# Trigonocephaly treatment

Management has been based upon the subjective clinical impression of presence and severity of trigonocephaly. Craniofacial surgery for trigonocephaly is rarely indicated for signs of raised intracranial pressure or restricted perfusion for patients younger than 18 months [1].

Surgery is performed predominantly for aesthetic and psychosocial considerations. Various techniques have been described for the surgical treatment of trigonocephaly ranging from simple suturectomy to calvarial bone remodeling, minimally invasive procedures to distraction osteogenesis [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13].

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Endoscopic approaches for craniosynostosis are a growing field in pediatric neurosurgery. In metopic synostosis, previous reports for complete fronto-orbital remodeling have proposed an intervention with multiple incisions (bregmatic, tarsal, and preauricular) to open frontonasal and frontoethmoidal synostotic sutures, and orbital roof.

Delgado-Fernández et al. propose a technique to complete all these osteotomies with a unique incision anterior to the bregmatic fontanel under 3D endoscopic vision, and review possible complications, limits, and pitfalls.

Under endoscopic assistance, a complete fronto-orbital remodeling could be completed with a unique incision without mayor drawbacks [14].

Since most functional and cosmetic anomalies benefit from early surgical treatment, over the last few years neurosurgeons have been forced to elaborate less drastic, but nonetheless effective, surgical techniques.

Di Rocco et al., analyze the surgical results obtained in a series of 62 infants with trigonocephaly operated on within their 1st year of life. Patients were subdivided into two groups (group I: 8 patients; group II: 54 patients) according to the specific dysmorphic characteristics of the frontal bone and anterior cranial fossa, and the presence of compensatory deformities affecting the anterior cranial base and temporo-parietal region. All the patients were treated using one of two relatively simple surgical techniques (procedure A: inversion of two hemifrontal bone flaps–48 cases; procedure B: the “shell” operation–14 cases). Both surgical procedures appeared to be effective, allowing adequate functional and cosmetic correction of the cranial deformity. In patients operated on following procedure B surgical time and blood loss were dramatically reduced. Long-term outcomes were satisfactory in all cases, irrespective of the surgical technique used. In the group II patients, however, progressive normalization of the interorbital distance was constantly observed, suggesting a different degree of stenotic involvement at the level of the anterior cranial base in these patients [15]

The shell technique for the correction of trigonocephaly, is associated to a significant reduction in surgical time and intraoperative blood loss as compared to other procedures, while allowing an adequate remodelling of the bifrontal bone by means of multiple radial osteotomies. The technique does not necessitate the creation of a supraorbital bar, as the supraorbital ridges are modified in situ, further reducing the operative blood loss. In spite of reduced surgical time and manipulation, this procedure ensures aesthetic and functional results comparable to more extensive and complex cranial vault reshaping procedures. The main limitation of this technique is related to the surgical timing, as better results are obtained between 3 and 9 months of age, when the skull bone is still ductile to work with, thus allowing it to be remodelled by greenstick fractures. Moreover, in this age group, the cranial defects that result from the enlargement of the frontal bone flap by means of radial cuts and from the anterior displacement of its lateral portions may benefit from the more effective bone regeneration which characterizes younger children as compared to their older counterparts. A small number of cases showing either persistent hypotelorism or temporal depression have been observed in the post-operative period, although these residual deformities probably depend on a more extensive involvement of the cranial base in the synostotic process in these patients than on the procedure itself [16].

Fronto-supraorbital bar advancement in the treatment for trigonocephaly is associated with extensive intraoperative blood loss and compensatory erythrocyte transfusions. Since both are related to the length of surgery, efforts have been focused on optimizing preoperative preparations. The utilization of three-dimensional skull models in surgical planning allows for familiarization with the patient's anatomy, the optimization of osteotomies, the preparation of bone grafts and the selection of fixation plates.

Stereolithography were used in the surgical planning for five patients with nonsyndromic trigonocephaly treated in Wilhelmina Children's Hospital in 2012. A comparison group was composed of six patients with nonsyndromic trigonocephaly treated by the same surgical team. Once all patients had received surgery, a retrospective chart review was performed to identify the volumes of perioperative blood loss and erythrocyte transfusions and the length of the procedure. Furthermore, the educational value of the models was assessed in a round table discussion with the surgical team and residents.

In the model group patients were transfused a mean 24 ml/kg (27% of Estimated Blood Volume [EBV]) compared to 16 ml/kg (18% of EBV) in the comparison group (P = 0.359) for a mean perioperative blood loss of 53 ml/kg (60% of EBV) in the model group against 40 ml/kg (41% of EBV) in the comparison group (P = 0.792). The mean length of surgery in the model groups was 256 min versus 252 min in the comparison group (P = 0.995). Evaluation of educational purposes demonstrated that the models had a role in the instruction of residents and communication to parents, but did not improve the insight of experienced surgeons.

The usage of stereolithographic skull models in the treatment of nonsyndromic trigonocephaly does not reduce the mean volume of perioperative erythrocyte transfusions, the mean volume of perioperative blood loss nor the mean length of the surgical procedure. Nonetheless, the models do facilitate the education of the patient's parents as well as support the training of residents [17].

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