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Case Report

Decompressive Craniectomy Saves Life When Performed in Time. A Member of Our Own Team, From Herniation to Independent Life; Case Report

Erkin ÖZGIRAY[1], Ramiz AHMEDOV[1], Celal ÇINAR[2], Taşkın YURTSEVEN[1], Sertaç İŞLEKEL[1]

[1]Ege University, School of Medicine, Department of Neurosurgery, İzmir, Türkiye [2]Ege University, School of Medicine, Department of Radiology, İzmir, Türkiye

Abstract

Stroke remains to be the leading cause of morbidity and mortality all over the world among the aging population. Despite the ultimate developments in vascular neurosurgery and interventional endovascular methods, none have succeeded to be performed widely yet. Decompressive craniectomy is probably one of the basic practices of neurosurgery, which is simple but neglected time to time. It must be considered in all patients suffering from ischemic stroke with findings of mass effect but especially young patients with a non-dominant hemisphere affected. We would like to remind once more the useful and life-saving method by reporting the dramatic benefit of the patient who is also a member of our medical team.

Keywords: Decompressive craniectomy, ICA occlusion, stroke

Dekompresif Kranyektomi Zamanında Uygulandığında Hayat Kurtarır. Herniasyon Tablosundan Bağımsız Hayata Bir Çalışma Arkdaşımız; Olgu Sunumu

Özet

İnme özellikle yaşlanmakta olan nüfus içerisinde tüm dünya genelinde morbidite ve mortalitenin önde gelen nedeni olmaya devam etmektedir. Vasküler mikro-cerrahi ve girişimsel endovasküler radyolojideki son gelişmelere karşın akut iskemik kökenli inmenin rutin uygulanan standart bir tedavisi henüz yaygın kullanıma girmemiştir. Dekompresif kranyektomi ise nöroşirurjinin en temel ve eski girişimlerinden birisidir. Uygulaması ne kadar basit olsa da zaman zaman farklı nedenlerle farklı merkezlerde göz ardı edilebilmektedir. Elimizdeki bu eski tedavi yöntemi, kitle etkisine yol açan bütün iskemik inme olgularında ama özellikle genç ve dominant olmayan hemisferik olgularda mutlaka dikkate alınmalıdır. Aynı zamanda genç bir çalışma arkadaşımız olan olgunun yaşadığı dramatik yarar dolayısıyla dekompresif kranyektominin zamanında yapıldığında gösterdiği etkinliğini bir kez daha hatırlatmayı amaçlıyoruz.

Anahtar Kelimeler: Dekompresif kranyektomi, IKA oklüzyonu, inme

CASE PRESENTATION

Forty five years old woman, a member of our university hospital's medical staff, was immediately admitted to the emergency service, just after her sudden loss of consciousness during working hours. First computerized tomography (CT) scans taken in the first half an hour revealed no pathological findings (Figure 1a). There after she underwent a Doppler ultrasonography (USG) which revealed a dissection of the right internal carotid artery (ICA) resulting in total occlusion.

She was hospitalized in intensive care unit (ICU) of Neurology Department with a Glasgow Coma Scale (GCS) of 13 and mild left hemiparesis. Hours later she suddenly deteriorated whilst the aggressive anti-edema treatment. This time her CT scans depicted a mid-line shift to left side more than 10 mm's (Figure 1b). When the findings of herniation like right pupil dilatation were observed she was immediately taken to operation theatre for a right sided hemi-craniectomy.

The surgical approach involved reverse question mark shaped skin flap based on the right ear. A wide hemicraniectomy was performed with removal of frontal, temporal, and parietal bone using a high speed pneumatic drill. The dura was opened in stellate fashion and a large pericranial graft was used to augment the dura before closure. First the temporalis muscle and then skin, with a soft drainage under it, were approximated. The bone flap was packed in sterile conditions for deep-freezing, which was used later for cranioplasty.

Her GCS was upgraded to E2M6V3 from E1M3Ventubated, a few hours after the surgery. A cranioplasty utilizing autolog bone flap, which was kept in deep-freezer in sterile conditions is performed at the 6.th month of the first operation to the patient (Figure 2). On her third month follow-up after the second operation, she is fully conscious and even independently mobilized despite the severe ischemic changes depicted in her follow-up CT scans (Figure 1c and 3).

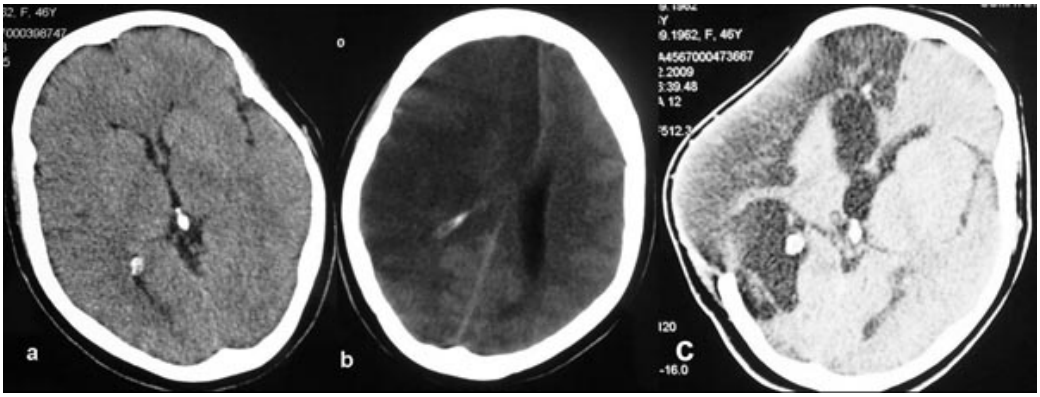


Figure 1: *Axial CT scan images depicting the dramatic changes due to occlusion of right ICA. CT scan taken in the first hours of the stroke in emergency department (a) does not reveal any major changes yet. Second CT (b) taken about ten hours after the incidence depicts right hemispheric ischemia with a more then 10 mm's mid-line shift to the left. Last image (c) is taken weeks after craniectomy. Right hemispheric ischemia resulted in irreversible gliotic changes. Non vital cerebral tissue is mildly herniated from the decompression area. This last change resulted in survival of the patient via decreasing the ICP.*

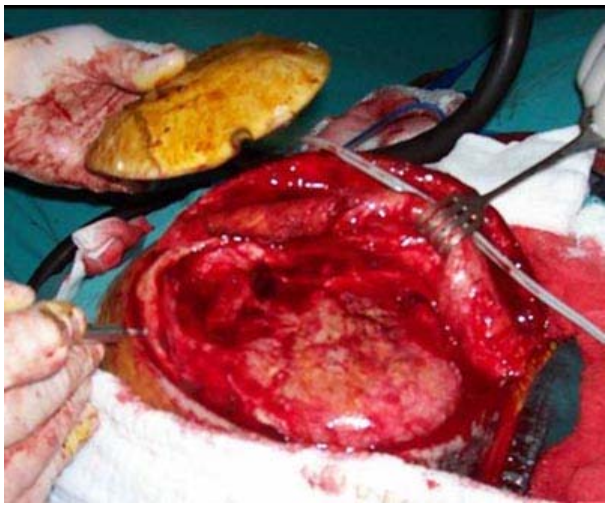


Figure 2: *Peri-operative (during cranioplasty with auto-graft) and post-operative final images of the patient. Large craniectomy material was frozen under sterile conditions following the first operation. Old skin flap incised once more for the repair of the craniectomy(2). During sixth month follow-up patient is able to walk independently(3)*



Figure 3: *Peri-operative (during cranioplasty with auto-graft) and post-operative final images of the patient. Large craniectomy material was frozen under sterile conditions following the first operation. Old skin flap incised once more for the repair of the craniectomy(2). During sixth month follow-up patient is able to walk independently(3)*

DISCUSSION

Decompressive craniectomy was first described by Kocher in 1901 for the treatment of posttraumatic brain edema[2,13]. Initially described by Cushing too in 1905 as a therapy for inaccessible brain tumors, surgical decompression is cautiously considered a "rescue" therapy for stroke and traumatic brain injury patients with massive unilateral hemispheric edema failing medical management[6]

The malign infarct in the middle cerebral artery (MCA) occurs in 10% of the brain vascular accidents with up to 80% mortality, due, mainly to the post-ischemic severe brain edema and herniation[11].

A reduction in cerebral blood flow and or oxygenation lower than a certain threshold and increasing intracranial pressure (ICP) causing cerebral herniation are the main determinants of brain damage and morbidity[7].

In another hand, traumatic brain injury is one of the most common causes of death in young people in industrialized countries and makes up the larger proportion of lifelong disability after trauma settling a very high social cost. The rationale for decompressive surgery is to reduce ICP and the malicious circle of extensive edema and further infarction. Several authors worldwide have shown that decompressive craniectomy not only reduces mortality, but can also result in a good functional outcome[4,9,14].

Decompressive craniectomy reduced the midline shift in all patients with monolateral diffuse brain edema and contusions having a median value of 7 mm; in the remaining, it improved the basal cisterns' effacement. Predictors for a favorable outcome have included younger age, early surgery performed before clinical signs of herniation, nondominant hemispheric lesions, and in trauma patients, higher initial GCS scores and lower ICP. Volume-enlarged dural repair can help prevent cortex conglutination and possible brain shift after surgery[5].

Like any other surgical procedures, unfortunately, a decompressive craniectomy is not without complications. Among those reported include sub-galeal or subdural hygroma, hemorrhagic contusions, epilepsy, hydrocephalus and bone flap infection or resorption[1,8,10,15].

So, the selection of patients who may benefit from decompressive surgery remains controversial. One of the significant reasons that some authors argue against decompressive surgery is that this procedure can allow a bulge of brain tissue through the defect. This frequently results in compression of vessels by the dural margin with further congestion, edema, ischemia, and hemorrhage in the bulged brain tissue[3,12].

Decompressive craniectomy awards a clear survival benefit in patients who present with neurologic deteriorated malignant MCA territory infarction and secondary edema. Currently, evidence indicates that the majority of younger survivors have a favorable outcome.

CONCLUSION

Despite the progress in the endovascular methods and wide propaganda and recent studies for urgent therapies for vaso-occlusive diseases, it is nearly always late for revascularization when the disease is diagnosed. The case reported here is an unpleasant example from this point of view. Even the stroke has happened in the hospital, it was impossible to re-open the vessel when it was diagnosed. Her neurological status deteriorated in hours as expected and experienced in most of the cases. However, the pleasing way of the case started from that point with an immediate and proper surgical approach which was responded very satisfactory by the patient. Six months later patient was even able to walk herself back into the

operation theatre for cranioplasty where she was brought in herniation status on a stretcher. We conclude that decompressive surgery must always keep in mind as a life-saving choice, especially with young and non-dominant affected patients.

Correspondence to:
Erkin Özgiray
E-mail: eozgiray@gmail.com

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REFERENCES

1. *Aarabi B, Hesdorffer DC, Ahn ES, Aresco C, Scalea TM, Eisenberg. Outcome following decompressive craniectomy for malignant swelling due to severe head injury. J Neurosurg. 2006; 104: 469-79*
2. *Bayir H, Kochanek PM, Clark RS. Traumatic brain injury in infants and children: mechanisms of secondary damage and treatment in the intensive care unit. Crit Care Clin. 2003; 19:529- 49*
3. *Brown MM. Surgical decompression of patients with large middle cerebral artery infarcts is effective: not proven. Stroke 2003; 34:2305-6*
4. *Carter BS, Ogilvy CS, Candia GJ, Rosas HD, Buonanno F. One-year outcome after decompressive surgery for massive nondominant hemispheric infarction. Neurosurgery 1997; 40:1168-75*
5. *Chibbaro S, Tacconi L. Role of decompressive craniectomy in the management of severe head injury with refractory cerebral edema and intractable intracranial pressure. Our experience with 48 cases. Surg Neurol. 2007; 68:632-8*
6. *Cushing H: Subtemporal decompressive operations for the intracranial complication associated with bursting fractures of the skull. Ann Surg. 1908; 47:641-44*
7. *Dewitt DS, Jenkins JW, Prough DS. Enhanced vulnerability to secondary ischemic insults after experimental traumatic brain injury. New Horizons 1995; 3:376-83*
8. *Jüttler E, Schwab S, Schmiedek P, Unterberg A, Hennerici M, Woitzik J, Witte S, Jenetzky E, Hacke W; DESTINY Study Group. Decompressive surgery for the treatment of malignant infarction of the middle cerebral artery (DESTINY): a randomized, controlled trial. Stroke 2007; 38:2518-25*
9. *Kalia KK, Yonas H. An aggressive approach to massive middle cerebral artery infarction. Arch Neurol. 1993; 50:1293-7*
10. *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; 105:337-42*
11. *Kilincer C, Asil T, Utku U, Hamamcioglu MK, Turgut N, Hicdonmez T, Simsek O, Ekuklu G, Cobanoglu S. Factors affecting the outcome of decompressive craniectomy for large hemispheric infarctions: a prospective cohort study. Acta Neurochir (Wien) 2005; 147:587-94*
12. *Morley NC, Berge E, Cruz-Flores S, Whittle IR. Surgical decompression for cerebral edema in acute ischaemic stroke. Cochrane Database Syst Rev. 2002;3:CD003435*
13. *Mussack T, Wiedemann E, Hummel T, Biberthaler P, Kanz KG, Mutschler W. Secondary decompression trepanation in progressive post-traumatic brain edema after primary decompressive craniotomy. Unfall chirurg. 2003; 106:815-25*
14. *Schwab S, Steiner T, Aschoff A, Schwarz S, Steiner HH, Jansen O, Hacke W. Early hemicraniectomy in patients with complete middle cerebral artery infarction. Stroke 1998; 29:1888- 93*
15. *Vahedi K, Vicaut E, Mateo J, Kurtz A, Orabi M, Guichard JP, Boutron C, Couvreur G, Rouanet F, Touzé E, Guillon B, Carpentier A, Yelnik A, George B, Payen D, Bousser MG; DECIMAL Investigators. Sequential design, multicentre, randomised, controlled trial of early decompressive craniectomy in malignant middle cerebral artery infarction (DECIMAL TRIAL). Stroke, 2007; 38:2506–17*