CT DATA - VISUALIZATION, SIMULATION AND PHYSICAL MODEL PREPARATION

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CT scan has become an important investigation to evaluate the anatomy and anatomical pathology in oral and maxillofacial surgery. The latest generation of CT technology has improved in speed and accuracy. The modern spiral and 64 slice cardiac CT's are able to reproduce fast and accurate images with very low radiation effect to the patient. 3D picture and panoramic view is possible by reformatting the CT data. These data are presented in a compact disc in DICOM format (Digital imaging and communication in medicine).Though the technology has immensely improved, it can produce only pictures which can only be viewed and further manipulation for simulation is not possible.
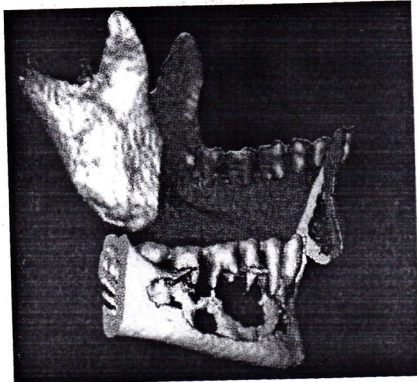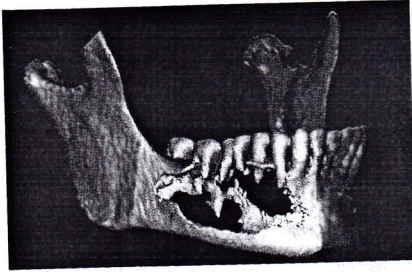
The advancement in CADCAM technology has opened a new avenue in MEDCAT.The CT data imported in to software can produce a virtual object which can be manipulated for further evaluation.

There are many soft wares, open source and free then commercial soft wares are also available. When a sequential CT images imported in to software, the region and structure of interest, bone or soft tissue can be reconstructed in to virtual object by thresholding technique. Further the object can be exported or saved in suitable format STL (Standard triangulation language) a common CAD format. This can be imported in to a RP (Rapid prototyping) machine to produce a physical model.

VISUALIZATION
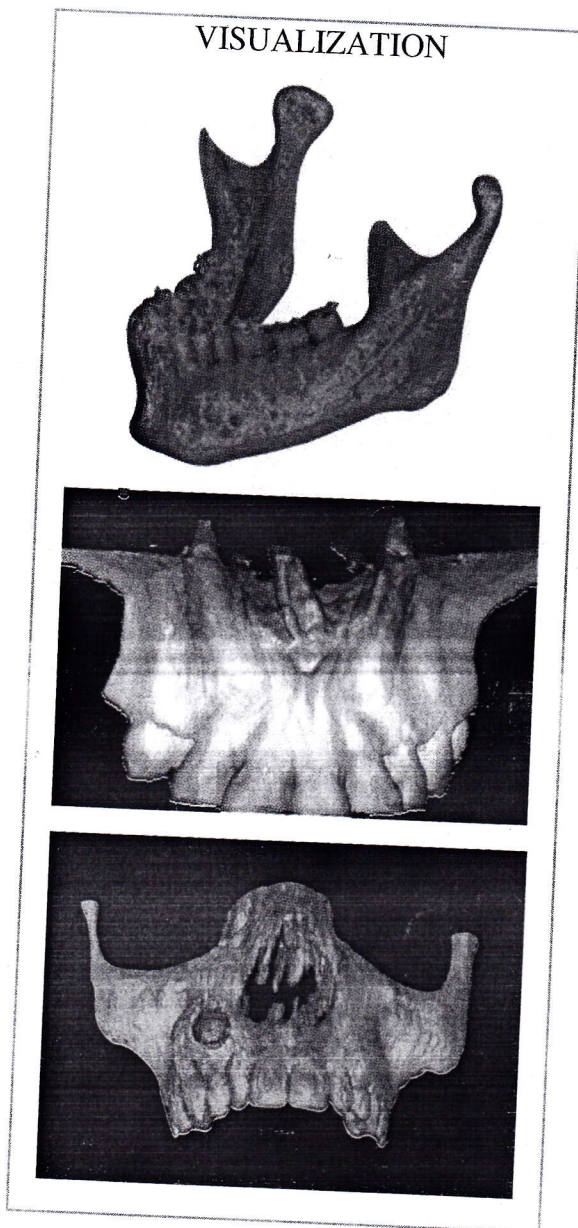
This software is capable of visualizing the desire structure in different axis, bone density can be measured, distance between two land marks can be measured in the 3D object and compared with 2D slice images in all axes and if a physical model is prepared, the measurement. Can be compared in the model also .
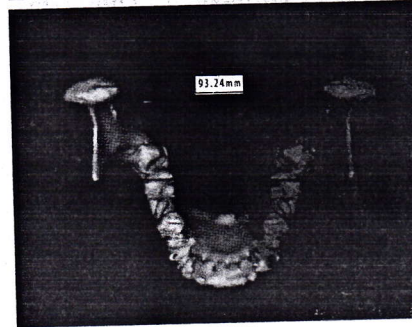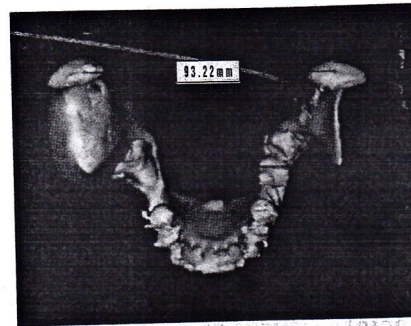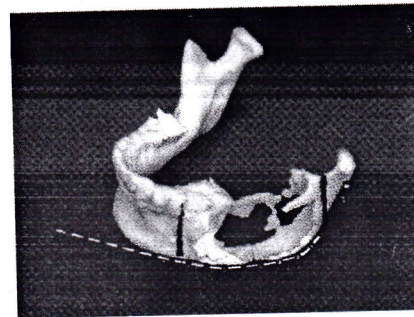
SIMULATION

RAPID PROTOTYPE MODELS

CUTTING- The 3D object cab be cut in to different parts according to the anatomy e.g.maxilla, mandible, zygoma etc.Surgical resection (cutting) can be simulated for an existing pathology.

REPOSITIONING- With the repositioning option, the cut or separated anatomical regions can be moved to desired positions with predetermined measurements and angulations in all axes to predict and evaluate the possibilities and feasibilities of surgical techniques and osteotomies.

MIRRORING- This option enables any part of a structure to be mirrored; i.e a left side structure (ramus of the mandible) can be mirrored and changed in to right side. So in case of reconstruction, the normal side corresponding to the defective side can be mirrored to produce an exact prosthesis for the defect.

CONCLUSION- CT scans and MRI imaging not only are inevitable for understanding and diagnosing a pathology, they are also basic source for further advanced manipulation, simulation and prosthesis production. Advancement in CAD technology and the availability of medical based CAD Soft wares has opened avenues for virtual simulation, navigational surgery, physical model production, and custom prosthesis manufacturing.