

A BRIEF REVIEW:

DIFFERENT POLYMER MATRIX COMPOSITE (PMC'S) USED AS TIBIA IMPLANT MATERIAL OR BIOMATERIALS AND THEIR APPLICATION IN TIBIA IMPLANT

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Abstract

In this review paper /research work the investigation of mechanical properties of zirconium gadalium oxide, ceramic, Hydraxiapatite powder Hybrid and Natural fiber i.e. Sisal Banana Jute Hemp with Mat type or random orientation polymer composite material or with different orientation characterisation is carried out with epoxy resin LY-556 or high density resin and investigate the mechanical properties of these polymer composite and compare with human tibia bone.

Keywords:

Biomaterials, different powders or natural fibers.

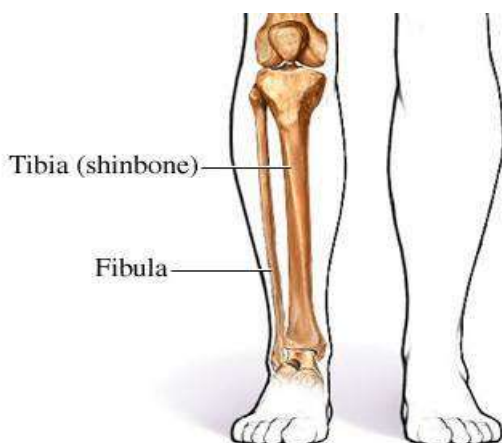
Introduction

A biomaterial is essentially a material that is used and adapted for a medical application. Biomaterials are also used every day in orthopedic applications, dental applications, surgery, and drug 3delivery. While a definition for the term 'biomaterial' has been difficult to formulate, more widely accepted working definitions include: "A biomaterial is any material, natural or man-made, that comprises whole or part of a living structure or biomedical device which performs, augments, or replaces a natural function".

Literature review

M.A.Godse,et.al they found that stress developed in implant model of SS316L was higher than the Ti grade 4 [1]. Mihai Voinescu et al compared the data used to study loads in the skeleton and simulate the behavior of the tibia in a finite element environment[2]. FEA provides the optimized implant design and proper material selection in load bearing implants [3], Andrew Kemper et al Compared the human tibia compact bone (of different age group) material properties compression and axial tension[4] and also General information of polymer composites & their application in different areas. Like, PMCS as Bone Plates, Bone cement, intramedullary nails etc. [5] Dr.Mohammed Haneef,et.al found that Increased in the mechanical and tribiological properties of PMC'S has been observed[6] some investigations of Mechanical properties of ceramic filled(% variation)PMC's are compared[7] General information of polymer composites which are used as implant material and their function and also application over other biomaterials like ceramics and metals[8] Jagadish S P et al, Research is carried out on utilization of Natural fiber reinforced polymer composite materials which are less rigid than metals may be good alternatives because of properties closer to bone mechanical properties[9] and compared the advantageous properties of carbon fiber reinforced polyetheretherketone (CF-PEEK) composites for use as orthopedic implants include similar modulus to bone and ability to withstand prolonged fatigue strain [10]

BRIEF INTRODUCTION ABOUT TIBIA



- ❖ Tibia is also known as the shine bone, is the larger and stronger of the two lower leg bones.
- ❖ The tibia is located in the lower leg medial to the fibula of the foot.
- ❖ Receives the weight of body from femur and transmits to foot.
- ❖ Second to femur in size and weight.
- ❖ The support and movement of the tibia is essential to many activities performed by the legs, including standing, walking, and running, jumping and supporting the body's weight.

ADVANCED POLYMER COMPOSITE /BIOMATERIAL USED AS IMPLANTS

- ❖ Total knee replacement:: polyethylene, carbon fiber and ultra molecular weight polyethylene.
- ❖ Total hip replacement:: carbon fiber-epoxy carbon fiber –Polysulphone, Polyethylene carbon fiber.
- ❖ Finger Joint:: (UHMWP) Ultra High Molecular weight Polyethylene, Polysulphone Etc...
- ❖ Bone Plate and screws - Polyethylene/Hydroxyapatite, carbon fiber/epoxy, Kevlar fiber/polycarbonate etc.
- ❖ Dental Implant- Carbon fiber/ carbon, Silicon carbide(SiC) / carbon.
- ❖ Silicone rubber
- ❖ Dacron
- ❖ Cellulose
- ❖ Poly(methyl methacrylate)
- ❖ Polyurethanes
- ❖ Hydrogels
- ❖ Stainless steel
- ❖ titanium
- ❖ Alumina
- ❖ Hydroxyapatite
- ❖ Collagen (reprocessed).

RESEARCH OBJECTIVES

With all drawbacks of existing materials used for ortho-implants, advanced PMC's are considered in this research work. Detailed Parameters & Mechanical Properties of TIBIA are studied.

1. Carrying out the Characterization & Investigation of mechanical properties PMC'S.
2. Comparing considered PMC's with one of the alloy.
3. Comparing effect of Different Coating materials on Considered PMC's.
4. Using suitable FEM Software, Analysis has to be carry out on different Test,
5. Suitable PMC's are to be developed and checked for the biocompatibility

RESEARCH METHODOLOGY

1. Identifying the existing PMC's which are used as implant
2. Collecting the Technical data's of the TIBIA Bone & its present implant materials.
3. Effect on TIBIA Bone during activities such as Gating, Running, and Jumping
4. Fabrication of PMC's
5. Investigation & Characterization of developed PMC's
6. Mechanical Testing Such as Tensile, Compression, DWIT (3/4Point Bending), Fatigue, Creep.
7. Microstructure Study. COATING, CORROSION, XRD, SEM
8. Biocompatibility test.
9. FE analysis .

Applications

Joint replacements,• Bone plates, Bone cement, Artificial ligaments and tendons, Dental implants for tooth fixation, Blood vessel prostheses, Heart valves, Skin repair devices, Cochlear replacements, Contact lenses, Catheters, tubing, Vascular grafts, Dialysis membrane, Intraocular lenses, bone cement, catheters, Pacemaker leads, Ophthalmological devices, Drug delivery, orthopedic devices, stents.

Conclusion

A biomaterial is essentially a material that is used and adopted for a medical application. Also Experimental investigations are carried out for different Biomaterials and conclude the results and compare with tibia bone finally economical material will be produced for the medical field.

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