

# Cranioplasty timing

After the resolution of [brain edema](#) and/or reduction of [intracranial pressure](#), following cranioplasty (CP) may lead to improved [cerebral blood flow](#) and a better neurosurgical outcome <sup>1) 2) 3) 4) 5) 6) 7)</sup>.

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The optimal timing of cranioplasty remains widely debated. Delayed cranioplasty does offer fewer chances of postoperative infection <sup>8)</sup>.

- [brain swelling](#): enough time needs to have lapsed so that any brain swelling that was present has subsided to the point that the brain is no longer protruding beyond the normal confines of the intracranial space (you don't want to be "pushing brain" back into the skull with the cranioplasty flap). This sometimes requires shunting hydrocephalus if present

- Contamination status of [wound](#)

- [skull defect](#) from clean [wounds](#) (following decompressive craniectomy, post-craniotomy brain swelling...): recent studies found no significant difference in infection between early and late (variously defined) cranioplasty (contaminated cases were not included).

Although one series reported an increased risk of infection for the repair of a [decompressive craniectomy](#) within 14 days.

Clean surgical cases without brain swelling (e.g. repair of the defect after removing skull hemangioma): there appears to be little risk of infection with immediate cranioplasty

- contaminated wound (open fracture, fractures that traverse the nasal sinuses, penetrating trauma, infection...): classic teaching was to delay cranioplasty using an allograft (a "foreign body" e.g. PEEK implant) at least 6 months to reduce the risk of infection. Some authors even recommended waiting > 1 year.

The more contemporary practice seems to be to wait for  $\approx$  3-6 months after the craniectomy if there are no signs of infection

- extenuating circumstances: consideration may be made to shorten the delay before cranioplasty e.g. if the patient is having significant symptoms related to the absent area of bone (e.g. "syndrome of the trephined" or "sinking skin flap" syndrome).

## Autologous bone flap cranioplasty timing

see [Autologous bone flap cranioplasty timing](#).

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[Communicating hydrocephalus](#) is an almost universal finding in patients after [hemicraniectomy](#). Delayed time to cranioplasty is linked with the development of persistent hydrocephalus, necessitating permanent CSF diversion in some patients.

Waziri et al., propose that early cranioplasty, when possible, may restore normal [intracranial pressure](#) dynamics and prevent the need for permanent CSF diversion in patients after hemicraniectomy <sup>9)</sup>.

## Factors

One modifiable factor that may alter the risk of cranioplasty is the timing of cranioplasty after craniectomy. Case series suggest that early cranioplasty is associated with higher rates of infection while delaying cranioplasty may be associated with higher rates of bone resorption.

When considering ideal timing for cranioplasty, predominant issues include residual brain edema, brain retraction into the cranial vault, risk of infection, and development of delayed post-traumatic hydrocephalus.

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Waiting to perform cranioplasty is important to prevent the development of devitalized [autograft](#) or [allograft](#) infections.

It is generally accepted to wait 3 to 6 months before reconstructive surgery. If there is an infected area, this waiting period can be as long as one year.

Cranioplasty is performed after craniectomy when intracranial pressure is under control for functional and aesthetic restorations and for protection, but it may also lead to some neurological improvement after the bone flap placement <sup>10) 11) 12)</sup>.

## Timing of cranioplasty after decompressive craniectomy for trauma

The optimal timing of cranioplasty after decompressive craniectomy for trauma is unknown.

After decompressive craniectomy for trauma, early (<12 weeks) cranioplasty does not alter the incidence of complication rates. In patients <18 years of age, early (<12 weeks) cranioplasty increases the risk of bone resorption. Delaying cranioplasty (≥12 weeks) results in longer operative times and may increase costs <sup>13)</sup>.

## Timing of cranioplasty after decompressive craniectomy for malignant middle cerebral artery infarction

Patients with [malignant middle cerebral artery infarction](#) frequently develop [hydrocephalus](#) after [decompressive hemicraniectomy](#). Hydrocephalus itself and known shunt related complications after [ventriculoperitoneal shunt](#) implantation may negatively impact patients outcome.

A later time point of [cranioplasty](#) might lead to a lower incidence of required shunting procedures in general <sup>14)</sup>.

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