Introduction

Deformations and malformations: the history of induced and congenital skull deformity

Charles J. Prestigiacomo, M.D., and Mark Krieger, M.D.

Departments of Neurological Surgery, Radiology, and Neurology, University of Southern California, Los Angeles, California

The human skull is amazing in its design. Although it matures into a solid, protective casing for the brain, it begins as a softer, more malleable structure that allows for the enormous growth of the brain in the child’s early years. During this period, there are numerous biological and environmental forces (intentional and unintentional) that can affect the shape of the human skull. This issue of Neurosurgical Focus brings together the internal biological mechanisms that can alter the shape of the skull and the external forces that can do likewise.

External forces that can contribute to deformations of the skull, in its broadest sense, may depict evolutionary trends. Indeed, the skull has been “deforming” for over 500 million years, from the days when the first vertebrates developed a bony encasement for the brain and several important organs that support life such as the special senses and aerodigestive organs. As animals evolve, skulls represent one of the most prominent manifestations of an animal’s phylogenetic development.

Humans are no different. Comparison of specimens of various anthropological morphologies has reflected this relative change in the neurocranial (braincase) component and the viscerocranial (facial) component over the course of human evolution. These changes, for the most part, reflected functional (and assumed survival) advantages. It is not surprising, although fascinating that the development of the brain and its size relative to the organism has had a major impact on the ultimate evolutionary shape of the modern human skull. Interestingly, as humans became more adept at changing their environment, they became adept at changing their own appearance. Whereas evolutionary changes in the skull were associated with functionality (and likely survival advantage), the induced changes are for cosmesis or “communication.”

Intentional deformations of the skull have been practiced since approximately 45,000 BC as noted in the anthropological record. The written records date back to the Hippocratic writings of 400 BC. It is believed that among other reasons, intentional deformation of the skull was a means of denoting social status. Several authors in this issue provide the reader with carefully researched, succinct information about this topic. Ayer et al. begin by describing the implications of skull deformation in ancient Peru and Egypt, and bring it forward to the modern era where skull deformity, though previously suggestive of high stature in certain cultures, may actually be deleterious in modern Western cultures. Romero-Vargas et al. revisit the Mayans and provide excellent insight into a methodology that seemed to change and evolve over time as well as to the significance of such skull deformations. Enchev et al. reveal the many fascinating aspects of proto-Bulgarian culture and the complex role skull deformations had in that culture. Most interestingly, although most believe skull deformity is a thing of the ancients, Dr. Gump presents a very intriguing look at the practices of skull modification through the use of implants and the potential implications for neurosurgeons.

Skull deformations are not necessarily just induced. Neurosurgeons in general and pediatric neurosurgeons in particular are experts in the biological and indeed the environmental forces involved in skull deformity. Pediatric neurosurgeons and our basic science colleagues continue to study and learn about these factors, ranging from hydrocephalus, to the craniosynostoses, to benign positional molding. Mehta et al. provide an excellent overview of the history of the diagnosis and treatment of craniosynostosis. The article authored by Maher et al. presents to us Cushing’s limited but some may say seminal work in deformity surgery of the skull. Manjila et al. provide an excellent historical perspective and modern therapy for Kleeblattschadel deformity, giving the reader a surgical strategy for treatment of this rare disorder. The reader is then invited to consider the future of the treatment of all cranial bone deformities, iatrogenic and otherwise, by looking at future bioactive technology for new implants.

Indeed, this issue of Neurosurgical Focus is unique in many respects. It provides a different look and a newfound respect to that structure through which all of us have had the privilege of entering. Understanding the skull, civilization’s fascination with it and its pathology is what this issue will provide the reader. (DOI: 10.3171/2010.12. FOCUS.Intro)

Reference