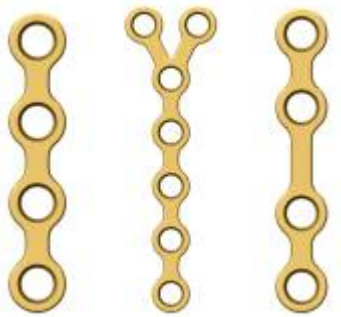
Titanium plate

Titanium fixation plates are routinely used for rigid fixation of bone flaps after craniotomy.



Titanium miniplate cranial fixation provides more accurate and rigid reapproximation of the bone edges, with results that are significantly better on close inspection or palpation [1)].

They are currently available in 0.3-mm thickness, which does not require indentation of the bone to hide the surface thickness. This has resulted in excellent functional and cosmetic outcomes and faster operating times, reducing the tediousness and uncertainty associated with nonresorbable sutures.

Improper closure of a craniotomy has been known to cause physical disfigurement that is a source of patient distress and cosmetic damage and is usually attributed to temporalis muscle asymmetry, bone flap depression, or a combination of both.

Physical disfigurement is not the only complication that should preclude an improper closure because neurological deficits such as constructional apraxia have been known to develop in patients associated with sinking of a flap that is not securely anchored.

Titanium miniplates have been shown to be superior to stainless steel wires for fixation with a reduced operating time by 40% and less mobility on digital pressure with none of the patients having suboptimal results.

During closure, the space left between the skull and the bone flap can be filled with bone powder mixed with the patient's own blood. Bone cementum can give a near perfect result, although this is the more expensive option. The importance of cosmetic outcome can be gleaned by the fact that more and more surgeons are using keyhole approaches for major neurosurgical procedures.

Based on these observations, Frati et al. have described an excellent protocol that minimizes scarring, reduces tissue loss, and maintains symmetry following craniotomies that we believe should be learnt by young neurosurgeons.

Another option currently available is bioresorbable plates (Bonamates®), which are similar to titanium miniplates, although significantly more expensive and essentially similar outcomes. They should be preferred when the patient requires follow up radiotherapy to avoid dosing adjustments and problems. They do not cause any artifacts either. [2)].

Complications

In craniofacial surgery or after craniotomy involving orbitozygomatic osteotomies, these plates are

occasionally removed because of infection, pain, protrusion, soft tissue erosion, and plate malfunction. However, plate removal because of pain and protrusion after craniotomy without orbitozygomatic osteotomy has rarely been reported.

A retrospective analysis of all patients who underwent removal of cranial fixation plates after craniotomy, performed by the senior authors at one institution between 2014 and 2016, was conducted.

A total of 319 patients underwent bone flap fixation after craniotomy using cranial fixation plates between 2014 and 2016. Five of those patients (1.6 %) had their cranial plates removed because of pain and protrusion. An additional four patients had a cranial fixation plate removed during that time frame with the original craniotomy performed before 2014. All nine patients had immediate resolution of symptoms after plate removal.

Gupta et al., report the experience with cranial fixation plate removal because of pain and protrusion in patients who underwent craniotomy without orbitozygomatic osteotomy, particularly frontotemporal craniotomy. In an attempt to reduce this complication, they recently stopped placing a full-size burr hole in the keyhole area of a frontotemporal craniotomy, eliminating the need for a titanium burr hole cover plate [3].

1)
Broaddus WC, Holloway KL, Winters CJ, Bullock MR, Graham RS, Mathern BE, Ward JD, Young HF. Titanium miniplates or stainless steel wire for cranial fixation: a prospective randomized comparison. J Neurosurg. 2002 Feb;96(2):244-7. PubMed PMID: 11838797.
2)
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4429332/
3)
Gupta R, Adeeb N, Griessenauer CJ, Moore JM, Patel AS, Thomas AJ, Ogilvy CS. Removal of symptomatic titanium fixation plates after craniotomy. Acta Neurochir (Wien). 2016 Oct;158(10):1845-8. doi: 10.1007/s00701-016-2929-7. Epub 2016 Aug 12. PubMed PMID: 27520360.