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Short communication

Clinical application of a 3-dimensional morphometric apparatus for diagnosis and treatment of a Class III patient with facial asymmetry: A pilot study

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ABSTRACT

This article demonstrated the usefulness of a non-contact 3-dimensional (3D) morphometric apparatus in orthodontic diagnosis and treatment evaluation. A female patient, 23 years 6 months of age, had a Class III malocclusion with mandibular deviation. The 3D images taken by a 3D morphometric apparatus figured out her protrusive chin of 6 mm on the deviation side compared to the non-deviation side, and showed a possibility of orthognathic surgery. Before starting of orthodontic treatment, a diagnostic splint was used for 2 months to determine her proper mandibular position. The 3D images retaken for quantitative evaluation showed decrease of the mandibular protrusion by approximately 3 mm, and improvement of facial asymmetry. Then, we decided to treat the patient without orthognathic surgery. After 18 months of active orthodontic treatment with miniscrew anchorage, the mandibular deviation was improved and an acceptable occlusion was achieved. The 3D images at posttreatment demonstrated significant decrease of chin protrusion on the deviation side, and improvement of facial asymmetry. In conclusion, a 3D morphometric apparatus could provide quantitative data of facial asymmetry and chin protrusion and contributed decision making process of treatment planning in a patient with facial asymmetry.

1. Introduction

Evaluation of facial proportions is certainly important for orthodontic diagnosis because numerous patients complain of their facial esthetics [1–3]. In general, facial photographs and cephalometric radiographs are taken as diagnostic records, and frontal view and facial profile are evaluated, respectively. However, they have the inherent limitation of esthetic assessment because of 2-dimensions [4,5].

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Recently, computed tomography (CT) has been widely used to evaluate 3-dimensional (3D) morphology of both maxillofacial skeleton and soft tissue [6,7]. Images of 3D-CT are quite useful as a diagnostic record but include some concerns, i.e., higher radiation exposure and medical costs compared to traditional radiographs [7]. Moreover, it is difficult to appreciate facial soft tissue in a natural head position because CT images are generally taken under dorsal position. Even if cone-beam computed tomography (CBCT) is used, it can only visualize a localized area, due to a smaller imaging volume. Furthermore, the ability to extract soft tissue is lower.

In medical field, a non-contact 3D morphometric apparatus is often applied for 3D assessment such as evaluation of breast reconstruction surgery and designing an auricular prosthesis [8,9]. This system is easy to use as it is automated and picture-capturing process is within less than 5 min. The 3D photographs are taken in a natural head position. Additionally, these images can be inverted, rotated, translated and zoomed. Therefore, it allows for more precise measurement and analysis of facial soft tissues, particularly in frontal views. Against these background, this device is becoming more acceptable in dental field [10].

In this article, we demonstrate the usefulness of a non-contact 3D morphometric apparatus for quantitative evaluation of facial soft tissues and orthodontic diagnosis and treatment evaluation in a patient with mandibular deviation.

2. Case presentation

A female, 23 years 6 months of age, had a chief complaint of protrusive chin and facial asymmetry (Fig. 1A). Her mandible was deviated 2.5 mm to the left toward the facial midline. For evaluating the soft tissue, we used a non-contact 3D

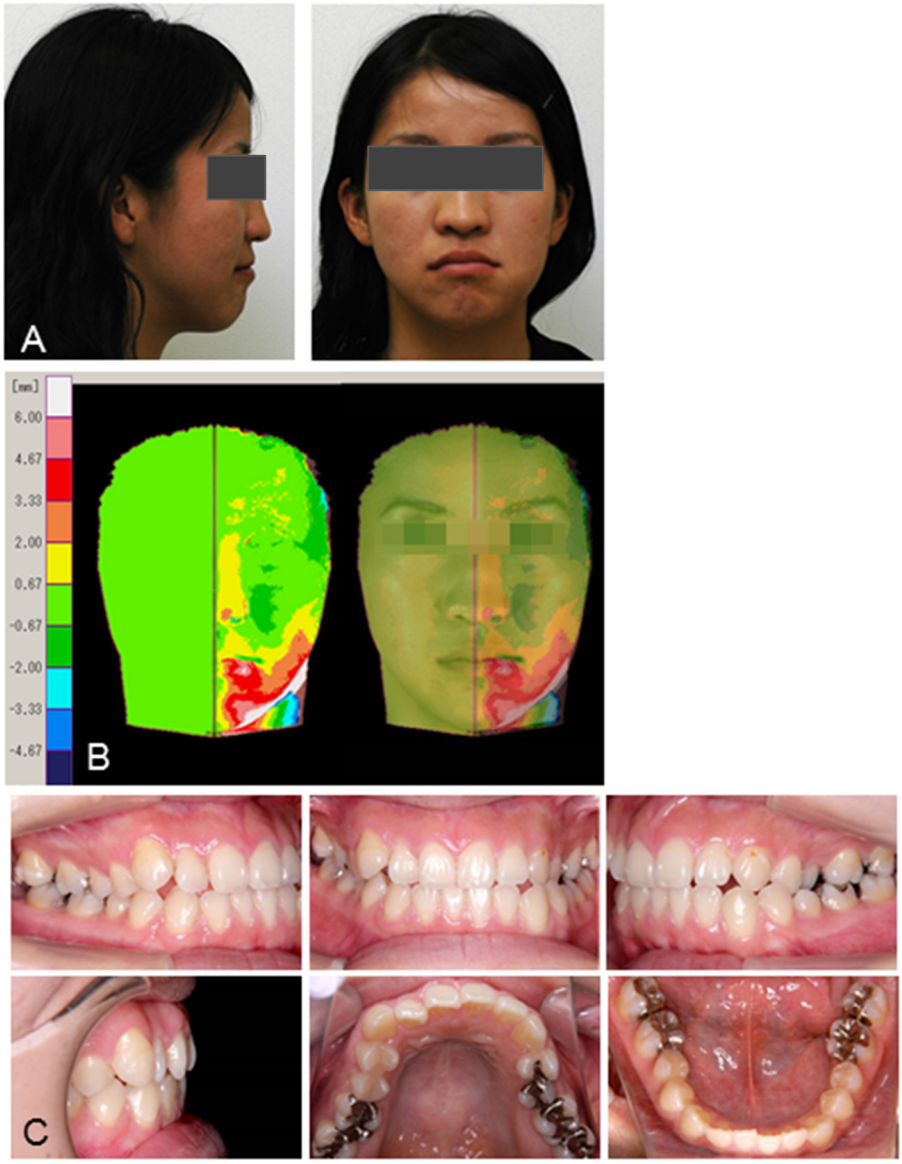

Fig. 1 – Pretreatment: (A) facial photographs; (B) 3D color mapping image showed remarkable chin protrusion on the left side (light red areas indicated 4.67–6.0 mm protrusion); (C) intraoral photographs. (For interpretation of the references to color in text, the reader is referred to the web version of the article.)