Personalization of Medical Implants: Design, Simulate and 3D Print of Patient Specific Knee Implant for Total Knee Replacement.

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Total knee replacement is the most effective treatment to relief pain and restore normal function in a diseased knee joint. The aim of this research was to develop a patient-specific knee implant which can be fabricated using 3D Printing also called as additive manufacturing techniques. 3D printing is an emerging technology and its use in orthopaedics is slowly gaining acceptance. This technique makes it easy to manufacture patient specific devices/guides and instrumentation of any shape and size.

The patient-specific technology improves on conventional of the shelf process by allowing to consider each patients anatomical structure, shape and size. In this study patient specific knee implant design , simulation and 3D print is discussed. In particular we want to highlight the role of computer simulations in testing and optimising patient specific device.

Patient knee CT scan data was modeled in ImageSim software and 3D model was generated. This model was used as the base model to capture the outer shape of distal femur and proximal tibia. Full set of J curves of condyles were captured and then exported. These set of J curves along with other landmarks were imported in Solidworks and full implant for femur , tibia components and insert were designed.

A detailed total knee-joint FE model was created in order to predict stress and strain at various flexion angles. Results from these simulations highlighted some initial stress riser sites especially in femur component. The design was accordingly changed and simulations were run again to make sure that design changes were correctly done. Finally, the patient-specific knee implant was successfully built using additive manufacturing techniques

I. Biography: Biography:

Ash Harkara is a founder director of VOLMO LTD. Ash completed his PhD from University Pune and Postdoctoral Studies from school of EE, University of Leeds, UK. Ash has twenty years of experience in industry and academics . He has written number of papers in reputed journals and also presented papers in number of international conferences. Since last ten years Ash has been working in medical image processing and patient specific implants .

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