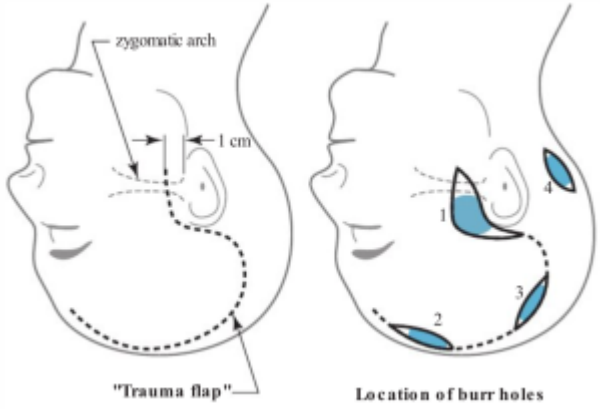
Exploratory burr holes



In the era before computerized tomography (CT), extradural hematomas were usually diagnosed by invasive and less accurate techniques, such as cerebral angiography, pneumoencephalography, or exploratory burr holes. Thus, the philosophy for immediate and universal evacuation to avoid the inevitability of brain stem compression is understandable. However, with the advent of CT, an increasing number of patients receive imaging despite minimal neurologic findings. In some cases, an EDH may be identified and the surgeon must decide whether to recommend surgical intervention [1].

In a trauma patient, the clinical triad of altered mental status, unilateral pupillary dilatation with loss of light reflex, and contralateral hemiparesis is most often due to upper brainstem compression by uncal transtentorial herniation which, in the majority of trauma cases, is due to an extraaxial intracranial hematoma. Furthermore, the prognosis of patients with traumatic herniation is poor. Outcome may possibly be improved slightly by increasing the rapidity with which decompression is undertaken, however, an upper limit of salvageability is probably still only ≈ 20% satisfactory outcome. Burr holes are primarily a diagnostic tool, as bleeding cannot be controlled and most acute hema- tomas are too congealed to be removed through a burr hole. However, if the burr hole is positive, it is possible that modest decompression may be performed, and then the definitive craniotomy can be undertaken incorporating the burr hole(s). With widespread availability of quickly accessible CT scanning, exploratory burr holes are infre- quently indicated.

Indications

1. clinical criteria: based on deteriorating neurologic exam. Indications in E/R (rare): patient dying of rapid transtentorial herniation or brainstem compression that does not improve or stabilize with mannitol and hyperventilation [2].

a) indicators of transtentorial herniation/brainstem compression:

- sudden drop in Glasgow Coma Scale (GCS) score
- one pupil fixes and dilates
- paralysis or decerebration develops (usually contralateral to blown pupil)

b) recommended situations where criteria should be applied:

● neurologically stable patient undergoes witnessed deterioration as described above

● awake patient undergoes same process in transport, and changes are well documented by competent medical or paramedical personnel

2. other criteria

a) some patients needing emergent surgery for systemic injuries (e.g. positive peritoneal lavage +hemodynamic instability) where there is not time for a brain CT

Management

Controversial. The following should serve only as guidelines:

1. if patient fits the above criteria (emergent operation for systemic injuries or deterioration with failure to improve with mannitol and hyperventilation), and CT scan cannot be performed and interpreted immediately, then treatment should not wait for CT scan

a) in general, if the O.R. can be immediately available, burr holes are preferably done there (equipped to handle craniotomy, better lighting and sterility, dedicated scrub nurse…) especially in older patients (>30 yrs) not involved in MVAs. This may more rapidly diagnose and treat extraaxial hematomas in herniating patients, although no di erence in outcome has been proven

b) if delay in getting to the O.R. is foreseen, emergency burr holes in the E/R should be performed

2. placement of burrhole(s) as outlined under Technique

Technique

Position

Shoulder roll, head turned with side to be explored up. Three pin skull-fixation used if concern about possible aneurysm or AVM (to allow for retractors and increased stability) or if additional stability is desired (e.g. with unstable cervical fractures), otherwise a horse-shoe head-holder succes and saves time and makes it easier to turn the head to access to the other side if needed.

Choice of side for initial burr hole

Start with a temporal burr hole on the side:

1. ipsilateral to a blown pupil.This will be on the correct side in> 85% of epidurals [3] and other extraaxial mass lesions [4].

2. if both pupils are dilated, use the side of the first dilating pupil (if known)

3. if pupils are equal, or it is not known which side dilated first, place on side of obvious external trauma

4. if no localizing clues, place hole on left side (to evaluate and decompress the dominant hemisphere)

Approach

see Trauma Flap.

Burr hole locations

1. first (temporal) burrhole: over middle cranial fossa just superior to the zygomatic arch. Provides access to middle fossa (the most common site of epidural hematoma) and usually allows access to most convexity subdural hematomas, as well as proximity to middle meningeal artery in region of pterion

2.if no epidural hematoma, the dura is opened if it has bluish discoloration (suggests subdural hematoma(SDH)) or if there is a strong suspicion of a mass lesion on that side

3. if completely negative, usually perform temporal burr hole on contralateral side

4. if negative, further burr holes should be undertaken if a CT cannot now be done

5. proceed to ipsilateral frontal burr hole

6. subsequent burr holes may be placed at parietal region and lastly in posterior fossa.

Literature

In 100 trauma patients [5] undergoing transtentorial herniation or brainstem compression as outlined above, [6] exploratory burr holes (bilateral temporal, frontal and parietal, done in the O.R.) were positive in 56%. Lower rates in younger patients (<30 yrs) and those in MVAs (as opposed to falls or assaults). SDH was the most common extraaxial mass lesion (alone and unilateral in 70%, bilateral in 1 1 %, and in combination with EDH or ICH in > 9 %) . When burr holes were positive, the first burr hole was on the correct side 86% of the time when placed as suggested above. Six patients had significant extraaxial hematomas missed with exploratory burr holes (mostly due to incomplete burr hole exploration). Only 3 patients had the above neurologic findings as a result of intraparenchymal hematomas.

Outcome

Mean follow-up: 11 mos (range: 1–37). 70 of the 100 patients died. No morbidity or mortality was directly attributable to the burr holes. Four patients with good outcome and 4 with moderate disability had positive burr holes.

References

1)
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