Epilepsy after cranioplasty

Among the several cranioplasty complications, epilepsy is a common complication with an incidence of 14.8-33.0% [1) 2)].

Antiepileptic drugs can effectively reduce the occurrence of seizures [3)].

Systematic review

Seizures are a recognised complication of cranioplasty but its incidence and risk factors in TBI patients are unclear. Accurate prognostication can help direct prophylactic and treatment strategies for seizures. In a systematic review, Spencer et al., aimed to evaluate current literature on these factors. A PROSPERO-registered systematic review was performed in accordance with PRISMA guidelines. Data was synthesised qualitatively and quantitatively in meta-analysis where appropriate. A total of 8 relevant studies were identified, reporting 919 cranioplasty patients. Random-effects meta-analysis reveals a pooled incidence of post-cranioplasty seizures (PCS) of 5.1% (95% CI 2.6-8.2%). Identified risk factors from a single study included increasing age (OR 6.1, p = 0.006), contusion at cranioplasty location (OR 4.8, p = 0.015), and use of monopolar diathermy at cranioplasty (OR 3.5, p = 0.04). There is an association between an extended DC-cranioplasty interval and PCS risk although it did not reach statistical significance (p = 0.062). Predictive factors for PCS are poorly investigated in the TBI population to date. Heterogeneity of included studies preclude meta-analysis of risk factors. Further studies are required to define the true incidence of PCS in TBI and its predictors, and trials are needed to inform management of these patients. [4)].

Case series

Two hundred and thirty-eight patients who received cranioplasty following craniectomy between January 2012 and December 2014 were included in a study. The risk factors of the patients with early and late post-cranioplasty seizures were compared to those with no post-cranioplasty seizures.

Seizures (73/238, 30.3%) were the most common complication after cranioplasty. Of these 73 patients, 17 (7.1%) had early post-cranioplasty seizures and 56 (23.5%) had late post-cranioplasty seizures. Early post-cranioplasty seizures were related to a longer interval between craniectomy and cranioplasty (P = 0.006), artificial materials (P < 0.001), and patients with late post-craniectomy seizures (P = 0.001). Late post-cranioplasty seizures were related to the presence of neurological deficits (P = 0.042). After stepwise logistic regression analysis, a longer interval between craniectomy and cranioplasty (P = 0.012; OR: 1.004, 95% CI: 1.001-1.007) and late post-craniectomy seizures (P = 0.033; OR: 4.335, 95% CI: 1.127-16.675) were independently associated with early post-cranioplasty seizures.

Delayed cranioplasty procedures and seizures before cranioplasty were significantly associated with early post-cranioplasty seizures. Further studies are warranted to investigate whether early surgery after craniectomy can reduce the risk of early post-cranioplasty seizures [5)].

A retrospective study, covering the period between January 2008 and July 2015, compared postcranioplasty seizures (PCS) in postcranioplasty patients. Postcranioplasty seizures risk factors included diabetes mellitus, hypertension, time between DC and cranioplasty, duraplasty material, cranioplasty contusion location, electrocautery method, PCS type, and infection. Multivariate logistic regression analysis was performed and confidence intervals (CIs) were calculated (95% CI).

Of 270 patients, 32 exhibited initial PCS onset postcranioplasty with 11.9% incidence (32/270). Patients fell into immediate (within 24 hours), early (from 1 to 7 days), and late (after 7 days) PCS groups with frequencies of 12, 5, and 15 patients, respectively. Generalized, partial, and mixed seizure types were observed in 13, 13, and 6 patients, respectively. Multivariate logistic regression analysis showed increased risk with increasing age (>50 years). Cranioplasty contusion location, precranioplasty deficits, duraplasty material, and monopolar electrocautery were predictive of PCS onset ($P<0.05$). Increased DC to cranioplasty interval increased risk but was not statistically significant ($P=0.062$).

Understanding risk factors for PCS will benefit the management of cranioplasty patients [6].

Unclassified

1: Zhang J, Chen J. Seizures and epilepsy following cranioplasty. Seizure. 2019 Apr 7;69:76. doi: 10.1016/j.seizure.2019.04.004. [Epub ahead of print] PubMed PMID: 30986720.

3: Wang K, Li S, Xiang W, Ming Y, Peng T, Wang H, Chen L, Zhou J. Cerebral granuloma mimicking malignant neoplasm in a patient with seizures 21 years after head trauma. World Neurosurg. 2019 Feb 19. pii: S1878-8750(19)30405-X. doi: 10.1016/j.wneu.2019.01.286. [Epub ahead of print] PubMed PMID: 30794983.

4: Qiu JQ, Cui Y, Sun LC, Zhu ZP. Aphasic status epilepticus as the sole symptom of epilepsy: A case report and literature review. Exp Ther Med. 2017 Oct;14(4):3501-3506. doi: 10.3892/etm.2017.4979. Epub 2017 Aug 21. PubMed PMID: 29042939; PubMed Central PMCID: PMC5639272.

5: Valci L, Dalolio M, Kuhlen D, Pravatà E, Gobbi C, Reinert M. Intradiploic encephalocele of the primary motor cortex in an adult patient: electrophysiological implications during surgery. J Neurosurg. 2018 Mar;128(3):871-874. doi: 10.3171/2016.11.JNS162426. Epub 2017 Apr 28. PubMed PMID: 28452617.

7: Wang X, Wu R, Zhang P, Zhang C, Song G, Gao Z. Superior Sagittal Sinus Obstruction by Giant Meningiomas: Is Total Removal Feasible? World Neurosurg. 2016 Oct;94:111-119. doi: 10.1016/j.wneu.2016.06.113. Epub 2016 Jul 5. PubMed PMID: 27392897.

8: Krause-Titz UR, Warneke N, Freitag-Wolf S, Barth H, Mehdorn HM. Factors influencing the outcome (GOS) in reconstructive cranioplasty. Neurosurg Rev. 2016 Jan;39(1):133-9. doi: 10.1007/s10143-015-0678-3. Epub 2015 Dec 1. PubMed PMID: 26621678.

9: Du H, Li Z, Li M, Li L. [CLINICAL RESEARCH AND DISCUSSION OF MODIFIED CRANIOPLASTY]. Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2015 Jul;29(7):822-5. Chinese. PubMed PMID: 26540973.

11: Wang C, Han G, You C, Liu C, Wang J, Xiong Y. Individual surgical treatment of intracranial arachnoid cyst in pediatric patients. Neurol India. 2013 Jul-Aug;61(4):400-5. doi: 10.4103/0028-3886.117618. PubMed PMID: 24005732.

12: Creutzfeldt CJ, Tirschwell DL, Kim LJ, Schubert GB, Longstreth WT Jr, Becker KJ. Seizures after decompressive hemicraniectomy for ischaemic stroke. J Neurol Neurosurg Psychiatry. 2014 Jul;85(7):721-5. doi: 10.1136/jnnp-2013-305678. Epub 2013 Aug 5. PubMed PMID: 23918640.

14: Alibhai MK, Balasundaram I, Bridle C, Holmes SB. Is there a therapeutic role for cranioplasty? Int J Oral Maxillofac Surg. 2013 May;42(5):559-61. doi: 10.1016/j.ijom.2013.01.001. Epub 2013 Feb 14. PubMed PMID: 23415243.

15: Adetchessi AT, Pech-Gourg G, Metellus P, Fuentes S. [Fracture of macroporous hydroxyapatite prosthesis]. Neurochirurgie. 2012 Dec;58(6):382-5. doi: 10.1016/j.neuchi.2012.06.001. Epub 2012 Aug 13. French. PubMed PMID: 22898300.

16: Morrison DA, Guy DT, Day RE, Lee GY. Simultaneous repair of two large cranial defects using rapid prototyping and custom computer-designed titanium plates: a case report. Proc Inst Mech Eng H. 2011 Nov;225(11):1108-12. PubMed PMID: 22292209.

17: Zhang GL, Yang WZ, Jiang YW, Zeng T. Extensive duraplasty with autologous graft in decompressive craniectomy and subsequent early cranioplasty for severe head trauma. Chin J Traumatol. 2010 Oct 1;13(5):259-64. PubMed PMID: 20880449.

18: Male KR, Guha A, James S, Ahuja S. Intracranial halo pin penetration causing brain injury secondary to poor halo care technique: a case report and literature review. Cases J. 2008 Dec 9;1(1):380. doi: 10.1186/1757-1626-1-380. PubMed PMID: 19068118; PubMed Central PMCID: PMC2614943.

19: Anderson WS, Kossoff EH, Bergey GK, Jallo GI. Implantation of a responsive neurostimulator device in patients with refractory epilepsy. Neurosurg Focus. 2008 Sep;25(3):E12. doi: 10.3171/FOC/2008/25/9/E12. PubMed PMID: 18759613.

20: Kan P, Amini A, Hansen K, White GL Jr, Brockmeyer DL, Walker ML, Kestle JR. Outcomes after decompressive craniectomy for severe traumatic brain injury in children. J Neurosurg. 2006 Nov;105(5 Suppl):337-42. PubMed PMID: 17328254.

21: Cho JH, Jung TY, Kim IY, Jung S, Kang SS, Kim SH. A giant intradiploic epidermoid cyst with perforation of the dura and brain parenchymal involvement. Clin Neurol Neurosurg. 2007 May;109(4):368-73. Epub 2007 Jan 24. PubMed PMID: 17254702.

22: Carod-Artal FJ, Vázquez-Cabrera CB. [Neurological paleopathology in the pre-Columbine cultures of the coast and the Andean plateau (II). The history of cranial trepanations]. Rev Neurol. 2004 May 1-15;38(9):886-94. Spanish. PubMed PMID: 15152360.

23: Fontes RB, Aguiar PH, Zanetti MV, Andrade F, Mandel M, Teixeira MJ. Acute neurogenic pulmonary edema: case reports and literature review. J Neurosurg Anesthesiol. 2003 Apr;15(2):144-50. PubMed PMID: 12658001.

24: Di Rocco C, Iannelli A. Hemimegalencephaly and intractable epilepsy: complications of hemispherectomy and their correlations with the surgical technique. A report on 15 cases. Pediatr Neurosurg. 2000 Oct;33(4):198-207. PubMed PMID: 11124637.

25: Rish BL, Dillon JD, Meirowsky AM, Caveness WF, Mohr JP, Kistler JP, Weiss GH. Cranioplasty: a review of 1030 cases of penetrating head injury. Neurosurgery. 1979 May;4(5):381-5. PubMed PMID: 111153.

26: MILLARD DR Jr, YATES BM. PRACTICAL VARIATIONS OF CRANIOPLASTY. Am J Surg. 1964 Jun;107:802-9. PubMed PMID: 14169005.

27: ERCULEI F, WALKER AE. POSTTRAUMATIC EPILEPSY AND EARLY CRANIOPLASTY. J Neurosurg. 1963 Dec;20:1085-9. PubMed PMID: 14186110.

References

1)
L. Lee, J. Ker, B.L. Quah, N. Chou, D. Choy, T.T. Yeo, A retrospective analysis and review of an institution's experience with the complications of cranioplasty, Br. J. Neurosurg. 27 (2013) 629e635.
2)
A. Pechmann, C. Anastasopoulos, R. Korinthenberg, V. van Velthoven-Wurster, J. Kirschner, Decompressive craniectomy after severe traumatic brain injury in children: complications and outcome, Neuropediatrics 46 (2015) 5e12.
3)
Chen F, Duan Y, Li Y, Han W, Shi W, Zhang W, Huang Y. Use of an antiepileptic drug to control epileptic seizures associated with cranioplasty: A Randomised Controlled Trial. Int J Surg. 2017 Feb 18. pii: S1743-9191(17)30140-1. doi: 10.1016/j.ijsu.2017.02.017. [Epub ahead of print] PubMed PMID: 28223259.
4)
Spencer R, Manivannan S, Sharouf F, Bhatti MI, Zaben M. Risk factors for the development of seizures after cranioplasty in patients that sustained traumatic brain injury: A systematic review. Seizure. 2019 Mar 21;69:11-16. doi: 10.1016/j.seizure.2019.03.014. [Epub ahead of print] Review. PubMed PMID: 30952091.
5)
Shih FY, Lin CC, Wang HC, Ho JT, Lin CH, Lu YT, Chen WF, Tsai MH. Risk factors for seizures after cranioplasty. Seizure. 2019 Mar;66:15-21. doi: 10.1016/j.seizure.2018.12.016. Epub 2018 Dec 19. PubMed PMID: 30772643.
6)
Wang H, Zhang K, Cao H, Zhang X, Li Y, Wei Q, Zhang D, Jia Q, Bie L. Seizure After Cranioplasty: Incidence and Risk Factors. J Craniofac Surg. 2017 Sep;28(6):e560-e564. doi: 10.1097/SCS.0000000000003863. PubMed PMID: 28796104.