DESIGN AND STATIC MODEL ANALYSIS OF VARIOUS DENTAL IMPLANTS THREADS USING VARIOUS MATERIALS

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ABSTRACT

enerally implants are inserted the jaw bone under the surgeon and act as an artificial tooth this is called as crown. Artificial tooth is connected to the dental implant in abutments.This crown is designed to fit the patient mouth. Crowns provide the same appearance feel and function as a natural teeth.The choice of materials has a significant impact the stability of implants. Because dental implants are subjected to cyclic loads while eating and excellent fatigue a resistance are necessary.The aim of the project is study various design using the catia software and evaluates the performance of various types of materials cylindrical shape with square thread implant, cylindrical shape with v thread implant, cylindrical shape with knuckle thread impant using the different materials and performed the static and modal anlaysis . Finally observed the von-misses stress, strain, deformation and shear stress in static analysis and in modal anlaysis find out the total deformation at different frequencies and observed the which one is the best material and design after preparing the 3d printing using abs material.

Keywords: Dental implants, V threads , Square threads , Knuckle threads ,3d printing , static and model analysis

INTRODUCTION OF DENTAL IMPLANT

In the biomechanical optimization of dental implants, thread form and geometry are key considerations. Threads are used to increase preliminary contact, improve initial stability, increase implant outer area, and promote interfacial stress dissipation. To increase clinical success, it is necessary to assess the thread design of dental implants.The goal of the implant, according to the invention, is to achieve mechanical properties and stress distribution in bone that are similar to natural tooth attributes. Excessive tension from the implant to the bone can cause injury. As a result, the interface threaded component of the implant must be self-tapping for greater integrity and increased contact surface area for a better bone implant. Many elements have been discovered that influence the interfacial bonding between the implant and the bone, as well as the implant's success.

Figure 1 Components of dental parts

Because modelling a complete mandible is difficult, we employ a portion of the mandible that is considerably easier to model. We will use a cut portion of the mandible for our investigation, as illustrated below. A fragment of the mandible bone is chosen. The geometry of bone has been reduced and simulated as a rectangle, or brick, made up of two layers of bone. The inner bone is a spongy bone (size= 15 X 20 X 15 mm) that occupies the inner space of the outer bone, which is a cortical bone with thicknesses of 2mm.

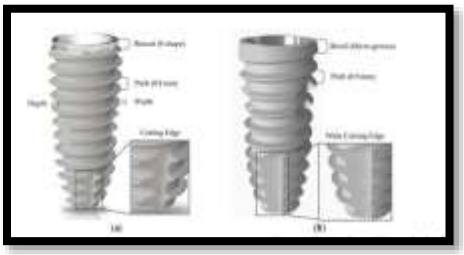

Figure 2 Implant macro design parameters in dental fixtures

CORTICAL BONE AND CANCELLOUS BONE:

Cortical bone and cancellous bone are the

two forms of bone present in the human body. Cancellous bone is a soft, spongy kind of bone that produces stem cells and blood cells. Since of these amazing features, cancellous bone is commonly used for bone grafts because it has more osteoprogenitor cells and so has a stronger ability to create new bone than cortical bone. Although all bone is constantly renewing, due to its intrinsic lack of cellularity, a cortical vs cancellous bone graft is unlikely to be osteogenic or osteo inductive. Cancellous allograft bone chips are frequently used to replace holes in bone and have a variety of medicinal uses, including osteopathy and implant dentistry. When bone can be taken from one place and grafted to another inside the same patient, this is considered the gold standard of bone grafts, including cancellous bone transplants.

APPLICATIONS OF THE DENTAL IMPLANTS

Dental implant treatment is executed to update a missing tooth. Unlike without difficulty removable dentures, dental implants are placed on your jawbone with a chain ofteen surgical procedures.

When people have lacking tooth, it is ordinary for them to experience uncomfortable. With implant remedy, you may regain your self-belief and have a stunning smile. One of the reasons human beings choose implant is because they're a greater everlasting option than prostheses. As lengthy as you take care of dental implants well, they are able to last as long as herbal teeth. Dentures have a life style of approximately five to ten years.

Because they're tailor made to fit your mouth, they may turn out to be uncomfortable as your mouth modifications through the years.

If you want to keep away from detrimental your current tooth, dental implant applications are a good option. People may additionally pick out to have a bridge because in a few instances it's miles less complex than implants. The most apparent implant blessings are:

- Ability to bite and talk effectively
- Restoration of facial aesthetics
- Preservation of the ultimate jaw bone
- Restoration of the natural appearance and feature of tooth
- Increased confidence and self-self-assurance

This organic fusion system is called osseointegration and might help extensive physicalstress for extended periods of time safe and effective manner to update the appearance and characteristic of missing enamel.

CHAPTER 2 LITERATURE REVIEW

1. By building a 3D solid model of an Indigenous titanium dental implant and mandible and applying it to FEA using Ansys, Saluja et colleagues investigated the effect of length and diameter on stress distribution. Stress concentration and distribution are unaffected by implant length. As the diameter of the implant grows, the surface contact area grows, making the implant more stable and minimizing the stress pattern.
2. The influence of different thread types on loading in the implant abutment interface was examined by Arsalanlo et al. To better understand stress distribution, FEA was used to analyses models with changing diameter and length. They discovered that increasing thread depth improves stress distribution while decreasing thread pitch affects implant stability.
3. By modelling three screw type dental implant systems with three fixed screw diameter sizes and subjecting them to a static occlusal force of 100N with 15o for FEA, Zhidong Mao analyzed the influence of abutment and fixed screw on dental implant system. When the abutment and fixed screw are the wrong size, stress builds up.
4. By examining and comparing ten various types of implants, Giuseppe et al investigated the impact of implant design characteristics such as diameter, thread type, and length on the load transmission mechanism of Osseo integration in dental implants (varying length, diameter, thread shape and geometry). He came to the conclusion that design elements in load transfer on implants, such as implant diameter, length, and thread form, have a significant impact.
5. In FEA and experimental research, Ghorpade et al conducted a literature review to examine the influence of design parameters related to the bone–implant interface on stress distribution. The modelling method and implant geometry have an impact on the accuracy of the study.
6. Ausiello et al looked at the impact of implant design parameters on implant longevity. A DOE technique was used to generate different implant

designs automatically and analyses them using FEA. By linking design characteristics, implant stability is influenced by thread width and thickness.

7. Using various dental implant designs, Desai et al assessed stresses in the bone implant interface. Modeling and analysis of eight distinct types of implants with various thread patterns in order to assess stress and strains surrounding the implants.
8. Bahrami et al investigated stress distribution in the interaction between bone implants and dental prostheses. More thread depth can relieve stress in surrounding bone by increasing contact surface area.
9. Szajek et al. present a way for reducing the diameter of a two-component implantologysystem. The hybrid optimization approach was used to optimize a two-component implant model based on FE analysis (genetic and HookeJevees algorithm). The hybrid approach provided here optimized diameter while maintaining defined limits.
10 Mohammed et al investigated stress distribution in dental implants by modelling and analyzing various implant designs with changing length and diameter under 50N tensile, 100N compressive, and 20N bending loads. The load transfer mechanism is affected by implant diameter and length, crestal bone shape, and implantation site.
11. Using 3D finite element analysis, Kong et colleagues assessed the cylinder implant thread height and width. He came to the conclusion that when designing a screw type implant, proper thread height is more significant than thread width for reducing bone stress.
12 Mansour et al used three-dimensional finite element stress analysis to investigate stress distribution around tapered and cylindrical threaded implant designs.
13 Baggi et al looked into how implant diameter and length affected stress distribution. The weight transmission mechanism may be affected by implant shape, geometry, and bone resorption, resulting in failure.

PROJECT OVERVIEW

OBJECTIVE OF THE PROJECT

Stress concentration on the contact surface between the Denture and various Implants, Abutment, and Crown is minimised. Finally, using the catia Ansys programme, design and static modal analysis are performed before selecting the appropriate Prosthetic Implant Material.

SPECIFIC OBJECTIVES:

1. A general assessment of mechanical reliability in terms of stress concentration for dental implants.Using FEM to determine the best material to use.

2. Examining the stress concentration on various geometries of dental implants prostheses. Cylindrical Shape with Square Thread Implant, Cylindrical Shape with V Thread Implant, and Cylindrical Shape with Knuckle Thread Implant
3. Finally, utilizing various materials TiCP2, Ti-6Al-7Nb, TI-6AL-4V, Ni14Ti11, discover stress, total deformation, shear stress in static analysis and Total deformations at different frequencies in modal analysis.
4. Recommending the geometry and appropriate material to use in future implant surgeries.
5.

METHODOLOGY

Step 1: Gathering data and information on different dental implants with abetment and compact bone.
Step 2: Create a fully parametric model of the Artificial different implants in Catia software, including Cylindrical Shape with Square Thread Implant, Cylindrical Shape With V Thread Implant, and Cylindrical Shape With Knuckle Thread Implant.
Step 3: In igs, create a model. ANSYS 16.2 (workbench) was used to calculate stresses, deformation, and shear stress for the following materials: TiCP2, Ti-6Al-7Nb, TI-6AL- 4V, and Ni14Ti11.
Step 4: Using 100N as a boundary condition for eating
Step 5: Finally, we analysed the ANSYS findings and compared geometry with various materials under static and modal analysis.

PROBLEMS OF THE DENTAL IMPLANTS:

A dental implant is a long-term tooth replacement that replaces a missing tooth. The implant is a titanium screw that is inserted into the jawbone by a dentist. The implant and jawbone fuse together over a period of weeks. Once

united, the implant can support aset of artificial teeth or a crown.

Around 3 million people in the United States have dental implants, according to the American Academy of Implant Dentistry (AAID). Dental implants are likewise becomingincreasingly popular. According to the AAID, the number of persons getting them is growing at a rate of roughly 500,000 each year.

This page discusses the capability issues and long-term problems that might arise as a result of DIS. It also includes information on implant success rates, aftercare, and recovery time.

TABLE 1 MATERIAL PROPERTIES

MATERIAL PROPERTIES	DENSITY (g/cm³)	POSSION'S RATIO (μ)	YOUNG'S MODULUS (Gpa)	TENSILE STRENGTH (Mpa)
TiCP2	4260	0.1	410	333.8
Ti-6Al-7Nb	4429	0.31	117	873
TI-6AL-4V	4420	0.30	116	872
Ni4Ti11	4510	0.29	127	814
COMPACT BONE	2100	0.35	30	133
ZrO2	4560	0.33	102	990

INTRODUCTION TO CATIA V5R20

CATIA is pleased to welcome you (Computer Aided Three-Dimensional Interactive Application). As a new client of this product package, you will join a vast number of other customers of this high-quality CAD/CAM/CAE device all around the world. If you're already familiar with previous releases, you can brush up on your planning skills with the significant advancement in this most current release.

DESIGN PROCEDURE IN CATIA:

Catia software was used to construct a 3Dimensional Geometrical Model of a dental implant prosthetics system and denture bone using sketcher, Part design, and Assembly work bench.

IMPLANT DESIGN:

Go to the sketcher workbench, create the half of the cylindrical shape implant 2.15mm height is 13mm after apply the Shaft option 360º in Part Design workbench. Now go to the wire frame and Surface design create the point in apply Helix after go to the sketcher workbench create the profiles square shape, knuckle shape, v shape at end of the helix again go to the rib option in Part design workbench now profile is travel to the path curve with adding the material as shown below figures

.

CROWN DESIGN:

Go to the sketcher workbench select xy plane using spline option Standard Norms Dimensions of tooth is 9.8mmx9.7mm First molar teeth of Mandibular teeth Now go to the part design workbench apply height is 9mm as shown below figures

ABUTMENT DESIGN:

A dental laboratory usually makes custom abutments. The position of the abutment inserted in the implant top side is captured by the restorative dentist, and the crown is placed in the abutment top side, acting as a natural tooth inside part. Create the sectional view dimensions on the sketcher workbench. Apply the shaft as illustrated in the diagrams below.

ASSEMBLY WORK BENCH

All Parts are assembly in assembly workbench using product structure tools and constraints as shown below figures

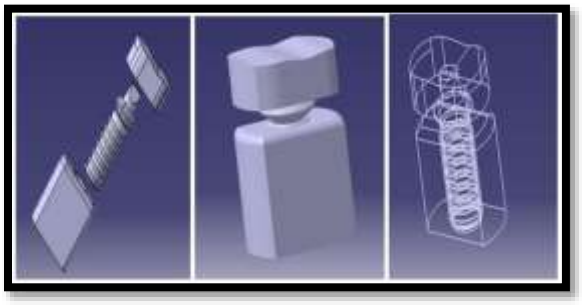

FIGURE 3 CYLINDRICAL SHAPE WITH SQUARE THREAD IMPLANT

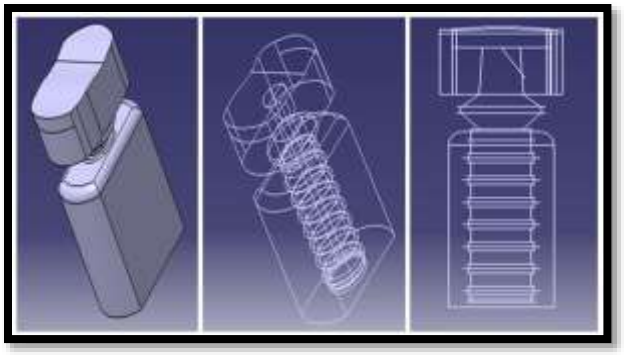

FIGURE 4 CYLINDRICAL SHAPE WITH V THREAD IMPLANT

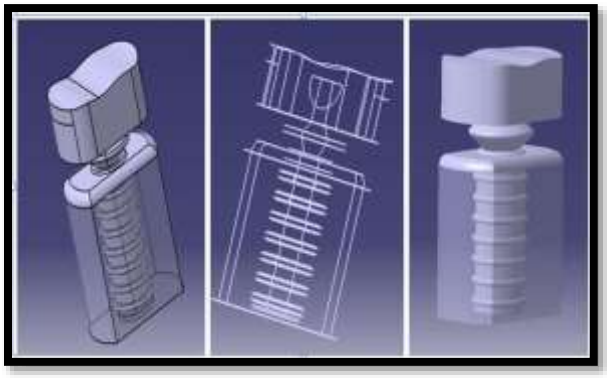

FIGURE 5 CYLINDRICAL SHAPE WITH KNUCKLE THREAD IMPLANT

CHAPTER 5 INTRODUCTION TO ANSYS

ANSYS is a large-scale multipurpose limited component programmed developed and maintained by ANSYS Inc. to investigate a wide range of difficulties encountered in mechanical design.

PROGRAM ORGANIZATION:

The ANSYS programme is divided into two main sections:

- Processor (or Routine) level
- Begin level

The Begin level serves as an entry and exit point for the ANSYS software. It's also used for several global programme controls, such as altering the task name, clearing (focusing out) the data set, and duplicating parallel records. The Begin level is where you start when you first start the software.

A few processors are available at the processor level. Every processor consists of a collection of capabilities that work together to complete a specific inquiry assignment. The overall pre-processor (PREP7), for example, is where you build the model, the solution processor (SOLUTION) is where you apply stacks and receive the arrangement, and the general postprocessor (POST1) is where you evaluate the repercussions of an answer. POST26, an additional postprocessor, allows you to evaluate arrangement results over time at specific points in the model.

PROCEDURE OF STATIC ANALYSIS AND MODAL ANALYSIS :

Open Ansys workbench and apply designing data (material properties), make or import the geometry, apply model(meshing), apply limit conditions(setup), and present the results (stress, deformation, heat transition).

STEPS INVOLVED IN ANSYS

Preprocessor
Solution
Post processor

LOADS AND BOUNDARY CONDITIONS:

Mastication is characterised by a series of impact loads that load the implant components and transfer the force to the bone contact. When using the finite element approach to design dental implants, it's vital to take into account not just the axial load but also the buccal load of 100N at a 30-degree angle, as the latter represents a more realistic masticatory pattern and can produce localised stress in compact bone. Bite force studies revealed a significant difference in bite force from one section of the mouth to the next, as well as from one person to the next.

CYLINDRICAL SHAPE WITH SQUARE THREAD IMPLANT

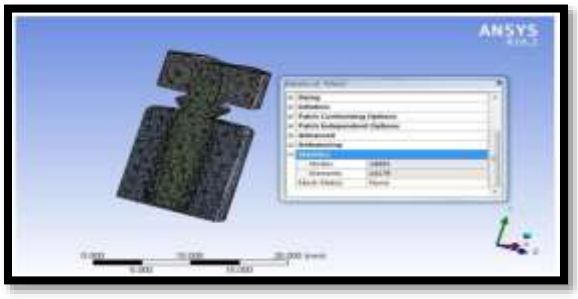

FIGURE 6 MESH :NODES:24601, ELEMENTS 14179

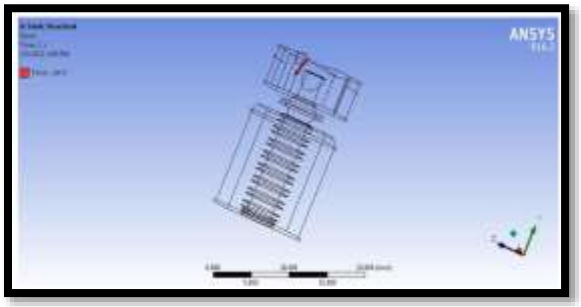

FIGURE 7 FORCE 100 N 30 DEGREES

CHAPTER 6 RESULTS AND DISCUSSIONS

Tooth loss is a common condition in humans, and it can be caused by a variety of diseases and injuries. Dental implants are used to replace lost teeth and give support. Dental implant designs, materials, and methods are all being studied more and more. To improve the long-term benefits of implant treatment, more study needs to be done on better biomaterials, implant design, surface alteration, and fictionalization of surfaces. In this project, various designs such as Cylindrical Shape with Square Thread Implant, Cylindrical Shape with V Thread Implant, Cylindrical Shape with Knuckle Thread Implant were constructed using various materials such as TiCP2, Ti-6Al-7Nb, TI-6AL-4V, Ni14Ti11, and static and modal analysis were performed to determine von- misses stress, strain, shear stress, total deformation, and total deformation at different frequencies were determined.

CYLINDRICAL IMPLANT WITH KNUCKLE THREAD:

Ti-6Al-7Nb Material:

The Model of Denture, Cylindrical Implant with knuckle Thread, Abutment, Crown Design Process using in Catia software and analysis is using Ansys performed the static analysis with Ti-6Al-7Nb Material applied the Bucual force is 100 N with 30º Angle we observed the a) von-misses stress Maximum value obtained 60.015 Mpa and minimum value 0.018482 b) Total deformation obtained maximum value is 0.0075639 and Minimum value is 0 c) Strain obtained 0.00048635 Maximum value and 1.3763e-7 Minimum value d) Shear stress obtained 20.793 Maximum and Minimum Value is -
21.306 as shown below figures.

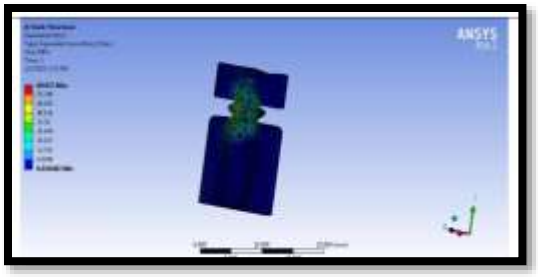

FIGURE 8 Von-misses stress of Ti-6Al-7NbMaterial

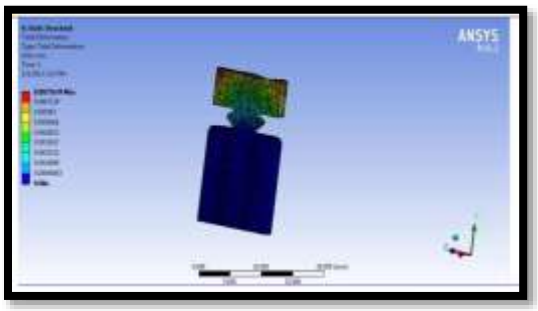

FIGURE 9 Total deformation of Ti-6Al-7NbMateri

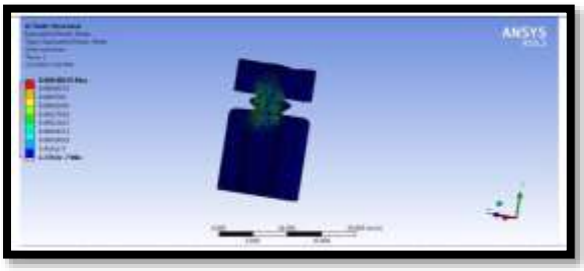

FIGURE 10 Strain of Ti-6Al-7Nb Material

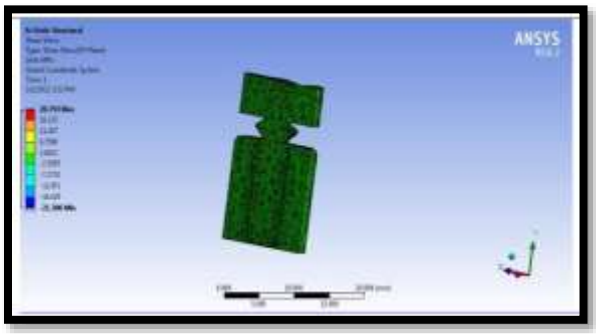

FIGURE 11 Shear stress of Ti-6Al-7NbMaterial

GRAPHS:

VON-MISSES STRESSES OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITH DIFFERENT MATERIALS:

we can observe that in case of equivalent (von-misses) stress, on different designs Cylindrical Shape With Square Thread Implant, Cylindrical Shape With V Thread Implant, Cylindrical Shape With Knuckle Thread Dental implants and made of TiCP2, Ti-6Al-

7Nb, TI-6AL-4V, Ni14Ti11 these materials is found to have least Von-misses stress Cylindrical Implant with square thread is Ti-6Al-7Nb Material 57.55Mpa of Consider the load is 100 N at Buccal Load at 30º Angle in comparison with remaining Design and materials as shown below graph.

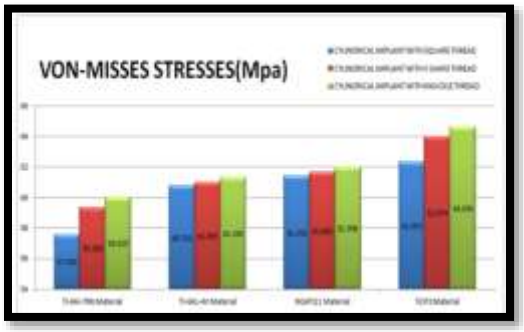

FIGURE 12 **VON-MISSES STRESSES OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITH DIFFERENT MATERIALS**

TOTAL DEFORMATION OF VARIOUS CYLINDRICAL THREADIMPLANTS WITH DIFFERENT MATERIALS:

we can observe that in case of Total deformations, on different designs Cylindrical Shape With Square Thread Implant, Cylindrical Shape With V Thread Implant, Cylindrical Shape With Knuckle Thread Dental implants and made of TiCP2, Ti-6Al-7Nb, TI-6AL- 4V, Ni14Ti11 these materials is found to have least Total deformation Cylindrical Implant with square thread is Ti-6Al-7Nb Material 0.00748mm of Consider the load is 100 N at Buccal Load at 30º Angle in comparison with remaining Design and materials as shown below graph.

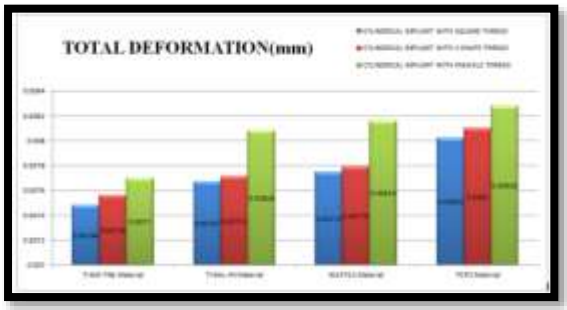

FIGURE 13 ON OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITHDIFFERENT MATERIALS

STRAIN OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITHDIFFERENT MATERIALS:

we can observe that in case of Strain on different designs Cylindrical Shape with Square Thread Implant, Cylindrical Shape with V Thread Implant, Cylindrical Shape with Knuckle Thread Dental implants and made of TiCP2, Ti-6Al-7Nb, TI-6AL-4V, Ni14Ti11 these materials is found to have least Strain Cylindrical Implant with square thread is Ti- 6Al-7Nb Material 0.000421 of Consider the load is 100 N at Buccal Load at 30º Angle in comparison with remaining Design and materials as shown below graph.

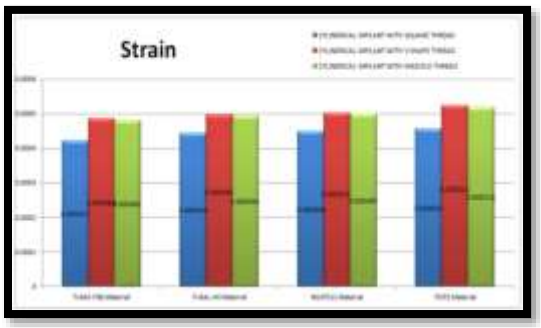

FIGURE 14 STRAIN OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITH DIFFERENT MATERIALS

STRESSES OF VARIOUS CYLINDRICAL THREAD IMPLANTSWITH DIFFERENT MATERIALS:

we can observe that in case of shear stresses, on different designs Cylindrical Shape With Square Thread Implant, Cylindrical Shape With V Thread Implant, Cylindrical Shape With Knuckle Thread Dental implants and made of TiCP2, Ti-6Al-7Nb, TI-6AL-4V, Ni14Ti11 these materials is found to have least shear stresses Cylindrical Implant with square thread is Ti-6Al-7Nb Material 20.512 Mpa of Consider the load is 100 N at Buccal Load at 30º Angle in comparison with remaining Design and materials as shown below graph.

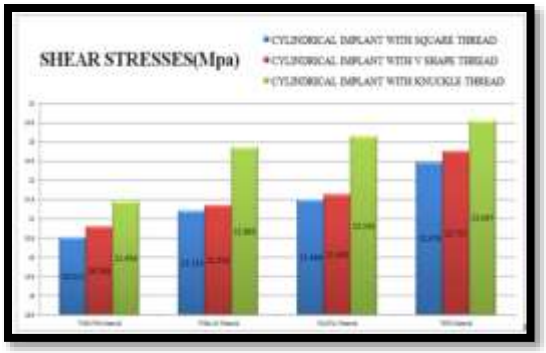

FIGURE 15 STRESSES OF VARIOUS CYLINDRICAL THREAD IMPLANTS WITH DIFFERENT MATERIALS

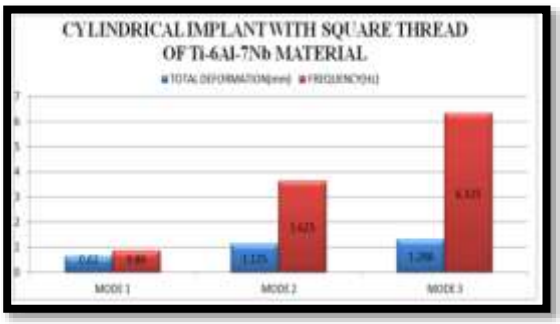

FIGURE 16 CYLINDRICAL IMPLANT WITH SQUARE THREAD OF TI-6AL-7NB MATERIAL

Cylindrical Implant with Square Thread of Ti-6Al-4v Material:

We observed the Graph between different modes and frequencies using cylindricalimplant with square thread using Ti-6Al-4v Material as shown below grap

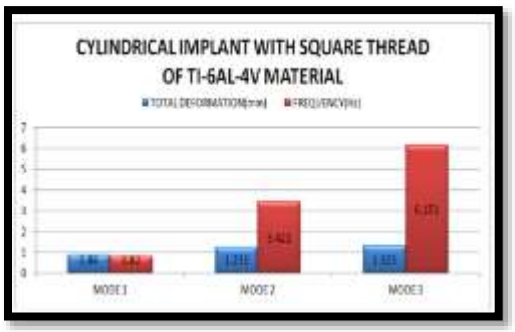

FIGURE 17 Cylindrical Implant with Square Thread of Ti-6Al-4v Material

Cylindrical Implant with V Shape Thread of Ti-6Al-7Nb Material:

We observed the Graph between different modes and frequencies using cylindricalimplant with V shape thread using Ti-6Al-7Nb Material as shown below graph

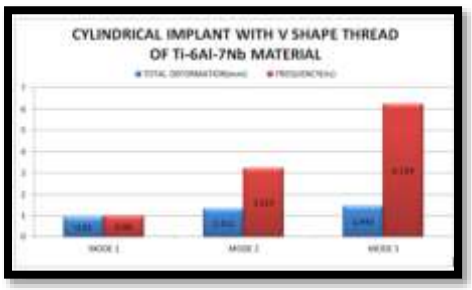

FIGURE 18 Cylindrical Implant with V Shape Thread of Ti-6Al-7Nb Material

Cylindrical Implant with V Shape Thread of Ti-6Al-4v Material:

We observed the Graph between different modes and frequencies using cylindricalimplant with V shape thread using Ti-6Al-4v Material as shown below graph

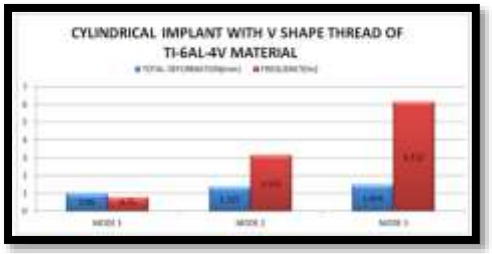

FIGURE 19 Cylindrical Implant with V Shape Thread of Ti-6Al-4v Material

Cylindrical Implant with Knuckle Thread of Ti-6Al-7Nb Material:

We observed the Graph between different modes and frequencies using cylindricalimplant with Knuckle thread using Ti-6Al-7Nb Material as shown below graph

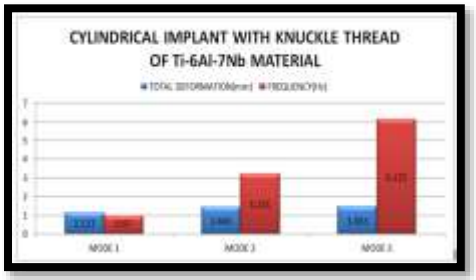

FIGURE 20 Cylindrical Implant with Knuckle Thread of Ti-6Al-7Nb Material

FUSED DEPOSITION MODELING (FDM)

After stereo lithography, fused

deposition modelling is the second most often used process. The filler coil that continuously supplies filament to the nozzle is the plastic filament supply coil. The PLA substance is commonly used as filament. The extrusion nozzle moves in all three directions. A filament supply coil is attached at one end, and a heater is attached at the other. The filament is heated to a semi-molten state bythe heater. A hopper is located at the tip of the nozzle for filtering extrusion. Plastic pellets fed from a hopper, rather than filament, are used in some lower-cost variants of the apparatus. The table is used to support the product that will be manufactured. Because only STL files are readable by the FDM machine, input to the machine is in the.stl file format. After providing input to the FDM machine, it will begin its work. Filament is continuously supplied to the nozzle via the filament drum. After entering the nozzle, the filament heated up to a semi-molten state, allowing it to pass through. The nozzle begins to move in a predetermined pattern, and filament continues to emerge from the nozzle, one layer on top of the other. The femur bone is prepared by stacking a series of slices one on top of the other in a predetermined order. Supporting structure is prepared if suppers are necessary for any portion due to the cantilever shape.

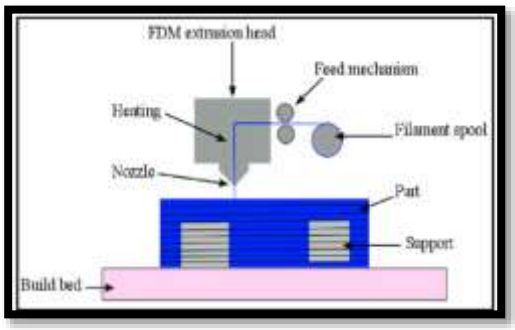

FIGURE 21 FUSED DEPOSITION MODELING

The produced model has a rough surface finish, thus the smoothening option from object modifiers is utilized to achieve a smooth completed model. The final 3D CAD model of the femur with a nice surface quality is displayed in the image below after applying the smoothening option.

GCODE:

FLAVOR: Marlin

TIME:3720

Filament used: 1.67453m

Layer height: 0.2

MINX:77.11

MINY:93.874

MINZ:0.2

MAXX:167.717

MAXY:139.125

MAXZ:8.6

Generated with Cura Steam Engine 4.10.0

M140 S55

M105

M190 S55

M104 S200

M105

M109 S200

M82; absolute extrusion mode

M201 X500.00 Y500.00 Z100.00 E5000.00; Setup machine max acceleration

M203 X500.00 Y500.00 Z10.00 E50.00; Setup machine max federate

M204 P500.00 R1000.00 T500.00; Setup Print/Retract/Travel acceleration

M205 X8.00 Y8.00 Z0.40 E5.00; Setup Jerk

M220 S100; Reset Federated

M221 S100; Reset Flowrate

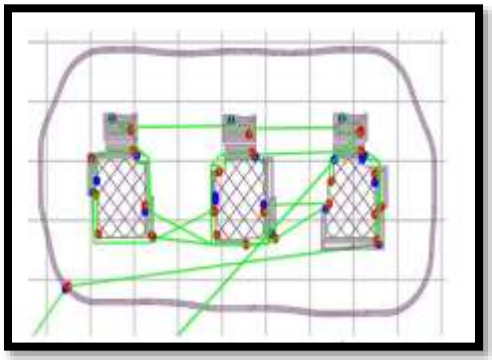

FIGURE 22 3D View in g code analyzer

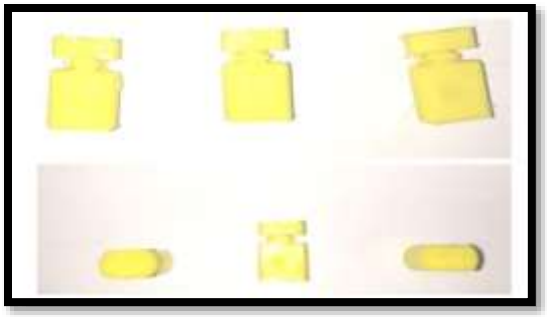

FIGURE 22 3D Printed views of Cylindrical Shape with Square Thread Implant, Cylindrical Shapewith V Thread Implant, Cylindrical Shape with Knuckle Thread Implant

CHAPTER 8 CONCLUSION

Experimental Investigation Of Improvement Capability, Temperature Transfer Individuality Of A Circular Tube Fitted With Twisted Tape Inserts Has Been Studied And Best Twist Ratia H/D Value Of 20 Has Been Selected For The Better Improvement Of Temperature Transfer With Two Different Materials Like Steel And Copper.It Is Observed That After Comparing Experimental Results With Cfd Results With And Without Twisted Tape Inside The Double Pipe Heat Exchanger Of Various Materials It Is Concluded That Heat Exchanger With Twisted Tape Of Twist Angle Is A 180o And Twist Ratio H/D Value 20 With Copper Material Gives Elevated Effective Heat Take Out Rates When Twisted Tapes Inserted Into Annulus Formed Optimum Performance.The Major Goals Of This Research Are To Estimate The Heat Transfer Rate In A Double Pipe Design The Double Pipe Heat Exchanger Using The Catia Software And Analysis Using The Ansys Software Compare The Abnormal Pipe And Non Twisted Tape With Only Water And 0.3% Application Of Water+ Al2o3, Water+ Tio2 Nano Particles Consider Two Different Materials Copper And Steel Heat Exchanger And Compare The Results With And Without Twisted Tape Advance, The Effect Of Twisted Tape Inside The Flow For Extension Heat Transfer And Similarity Of The Achieved Heat Transfer Coefficient With Inserts In Double Pipe Heat Exchanger With And Without Twisted Tape Using Different Materials Steel And Copper, And Is Validated With Numerical Analysis Results. The Heat Exchanger With Annular Twist Tape Of Angle 180° Resulted In Highest Increase In Quantity Over Plain Double Pipe Heat Exchanger And Increased 10.15% Experimentally And 9.8% Numerically. Finally Completed The Twisted Tape With Water And 0.3Tio2 Twisted Tape Is Gives The Best Results And This Is Used By The Further Manufacturing Process In Industrialized Applications

REFERENCES

[1]. Bobin Saluja, MasoodAlam, T Ravindranath, A Mubeen et.al , Effect of length and diameter on stress distribution pattern of INDIDENT dental implants by finite element analysis , Journal of Dental Implants, Vol 2 , Issue 1, PP 19-25, 2012.

[2]. Zeinab Arsalanloo, Reza Telchi, and Kambiz Ghaemi Osgouie, Selection of Optimum Thread Type in Implants to Achieve Optimal Biomechanical Properties by Using 3D Finite Element Method , International Journal of Bioscience, Biochemistry andBioinformatics, Vol. 4, Issue 3, PP 185 – 190,May 2014

[3]. Zhihong Mao, Nanning, Design of dental implant system by FEA, 2014 IEEE Workshop on Electronics, Computer and Applications, 978-1-4799-4565-8, PP 675-677, 2014.

[4]. Giuseppe Vairo and Gianpaolo Sannino, Comparative Evaluation of Osseointegrated Dental Implants Based on Platform - Switching Concept : Influence of Diameter, Length, Thread Shape, and In-Bone Positioning Depth on Stress-Based Performance, Computational and Mathematical Methods in Medicine ,Volume 2013, Article ID 250929,PP 1-15,2013.

[5]. Ratnakar R. Ghorpade , Shailesh S. Yelekar, Computational And Experimental Studies In Threaded Dental Implant Research , e-Journal of Dentistry , Vol 3, Issue 4, PP457 -465 , Oct - Dec 2013

[6]. Pietro Ausiello, Pasquale Franciosa , Massimo Martorelli , David C. Watts, Effects of thread features in osseo-integrated titanium implants using a statisticsbased finite element method ,ELSEVIER, Dental materials , Issue 28,PP 919–927(2012).

[7]. S.R Desai, MS Desai, G Katti, I Karthikeyan, Evaluation Of Design Parameters Of Eight Dental Implant Designs: A Two-Dimensional Finite Element Analysis, NJPC Vol. 15,Issue 2,PP 176-181, 2012

[8]. Babak Bahrami, Farzan Ghalichi, Finite Element Analysis of Stress Distribution in Immediately Loaded Dental Implant, International conference of Biomedical Engineering,Tehran,Iran,21-22 Dec, 2012.

[9]. Krzysztof Szajek, Marcin Wierszycki and Tomasz Łodygowski, Reduction of the tooth-implant components dimensions by optimization procedure, CMM-2011 – Computer Methods in Mechanics, Vol.4, 9–12 May 2011.