Biomaterials....

The concept of maxillofacial hard tissue regeneration has exhibited tremendous research since the time tissue engineering has been instituted.The availability of such bone constructs has potentially alleviated the need of autografts or allografts for augmenting bone defect healing.

Scaffolds are pivotal in bone or cartilage bioengineering as they provide structural support to the stem cells, act as template to guide new tissue growth, and provide strength to bear load during the healing phase.

The biocompatible scaffold facilitates cell migration, proliferation and differentiation and can be customized to regulate the microenvironment during neo-osteogenesis. The rate of regeneration can also be manipulated by altering the composition, architecture, and properties of different biomaterials, and osteogenesis can be promoted.

In the last few years, several categories of biomaterials, such as natural and artificial polymers, ceramics, and metals, have been developed for bone regeneration. The basic rational behind selection of biomaterial is to mimic the organic-inorganic composition of native bone, and collagen fibrils are reinforced with hydroxyapatite crystallites to form a strong and durable biomaterial.

Several novel biomaterials have been fabricated in various combinations and blends developed by different techniques in order to achieve desired properties and result from the construct.

Polymeric scaffolds are drawing a greater attention due to their distinctive properties viz. high surface-to-volume ratio, high porosity and very small pore size, biodegradation, biocompatibility, versatility of chemistry, and its biological and mechanical properties.

Natural polymers commonly used in scaffolds are proteins (silk, collagen, gelatin, fibrinogen), polysaccharides (dextran, chitin). Synthetic polymers have an advantage of being tailorable, cost effective and ease of storage. Most commonly used synthetic polymers in tissue engineering include PLA, PGA, PCL, PLGA copolymers, and PHA.

Many upcoming studies have been focussed on the use of these biomaterial for scaffolds in maxillofacial region where by applying tissue engineering principles invoving suitable combination of growth factors and cells synthetic bone grafts are being developed and studied *in vivo* and compared with autografts.