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Editorial

Tissue engineering

In a quest to identify better substitutes for maxilla–mandibular defects, the surgeons have been trying numerous materials. From synthetic, alloplastic material to naturally occurring chitin based products, each of such materials were projected as the best reconstructive material in different time frames. Nature has proved

that surgeons have overestimated their armamentarium. In late 20th century, autologous bone grafts were the standard surgical protocol for management of critical sized defect including post-neoplastic defects, trauma and congenital deformities. To procure autologous bone graft, a second surgery would be required, often from critical areas.

With arrival of recombinant technology and later decoding of human genome, newer material based on human proteins synthesized using recombinant technology occupied center stage in last decade of 20th century. Studies demonstrated the efficacy of human Bone Morphogenetic Protein (rhBMP-2) in chemotactically attracting monocytes to the area of interest. Then, these attracted cells are induced to differentiate into bone synthesizing precursor cells – Osteoblasts. When these BMPs are placed in sufficiently stable scaffolds, they form bone rapidly to the desired shape and size.¹

With the deciphering of adipocyte stem cell population and their application, use of rhBMP-2 along with isolated adipocyte extract has further increased the strength of these tissue engineering based techniques.² The best outcome of these techniques is that the patient is saved of unnecessary, risky second surgery and prolonged anesthesia. As one's own cells are stimulated to form bone inside the body, issues like allergy, graft rejection or similar reaction is eliminated. Autologous bone grafts would require more than 6 months to consolidate and show initial effects. The tissue engineering/stem cell based reconstruction exhibit the same amount of bone formation as early as 6 weeks. These advantages place tissue engineering and stem technology in forefront of all other standard techniques. Though the safety, efficacy and outcomes of these techniques are still being investigated, the primary results are truly encouraging.³

These technologies also have influenced several spheres of Oral and Maxillofacial Surgery. The atrophic edentulous ridges could be safely augmented for placement of implants. Bone formation in sinus lift procedures could be accelerated. Autologous fat transfer could help in minimizing facial lipodystrophies and syndromes like Parry–Romberg. Addition of BMP in Distraction Osteogenesis has helped to recruit and actively consolidate the newly formed bone faster. This by itself has been intensely studied and object of current research.

Though tissue engineering for craniofacial applications has been advanced globally, only few centers in India are actively pursuing the tissue engineering and adipocytes based therapy for craniofacial application. High cost of these materials impedes widespread use of these materials. But on considering all other inputs like duration of stay and loss of man-power days, these costs are negligible. When widely sought and used, the price of the material also will come down. Integration of basic medical research in such avenues may help in finding more cost effective and better materials. More work needs to be performed in this direction. I call in the research groups to unify their resources to utilize the novel materials and techniques for better reconstruction of facial structures than ever before.

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2212-4268/\$ – see front matter

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<http://dx.doi.org/10.1016/j.jobcr.2013.04.003>