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Maxillofacial prosthetic rehabilitation in a patient with a high-arched palate

Hongli Yu; Yujia Wang; Yuka I. Sumita; Mariko Hattori*

***Corresponding Author: Mariko Hattori**
Department of Maxillofacial Prosthetics, Graduate School, Tokyo Medical and Dental University (TMDU), Tokyo, Japan
Email: sasamfp@tmd.ac.jp

Abstract

Objective: This report describes maxillofacial prosthetic treatment of a 67-year-old patient with intellectual disability with a narrow high-arched palate.

Case presentation: The chief complaints were denture misfit and difficulty in mastication. Clinical examination revealed a high-arched palate. A complete denture with an acrylic base was fabricated for the upper jaw, with a ridge created to fill the raphe defect. A complete overdenture with an acrylic base was fabricated for the lower jaw. Food-comminuting and food-mixing abilities were assessed and a food intake questionnaire was completed to evaluate masticatory performance. A visual analogue scale was used to evaluate the patient's satisfaction with the prostheses.

Results: Food-comminuting and food-mixing abilities were 106.7 mg/dL and ΔE_{1min}=47.4, respectively. Scores on the food intake questionnaire and visual analogue scale were clearly improved with the prostheses.

Conclusion: Meticulous clinical examination enabled a pair of suitable prostheses to be designed. Fabricating the prosthesis with a ridge improved masticatory performance and patient satisfaction.

Keywords

High-arched palate; moderate intellectual disability; ridge; masticatory performance; patient satisfaction.

Introduction

High-arched palate is a congenital malformation of the palate and is often associated with other anomalies or syndromes. Solitary high-arched palate is often overlooked and is difficult to distinguish from submucous cleft palate. Diagnosis is typically based on the presence of at least 1 of 3 classical signs of submucous cleft palate: bifid uvula, a translucent zone in the midline of the soft palate, and a palpable 'V' notch on the posterior border of the bony palate [1]. High-arched palate is characterized by a pronounced median groove, but the roof of the mouth remains intact across the midline [2]. Therefore, the most intuitive way to distinguish between submucosal fissure and high arch is computed tomography.

Some patients with cleft lip and palate have accompanying intellectual disability [3], but patients with both high arched palate and intellectual disability are almost in the syndrome [4]. Both the high-arched palate and intellectual disability may affect the wearing and use of dentures. This report describes successful maxillofacial prosthetic treatment of a patient with moderate intellectual disability with a narrow high-arched palate.

Case Report

The patient was a 67-year-old man who first visited the prosthetic department of Tokyo Medical and Dental University Hospital in 2013 with chief complaints of denture misfit and difficulty in mastication. Intraoral examination revealed a cleft in the middle of the palate (Figure 1), and he was referred to the maxillofacial prosthetics clinic. He had moderate intellectual disability. Family history suggested that he was born with palate deformity but had not been diagnosed with any congenital syndrome, and he had no past history of oral surgery. He had a pair of complete dentures fabricated in a dental clinic 7 years earlier, which showed some instability. Oral examination showed that teeth #17, 31, 32, 41, 42, and 43 were the residual roots only. He had hypertonia of the tongue, lips, and buccal muscles. Radiographic examination using computed tomography showed that the palate was higher than the floor of the maxillary sinus, and the raphe defect was deep (Figure2). The roof of the mouth, however, was intact across the midline, and only the palate had a characteristic pronounced median groove. The patient was diagnosed as having a high-arched palate. A pair of complete dentures was considered a suitable treatment plan.

Residual roots #17 and 32 were extracted and root canal treatment was done for #31, 41, 42, and 43. Maxillary and mandibular preliminary impressions were recorded in alginate (Algiace Z; normal set yellow; Dentsply Sirona, Tokyo, Japan). Custom trays were fabricated with border molding, and secondary impressions were recorded using silicone impression materials (Exahiflex® regular and Exahiflex® injection types; GC Corp., Tokyo, Japan). The depression in the maxillary middle seam was filled with impression material before taking the impression. Jaw relation was recorded and teeth arrangement was done.

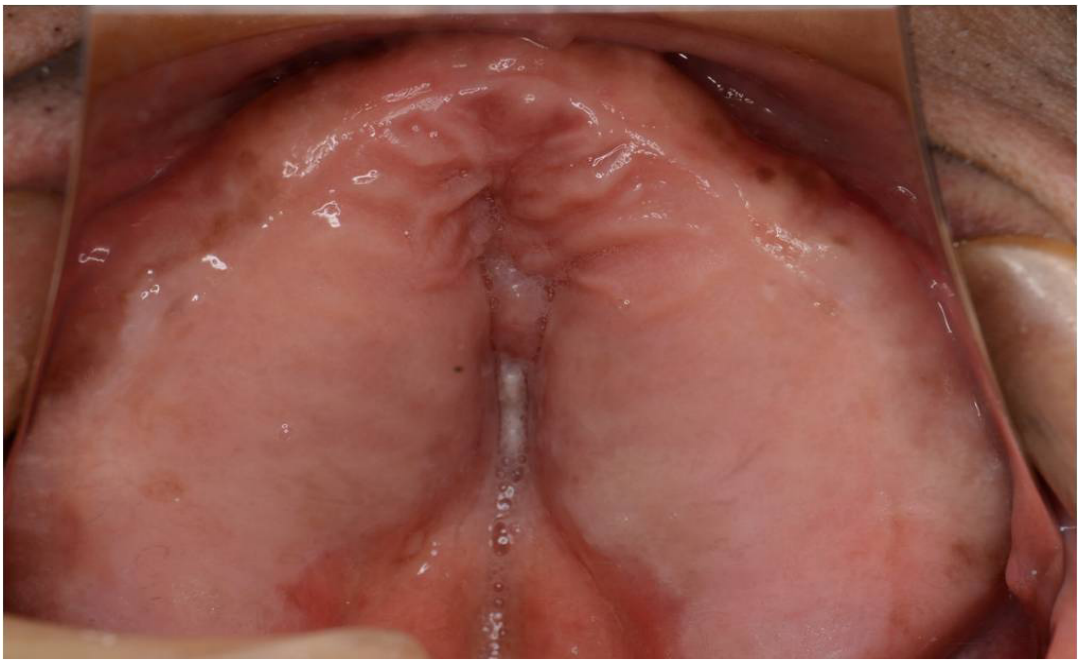

Figure 1: Intra oral photo of the patient with a deep cleft in the middle of the palate.

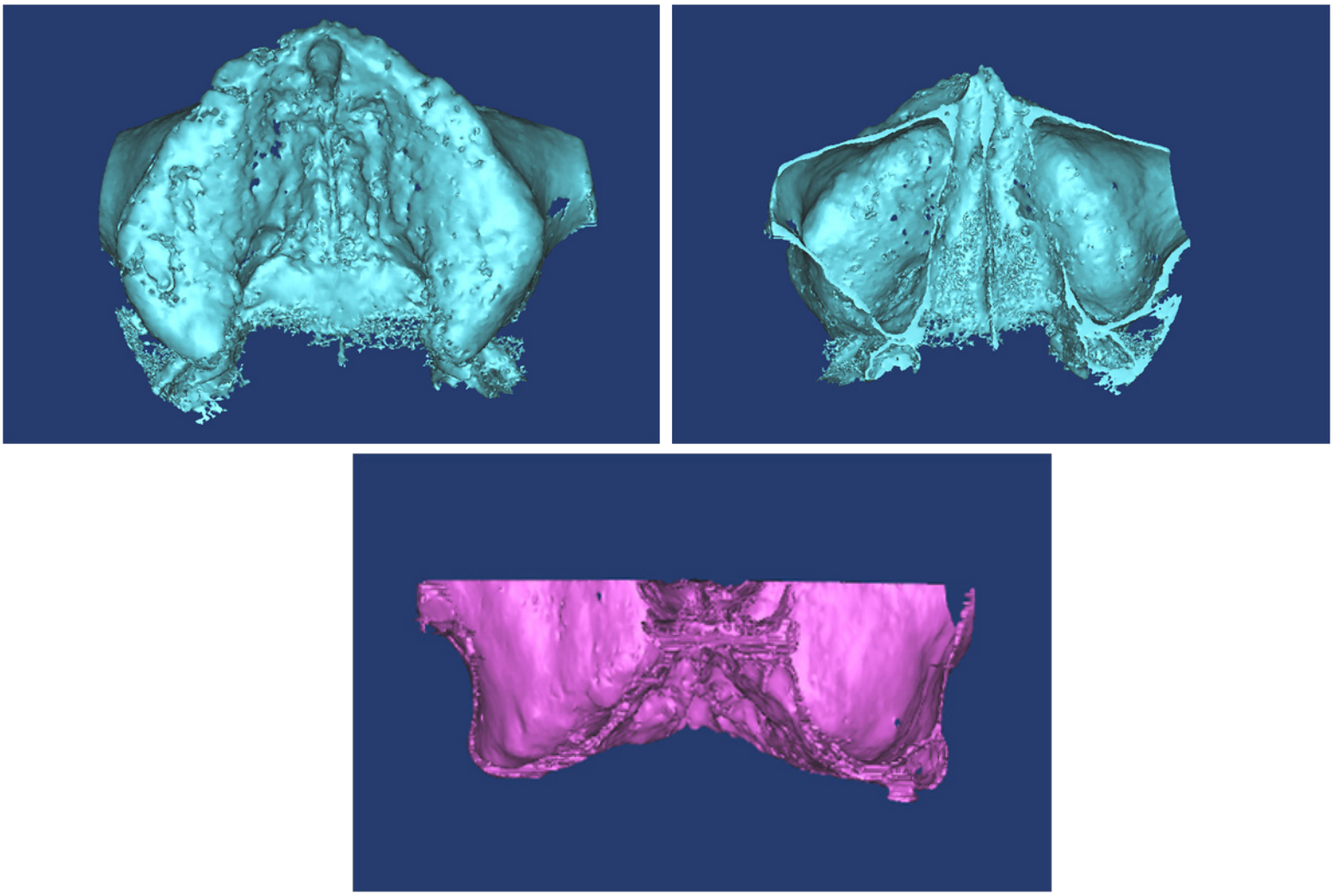

Figure 2: Radiographic examination using computed tomography calculated by mimics was showed that the palate was higher than the floor of maxillary sinus, and the raphe defect was deep.


Figure 3: A complete denture with an acrylic base was fabricated on the maxilla, and the median palatine suture defect was filled by making a ridge.

A complete denture with an acrylic base was fabricated for the maxilla, with the median palatine suture defect filled by creating a ridge (Figure 3). A complete overdenture with an acrylic base was fabricated using piezography for the lower jaw, and O-ring attachments were applied on #31 and 43. The treatment procedure was explained to the patient using the 'tell, show, and do' technique as needed. The prostheses were adjusted several times. Occlusion was checked while he was relaxed and while talking to eliminate undesired involuntary movement.

Evaluation

To evaluate masticatory performance, food-comminuting and food-mixing abilities were assessed and a food intake questionnaire was completed [5,6]. Visual analogue scale scoring was used to evaluate patient satisfaction. The patient answered the food intake questionnaire and visual analogue scale questions with help from his sister.

Food-comminuting ability was assessed by measuring the concentration of dissolved glucose obtained from gummy jelly (Glucolumn, GC Corp.). The patient was instructed to chew the gummy jelly for 20 s, rinse the mouth with 10 mL distilled water, and then spit out the soaked particles into a cup containing filter paper. The amount of dissolved glucose from the comminuted jelly was measured using a portable blood glucose meter (Glucosensor GS-II; GC Corp.).

Food-mixing ability was assessed using color-changeable chewing gum (70 mm X 20 mm X 1 mm, 3.0g, Xylitol; Lotte Co., Ltd., Saitama, Japan). The gum was chewed for 1 min and was collected and the color change was measured with a colorimeter (CR13; Konica-Minolta Sensing, Tokyo, Japan).

The food intake questionnaire was composed of a list of 35 food items, which were ranked for each type of food according to 5 categories: easily eaten, eaten with difficulty, cannot be eaten, do not eat because of dislike, and have not eaten since starting to wear dentures [6].

The visual analogue scale for satisfaction consisted of 5 single question domains of eating, biting,

face shape, speaking, and maxillofacial prosthetic. The patient marked on a straight horizontal line of fixed length the point that he felt represented his current state.

For food-mixing ability, ΔE offers a single value that takes into account differences in L*, a*, and b* between the sample and a standard [9]. The value ΔE_{1min} used as the index of masticatory performance in this study was calculated using the formula MS=[(L*−72.3)2+(a*+14.9)2+(b*−33.0) 2]1/2. For the food intake questionnaire, 35 foods were classified into 5 grades of masticatory difficulty, with a difficulty ratio of 1.00, 1.14, 1.30, 1.52, and 3.00. The letters a, b, c, d, and e represent the total score of each grade. The maximum value was 111.4 points. Masticatory score was calculated using the formula MS=(a+1.14b+1.30c +1.52d+3.00e)*100/111.4.

Results

The prostheses were successfully fitted. The patient could wear and remove them easily and could clean them by himself. He could also maintain his residual teeth by himself. The average food-comminuting ability value determined using the blood glucose meter was 106.7mg/dL with the prostheses. Food-mixing ability values from colorimetry were a*=5.9, b*=8.2, L*=37.7, and ΔE_{1min}=47.4. Values from the food intake questionnaire without the prostheses placed were a=12, b=9, c=11, d=11, and e=3; those with the prostheses placed were a=12, b=10, c=14, d=14, e=8 (Figure 4). Masticatory scores were MS1=55.9 without the prostheses and MS2=78.0 with them (Figure 5). The visual analogue scale scores are shown in Fig 6.

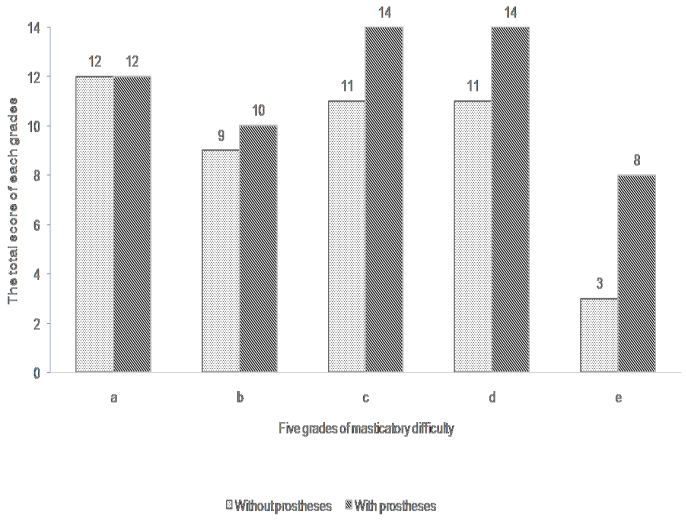

Figure 4: Results of the food intake questionnaire with and without prosthesis.

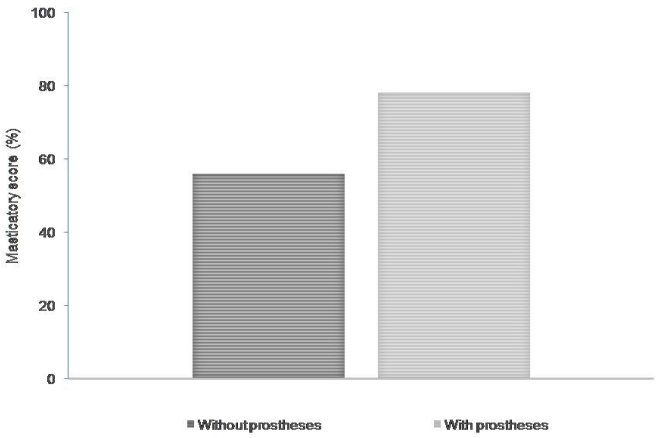

Figure 5: Masticatory scores with and without prosthesis.

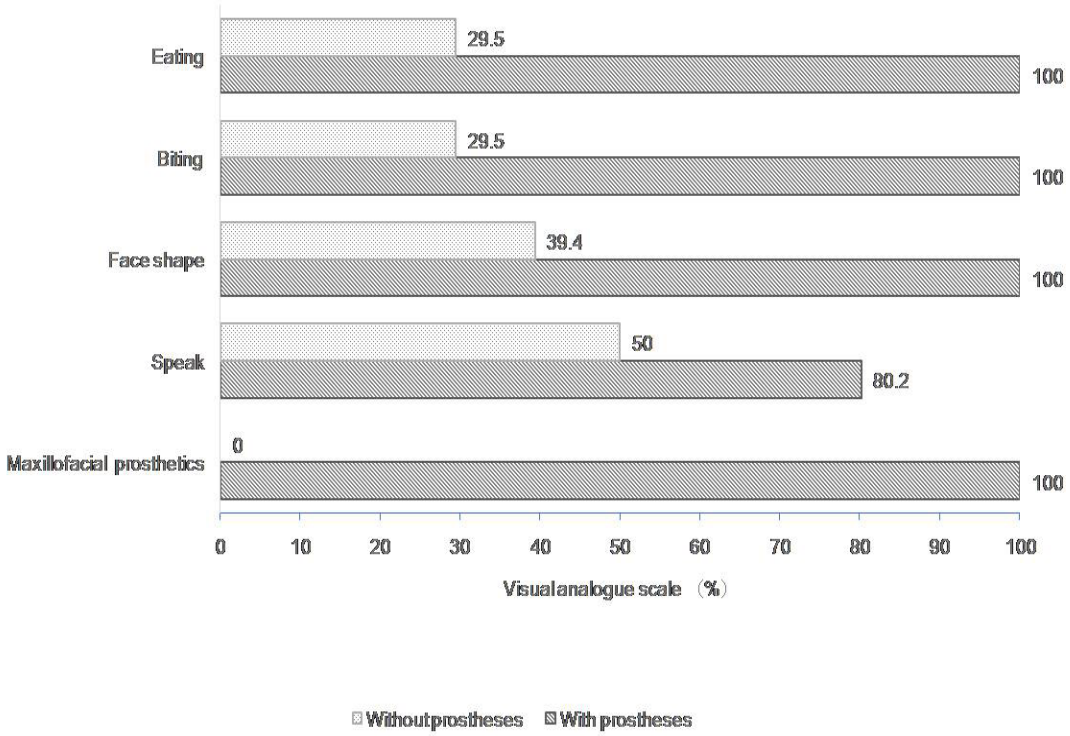

Figure 6: Results of the visual analogue scale with and without prosthesis.

Discussion and Conclusion

The prostheses were stable with the ridge on the maxillary prosthesis and O-ring attachments on the mandibular prosthesis. The patient could eat and had no problems with either prosthesis. Our findings were consistent with those from other studies, although the values were slightly lower than in patients without jaw defect [5,7,8]. Comparison of the results of the food intake questionnaire before and after treatment showed that the prostheses improved masticatory performance. The visual analogue scale scores

showed that the patient was satisfied with the prostheses.

In this case, careful examination helped the dentist to make a correct assessment of the patient's difficulties. Meticulous clinical examination enabled effective maxillofacial rehabilitation in a patient with a high-arched palate. Instructions on how to place the prostheses correctly and easily helped the patient to successfully use the prostheses and improve his quality of life.

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Authors Information: Hongli Yu; Yujia Wang; Yuka I. Sumita; Mariko Hattori*
Department of Maxillofacial Prosthetics, Graduate School, Tokyo Medical and Dental University (TMDU), Tokyo, Japan

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