PROSTHODONTIC MANAGEMENT OF RARE ODONTOGENIC TUMOR (PINDBORG TUMOR) WITH IMPLANT RETAINED MANDIBULAR OVERDENTURE

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Abstract

Pindborg tumour or calcifying epithelial odontogenic tumour (CEOT) is a rare, slow-growing benign tumour occurring most frequently in the posterior part of the mandibular arch. Management ranges from simple enucleation to a segmental resection of the mandible. The latter compromises the jaw foundation for any future prosthetic rehabilitation and warrants jaw reconstruction procedures to improve the retention and stability of the prosthesis. Using mini-implants in such compromised situations is a minimally invasive and cost-effective aid compared to conventional implants. The present case report documents the prosthetic rehabilitation of a patient who underwent mandibular resection for a Pindborg tumour using mini-implants.

Keywords: Pindborg Tumour, Mini Implant, Overdenture, Mandibular Resection

Introduction

In 1955, pathologist Jens Jorgen Pindborg was the first to describe Pindborg's tumour-calcifying epithelial odontogenic tumour (CEOT) as a distinct pathologic entity (1). This tumour is a rare benign tumour, representing only about 0.4% to 3% of all odontogenic tumours, and it presents as a painless, slow-growing swelling (2, 3). The histopathological examination suggested that it originated from remnants of the dental lamina and stratum intermedium (4).

Management of CEOTs ranges from simple enucleation to segmental mandible resections (5). Mandibular resection would significantly reduce the surface area and height of the residual alveolar ridge, compromising the retention and stability of the future prosthesis. Several techniques have been developed to improve the mandible's residual alveolar ridge height and width to increase the denture stability and patient satisfaction, such as guided bone generation (6), distraction osteogenesis to increase the ridge height (7), and the use of autogenous bone grafts (8). Dental implants aid denture retention (9), and the patient's preference toward mandibular implant-retained overdenture has significantly increased recently (10).

Standard dental implants necessitate sufficient bone quantity and quality, which are often dramatically reduced after surgical resection treatment of CEOTs patients. The mini-dental implant-retained overdentures show improved satisfaction compared to conventional dentures (11) and considering the high success rate of 94-95% (12, 13), the mini-implant is considered the treatment of choice in limited anatomic regions.

The aim of this report is to describe the prosthetic rehabilitation of a resected mandible that is augmented with a fibula graft using a mini-implant-retained prosthesis.

Case report

A 52-year-old woman complains of difficulty in eating and speaking. She is also concerned with her appearance. She was diagnosed with calcifying epithelial odontogenic tumour (Pindborg tumour) of the right mandible one year ago, extended to the symphysis area. Segmental resection was performed, followed by reconstruction of the mandible using a fibula bone graft.

Upon examination, the mandibular arch is partially dentate with only existing tooth 35. Tooth 35 is not periodontally compromised, non-carious, and not endodontically treated. The edentulous ridge area is covered with adequate keratinised tissue at the left side. The right mandibular residual ridge is severely compromised in terms of clinical height (Figure 1A and 1B). However, the radiographic bone of the mandibular edentulous ridge area is in the range of 10 mm in height and 8 mm in width

at the grafted area. Conversely, the alveolar ridge width at the left side was limited, and less than 6 mm, verified by Cone-beam computed tomography (CBCT) (Figure 1). Mandibular overdenture retained by three mini-implants is the treatment of choice to ease her eating and speaking ability and address her aesthetic concerns. A shortened dental arch (SDA) concept is adopted for the maxillary arch (14).

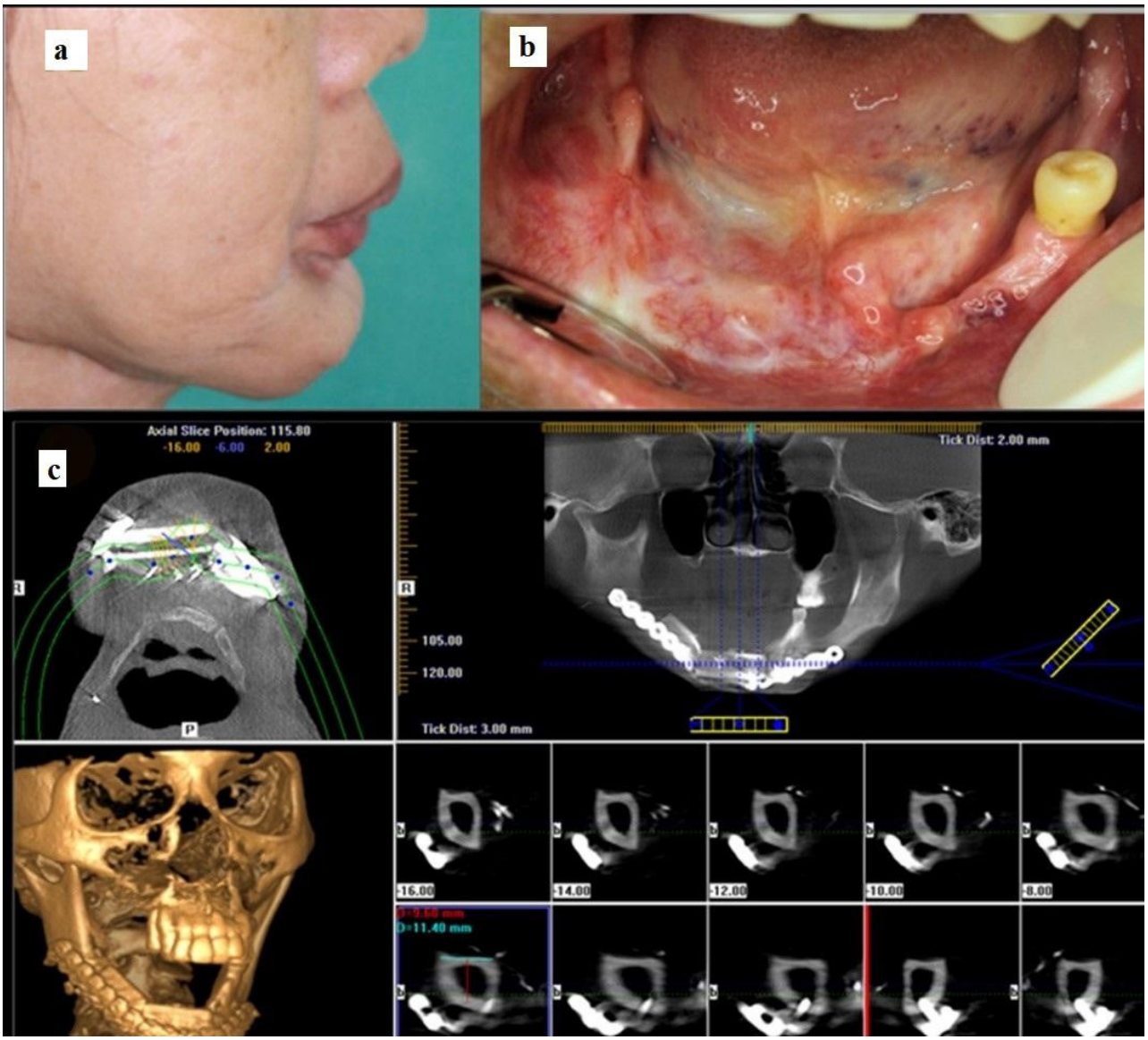

Figure 1: (A) The extra-oral showing the unsupported lower lip and facial defect. (B) The intraoral view showing the severely compromised mandibular alveolar ridge. (C) Cone-beam computed tomography (CBCT) evaluation of the bone quantity and quality

Treatment procedure

A conventional mandibular acrylic removable partial denture is constructed at the current vertical dimension, and the confirmative approach is followed. The constructed RPD is duplicated using auto-polymerising acrylic resin (Huge, Huge Dental Material Co., Shanghai, China), fabricating a surgical guide for implant placement. The proposed dental implant locations are roughly determined around teeth 33, 31, 42, and 44.

At the dental implant placement surgery, the surgical guide is used to determine the dental implant locations and guide the initial drilling (Figure 2). The patient is asked to occlude normally on the surgical guide to stabilise the surgical guide in place during the initial implant entry marks drilling. The surgical guide is relieved facially (side-entry slot) at the locations tooth 31 and 33 to provide access for the drill while the patient is occluded. However, there is no need for a side-entry slot at location tooth 44, as the patient was

occluding in crossbite at the right side, which enables drill entry from the occlusal side.

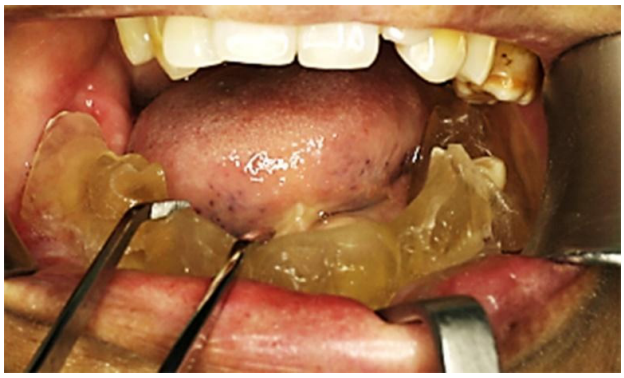

Figure 2: Surgical guide in place with side-entry slots

The dental implants (Onebody, Slimline, Dentium, Seoul, Korea) are placed according to Dentium® System surgical protocol at locations teeth 33, 31, and 44. However, the dental implant at location 42 was omitted due to placement difficulty, as the overlying mucosa was very thick and unsuitable for the one-piece mini-implant. Hence, instead of four mini-implants, three mini-implants with size [(diameter x length) (2.8 mmθ * 10 mm), type Onebody, Slimline, Dentium have been placed at the proposed locations (33, 31, and 44) (Figure 3). In the same visit (the dental implant placement surgery), the intaglio surface of the prosthesis was relieved around the dental implants' locations and relined with tissue conditioner (Visco-Gel, Dentsply Sirona, Charlotte, North Carolina, USA) before issuing.

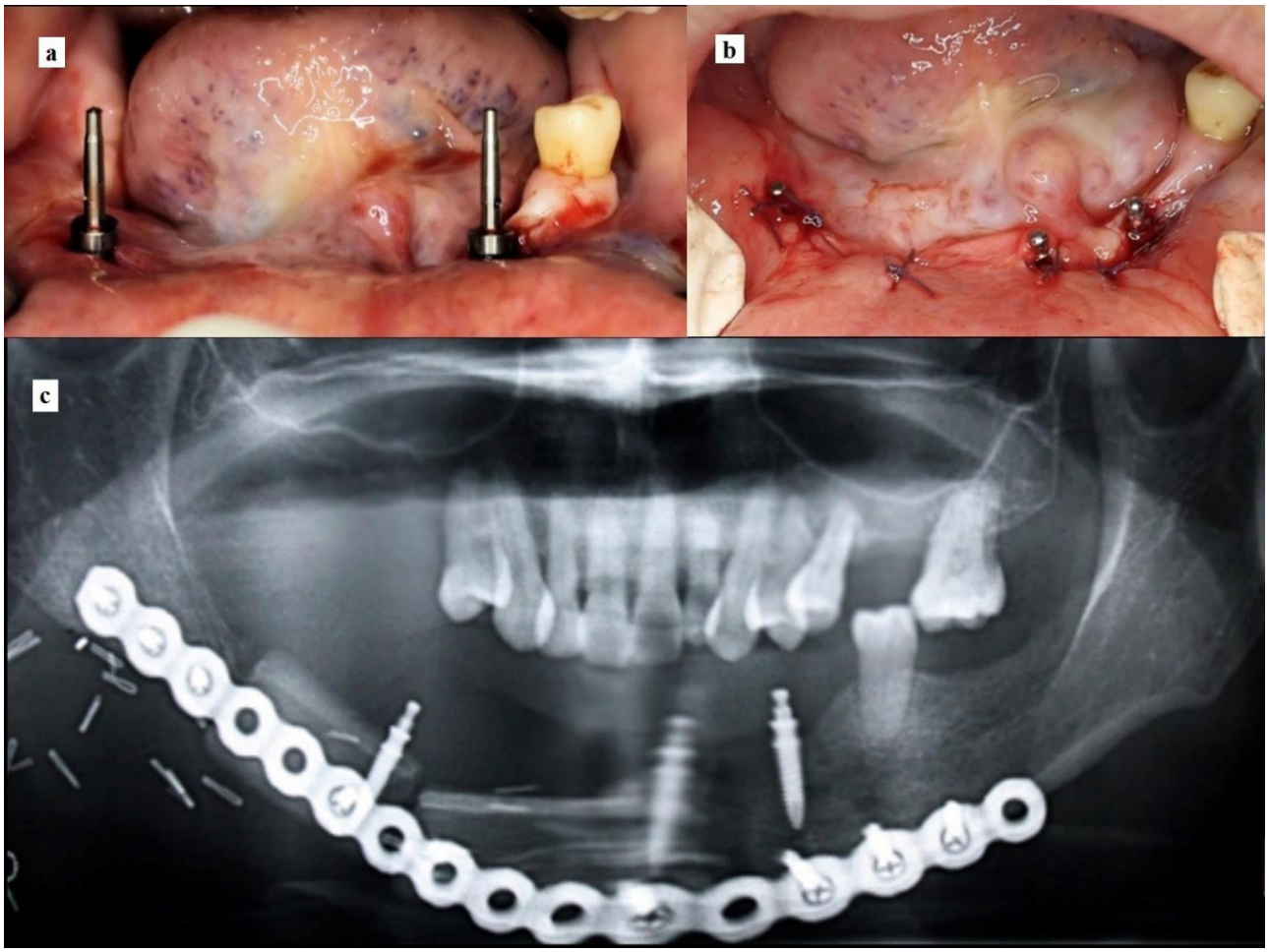

Figure 3: (A) Parallel pin to ensure implant alignment. (B) Three mini-implants at teeth 33, 31, and 44 locations. (C) Postoperative dental radiograph

Following two weeks of tissue healing, the prosthesis is prepared to receive three Dentium® female sockets BPF2 for the mini-implants. Conventional chair-side intra-oral pick-up technique is followed. The overdenture prosthesis is relieved with slightly oversized recess, lingual vent holes at the dental implant locations. The dental implant head's indentations in the overdenture tissue conditioner lining are used to guide these locations. The female sockets snapped onto the dental implants, and silicone fit-checking material (Fit-Checker Advanced, GC America Inc., Alsip, IL, USA) is used to confirm the clearance's sufficiency. The acrylic prosthesis's areas that show through were marked, and acrylic resin bur used to relieve it and ensure the clearance of the vents through the denture. Following denture cleaning and air-dry, auto-polymerising acrylic resin (Tokuyama® Rebase II, Tokuyama Dental Corporation, Kobe, Japan) is placed into the prepared recesses. The denture is seated into place and held with light finger pressure at the buccal of the denture while asking the patient to occlude and stabilise the prosthesis in place. The excess material would flow out through the lingual vent holes. After the complete set of the material, the overdenture was removed and evaluated.

The prosthesis is issued to the patient after confirming the stability, retention, and the patient's comfort (Figure 4). On subsequent review visits (four weeks followed by six months), the patient was pleased as her aesthetic and functional compromise had been restored and met her expectation.

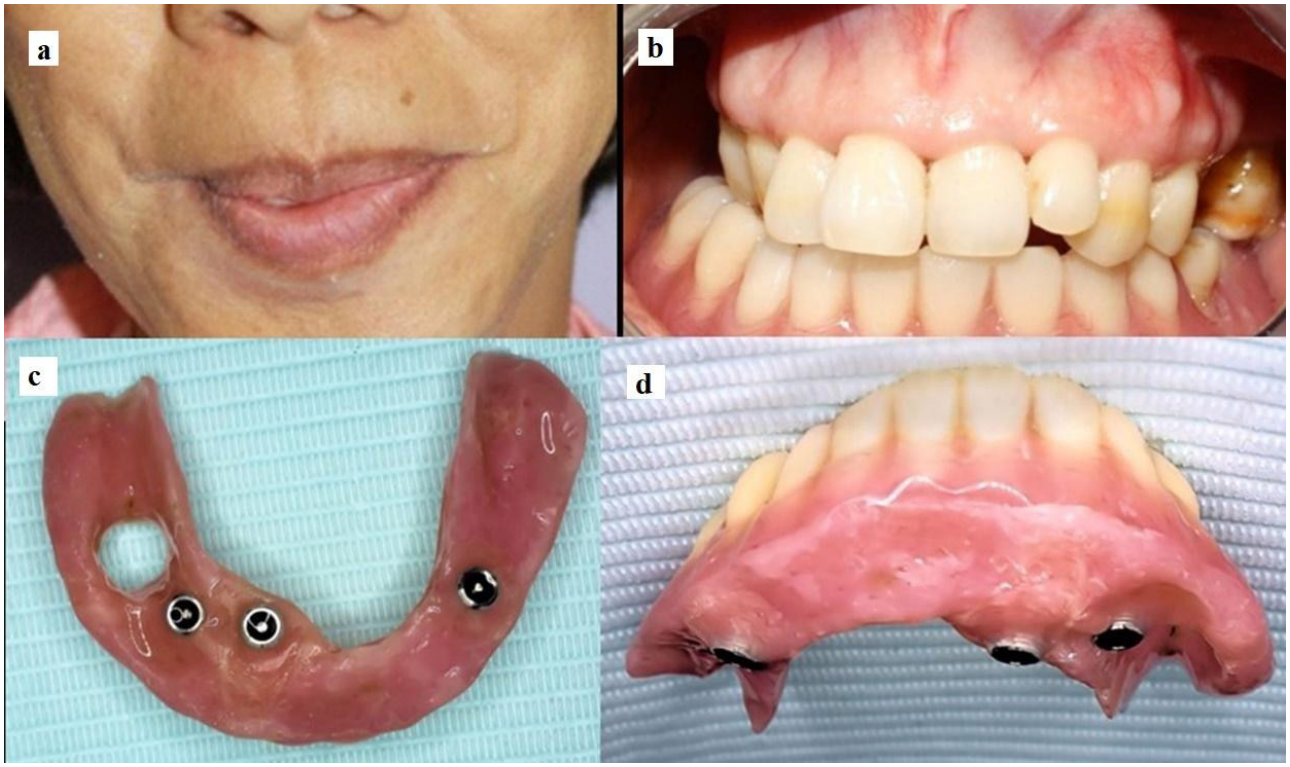

Figure 4: (A) Frontal view of the patient with the overdenture. (B) Overdenture teeth set on crossbite at the right side, notice palatal inclination of maxillary posterior teeth. (C&D) The intaglio surface of the prosthesis with mini-implant attachments

Discussion

Prosthetic rehabilitation of cancer patients following surgical resection of the mandibular ridge poses a significant challenge for clinicians. The lack of support and stability of the planned removable prosthesis is not uncommon. The dental implant can enhance both the retention and the stability of the removable prosthesis provided for such patients. However, for dental implants to be utilised in the inter-foraminal region, a minimum of 6.0 mm bone width is required (15, 16). The mini-implant with a narrower diameter is a valuable alternative in these challenging clinical scenarios. These mini-implants feature a narrow diameter of 3.0 mm or less and generally come as a one-piece design with the abutment already fused to the threaded implant fixture body (17, 18).

Placing mini-implants for this case simplified the overall treatment by omitting the need for a complex reconstruction procedure to build the foundation to receive the regular diameter dental implant. Relatively, that reduces postoperative morbidity by avoiding extra surgical procedures and visits. Other advantages of using the mini-implant system in such cases are reduced overall

operating time, immediate loading, minimally invasive, cost-effective, and one-stage denture stabilisation (19, 20). On the other hand, there are limitations to use a mini-implant in prosthetic rehabilitation. These include the inability to remove the implant abutment for subsequence submerging the implant or to convert it into a fixed implant prosthesis due to the one-piece design, narrower diameter also predisposed the mini-implant for potential fatigue fracture (21).

In the present case, the surgical resection of the mandible resulted in a compromised residual alveolar ridge height, significantly reducing the stability of any conventional prosthodontic rehabilitation. Such clinical conditions require bone graft and reconstruction, including free bone grafts, vascularised grafts, or distraction osteogenesis (22-24). However, a bone grafting procedure for such conditions would not guarantee optimal denture performance. This can be due to several factors, such as reduced vestibular depth, displaceability of the grafted ridges, atrophic ridges, and deviated jaw (25).

In the present case, the right mandibular residual ridge was severely compromised clinically, as the vestibular depth was severely reduced, and no definitive ridge can be observed, even though that is a common finding in cases of the resected mandible that has been grafted.

Mini-implant system improves the stability of prostheses where bone quantity is inadequate for regular dental implants (26-28). Hence, the mini-implant systems approach in such cases would be recommended for the medically compromised patient with extremely flat alveolar ridges for the aforementioned reasons. However, the soft tissue thickness should be considered at the implant placement locations. The one-piece dental mini-implant would be contraindicated if the soft tissue is thicker than the dental mini-implant's tissue height, and hence using a two-piece implant and custom abutment will be more appropriate. For the current case, the one-piece dental mini-implant was chosen, as the two-piece dental mini-implant was found to be more expensive as per discussion with the patient.

The rationale for choosing the mini-implant locations was as follows: 1) The bone availability at the sites: the selected area had adequate bone to allow implant placement. 2) Soft tissue thickness: the area with thinner and less soft tissue bulk chosen to avoid soft-tissue overgrowth and subsequent submergence of the mini-implants.

There are concerns related to the biomechanical behaviour of two mini-implants retaining overdenture, and finite element analysis showed higher stress concentration in and around two mini-implants than the standard implant-retained overdenture (29). On the other hand, clinical study shows an excellent survival rate of mini-implants retaining mandibular overdenture when there are more than two implants to retain the prosthesis in a short- to medium-term treatment period (13). Furthermore, the advantage of minimally invasive treatment is invaluable for this patient, as she had already undergone major jaw resection and reconstruction surgery.

During designing the final prosthesis, tooth 35 was retained as the patient was not keen to render edentulous. Hence, a through and through relief hole was made at the corresponding tooth 35 location. Furthermore, considering the palatal inclination of teeth 13 and 14, the right posterior acrylic artificial teeth were set into crossbite to enhance stability and avoid tongue space encroaching. Although mini-implants were used to support the removable prosthesis, optimising the denture design and setup would provide further stability to the denture due to the compromised anatomical structure.

Conclusion

The use of mini-implants improved the stability and retention of the removable prosthesis for patients with a severely compromised mandibular condition of CEOT. However, the thickness of the soft tissue at the implant placement locations in such grafted cases has to be considered, the mini-implant would not be indicated if tissue thickness is more than the implant's tissue height, and the use of a two-piece implant and custom abutment should be considered.

Competing interests

The authors declared that there was no competing of interest as the authors did not receive any financial aid for the production of the report.

Informed consent

Informed consent was obtained prior to the commencement of the treatment and reporting of the cases from the patient.

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