

KRANIYOPLASTİ ÖNCESİ ve SONRASI NÖROLOJİK ve PSİŞİK DEĞİŞİKLİKLER*

NEUROLOGICAL AND PSYCHIC CHANGES BEFORE AND AFTER CRANIOPLASTY

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*Dünya Nöroşirurji Dernekleri Federasyonu'nun Ekim 1995, Selanik-Yunanistan Toplantısında Kısmen Sunulmuştur

Özet

Travma, enfeksiyon, neoplazm ya da konjenital malformasyonlar sonucunda meydana gelen, özellikle geniş kranial kemik defektleri, defektin oluşmasından birkaç ay sonra nörolojik ve psişik değişikliklere neden olabilmektedir. Bu değişiklikler üzerine yeterli çalışma bulunmamaktadır. Bu amaçla, 10 yıllık bir dönem içerisinde kliniğimizde kranioplasti ameliyatı yapılan her iki cinsten 80 olguyu inceledik. En genç hasta 18, en yaşlısı 67 yaşında idi. Kranioserebral yaralanmalar kranial kemik defektine yol açan en sık nedendi. Küçük kranial kemik defekti olan olguların ekserisinde nörolojik semptomlar yok ya da alt düzeyde iken geniş defektli olanların %26'sında nörolojik bozukluk yoktu. kontrol muayenelerinde, geniş defekti olan 69 olgunun 8'inde tam düzelme olduğu belirlendi. Küçük defekti olanlardan ise sadece 1 olguda tam düzelme olmuştu. Geniş kraniektomi sonrası oluşan nöropsişik değişikliklere dejeneratif değişiklikler, beyin omurilik sıvısının dolaşım bozuklukları ve serebral kan akımı bozukluklarının neden olduğu kanısındayız. Bu sorun için kranioplasti bir çözüm olabilir.

Anahtar kelimeler: *Kraniyal defekt, Kranioplasti, Nörolojik defisit, Psikolojik değişiklik*

Summary

Cranial bone defects as a result from, infection, neoplasm or congenital malformation can cause neurological and psychic changes a few months after a craniotomy procedure. There has not been sufficient studies on these changes. For this reason, we analysed 80 patients of both sexes who undergone cranioplasty in our department in a period of 10 years. The youngest patient was 18 years old and the oldest 67. Cranio cerebral injuries appear to be the most frequent primary event leading to the skull defects. In the majority of patients with smaller skull defects, neurological symptoms were absent or minimal, while patients with large skull defects (26.0 %) showed no neurological impairment. In the control examinations, 8 of 69 patients with large skull defects showed complete improvement. Only one patients with small skull defects had complete recovery. We conclude that, neuropsychic changes occurring after a large craniectomy procedure may be the result of degenerative changes, cerebrospinal fluid circulation disturbances and cerebral blood flow disturbances. Cranioplasty may be a solution for the matters.

Key words: *Cranial defect, Cranioplasty, Neurological deficit, Psychological impairment*

AÜTD 1995, 27: 38-41

MJAU 1995, 27: 38-41

Introduction

Defects in the skull bone can be either acquired or congenital. Acquired defects are of various origin: a) traumatic, b) tumourous, c) bone infection (osteomyelitis), d) decompressive trepanations.

Congenital defects mostly result from dysraphic failures (1-3). A few months after a craniotomy procedure, especially involving large bone defects, neurological and psychic changes appear (2,4). The lack of appropriate methods to investigate these

changes was the reason why they have not been understood or described in a more detailed way.

Table I: The Relation Between Preoperative Neurological Status and Defect Size in Patients

neurological status	defect size		total
	defect < 100 cm ²	defect > 100 cm ²	
0	5	18	23
1	3	17	15
2	3	22	25
3	-	12	12
total	11	69	80

0= *normal* neurological status, without psychic changes; 1= *minimal* neurological deficit with discrete hemi- or monoparesis, some difficulty finding words and slight psychoorganic disturbances; 2= *moderate* neurological deficit with hemi- or monoparesis but without marked diasability of the patient, dysphasia, however, allowing certain degree of communication, and psychoorganic syndrome with preserved orientation; 3= *severe* neurological deficit with hemiparalysis, complete aphasia, mostly without sphincter control, and severe psychoorganic changes.

Material and Methods:

We analysed 80 patients of both sexes who undergone cranioplasty in our department during the period from 1985 to 1995. In this analysis, all patients were investigated from the point of view of age, sex, location and size of cranial defect, and neuropsychological condition. Neurological and psychic changes before and after cranioplasty were evaluated according to the classification of neurological deficits described by Stula (5). According to the severity of neurological and psychic impairment, Stula categorized the patients into four groups: 0= *normal* neurological status, without psychic changes; 1= *minimal* neurological deficit with discrete hemi- or monoparesis, some difficulty finding words and slight psychoorganic disturbances; 2= *moderate* neurological deficit with hemi- or monoparesis but without marked disability of the patient, dysphasia, however, allowing certain degree of communication, and psychoorganic syndrome with preserved orientation; 3= *severe* neurological deficit with hemiparalysis, complete aphasia, mostly without sphincter control, and severe psychoorganic changes. All these patients are reliant on outside help.

Results:

We analysed 80 patients of both sexes who undergone cranioplasty in our department during the period from 1985 to 1995. It is interesting to note that in all patients cranioplasty was performed with acrylates. The youngest patient was 18 years old and the oldest one was 67. The highest percentage of cranioplasties falls into the age group of 21-40 years (61.2 %). There was a marked prevalence of males in the patients (89% versus 11%). The number of the patients and their age groups are as follows: 9 patients 15-20 years of age, 29 patients between 21-30; 26 patients between 31-40; 11 patients between 41-50; 3 patients 51-60 and 2 patients over 61 years of age. We had no patients who had cranioplasty operation between 0-15 years of age. Craniocerebral injuries appear to be the most frequent primary event leading to the skull defects. In 91.2 % of the patients head injuries with deleterious primary and secondary consequences preceded cranioplasty. Large bone defects of more than 100 cm² were present in 69 (86.2 %) and small ones of less than 100 cm² in 11 (13.7 %) patients. Neurological and psychic changes before and after cranioplasty were evaluated according to the classification of neurological deficits described by Stula. Severe neurological and psychic symptoms were observed exclusively in patients with large bone defects. Among altogether 69 patients with large skull defects 26.0 % showed no neurological impairment, whereas minimal or moderate disturbances were diagnosed in 24.6 and 31.9 % respectively. In the majority of patients with smaller skull defects, neurological symptoms were absent (45.5 %) or minimal. For all the patients postoperative control examinations were done between 3 months and 2 years after the intervention. In the control examinations, 8 (11.6 %) of 69 patients with large skull defects completely improved, 35 (50.7 %) had partial improvement, and 16 (23.2 %) had preoperatively neurological symptoms. In the group of patients with small skull defects, 5 were patients with a normal preoperative neurological status. Of these patients, one patient had complete

Table II: Postoperative Neurological Status of Patients with Small Cranial Defect (<100 cm²)

preoperative neurological status	change of neurological status after cranioplasty			total
	partial improvement	complete improvement	unchanged	
0	2	3	-	5
1	1	2	-	3
2	1	1	1	3
3	-	-	-	-
total	4	6	1	11

improvement, 4 had partial improvement in neurological status.

Discussion:

There has been extensive research on late psychological effects of head injuries (2,4). But, the number of research on neurological effects of head injuries is insufficient. The studies belonging neurological and psychological changes of head injuries have been concentrated rather on closed head injuries. However, some neuropsychological impairments such as epileptic seizures, motor deficit, aphasia, anxiety, headache, dizziness have been observed in patients with skull defect (1-6). And, some of these disturbances have been improved after cranioplasty. Although controversially, many neurosurgeons stress the value of cranioplasty in patients with epilepsy following trauma and craniectomy, hemispheric collapse, and the " syndrome of the trephined" or "postconcussion syndrome" (1,4,7).

Erculei and Walker compared men with head injuries who had unrepaired defects with others who had had cranioplasty, both early and late, and found no difference in clinical course or subsequent development of posttraumatic epilepsy between the two groups (6). In 1984 Stula recorded pre- and postoperative electroencephalograms in 20 patients prior to and after cranioplasty and found that 11 of these patients had an improved electroencephalographic pattern and five of six patients with epilepsy improved clinically (2). In our patients, electroencephalograms were not performed.

Our experiences show that patients with minimal neurodeficiency have the best rate of recovery: 42 % of these patients showed complete recovery after the operation. Second-best prognosis have patients with neurological and psychic changes of a moderate degree. Unfortunately, we did not observe any recovery in patients with severe neurological impairment. Large cranial defects have been reported to produce hemispheric collapse with compromising neurological impairment (1,2,4). Tabaddor and LaMorgesse postulated that the unsupported scalp and dura depress the brain as a result of the direct effect of atmospheric pressure (4). Displacement of the scalp and dura may also obliterate the subarachnoid space, reducing cortical perfusion (1). Stula (2) and Tabaddor and LaMorgesse (4) have reported clinical neurological improvement in patients with hemispheric collapse following cranioplasty. Stula observed that patients with minimal and moderate neuropsychic changes have a chance of good recovery (2). It is probable that cranioplasty may prevent the development of local hemodynamic forces that would adversely affect the underlying brain (3).

We conclude that, large cranial skull defects performed in intracranial haematoma, osteomyelitis, etc., cause neurological and psychic changes after a few months. These changes may be caused by degenerative changes, cerebrospinal fluid circulation disturbances and cerebral blood flow disturbances. Cranioplasty may be a solution for the problem.

Table III: *Postoperative Neurological Status of Patients with Large Cranial Defect (> 100 cm²)*

preoperative neurological status	change of neurological status after cranioplasty			total
	partial improvement	complete improvement	unchanged	
0	-	-	18	18
1	12	5	-	17
2	13	3	6	22
3	10	-	2	12
total	35	8	26	69

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