Three-dimensional evaluation of a rare case with multiple impacted teeth using CT

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A 15-year-old patient is presented with 11 impacted teeth including 2 supernumerary teeth, who did not exhibit hereditary or clinical disease. The patient showed the extruded and lingually inclined lower incisors, the anteriorly inclined palatal plane, extremely large curve of Spee, and crowding in the bone. A detailed description of the positional relationship between each impacted tooth and the neighboring tooth was given using the 3D CT-image.
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INTRODUCTION

Several radiographic studies have documented the prevalence of impacted teeth to be in the range of 14.1% to 18.8%.[1-3] The third molar teeth are most frequently impacted followed by maxillary canines.[1] Multiple impacted teeth have been reported in patients with syndromes such as Cleidocranial dysplasia[4,5] and Mucopolysaccharidoses,[6] but have rarely been reported in patients without any associated syndrome.[7-9]

The spatial relationships between impacted and adjacent teeth have been examined using panoramic, occlusal, and intra oral periapical radiographs,[1-3] and computed tomography (CT).[4,5,10-13] CT has been shown to be superior to conventional radiographs in terms of visualization of the impacted teeth[1,12], particularly multiple impacted teeth.[4,5]

A case of a 15-year-old male with 11 impacted teeth including 2 supernumerary teeth is presented, who did not exhibit any associated hereditary condition or other disease. The three-dimensional (3D) position and direction of the impacted teeth, as well as the orthodontic problems were examined. The etiology and treatment plan for the patient are discussed.

CASE REPORT

The patient was a 15-year-old boy, who requested orthodontic treatment due to aesthetic problems caused by the lack of maxillary anterior teeth.

History and examination did not reveal any local or systemic causes for the impaction of teeth. His mother had no complications during pregnancy. There was no family history of congenital anomalies.

All the maxillary deciduous incisors that were retained were extracted at the age of 12 years. Although the maxillary permanent incisors showed no signs of eruption after the extraction of deciduous teeth, the patient had not consulted any dentist until his visit to our hospital, three years later.

Extra oral clinical examination revealed a straight soft tissue facial profile with retruded upper lip and protruded lower lip (Figures lA and 1B). Intra oral examination (Figure 2) showed that all maxillary anterior teeth, mandibular both canines and right first premolar did not erupt. Prolonged retention of both maxillary deciduous canines and the mandibular right deciduous canine and first molar was also noted. The mandibular incisors were extruded with the alveolar bone and were almost in contact with the opposing mucosa. The patient had a Class I molar relationship with bilateral posterior crossbite.

According to panoramic and occlusal radiographs (Figures 3, 4A, and 4B), all maxillary anterior teeth and mandibular both canines and the right first premolar were impacted. Two supernumerary teeth appeared to be impacted near the central incisors and another supernumerary tooth close to the apex of the left canine root.

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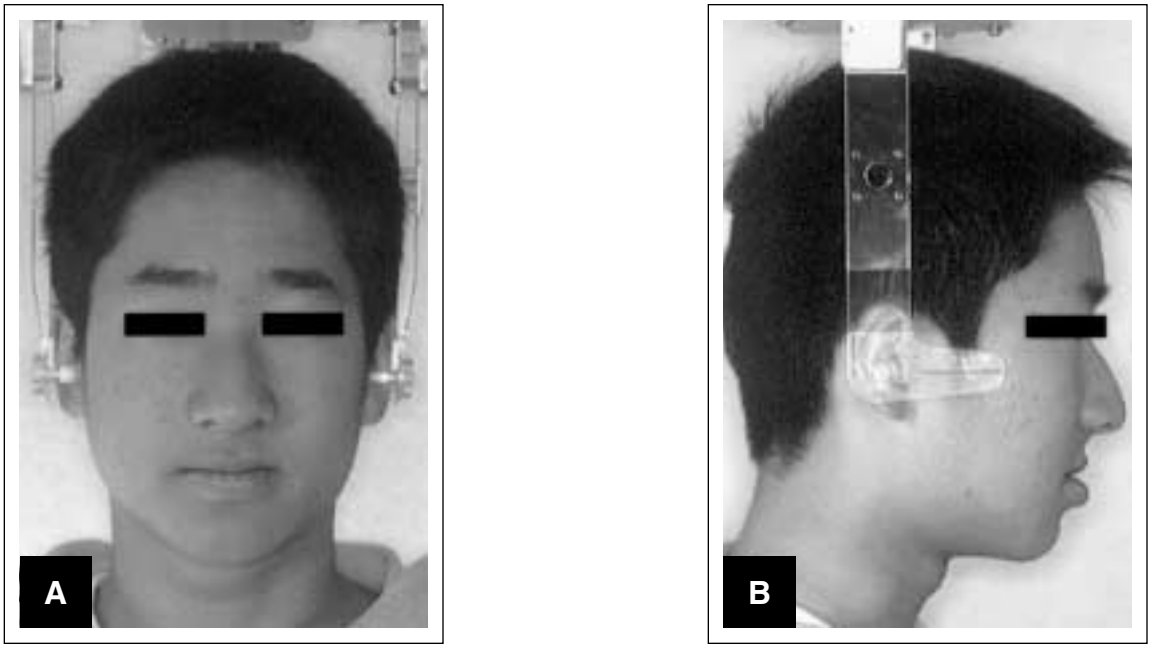

Figure 1. (A) Frontal and (B) lateral facial photographs. Note the retruded upper lip and the protruded lower lip.

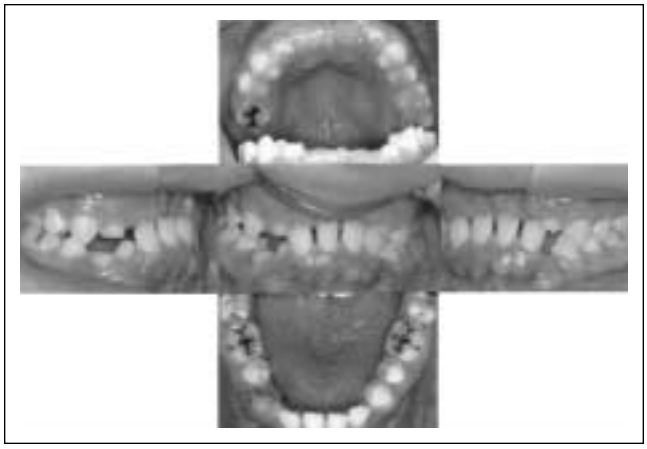

Figure 2. Intra oral photograph. Note the mandibular incisors were extruded with the alveolar bone and almost in contact with the opposing gingival tissue and a Class I molar relationship with posterior crossbite was observed bilaterally.

Figure 3. Panoramic radiograph. Note the impacted maxillary anterior teeth and the impacted mandibular canines and right first premolar with prolonged retention of the left deciduous canine and first molar.

Lateral cephalometric analysis (Figure 5) revealed a skeletal Class I jaw relationship with an average mandibular plane angle. The mandibular incisors were lingually inclined and extruded. The palatal plane was anteriorly inclined. The upper lip was 2 mm behind and the lower lip 4 mm ahead of the E-plane.

Scanning of the area between the inferior ridge of orbit and the most inferior point of tips of maxillary tooth crowns was performed using a helical type CT-scanner (GE, MW, USA). Slice thickness was 1.0 mm with no slice gap. CT slice dataset showed the root of the maxillary left first premolar was resorbed from the disto-palatal direction by the crown of the maxillary left canine (Figure 6).

According to the 3D reconstructed image of the maxillary anterior teeth (Figure 7), the right central incisor was very close to the right canine and the right lateral incisor was palatally displaced. The tips of the roots of both central incisors were slightly curved. A long supernumerary tooth was impacted palatal to the right central incisor and another short supernumerary tooth was impacted palatal to the left central incisor.

The structure around the apex of the left canine root, which was previously diagnosed as a supernumerary tooth according to the radiographs, was recognized as the curved root of the canine.

The left lateral incisor was mesially inclined, the crown positioned labial to the left central incisor

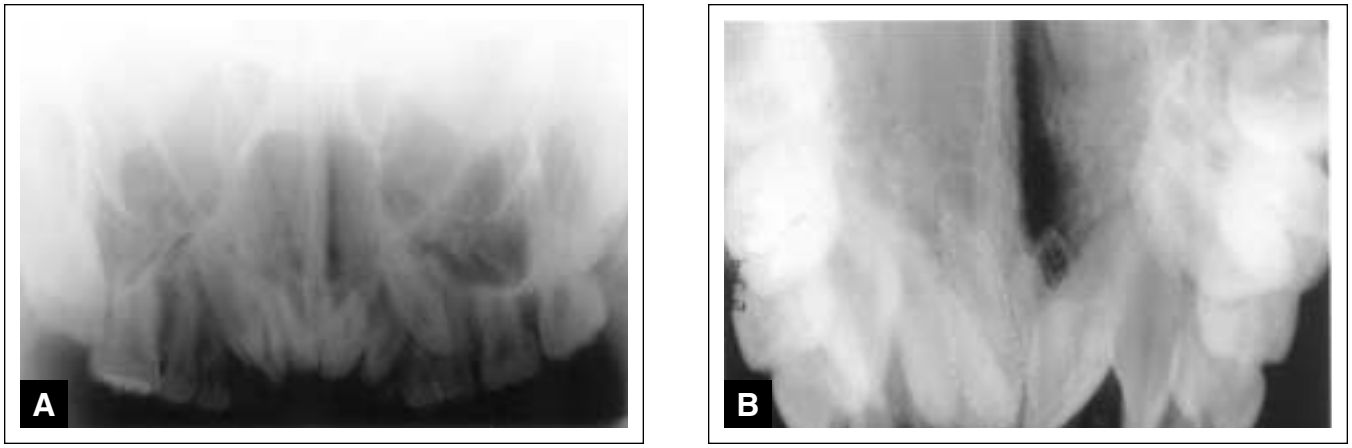

Figure 4. (A) Panography and (B) occlusal radiographs. Note six impacted maxillary anterior teeth and three supernumerary teeth with prolonged retention of the deciduous canines. The dotted line shows the three supernumerary teeth.

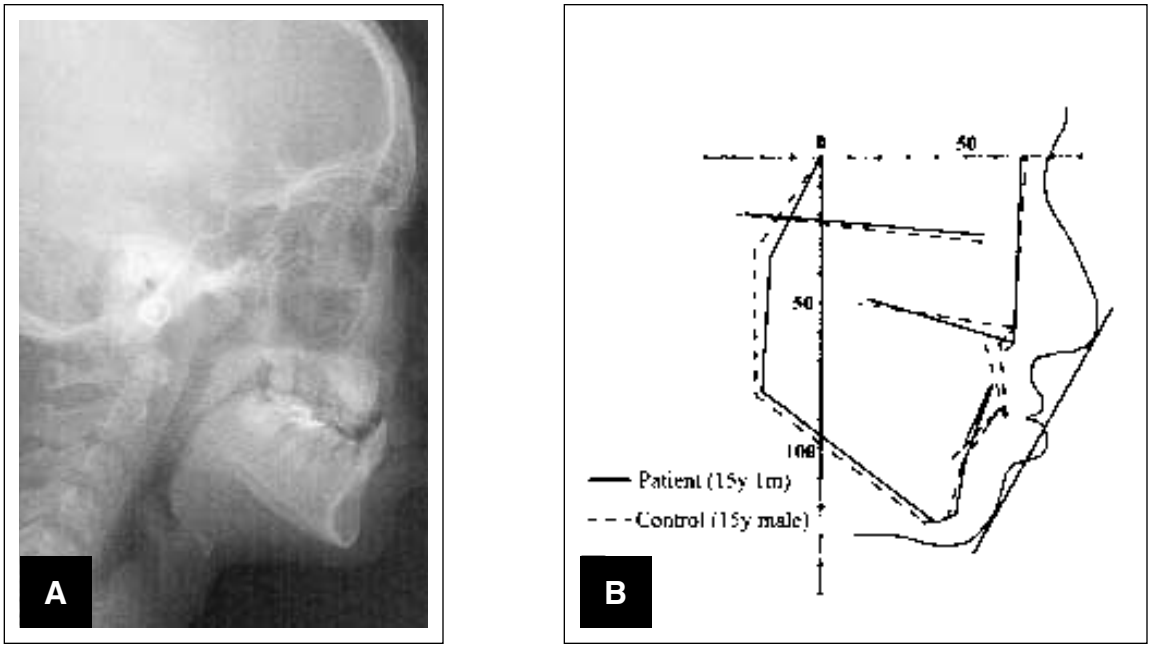

Figure 5. (A) Lateral cephalometric radiograph and (B) the tracing. The patient showed a skeletal Class I jaw relationship with an average mandibular plane angle, lingually inclined and extruded mandibular incisors, and anteriorly inclined palatal plane.

Figure 6. A CT slice which showed the resorption of the root of the maxillary left first premolar resorbed by the left canine. The white arrow indicates the resorption of the left first premolar from disto-palatal and the black arrow shows the crown of the left canine.

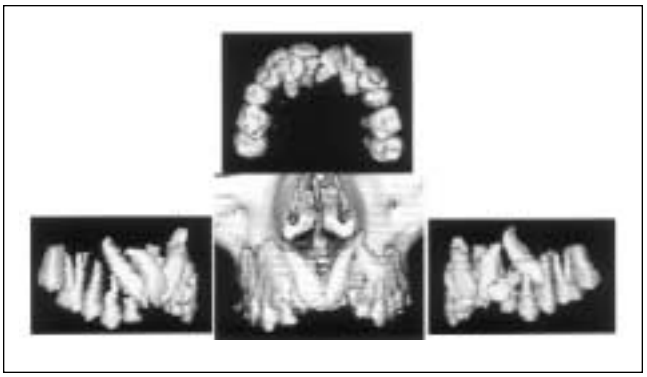

Figure 7. 3D reconstructed image of the bone, impacted teeth, and the erupted teeth in the maxillary dental arch. Note 8 impacted maxillary anterior teeth including 2 supernumerary teeth. The roots of the bilarteral central incisors and left canine were curved. The crown of the left canine was located between the roots of the first and second premolars and the root of the left first premolar was resorbed by the crown of the canine.

and the root situated close to the left canine. The crown of the left canine was positioned between the roots of the first and second premolars and the axis was toward mesio-lateral and mesio-distal direction. The tip of the root was clearly curved. The impacted left canine induced resorption of the root of left first premolar.

The treatment plan was as follows: (1) Extraction of 53, 63, 83, 84, and two supernumerary teeth, (2) Lateral expansion of the maxillary dental arch and intrusion of the mandibular anterior teeth, (3) Surgical exposure of 11, 12, 21, 22, 33, 43, 44 under general anesthesia followed by orthodontic traction, (4) After completion of the traction, re-diagnosis on which tooth should be extracted for surgical exposure and orthodontic traction of 13 and 23.

DISCUSSION

The patient had multiple impacted teeth. Since the patient did not have any systemic disease or relevant history that caused impaction, the etiology of the impacted teeth was assumed to be as follows. There were two supernumerary teeth close to the maxillary central incisors, which are the first to erupt among the maxillary anterior teeth. The arrested eruption of maxillary central incisors was probably caused by the supernumerary teeth preventing the eruption. Supernumerary teeth have been reported to prevent the adjacent unerupted teeth from erupting.[14] The lateral incisors and canines might have been impacted from the crowding within the bone after the impaction of the central incisors. The mandibular canines and the right first premolar were impacted probably from the arch length discrepancy caused by the extruded and lingually inclined mandibular incisors. Abnormal position of the tooth germ, ankylosis of the impacted teeth, and hardness of fibrous gingival tissues in the corresponding area might also result in impacted teeth.[7] However, the curved roots of the maxillary bilateral central incisors and the right canine might have formed after the impaction, because the direction of the curvature was along the present outline of the maxillary and nasal sinus.

The following orthodontic problems were noted in the present case: extruded and lingually inclined mandibular incisors, anteriorly inclined palatal plane, exaggerated curve of Spee, and crowding of dental units within the bone. The patient did not have any dental visits for about three years, since the extraction of the maxillary deciduous incisors. The orthodontic problems could be explained by the fact that the edentulous space in the maxillary anterior region was left untreated for a long period. Early treatment might have prevented these orthodontic problems.

The image, which was considered as a supernumerary tooth according to the conventional radiographs, was later diagnosed as the curved root using 3D CT-image. A detailed description of the spatial relationship between each impacted and adjacent teeth was obtained using the 3D image. Thus, CT examination is suggested to be helpful in the diagnosis of impacted teeth, particularly multiple impacted teeth, in spite of the greater radiation exposure than conventional radiographs. A case of cleidocranial dysplasia was previously reported to be examined using the 3D reconstructed image and the image showed delay in maturation and eruption of the multiple permanent teeth.[4,5]

In our case, the surgical exposure is to be performed in two steps to prevent extensive bone loss, caused by simultaneous exposure of all the maxillary impacted teeth. In addition, we used general anesthesia for the first surgical exposure because of the expected long operation time. Previous reports documented that multiple impacted teeth were only observed with no surgical exposure or orthodontic traction due to the risk of extensive bone loss after surgical intervention.[7,9]

The orthodontic traction is planned as follows: the teeth that are likely to be positioned easily because of the favorable position and direction will be moved accordingly. Further alignment and extractions will be considered later. The extraction of the maxillary left first premolar may be required due to the resorption of the root or for traction of the left canine. In case the tooth needs to be extracted, additional prosthetic and/or orthodontic treatment might be needed. Based on the antero-posterior relationship between the maxilla and mandible, the need for orthognathic surgery may be considered later.

In conclusion, the positions and the directions of multiple impacted teeth can be well visualized using 3D reconstructed CT image. The treatment procedures for the present patient are complicated and extensive due to that the edentulous space in the maxillary anterior region was left untreated for a long period. The fact suggests that proper observation and early treatment for unerupted teeth are very important in patients with multiple impacted teeth.

REFERENCES

1. Aitasalo K, Lehtinen R, Oksala E. An orthopantomographic study of prevalence of impacted teeth. Int J Oral Surg 1: 117-20, 1972.
2. Dachi SF, Howell FV. A survey of 3,874 routine full-mouth radiographs. II. A study of imapcted teeth. Oral Surg 14: 1165-9, 1961.
3. Mead SV. Incidence of impacted teeth. Int J Orthod 16: 885-93, 1930.
4. Sato K, Sugawara J, Mitani H, Kawamura H. Use of selectively colored stereolithography for diagnosis of impacted supernumerary teeth for a patient with cleidocranial dysplasia. Int J Adult Orthodon Orthognath Surg 13: 163-7, 1998.
5. Kreiborg S, Jensen BL, Larsen P, Schleidt DT, Darvann T. Anomalies of craniofacial skeleton and teeth in cleidocranial dysplasia. J Craniofac Genet Dev Biol 19: 75-9, 1999.
6. Schmidt H, Ullrich K, von Lengerke HJ, Kleine M, Bramswig J. Radiological findings in patients with mucopolysaccharidosis I H/S (Hurler-Scheie syndrome). Pediatr Radiol 17: 409-14, 1987.

7. Oi M, Oi K, Kawamura T. Case with multiple impacted teeth (3 deciduous teeth and 19 permanent teeth). Shikwa Gakuho 70: 903-7, 1970.
8. Black SL, Zallen RD. An unusual case of multiple impacted teeth. Oral Surg Oral Med Oral Pathol 37: 975-6, 1974.
9. Babu V, Nagesh KS, Diwakar NR. A rare case of hereditary multiple impacted normal and supernumerary teeth. J Clin Pediatr Dent 23: 59-61, 1998.
10. Freisfeld M, Dahl IA, Jager A, Drescher D, Schuller H. X-ray diagnosis of impacted upper canines in panoramic radiographs and computed tomographs. J Orofac Orthop 60: 177-84, 1999.
11. Preda L, La Fianza A, Di Maggio EM, Dore R, Schifino MR, Campani R *et al.* The use of spiral computed tomography in the localization of impacted maxillary canines. Dentomaxillofac Radiol 26: 236-41, 1997.
12. Krennmair G, Lenglinger FX, Traxler M. Imaging of unerupted and displaced teeth by cross-sectional CT scans. Int J Oral Maxillofac Surg 24: 413-6, 1995.
13. Schmuth GP, Freisfeld M, Koster 0, Schuller H. The application of computerized tomography (CT) in cases of impacted maxillary canines. Eur J Orthod 14: 296-30 1, 1992.
14. Crean SJ, Cunningham S, Coonar HS. Multiple supernumeraries: a case report. Dent Update 22: 343-5, 1995.