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Short Running Title: Fusion of molar and supernumerary tooth
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**TITLE:** A case of inversely fused tooth of impacted maxillary third molar and supernumerary tooth

**ABSTRACT**
We report an extremely rare case of an impacted maxillary third molar inversely fused with a supernumerary tooth in a 51-year-old male. The panoramic and dental radiographs show a radiopaque and tooth-like mass of 20×15 mm located in the third maxillary region of the right maxilla. Computed tomography reveals that the tooth-like structure was a union of the impacted maxillary third molar with a inversed supernumerary tooth, creating a fused tooth with a common dental pulp. To our knowledge, only one case of inversely fusion of a maxillary third molar with a supernumerary tooth has been reported.

**Keywords:** anomaly; inversed fused tooth; impacted third molar; maxilla; supernumerary tooth
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INTRODUCTION
Fused teeth result from the union of two or more tooth germs in the developing stage. This is common in the lower anterior, but rare in maxilla, and found in both sexes [1]. They are more commonly found in the deciduous dentition than in the permanent dentition. The reported incidence rate ranges from 0.5 to 2.5% [1]. But the etiology is still unknown. We report an extremely rare case of an impacted maxillary third molar inversely fused with a supernumerary tooth.

CASE REPORT
A 51-year-old male patient visited oral and maxillofacial surgery of Kyushu university hospital complaining of slight pain in the right maxillary molar region. Clinical examination revealed slight percussion pain on maxillary tuberosity, but with no sign of infection such as swelling and redness of the gingival mucosa, fistula formation, and pus discharge in the right maxilla. The right maxillary third molar was not erupted. First, we take a panoramic X-ray for overview, and dental X-ray for detail. The panoramic and dental radiographs showed a radiopaque mass (20x15 mm) located in the third maxillary molar region of the right maxilla (Figure 1A and 1B). To detect its shape and location, we took computed tomography (CT). CT also revealed a tooth-like mass composed of an enamel-like and a dentin-like region, and dental pulp-like cavities near arteria palatina major (Figure 1C and 1D). Furthermore, the mass consisted of two tooth-like structures that shared a dental pulp cavity. The lesion was partially projecting into the right maxillary sinus (Figure 1D). The clinical diagnosis of the lesion was odontoma or fused tooth. And slight pericoronitis may caused slight pain. As he had slight pain, removal of the mass through the canine fossa of maxilla was planed. From the point of view of operation time and procedure, this operation was performed under general anesthesia. The mass was divided into two pieces at removal, because the size of the mass was larger than that of the canine fossa aperture. The extirpated mass is shown in Figure 2.
DISCUSSION

Levitas [2] suggested that dental malformation might be classified as gemination, twinning, concrescence, and fusion. A fused tooth is defined as one in which there is union of dentin from two separate tooth germs during development. On the other hand, occurrence of two teeth with cementum union indicates concrescence. In the case described here, the mass consisted of two tooth-like structures that shared one dental pulp cavity, as revealed by CT imaging. Because the mass was located at the site of the third maxillary molar region and since the number of erupted teeth was normal, this mass was found to result from an inversely fusion of the third molar with a supernumerary tooth.

With respect to fusion of the third molar and the supernumerary tooth, a number of reports in the English scientific literature have described this occurrence primarily in the mandible [3-7], but there is only one report of a fused tooth in the maxilla [8]. On the other hand, we found many reports in the Japanese scientific literature. For example, Uchida [8] reviewed 46 cases of supernumerary teeth fused with maxillary or mandibular third molars reported between 1934 and 2008 in the Japanese literature. Of the 46 cases (24 males and 22 females), 12 were in the right maxilla and 10 were in the left maxilla. However, it was unclear whether these included a case of inversely fused tooth. Nakanishi [9] reported that the prevalence of supernumerary tooth is almost 1% in all regions of the dentition, and only 0.063% in the upper molar region; this suggests that the frequency of fusion of the maxillary third molar and supernumerary tooth may be even lower. These facts, considered together, indicate the extreme rarity of this case. Sugibayashi [10] proposed that the causes of supernumerary teeth might be heredity, physical forces, and/or trauma in the tooth germ. Few cases of fusion between maxillary third molar and supernumerary tooth have been reported in the English literature; the association of hereditary, racial, or environmental factors with the pathogenesis of this anomaly may not have been explored in detail.

About the treatment, most of the cases were extracted with local anesthesia. These kinds of cases were found after eruption. In this case, fused teeth were fully impacted, and located near arteria palatina major and pterygoid plexus. As we have to remove more carefully, operation under local anesthesia is intolerable.
CONCLUSION

We reported a rare case of inversely fusion of impacted maxillary third molar and supernumerary tooth. In previous reports, the reason may be hereditary, racial, or environmental factors and so on. To remove the fused teeth, we have to take better procedure of removal and anesthesia.

CONFLICT OF INTEREST

None of the authors had any conflict of interest regarding this case report.

AUTHOR’S CONTRIBUTIONS

Eiji Mitate
Group 1 - Conception and design, Acquisition of data, Analysis and interpretation of data
Group 2 - Drafting the article, Critical revision of the article
Group 3 - Final approval of the version to be published

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202 Group 3 - Final approval of the version to be published
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**FIGURE LEGENDS**

Figure 1: Radiography and computed tomography (A) - Panoramic and (B) - Dental radiography shows a radiopaque mass is located in the right maxilla. (C) Transverse plane of computed tomography (CT) images. The radiopaque mass is located in the right maxillary sinus. Some cavities can be seen in the mass. (D) - Coronal plane of CT images reveals that the radiopaque mass has pulp-like cavity. (R: right side, L: left side)

Figure 2: Operation procedure (A) and extracted material (fixed with dental utility wax) (B) - buccal side, (C) - nasal side, (D) - caudal side Bu: buccal side, N: nasal side, V: ventral side, D: dorsal side. The mass was 18x12x10 mm with enamel-like region and dentin-like region.
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