Face Transplantation Calls For Reverse Craniofacial Planning

As surgical teams gain experience with facial transplantation, a careful approach to planning, based on the principles of craniofacial surgery, can help to maximize patient outcomes in terms of facial form and function, according to an article in *The Journal of Craniofacial Surgery*. The journal, under the editorship of Mutaz B. Habal, MD, is published by Lippincott Williams & Wilkins, a part of Wolters Kluwer Health.

In patients with extensive facial defects, including loss of the normal bone and soft tissue landmarks, a "reverse craniofacial planning" approach can restore normal facial relationships, the report suggests. The lead author was Dr. Edward J. Caterson, a member of the facial transplant team at Brigham and Women's Hospital/Harvard Medical School, Boston. Dr. Caterson and colleagues apply some basic principles of craniofacial surgery to the planning and performance of facial transplants. Although still a rare and relatively new procedure, facial transplantation now offers a reconstructive option for patients with severe facial deficits. Most patients who are candidates for facial transplant have loss of soft tissues only (such as skin, muscle, blood vessels and nerves).

However, some patients also have defects of the underlying facial bones. In these cases, the challenge for the facial transplant team is nothing less than "the complete restoration of the structural anatomy of the craniofacial skeleton," the authors write. Through their experience with reconstructive surgery in patients with severe congenital deformities, craniofacial surgeons have developed an understanding of the "intimate functional relationship" between the facial soft tissue and supporting bone. In the traditional craniofacial procedure, the surgeon carefully plans and designs "bone movements that will translate into a desired change of the attached soft tissues."

But in facial transplantation, the situation is essentially reversed. The degree of injury and the subsequent transplantation of facial soft tissues dictate the "osteosynthesis" of the craniofacial skeleton. Dr. Caterson and colleagues describe a simple but practical technique for surgical planning to promote proper positioning of the facial transplant. The technique applies "normative" data on facial landmarks and relationships and then transposes them onto the recipient.

Understanding the relationships of facial structure allows surgeons to compensate for missing bony or soft tissue landmarks. The authors provide a straightforward approach to establishing a plane of reference, allowing the facial transplant to be positioned in a proper relationship with the skull base and occlusal plane (teeth and lower face).

Optimal positioning of the facial transplant is essential not only to achieve the most normal-appearing result, but also to maximize function—particularly in eating and

breathing. Dr. Caterson and colleagues emphasize that "proper positioning of the hard tissues of the allograft is the fundamental starting point for functional and aesthetic restoration." As long as the bony structure is right, any cosmetic soft tissue problems that remain after surgery are relatively easy to correct.

The authors believe that such craniofacial principles are likely to become an increasingly important consideration—"especially with the trend toward full face transplantation." In early experience, donor selection for face transplantation has focused mainly on immunological factors, similar to those used in organ transplantation.

In the future, transplant teams may become more sophisticated in donor selection—including assessment of the degree of "craniofacial match" between donors and recipients. In the meantime, Dr. Caterson and coauthors conclude, "[C]areful attention to the soft tissue relationships with the skeletal anatomy requires that face transplantation include 'reverse craniofacial planning' to optimize the form and function of the recipient's new face."

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