

# Evaluation of Dental Implants using Finite Element Analysis

## Overview

EinNel Technologies was established in 2010 with its Technology and Innovation Centre located in Chennai, India comprising 50 employees working with several leading OEMs and Technical centers. Our company is specialized in diverse engineering domains like Mechanical, Aeronautical, Thermal, Material Science, Chemical, Bioscience, Computer Science and Information Technology. We, as a group of technical and creative developers prioritize integrity in our business relations. We strive to be excellent communicators, creative thinkers and solution pioneers in the field of Computer Aided Engineering and Information Technology. Teamwork undergirds EinNel Technologies and we bring in the latest technology into operation.

EinNel started a dynamic domain called Bioscience where enormous innovative R&D processes are going on. Our company's vision in this bio-field is that it should serve humankind for a good life expectancy. Therefore we ideate a happier healthy society integrating with hospitals and medical companies providing support in medical imaging, medical equipment validation, diagnostics, and patient-specific modeling and validation. We position ourselves higher with the advantage of having multidisciplinary expertise befitting to provide sustainable solutions to our customers.

We provide virtual surgical environment which enables the surgeon to explore the various possibilities that can be applied in surgeries and analyze challenges in in-vitro studies which gives confidence to the surgeon. This step led by our company provides knowledge base to the clinicians based on statistical & experimental challenges they should overcome in a real time surgical environment.

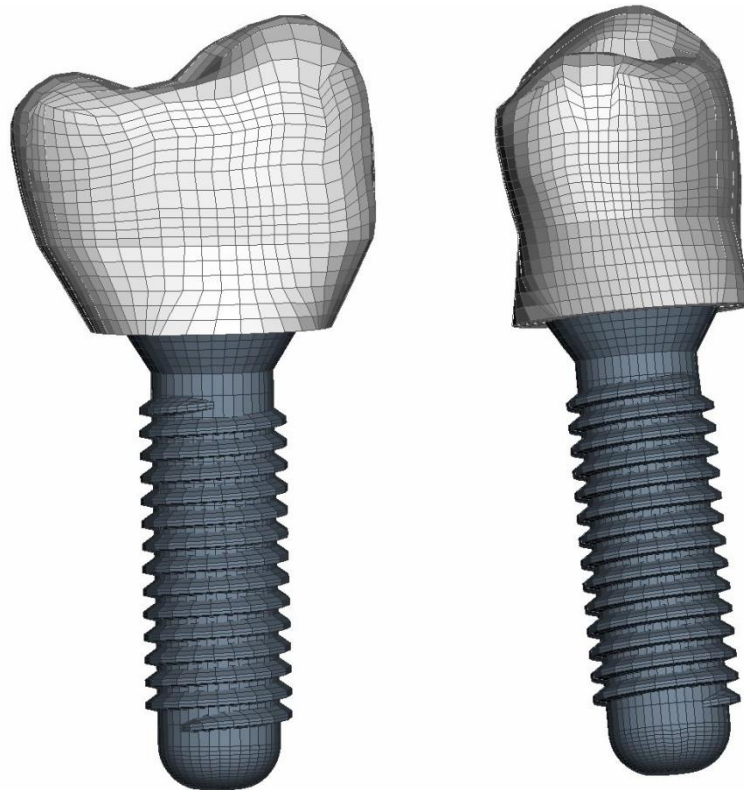
*"Let our efforts in dentistry help spread smiles to a thousand miles"*

## Specific problem

In the current fast growing busy life dental ailments have become a certainty in every common man's life. Almost 5 out of 10 people have dental issues and end up in dental implants in some or the other stage of their life. The most undesirable part of this is the trauma and swelling suffered by the patients post dental implantation. Repetitive treatments on such affected areas are never welcoming by patients. Even expert dentists may not succeed in providing happy smiles even after proper fixation of such artificial tooth. We took up this challenge and initiated an effort in this regard to evaluate dental implant designs for efficient and pain-free fixation.

## Solution

We acquired the dental implant design made of Titanium which had uniform implant diameter with a V-edge screw type and attached artificial patient-specific ceramic tooth. The complex tooth and implant geometry was simplified using numerous individual elements. Appropriate and accurate material properties were assigned to the model accordingly so as to idealize the biocompatibility of the implant. We modeled providing adequate contact properties at the cortical bone-implant interface and cancellous bone-implant interface that allows transmission of stresses from implant to bone. The Equivalent stresses of VonMises were analyzed giving load conditions on the dental implants. Thus we identified the problematic locations of high stress distribution and suggested novel modified implant design that could alleviate the present implant complications.



*Fig.1 Tooth Implant*

## Bottom-line Results

We suggested design modification after evaluating the uniform diameter dental implant design for its stress distribution that had influence on bone. We succeeded in providing precise prediction of dental implant stability using FEA which helped to reduce repetitive clinical experiments.