

Clinical needs and applications of Biotechnology in Cranio-Maxillofacial Surgery

Adrian Sugar BChD FDSRCSEng FDSRCSEd FDSRCPS MD hc FUWIC

Research representative on AO CMF International Specialty Board

*Consultant Cleft and Maxillofacial Surgeon, Morriston Hospital, Swansea, Wales, UK
Senior Lecturer, University of Wales Swansea School of Medicine*

adrian.sugar@aofoundation.org

Background and Introduction:

Cranio-Maxillofacial (CMF) surgeons are the specialist surgeons who treat the anatomical region of the head and neck. This surgical discipline is truly multi-disciplinary encompassing maxillofacial surgeons per se, oral and maxillofacial surgeons, plastic surgeons, neurosurgeons, ENT surgeons and ophthalmic surgeons.

Managing the hard and soft tissues of the face and cranium places CMF surgeons in a similar regional position to orthopaedic and general trauma surgeons in terms of their treatment of the rest of the skeleton. We have similar problems and similar needs but also 'vive la difference'.

Clinical Needs:

1. Reconstruction of bony and soft-tissue defects of the cranio-maxillofacial skeleton especially:
 - Tumour resection defects
 - Trauma, especially gun shot injuries
 - Deformity – mainly congenital
2. Enhancement of bone growth in children with congenitally hypoplastic tissues especially of the facial skeleton and overlying soft-tissues
3. Improvement in the quality and time of consolidation after distraction osteogenesis by the use of growth factors and other tissue engineering techniques

Applications:

1. Developments in tissue engineering of bone and soft tissue are highly relevant to CMF especially for reconstruction of defects of the jaws and cranium, for example continuity defects of the mandible and cranioplasty defects of the cranium
2. The use of free tissue transfer through microvascular anastomosis remains the state of the art in large defect reconstruction in the head and neck especially after resection of malignant tumours, for example for squamous cell carcinoma of the oral cavity
3. New techniques and others in development of prefabricated flaps supported by tissue engineering could well play a significant role in the future especially in reconstruction of large defects
4. Distraction osteogenesis (DO) which is used mainly in the head and neck for congenital defects in children to allow the process to be speeded up and more stable.
5. DO as transport osteogenesis also has a role to play in reconstruction of continuity defects and similarly would be greatly enhanced if TE techniques could be used to enhance and speed up the process