

## **CBCT single scan with intraorally placed radiopaque complete denture: A new approach in computer designing of patient specific subperiosteal implants**

### **Background**

Maxillary alveolar ridge atrophy presents a clinical challenge for successful fabrication and stability of a complete denture. Extreme resorption of the maxillary alveolar ridge usually requires surgical augmentation and insertion of intraosseous implants before dentures can be produced. Augmentation procedures (vertical, horizontal, sinus lift) in such patients are demanding, results are unpredictable and time consuming. To avoid the afore mentioned, prosthodontic treatment on patient specific subperiosteal implants (PSSI) is the method of choice. Before designing PSSI we have to know the position of the bone buttresses where the implant will be fixed to the maxilla and the thickness of soft tissues (gingiva) in order to optimize implant prosthodontic treatment.

### **Aim**

With a CBCT scan of the patient's midface, intraoral soft tissues and the inserted patient's complete denture we obtained a high quality outset for computer assisted design and manufacture of PSSI model.

### **Material and Methods**

To make the denture visible and soft tissues delineated on CBCT scan, additional radiopaque acrylic resin denture was produced with the use of barium sulphate powder. Small radiopaque acrylic resin plates (2 square centimetres) with four different concentrations of barium sulphate (10, 20, 40 and 60 %) were made and their radiopacity visually evaluated using a CBCT scan. The most favourably visualised plate was selected, with the 10% of barium sulphate, which presented our standard barium sulphate concentration in manufacturing acrylic resin denture duplicate for a single CBCT scan.

### **Results**

In the first step a conventional complete denture was fabricated. In the second step a barium sulphate containing complete denture radiopaque duplicate was made. A maxillofacial CBCT single scan of the patient with intra-orally placed radiopaque complete denture duplicate was performed and used for segmentation and PSSI design.

### **Clinical implication**

This approach has advantages over current (dual scan) method, including improved efficiency, faster times, and most importantly accuracy in three dimensional visualisation of the bone, soft tissues, denture and interjaw relationship. Only one CBCT scan is performed. Once the digital model based on CBCT single scan is created, the clinician can design PSSI by determining placement, size, shape, direction of fixation screws for the implant, and attachment elements for the prosthesis. The clinician can also use the model to simulate the outcome of the treatment and to evaluate the potential risks and benefits.