

# CRANIO-FACIAL SURGERY: THE NEW FRONTIER IN CORRECTIVE SURGERY "THE STATE OF THE ART"+

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Dr. Mutaz Habal is a well known plastic surgeon practicing in Tampa Bay, Florida. His contributions to cranio-facial surgery are well recognized.

He is a graduate of American University of Beirut, Medical School year 1964. He has had his plastic surgery training at Peter Bent Brigham Hospital, Children Hospital Medical Center and Harvard Medical School. His academic positions held were: Clinical Professor of Surgery, University of Florida, Adjunct Professor of Bio-Engineering & Material Sciences, University of Florida, Curtesy Professor of Human Sciences, University of South Florida.

For centuries children born with major facial deformities and no other functional abnormalities have had their major treatment concentrated on giving a name to their syndromes. Some such patients with normal mental ability reside in retardation institutions mainly because of their deformities, and develop mental deprivation syndromes over the years. The experience during World War II in operating on casualties with major facial disfigurements was the main factor leading pioneers in the field to direct their attention to the children with facial deformities. The complexity of these operative maneuvers made it impossible for such surgery to be practiced in every hospital on the continent. Now a dozen such centers are performing these procedures and providing a rehabilitative program for selected patients. The anatomic problem of hypertelorisms and lack of fusion is remedied by moving the orbits together. The problem of shallow orbits in exorbitism is corrected by moving the orbits forward. We are progressively selecting younger patients for these operative procedures. Patients with acquired disfigurements from tumor resection or trauma are finding better methods of rehabilitation. Our experience in over 60 patients with long-term follow-up is presented. The major complications are related to brain edema. And it is avoided by preventive measures and careful monitoring of the patients during the operative procedure.

For centuries children born with major complex facial deformities without any other functional abnormalities have had their major management focused on giving a name to their clinical problem. Syndrome identification for a group of conglomerate

deformities in the facial region has been the end of the treatment plan for most such problems. Occasionally, soft tissue camouflage operations have been described; the results were temporary and incomplete. The reason for such an approach is based on two factors. The first is that most complex facial deformities are skeletal in origin, and the second is based on the fact that our knowledge of operating on the facial skeleton in the cranio-orbital region was incomplete. Recent advances in that regard here<sup>1</sup> and abroad<sup>2</sup> have promoted a new frontier in pediatric plastic surgery, a new field of cranio-facial surgery has been brought into perspective and new advances are continuously being made. The operative maneuvers that are limited to the upper part of the face and the basal part of the skull are what we refer to as cranio-orbital surgery — when the focus of attention and correction is on and around the orbits.<sup>3,4</sup>

The cranio-orbital operative procedures are complex and time-consuming, so their performance is limited to a few centers in the northern part of our continent.<sup>5</sup> Such centers are also available in Europe and the Far East.

Careful thought is a prerequisite for adequate preoperative planning so that all of the strategies needed for the operative procedure can be studied. To date, such extensive operative procedures are limited only by the basal structures of the skull and the imagination of the operating surgeons.

## CLINICAL MATERIALS

This report is based on the experience of the authors with more than 246 children between the ages of one

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month and 15 years with major deformities in the cranio-orbital region upon whom we operated. These patients were selected out of 800 patients that were evaluated by the Tampa Bay Team. The main criteria of operability of any patient is related to the ability of the patient to be rehabilitated so they can assume their function in society without any derangement. The patients are usually evaluated by a team of experts in their own fields, with particular expertise in clinical problems related to the cranio-orbital region. Such experts on the team help in the initial planning and participate in the evaluation of the results. However, the operative procedures are done by the collaborative efforts of two surgeons at the operating table: the neurosurgeon and the plastic surgeon with particular expertise in the pediatric problems related to their specialties.

The clinical problems seen can be divided into the following categories based on the major anatomical abnormalities seen:

**1) Cranial:** The clinical problem seen in this category of cranio-orbital problems is related to the upper part of the orbit and the cranium. The major problem in this category of patients is related to the disfigurement of the cranium. Reshaping the cranium and upper orbits is done in a combined cranio-orbital fashion. The patients selected had an unusual situation in which a large hydrocephalic head prevented these patients from performing their usual activities. They are bedridden and unable to move from side to side. A staged procedure helped the rehabilitation by reducing the size of the skull of over sixty-three percent of the patients.

**2) Hypertelorism:** The major problem in these patients is a translocation of the orbits and its contents laterally. One or both orbits may be involved. The main aim of any corrective operative procedure in this category is to move the orbits medially, by excising a central core of bone followed by osteotomizing the orbital bones around the oculi. The free orbits are then fixed in the central median location and bone grafts fill the lateral defects.

The patients with hypertelorism should have their deformity corrected early in life as an attempt to help them achieve neurovisual fusion. The optic nerve function of neurovisual transmission can be easily monitored intraoperatively to prevent any inadvertent injury to the nerve. The use of the visually evoked response is a new "on-line" procedure employed during the cranio-orbital corrective procedures.

**3) Exorbitism:** The orbits in such clinical conditions are shallow, thus the oculus is protruberant because there is lack of space in the bony structures of the face. The orbital rims in this situation are moved forward so new space is created in which the oculus can be housed. The lids will then be able to assume their normal physiologic function of protecting the cornea.

**4) Dish face deformities:** In such circumstances, the upper part of the orbits are normal while the lower part is deficient. Treatment involves moving the lower part of the orbit with the facial structures forward. In the majority of these patients the face has to be moved downward and forward in order to achieve a normal facial balance.

**5) Unspecified deformities:** A number of patients that are seen do not fit into any category of the known problems discussed. The treatment plan for these problems is customized, and there is always a new approach for each, based on the innovative abilities of the treating team.

## COMMENTS AND CONCLUSIONS

These operative procedures are done on selected patients; careful planning decreases the risk of any major complications. Such planning includes a three-dimensional study of the skeletal structure of the face by polytomograms and a careful look into the cerebral structures by a computerized axial tomogram. These procedures are done through concealed incisions in the face, an important factor is avoidance of any major deformity due to an external scar which cannot be later corrected.<sup>6</sup> The concealed incisions provide a direct route for the surgeon to "deglove" the skeletal bones completely so he can perform the precision cuts.

The main factor that enhanced our understanding of the region was our knowledge of the fine detailed structures in and around the optic nerve. The restrictive bony structures are an important factor in inhibiting the mobility of the nerve and are the main reasons for the impairment in vision that may ensue in certain circumstances.<sup>7</sup> If such a problem is present, release of the tight periorbitae causes less damage to the nerve. The orbital bone movements cause major changes in the volume, which produces the major functional and cosmetic results needed. The face is the image of the person to the outside world, and any major improvement, no matter how small, enhances the psycho-social status of the patient significantly.

As with any operative procedure, there are major complications and minor complications. Some of the disadvantages can be outweighed by the advantages. This is what makes an operative procedure acceptable to the treating surgical team and to the family or patient.

The major complication differing from others seen with major pediatric procedures is related to cerebral edema. Avoidance of continuous trauma during manipulation of the cerebrum decreases the risk from such a complication. We have not seen any isolated optic nerve damage with these procedures, especially when the major anatomical details of the optic canal are kept in mind.

## PROSPECTS

This new frontier in pediatric neurosurgery and pediatric plastic surgery has opened a new horizon for treating patients with various other related congenital problems and acquired deformities. The 1980s will witness the emergence of the early corrective procedures as a major part of the rehabilitation plan for children with facial problems. The three major areas in the new field of craniofacial surgery that will be making significant advances are:

**1) Craniosynostosis:** Patients born with craniosynostosis are having the cranial and orbital regions corrected as early as possible in childhood. Experience with thirty such children with more than three years follow-up have demonstrated to us that those children have a normal facial growth, and in all probability will grow to be "normal" kids with no problems in their development, and should need no further rehabilitation procedures.

**2) Cranio-orbital trauma:** A similar approach to the above-discussed problem. The difference here is that the fractures are considered uncontrolled osteotomies. The repair that is indicated is early and immediate, with abundant use of bone grafts when indicated. These patients will not have any period of disfigurement and rehabilitation measures will not be necessary.

**3) Cranio-orbital tumors:** Tumors in that region can now be excised and the area reconstructed with bone grafts, primarily so that the children will have no period of disfigurement. The treating physician should not be concerned about any major rehabilitation.

These procedures are now in the stage of early infancy, and we hope we will see more surgeons become interested in major pediatric problems. Early rehabilitation can be achieved by an early cranio-orbital procedure. The future will witness a direct involvement in the pediatric procedures by a team interested in major rehabilitation for the patients in the pediatric age group.

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