more standard, techniques. Thus, attention to the closure of hemicraniectomy wounds can markedly reduce the rate of wound complications, thus improving the risk-to-benefit ratio of this procedure [3].

1)
Holland M, Nakaji P. Craniectomy: Surgical indications and technique. Operative Techniques in Neurosurgery. 2004; 7:10–15
2)
Sehweil SMM, Goncharova ZA. How I do it: decompressive hemicraniectomy supplemented with resection of the temporal pole and tentoriotomy for malignant ischemic infarction in the territory supplied by the middle cerebral artery. Acta Neurochir (Wien). 2022 Jun;164(6):1653-1657. doi: 10.1007/s00701-022-05152-7. Epub 2022 Feb 16. PMID: 35171374; PMCID: PMC9160119.
3)
Sughrue ME, Bloch OG, Manley GT, Stiver SI. Marked reduction in wound complication rates following decompressive hemicraniectomy with an improved operative closure technique. J Clin Neurosci. 2011 Sep;18(9):1201-5. doi: 10.1016/j.jocn.2011.01.016. Epub 2011 Jul 12. PMID: 21752652.