Bone flap resorption case series

A retrospective analysis was conducted on patients who underwent DC and autologous CP. Serial computed tomography (CT) images were used to quantify the degree of BFR over time. Risk factors included age, diabetes, smoking status, flap fragmentation, defect size, and DC-CP time interval. $\chi 2$ analyses and Student's t-tests were performed to examine differences between patients who experienced BFR and those who did not.

Results: Overall, 82% of patients demonstrated evidence of clinically relevant resorption on CT. On average, the bone flap decreased in volume by 36.7% within the first year, with a linear loss in volume after multiple years of follow-up. Individuals who developed greater BFR were significantly younger (43 ± 17 vs. 56 ± 12, P = 0.022), had a lower incidence of diabetes (5.9% vs. 43%, P = 0.037), and had more bone flap fragments (1.4 ± 0.67 vs. 1.00 ± 0, P < 0.001) than those who did not.

Resorption following CP with cryopreserved bone appears to progress in a fairly linear and continuous fashion over time. Using serial CT images, they found a resorption rate of 82% at our institution. We identified several possible risk factors for resorption, including flap fragmentation, younger age, and absence of diabetes [1)]

Schwarz et al. retrospectively analyzed 631 cranioplasty procedures (503 with autograft, 128 with bone substitute) by using a stepwise multivariable logistic regression model and discriminant function analysis.

There was a significantly higher risk for reoperation after placement of autograft than after placement of bone substitute; aseptic bone necrosis (n = 108) was the major problem (OR 2.48 [95% CI1.11-5.51]). Fragmentation of the flap into 2 or more fragments, younger age (OR 0.97 [95% CI 0.95-0.98]; p < 0.001), and shunt-dependent hydrocephalus (OR 1.73 [95% CI1.02-2.92]; p = 0.04) were independent risk factors for bone necrosis. According to discrimination analysis, patients younger than 30 years old and older patients with a fragmented flap had the highest risk of developing bone necrosis.

Development of bone flap necrosis is the main concern in long-term follow-up after cranioplasty with autograft. Patients younger than 30 years old and older patients with a fragmented flap may be candidates for an initial artificial bone substitute rather than autograft [2)].

1)
Spake CSL, Goli R, Beqiri D, Crozier JW, Cielo DJ, Klinge PM, Svokos K, Woo AS. Evidence of Linear Bone Flap Resorption in Patients Undergoing Autologous Cranioplasty Following Decompressive Craniectomy: A 3D Slicer Segmented Analysis of Serial Computed Tomography Images. World Neurosurg. 2022 Aug;164:e799-e807. doi: 10.1016/j.wneu.2022.05.047. Epub 2022 May 18. PMID: 35597539.
2)
Schwarz F, Dünisch P, Walter J, Sakr Y, Kalff R, Ewald C. Cranioplasty after decompressive craniectomy: is there a rationale for an initial artificial bone-substitute implant? A single-center experience after 631 procedures. J Neurosurg. 2016 Mar;124(3):710-5. doi: 10.3171/2015.4.JNS159. Epub 2015 Sep 25. PubMed PMID: 26406796.