blood vessels such as endothelial cells, pericytes and associated cells contribute to pulpal homeostasis along with nerves. Thus, the vascular contribution to regeneration of pulp-dentin complex is immense.

The innervation of pulp plays a critical role in the homeostasis of the dental pulp. Invasion of immune and inflammatory cells into sites of injury in the pulp is stimulated by sensory nerves.

Growth factors like bone morphogenic protein and vascular endothelial growth factor have shown encouraging results in the nervous regeneration and angiogenesis. The increasing interest in tissue engineering of tooth must take in account neuro-pulpal interactions and nerve regenerations.

The challenges include altered threshold to pain and also questions the response to injury. The anatomy of bioengineered tooth crowns closely resembles that of naturally formed tooth crowns; however the bioengineered tooth root structures are relatively undeveloped.

The presence of Hertwig's epithelial root sheath structures in bioengineered teeth, rudimentary tooth root structures that precede the formation of mineralized tooth root tissues suggests that although root development is initiated it does not continue to develop into functional tooth root containing cementum, periodontal ligament and alveolar bone, as found in naturally formed teeth.

Edwards PC and Mason JM outlined the pitfalls in the current tissue regenerative procedures by questioning the factors required for regulating the pulp dentin complex. They said that in vivo gene therapy techniques will only be effective for dentin regeneration/pulp capping situations in which some viable, uninfected apical pulp tissue containing an adequate number of progenitor stem cells is still present after the excavation of all the infective tissue. In ex vivo approaches, growth factor enhanced cells are transplanted onto the tooth require a source of oxygen and nutrients to sustain viability. Therefore, the local environment requires the ability to develop a vascular bed; either from remaining elements of dental pulp or in the presence of a patent apical foramen. The ability of implanted cells to survive in animal model of dental pulp exposure needs to be observed and discovered.

The researchers were faced with numerous challenges and setbacks before they could taste success. There are various important milestones on the road to a successfully tissue engineered tooth we have today.

Baum BJ and Mooney DJ provided an insight to the general review of the principles underlying key tissue engineering strategies as well as typical components used. This encouraged the various researchers/scientists to further continue the search on the prospects of tooth engineering. Hence, started a series of major preclinical and clinical accomplishments, which play an important role in today's achievement.

Guided tissue regeneration which was used to regenerate periodontal supporting structures and as a material barrier to create a protected compartment for selective would healing is one of the earliest example of successful tissue regeneration in dentistry. Also a passive approach as artificial implants was established in the late 20th century as a foundation of higher reaching goals for regenerating natural teeth as implants.

Although efforts are still going on for the engineering and transplantation of full organs. Tooth engineering seems to be the pioneer in the successful proof of possibility of such ambitions

Tissue engineering has already being applied on the repair of periodontal defects, endodontic and periodontic lesion repairs and certain fractures.

Gene therapy, which was used to develop artificial salivary glands by Baum BJ and Mooney DJis one such success story.

Numerous researchers/scientistshave been done to provide patients with successful bone grafts and periodontal repairs. Today implants, bone grafts, guided tissue regeneration for periodontic lesions and other periodontic and gingival lesions are being treated with gene therapies and regenerated tissue techniques. Focusing solely on the endodontic aspects of tissue regeneration the following studies are the jewels on the crown of successfully bioengineered teeth.

An important aspect of tissue engineering was the establishment of blood supply to the implanted pulp.

This is a story which does not yet have an ending. What remains remarkable about this story is that there is no single author: all efforts to date have been written by a team of investigators cross-fertilizing each other with newly won techniques and technologies that will push the process forward.

New technology has continually has had a major impact on dental practice, from the development of high speed hand pieces to modern restorative materials. Tissue engineering in the broadest sense unquestionably will affect dental practice significantly within the next 25 years The impact of tissue engineering likely will be most significant with mineralized tissues, already the focus of substantial research efforts.

The application of tissue engineering approaches in regenerative medicine and dentistry is an area of increasing interest and activityInitially it is likely that gene transfer approaches will not be used for any routine care, but rather for patients whose conditions are refractory to more conventional treatments. Soon we will be able to diagnose and treat pathologies affecting teeth whether they arise from genetic or environmental factors, injury or disease.

Several developmental issues have been described to accomplish endodontic regeneration. Each one of the regenerative technique has advantages and disadvantages, and some of the techniques are still hypothetical or are at an early stage of developmental.

The proposed therapies involving stem cells, growth factors and tissue engineering all require pulp revascularization in itself is an enormous challenge. The future development of regenerative endodontic procedures will require a comprehensive research programs directed at all the difficulties and their application to our patients. The unleashed potential of Endodontics may benefit millions of patients each year.

The field of tissue engineering certainly faces more questions than answers, presently the question being: can we do it in a way that is predictable, clinically feasible and practical?

Stem cell research and scaffolding are now the buzz words in the basic science pulp researches. The endodontic community needs to thus enhance its clinical understanding of the vital pulp and dentin and embrace new treatment modalities.

Several regenerative techniques have been described, proposed therapies involving stem cells, growth factors and scaffolds. Each technique has its own advantages, disadvantages, some techniques still in a hypothetical stage or in an early stage of development. The regenerative therapies will revolutionize the future endodontics with the synergitic confluence of advances in signaling pathways underlying morphogenesis and lineage stem/ progenitor cells by morphogens such as BMPs and synthetic scaffolds.

In addition to providing benefits to people who need new teeth, these researches also offer significant advantages for testing the concept of organ replacement: teeth are easily accessible, and can serve as a crucial test for of the feasibility of different tissue engineering techniques.

As we enter an exciting and a promising new era where the diverse fields of tissue engineering, material science, nanotechnology and stem cell biology have converged synergistically to provide unprecedented opportunities to characterize and manipulate signaling cascades regulating tissue and organ regeneration.

Interest in dental tissue-regeneration applications continues to increase as clinically relevant methods for the generation of bioengineered dental tissues, and whole teeth, continue to improve. Although obvious practical obstacles remain to be overcome before routine clinical treatments become commonly available, dental tissue regeneration research efforts provide an example of how advances in basic research can be translated into clinically relevant dental therapies.

Tissue engineering offers exciting opportunities for innovative collaborative research efforts, integrating the fields of medicine, developmental biology, and physical sciences. Clearly, the future application of regenerative and tissue-engineering techniques to dentistry is one of immense potential, capable of meeting a variety of patient needs. High-quality basic dental research is paramount to ensuring that the development of novel clinical treatments is supported by robust mechanistic data and that such approaches are effective. These efforts reveal how successful innovations in the field of dentistry can be guided by advances in basic research, highlighting the need for close partnerships between basic research and clinical scientists.