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CASE REPORT

A Subcranial Approach for Anterior Skull Base Pathology (Nasal Encephalocele)

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ABSTRACT

A modified subcranial approach based upon the procedure first described by Joram Raveh is a viable alternative to standard craniofacial resection for treating pathology of the anterior skull base. It is basically an extradural approach providing wide exposure to the anterior skull base with minimal brain retraction; thus decreasing significantly the morbidity. We present here two cases of a rare benign pathology of anterior skull base— naso-orbito-ethmoid encephalocele wherein this technique was used successfully.

Keywords: Craniofacial resection, Subcranial approach, Encephalocele.

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INTRODUCTION

Craniofacial approaches have become the procedures of choice for most tumors, trauma, and congenital anomalies involving the anterior cranial base and the orbits, nasal cavity or paranasal sinuses. Traditionally these approaches have been transfrontal transfacial,[1] transfrontal transbasal[2] and extended frontal with orbital osteotomies.[3] However, recent reports continue to document a complication rate of 39 to 50% and a mortality of 3 to 5% with these procedures,[4] prompting some authors to state that they are too morbid for routine use. A subcranial approach pioneered by Raveh[5] involves a low orbitonasal osteotomy and cranialization of the frontal sinus, thus avoiding brain retraction with its consequent complications like frontal lobe injury, seizures, neurological deterioration and infection.

CASE REPORT

A 3-year-old girl presented with nonprogressive swelling over left side of her nose, cosmetic deformity of the mid-face, and increased distance between both eyes since birth (Fig. 1). She had no complaint of nasal obstruction or any kind of nasal discharge or epistaxis. There were no complaints with regard to vision. On examination, she had a 3 × 3 cm nonpulsatile swelling near the left side of the nasal bridge and left medial canthus with underlying palpable bony defect. Ophthalmological examination revealed hypertelorism with increased intercanthal distance and an absent skin fold over the medial canthus. She had no associated squint or any visual problems. She was investigated with MRI (Fig. 2) that showed a defect in the left anterior cranial base involving the crista galli, through which herniated brain could be seen extending into the soft tissue in the area of left medial canthus. Posterior extent of the defect was upto the anterior edge of cribriform plate and hence there was no herniation of neural tissue intranasally. The second case was a 5-year-old girl with similar findings but on the right side (Fig. 3).

Both cases were scheduled for a single stage surgery for repair of dural and anterior cranial base defects. A bicoronal skin incision was marked to gain wide exposure. A scalp flap was raised and at the same time, a pericranial graft was also harvested to repair the dural defect (Fig. 4). The scalp was reflected to expose frontal bone, both supraorbital rims, and the nasal bridge with bony defect. The frontal sinus was not developed; as expected in pediatric cases and did not pose much of a problem in performing the craniotomy. A frontal craniotomy on the involved side (with high speed electric drill) was performed. The frontal bone flap after a low orbitonasal osteotomy was elevated, leaving the midline piece of frontal bone attached to the superficial soft tissue in the midline thus avoiding possible sequestrum formation in the later postoperative period. A satisfactory extradural exposure all around the herniating gliotic brain was thus achieved. Redundant brain tissue was reduced extradurally and the margins were freed all around the bony defect. A pedicled pericranial graft was put in deeply from above in an underlay fashion around the bony defect to reconstruct the anterior cranial fossa floor. The medial canthus was repositioned with prolene 3-0 stay sutures. After achieving hemostasis, the incision was closed in layers. Postoperatively, both patients recovered uneventfully (Fig. 5). There was no cerebrospinal fluid leak in the postoperative period.

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DISCUSSION

Traditionally pathology of the anterior skull base was dealt with a transfrontal approach usually combined with a transfacial approach. These reports described a significant incidence of CSF fistula, and infection compounded with the sequalae of a facial scar.[1] This led to the further development of the transfrontal transbasal approach which is usually ascribed to Derome.[2,11] Experience with this approach led to the elimination of facial incisions in many cases. Addition of orbital osteotomies to the transfrontal approach facilitated exposure of the skull base. These orbitofrontal operations have been given various names including the extended frontal approach, the extensive transbasal approach and the telecanthal approach.[3]

The subcranial approach was pioneered by Raveh.[5] The subcranial approach differs from these other orbitocranial approaches by including more of the nasal bones in the orbitonasal osteotomy and cranialization of the frontal sinus to have a wide exposure of the anterior skull base.

The complication rate for craniofacial resections has fallen steadily in the 35 years since Ketcham's report in 1963.[1] In one review of recent series, the overall complication rate was estimated at 39 to 50% and the mortality rate at 3 to 5%.[4] In looking at recent reports.

Sekhar et al[6] reported 19 complications in 49 (39%) patients undergoing an extended frontal approach, although most of these patients had additional procedures as well. Deschler et al[7] reported an overall complication rate of 40% in 52 patients undergoing combined transcranial and transfacial approaches, with 10 infections and 3 brain injuries secondary to retraction.

It is important to emphasize that the subcranial approach, with its aggressive removal of nasal bone and frontal sinus floor and posterior wall, is performed without the use of

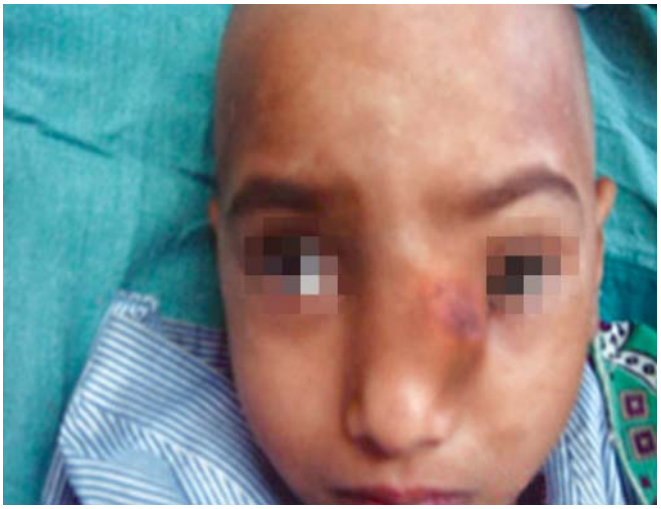

Fig. 1: Clinical photograph of patient 1 with left naso-orbitofrontal encephalocele

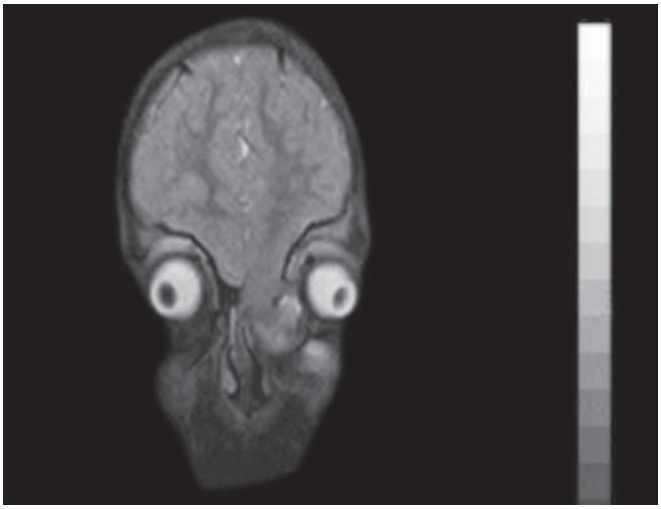

Fig. 2: MRI of patient 1

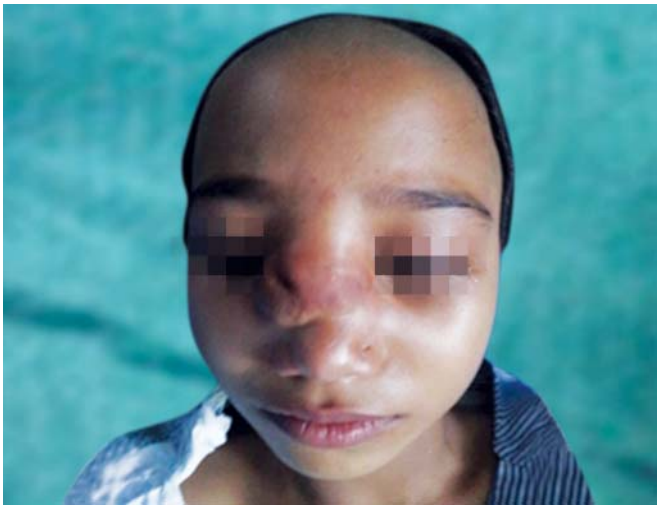

Fig. 3: Clinical photograph of patient 2 with right naso-orbitofrontal encephalocele

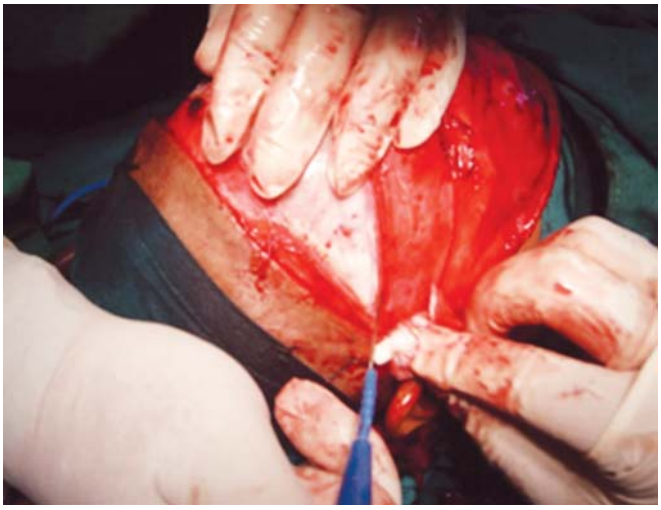

Fig. 4: Intraoperative photograph with blue arrow pointing to galeal flap being harvested and white arrow pointing to scalp flap already raised and everted

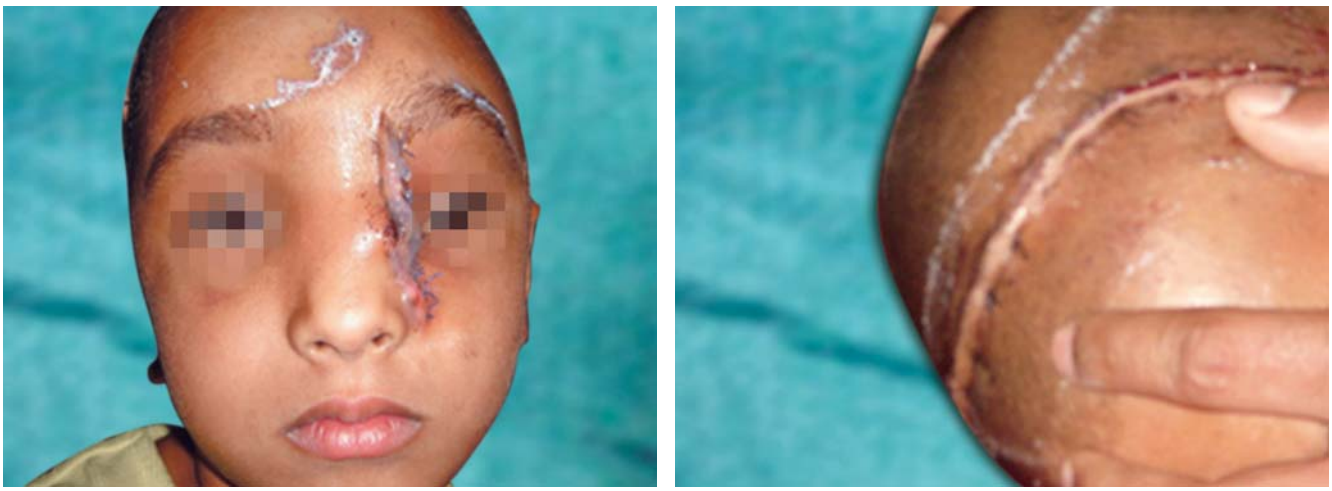

Fig. 5: Postoperative clinical photograph

brain retraction when there is no intradural pathology, thereby minimizing the risk of parenchymal injury present in other series.

Encephaloceles occur at a rate of 1 in 5,000 live births. For an unknown reason, 70% of occipital encephaloceles occur in females, whereas anterior encephaloceles are more often seen in males.[8] Anterior encephaloceles (15% of cranial encephaloceles) are generally classified as nasofrontal, nasoethmoidal, or naso-orbital, however, there can be overlap in the type of encephalocele.[9]

Both our cases were a rarity in that it was a naso-orbital type of anterior encephalocele in a girl child contrary to literature review which puts such lesions more common in males and more commonly to be meningoceles. Extracranial pathological findings of interest include herniating brain tissue, facial deformities and fronto-nasal bone morphology. In both our cases there was a fronto-orbito-nasal defect extending posteriorly upto the crista-galli with mild hypertelorism and cosmetic deformity. The aim of surgical treatment is to restore the functional brain tissue in the cranial cavity, perform dural repair, correct bone deficiency and restore esthetic facial appearance safely and successfully in a single stage.[10] Repair of frontonasal encephaloceles in the early childhood period may simplify the required operative procedures, even in the large lesions. In comparison to children, management of frontonasal encephalocele is a difficult and challenging task in adults. As the age advances, the defect enlarges in size (this could be due to continuous pulsations of the brain), and there will be more gliotic brain tissue herniating into the defect and also an increase in the size of frontal sinuses.[10] Our operative approach involved a bifrontal coronal incision and a subcranial approach with reduction of the encephalocele extradurally, to prevent complications, such as meningitis, epidural abscess, cerebrospinal fluid leak, and brain herniation. A watertight and durable closure of the dural defect was achieved by an autologous pericranial graft harvested while reflecting the scalp.

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