



VIRTUAL ASSESSMENT OF RIB GRAFT POSITION AFTER DISARTICULATION RESECTION

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ABSTRACT

Purpose: Immediate replacement of the mandibular condyle is sometime required when the mandibular condyle is involved in pathology. This study was designed to evaluate virtualY rib position in disarticulation resection after immediate replacement of the condyle using costochondral graft following disarticulation.

Patients and Methods: This study included 11 patients, where costochondral graft was used for immediate condylar replacement following disarticulation. Assessment was conducted immediately postoperatively by radiographic on specialized soft utilize post operative CT.

Results: Eleven patients suffered from benign and locally aggressive lesions of the mandibles were presented in this study, there were no complications in all patients .Radiographic outcome showed normal position of the replaced condyle in the glenoid fossa and virtual assessment using specialized soft ware virtually .

Conclusions: Immediate reconstruction of the condylar unit with costochondral graft is a viable technique combining ease of surgery and a high success rate.virtual assessment help us to identify good rib position or not.

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INTRODUCTION

Defects of the mandible may result from treatment of benign and malignant tumours, congenital abnormalities, trauma, infections, and osteoradionecrosis. Jaw resection following pathological lesions has been reported as the most common cause of mandibular defects requiring reconstruction in Oral and Maxillofacial Surgery.

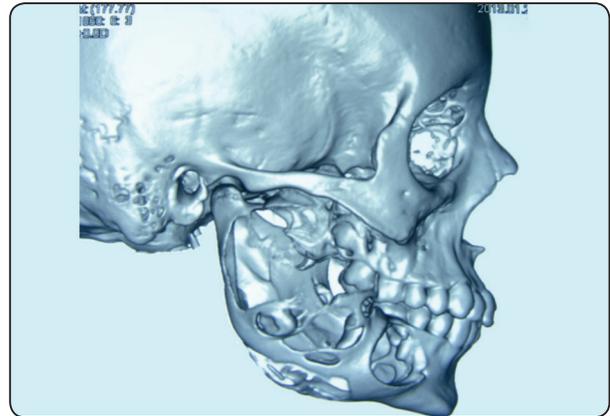
Reconstruction of mandibles after ablative surgery for benign tumours still poses a challenge for the profession. The resulting defects are rather big, but usually would not require composite flaps because the soft tissues are not resected along with the mandible. These defects would best be treated with bone grafts, preferably immediately following the resection. Different techniques of reconstruction of the mandible have been performed with various levels of success.

Disarticulation resection of the mandible results in a complex deformity that has significant potential to affect facial appearance and oral function.

The advent of computer-guided surgical planning based on computed tomography (CT) data and by the aid of rapid prototyping techniques allowed for virtual preoperative planning of different surgical scenarios and post operative follow up.

MATERIAL AND METHODS

Eleven Patients were selected diagnosed with benign tumour approaching to the condyle and free of any systemic disease that would interfere with bone or soft tissue healing. Patients were examined for facial asymmetry, intraoral buccal and lingual expansion, condition of related teeth, the occlusion and maximum mouth opening.



Intraoral incisional biopsy from the lesion was taken to determine the type of the lesion.

Radiographic examination by panorama and multislice CT.

Computer-aided planning was done using specialized software for surgical planning and simulation.

For creation a virtual surgical model. The data of virtual mode transferred to the machine to fabricate computer-guided stereolithographic model from a plastic material using 3D printing machine. The model was used to adapt and pre-contour a titanium reconstruction plate before surgery.

Surgical Technique

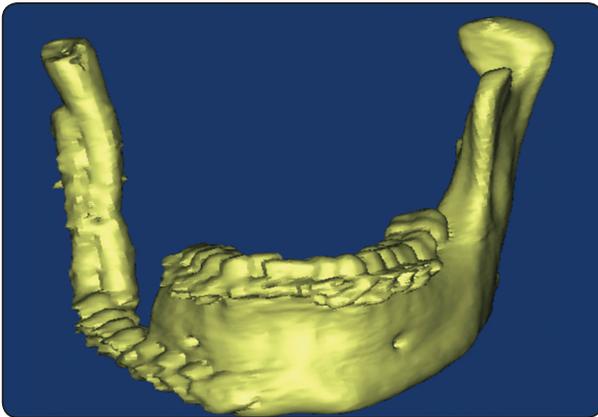
Disarticulation resection of the odontogenic tumor was done under G.A through an extra-oral submandibular incision. A rib graft was harvested and adjusted guided by the stereolithographic model and fixed to the pre-contoured reconstruction plate to be placed in glenoid fossa (hybrid technique), which fixed to remaining stump of the mandible. Patient placed in MMF for two weeks postoperatively.

Post operative clinical and radiographic Follow-up

- Radiographically, all patients were subjected to immediate postoperative digital panoramic radiograph (1:1) and computed tomography (CT) of the mandible to assess position of both the reconstruction plate and costochondral graft.

- Clinically the following parameters will be assessed:
- Extraorally:
- Facial symmetry-facial contour
- Intraorally:
- Occlusion-midline position

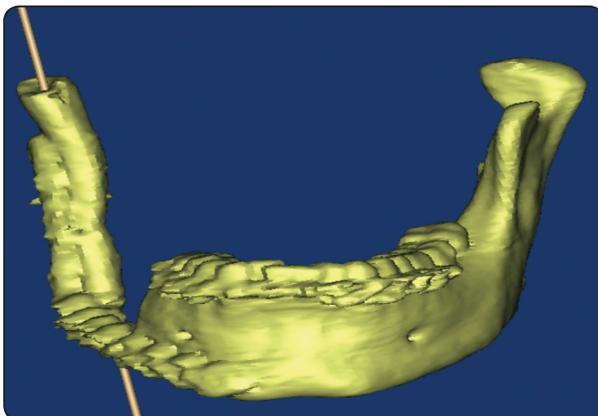
Post operative virtual image of the mandible



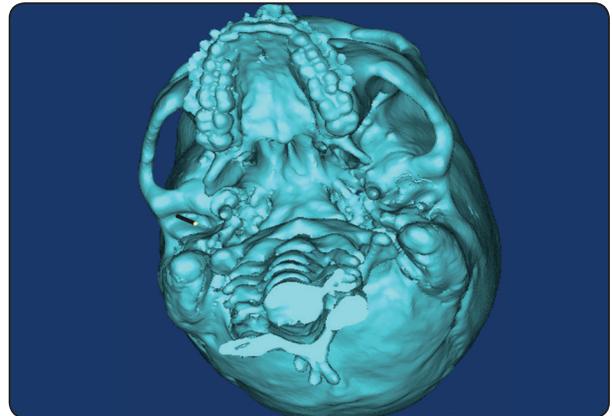
Virtual assessment of rib position :

- Post operative CT images in a DICOM format were imported into the software.
- 3D virtual image of mandible post resection and reconstruction will be created
- A cylinder drew passing in center of the rib along it axis reaching the glenoid fossa determining if the rib centralized inside the fossa or not

The cylinder determining the rib position in the glenoid fossa



A cylinder passing along the axis of the rib



RESULTS

We have operated on a total of eleven patients six males and five female whose ages ranged between 4 & 35.

Intraoperative Findings

- **Stereolithographic Model** had perfect replica of mandible before lesion affection in all cases that enabled accurate and precise guidance of bending reconstruction plate. And adjustment position of rib graft.

The pre-bent reconstruction plates together allowed accurate seating of the rib graft in to its proper place in the glenoid fossa. Standard IMF was enough on the distal segment during plate fixation.

Postoperative Findings

- All patients enjoyed an excellent and repeatable occlusion after and removal of IMF

Virtual verification of rib position

Using the soft ware virtual verification of rib position by drawing cylinder was very helpful to determine if the rib graft centralized in the fossa or not .

In all cases rib position was centralized in the fossa.

DISCUSSION

Disarticulation resections of the mandible are a specific form of segmental resection that is indicated in a variety of pathologic conditions that affect the mandible and contiguous structures.

The superior part of the ramus unit and the condyle are immediately reconstructed with a costochondral graft, while the body and angle region are reconstructed immediately with a reconstruction plate and then secondarily reconstructed with corticocancellous blocks from the iliac crest²².

Non-vascular grafts remain the preferred choice for most maxillofacial surgeons specially when reconstructing defects resulting from resection of benign tumors where enough soft tissue remains to obtain primary closure and where probably the patient did not receive any kind of radiotherapy that would compromise the blood supply of the recipient site.

Virtual verification of rib position was reliable in determine its relation to glenoid fossa.

SUMMARY AND CONCLUSION

The current study was designed to evaluate the role and efficacy of virtual planning in reconstruction of disarticulated Mandibular defects. Eleven patients suffering from benign tumour approaching to the condyle were selected from the outpatient clinic of the Oral and Maxillofacial Surgery department, Faculty of Oral and Dental Medicine, Cairo University.

The clinical parameters were facial symmetry, maximum mouth opening and occlusion, while the radiographic parameters were plate adaptability and rib position in glenoid fossa. Radiographic parameters were assessed on specialized software for surgical planning and simulation using pre operative and post operative CT which transferred to specialized software for virtual assessment.

Clinical parameters showed excellent results in all patients with satisfied facial symmetry for the patients, regain normal mouth opening and occlusion.

The results of this short term follow-up after resection and reconstruction Stereolithographic Model created by computer guided technology was of great help in planning and positioning of rib graft in glenoid fossa.

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