

## External Root Resorption Caused by Completely Impacted Teeth—Report of Three Cases

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### Abstract

External root resorption is a pathological phenomenon caused by multiple reasons, such as orthodontic treatment, dental trauma, pathologic jaw lesion, pressure from the adjacent impacted tooth that is directly contacted with the resorbed tooth, periodontitis, and idiopathic reasons. Its incidence has increased due to the popularity of three-dimensional imaging techniques (computed tomography or cone beam computed tomography). If the origin of the root resorption do not remove, the resorption process will continue. However, prevention is better than treatment. An impacted tooth, such as an impacted third molar or supernumerary tooth, should be immediately treated after establishing the diagnosis. Here, we report three cases of second molar external root resorption caused by an impacted third molar. One of the three cases underwent second molar extraction owing to severe resorption at the root of the second molar. The other two cases underwent third molar extraction. No mobility of the remaining second molars after the third molar extraction was noted. By presenting these cases, this article aimed to support the effectiveness of the preventive removal of the impacted third molar and supernumerary tooth. Being oral and maxillofacial surgeons, we can explain to the patients the effectiveness of the preventive removal of the impacted teeth in a more evidence-based manner.

**Key words:** External root resorption, Impacted teeth, Third molar.

### Introduction

Oral and maxillofacial surgeons perform third molar extraction almost daily in Taiwan. Patients

ask for third molar extraction for various reasons, such as periodontal condition, second and third molar caries, orthodontic aspect, and infection. For the asymptomatic third molar, most patients

decline the removal of the impacted third molar until disease exacerbation. A systematic review published in the Cochrane Library concluded that the available evidences on whether or not asymptomatic disease-free impacted wisdom teeth should be removed are insufficient<sup>1</sup>. However, an impacted mandibular third molar increases the risk of periodontal disease of the second molar. Here, we report three cases of patients diagnosed with asymptomatic impacted third molar during a routine dental check-up. They were referred from the orthodontic department to our department of oral and maxillofacial surgery at the Chung Shan Medical University Hospital, Taichung, Taiwan for further evaluation.

### Case 1

A 22-year-old man with good general health was referred from the orthodontic department at the Chung Shan Medical University Hospital to our department for further evaluation of severe root resorption and a supernumerary tooth over the right mandible. As reported by the patient, he underwent supernumerary tooth extraction of the central maxilla at the age of 8 years. At that time, no other supernumerary tooth was noted. He asked for orthodontic treatment due to class III malocclusion at the age of 13 years; at the time, the formation of four third molars and the supernumerary tooth at the right mandible had started (Fig. 1A). The orthodontic treatment was completed after 3 years. The root of all the impacted teeth were formed (approximately 1/2 root), and the dental follicle spaces were widened (Fig. 1B). Although surgical removal was suggested at that time, the patient preferred frequent follow-up. Two years later, the size of all the follicles had increased, but the patient still denied undergoing surgery,

until on December 2014, he noted mild teeth crowding and visited our hospital. The panoramic film revealed impacted teeth 18, 28, 38, 48, supernumerary tooth at the right mandible, and severe root resorption of teeth 27, 37, 46, 47 (Fig. 1C). Therefore, he was referred to our department. He practiced good oral hygiene, and physical examination revealed no abnormal mucosal lesion, no missing tooth, and no tooth loosening. All four wisdom teeth were unerupted. Computed tomography (CT) scan image revealed mesiobuccal and mesiolingual root resorption and furcation of the tooth 46, more than 3/4 distal root resorption of the tooth 47, 1/2 distal root resorption of the tooth 37, overall palatal root resorption and one distobuccal resorption of the tooth 27, and discontinuous distal root surface near the cemento-enamel junction of the tooth 17 (Fig. 2). We discussed with the orthodontist to decide which teeth should be extracted because teeth 38 and 48 were embedded into teeth 37 and 47; thus, extraction of teeth 38 and 48 would place teeth 37 and 47 at risk of injury. Moreover, the crown-to-root ratio of the tooth 27 was <1. Therefore, we decided to extract teeth 18, 27, 37, and 47. No mobility of the tooth 46 was noted, and the patient had a stable occlusion. Removal of the supernumerary tooth at the right mandible was also suggested. The patient was referred to the endodontic department for preoperative tooth 46 root canal treatment.

Teeth 18, 27, 37, 47, and the supernumerary tooth extraction was performed on February 5, 2015 (Fig. 1D). Six months postoperatively, the three wisdom teeth erupted, but the mesial inclination of teeth 38 and 48 required correction. Therefore, he received orthodontic treatment afterward. Two years postoperatively, teeth 38 and 48 were successfully uprighted with balanced

occlusion. The bone underlying tooth 46 had normal trabeculae and was of the same density as its surrounding bone. No mobility of the tooth 46 was noted (Fig. 1E).

### Case 2

A 26-year-old man with good general health was referred to our department from the orthodontic department for lower third molar extraction as he was going to receive orthodontic treatment. At that time, he had no symptoms in the bilateral lower posterior second molars. In the panoramic film, distal root resorption of the tooth 37 and 1/2 distal root resorption of the tooth 47 were observed (Fig. 3). No mobility of teeth 37 and 47 was noted. Teeth 18, 28, 38, and 48 were extracted under local anesthesia on June 6 and July 16, 2016. Over 18 months later (Fig. 4), no mobility or periodontal pocket was noted in teeth 37 and 47. The extraction wound healed well. The panoramic film revealed bone healing, and no periapical lesion was detected.

### Case 3

A 52-year-old woman was referred from a local dental clinic to the Chung Shan Medical University Hospital for tooth 38 extraction on June 6, 2016. Oral examination revealed no gingival swelling or pain upon palpation at the left retromolar region. A 35 × 37 metal bridge was noted; the patient reported to have no discomfort in this area. Radiographic examination revealed impacted teeth 38 and 48 and distal root resorption of the tooth 37. After discussing with her, tooth 38 extraction and frequent follow-up of the tooth 37 were suggested. After tooth 38 extraction, the repeated panoramic film revealed 1/2 distal root resorption of the tooth 37 (Fig. 5).

## Discussion

External root resorption is caused by various reasons, such as orthodontic treatment, dental trauma, pathologic jaw lesion, pressure from the adjacent impacted tooth direct contact with the resorbed tooth, periodontitis, and idiopathic reasons<sup>2</sup>. All three of our cases demonstrated pressure from direct contact with an impacted tooth (pressure resorption). The mechanism of external root resorption due to the pressure from an adjacent impacted tooth remains unclear. Some authors claimed that men had a significantly higher frequency of root resorption than women<sup>3</sup>; hence, it may be related to sex hormones. Several previous studies reported that external root resorption occurred at sites in direct contact with the root surface of the impacted teeth (not only the third molar but also the impacted canine and supernumerary teeth). There is a theory that the external root resorption of the second molars may arise because of the mechanical force during the eruptive force of the third molars. Sarrafpour et al. indicated that eruptive tooth movement does not stop after the root formation is completed, which means root resorption would progress if the impacted tooth do not remove. These findings helped us understand that root resorption occurs and gets worse until the impacted tooth remove.

The past and present incidences of external root resorption greatly vary. The incidence of the root resorption of the incisor caused by the impacted canines is 12.5%-47%<sup>4</sup> and that of the root resorption of the mandibular second molar caused by the impacted third molars is 0.9% to 49.43%<sup>2, 5</sup>. This can be attributed to the evolution of the diagnostic methods. Dentists examine the bone and tooth condition using two-dimensional (2D) images, such as orthopantomograph or

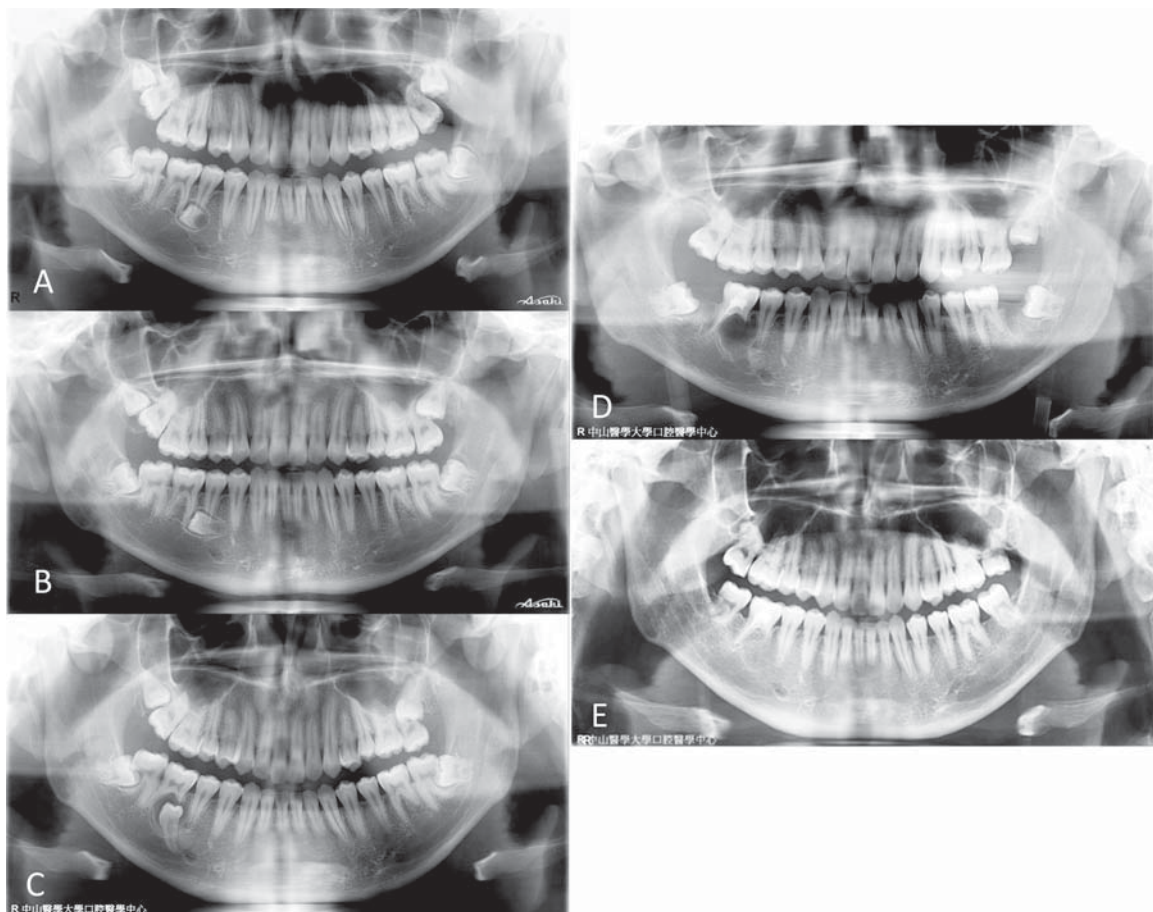


Fig. 1. This panoramic radiography image was obtained when the patient was 13 (A), 16 (B), and 20 (C) years old. Four wisdom tooth crowns and the supernumerary tooth at the right mandible were formed at the beginning. The root resorption of teeth 27, 37, 46, and 47 was gradually appeared. After the tooth extraction (D), the patient was started on orthodontic treatment. Final image shows stable occlusion after two years of orthodontic treatment (E).



Fig. 2. This computed tomography image reveals the root resorption of teeth 27, 37, 46, and 47.



Fig. 3. In this image distal root resorption caused by teeth 38 and 48 on teeth 37 and 47 is revealed.

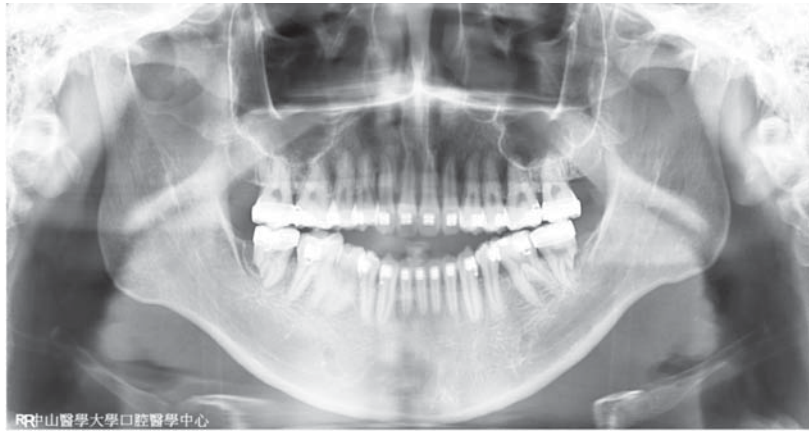


Fig. 4. This image was obtained over 18 months after the extraction of teeth 38 and 48. Bone cavity was healed well, and no mobility or pulp necrosis was noted in teeth 37 and 47.

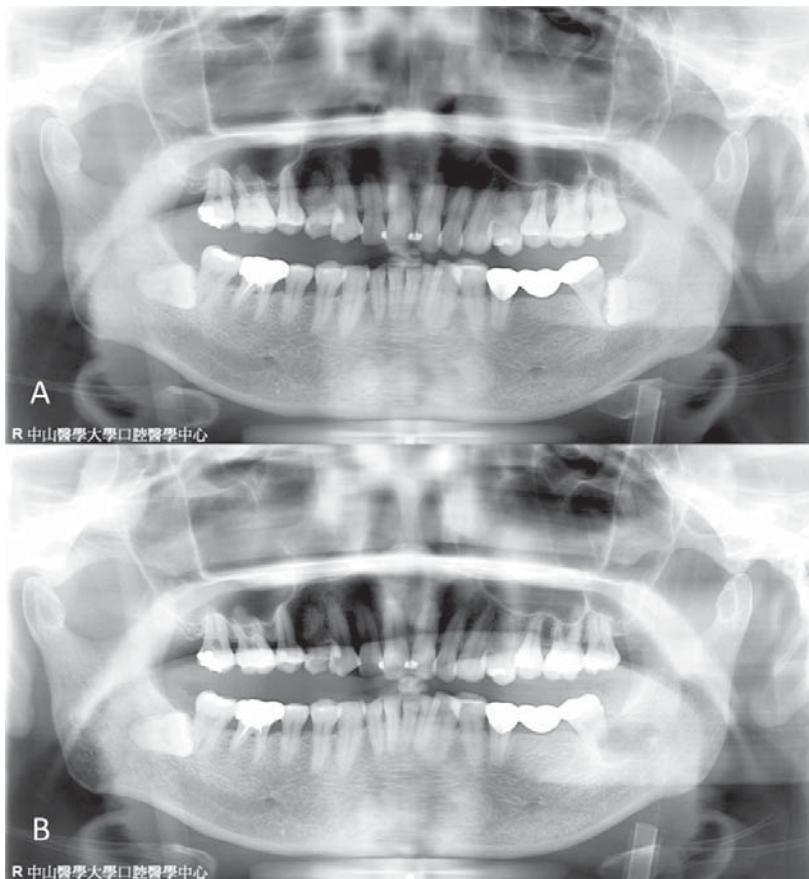


Fig. 5. These panoramic radiography images were obtained on the same day just before (A) and after (B) tooth extraction. Distal root resorption of the tooth 37 is noted.

periapical images that may lead to object overlap. Diagnosing root resorption is difficult, when the impacted third molar located more buccally, impacted mandibular third premolar more lingually, and impacted canine more orally. The diagnosis of external root resorption has become easier due to the advances in three-dimensional imaging techniques. Recent articles compared 2D and 3D images to detect external root resorption<sup>2, 5, 6</sup>. Because of the high incidence rate of external root resorption, taking 3D images is preferred when direct contact with the impacted adjacent tooth is observed on 2D images.

For classifying the severity of root resorption, many studies have reported the use of the Ericson and Kuroi<sup>7</sup> classification. Resorption is graded using the following four categories: (1) no resorption, intact root surfaces and may be lost cementum layer; (2) slight resorption, resorption up to half of the dentine thickness to the pulp; (3) moderate resorption, resorption from midway to the pulp or more with unbroken pulp lining; and (4) severe resorption, exposed pulp. Based on the above classification, in our first case, tooth 17 was slightly resorbed and severe resorption was noted in teeth 27, 37, 46, and 47. For severe root resorption, clinicians should decide whether to remove the impaction or extract the resorbed tooth.

For the management of third molars, removing or retaining them is usually a dilemma for clinicians. Nunn et al. observed that second molars adjacent to the soft tissue that impacted the third molars were at greater risk of incident distal bone loss  $\geq 20\%$  and incident distal probing depth of  $>4$  mm<sup>8</sup>. One study suggested that the external root resorption of the mandibular molar is usually detected in the cervical region of the second molar. The author concluded

that if the Pell and Gregory's<sup>9</sup> classification of the third molar is class A or B, the molar should be removed; otherwise, the incidence of external root resorption would be higher<sup>5</sup>. A systematic review published in the Cochrane Library concluded that the available evidences on whether or not asymptomatic disease-free impacted wisdom teeth should be removed are insufficient. However, an impacted mandibular third molar increases the risk of periodontal disease of the second molar<sup>1, 10</sup>. Some pathologic problems occur in the third molars especially in the lower jaw, such as caries, periodontitis, cysts and tumors, and external root resorption. If a pathologic problem occurs, such third molars should be completely removed. However, for the asymptomatic third molars, some authors suggested that patients' preference should be considered, and their clinical expertise should be used to guide the shared decision-making; otherwise, annual clinical assessment is advisable to prevent undesirable outcomes<sup>1, 11</sup>.

The incidence of supernumerary premolars is  $<0.7\%$ <sup>12</sup>, which are usually more developed at the mandible than at the maxilla, and the morphology is usually assembled on the normal premolar. The age of the formation of late-developing supernumerary premolars is approximately 12-13 years<sup>13, 14</sup>. Because it is asymptomatic, it is usually detected in panoramic radiographic images during orthodontic treatment or other jaw problems. Supernumerary teeth sometimes develop certain complications, such as delayed eruption and/or displacement of the permanent teeth, root resorption, and cyst formation. Once the supernumerary tooth is found, the decision of its removal or monitoring must be made. Some authors claimed that when the root displacement or root resorption was found on an

image, extraction was the only option<sup>13</sup>. Others suggested that if spontaneous eruption of the supernumerary premolar occurs, extraction should be postponed to facilitate surgery and reduce risks, such as nerve injury<sup>14</sup>.

Orthodontic tooth movement can modify and improve the periodontal anatomy of the hard and soft tissue morphology<sup>15</sup>. However, the patient should have no occlusion at the bilateral posterior teeth temporarily. In our first case, the other treatment option could be the extraction of teeth 18, 27, 37, and 47 followed by third molar autotransplantation to the second molar socket. The advantage of this approach is that the occluded teeth can be immediately replaced. However, the total surgical time would be prolonged, and the success rate of autotransplantation remains controversial. Another management method is extraction of the second and third molars then implantation. This method requires further surgery. It is more expensive, time-consuming, and requires temporary no occlusion of the posterior teeth. Orthodontic extrusion and uprighting of the third molar is a conservative approach that allows tooth retention without extraction<sup>15</sup>. This method can also increase the amount of bone and soft tissues. If the extrusion and uprighting of the tooth fail, it can be easily followed by implantation with less deficient bone.

## Conclusion

External root resorption is a common situation; however, the presence of four third molars and one supernumerary tooth all leading to slight to severe root resorption is rare. The importance of early diagnosis and assessment of the severity of external root resorption using

3D images can prevent further complications and determine the suitable treatment plan. For the management of third molars, prophylactic extraction is suggested unless contraindications exist. The same treatment is suggested for the impacted supernumerary tooth. Multidisciplinary therapy is essential and should always be considered by clinicians.

For all the three patients, we believed that prophylactic removal of asymptomatic disease-free impacted wisdom teeth was an essential treatment.

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## 阻生齒導致的牙根外吸收—三病例報告

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### 摘 要

牙根外吸收可能的原因很多，包含矯正治療、牙齒外傷、顎骨疾病、鄰近的阻生齒所產生的壓力、牙周病或是不明原因等。因為三維影像(電腦斷層及椎狀束電腦斷層)的普及，牙根外吸收的例子也逐漸增加。若是未將產生牙根外吸收的原因去除，此種病理狀況就會持續。然而預防勝於治療，應是在發現阻生齒(不論是阻生的第三大白齒或是多生牙)當下即進行治療。本篇文章中將提到三位患者，其中一位是將嚴重吸收的第二大白齒拔除，另兩位是將阻生的第三大白齒移除，並且剩餘的第二大白齒並沒有搖動度。本篇文章想藉由這三位患者來支持移除阻生的第三大白齒及多生牙。身為口腔顎面外科醫師，向患者解釋牙齒移除的好處能更有說服力。

**關鍵詞：**牙根外吸收，阻生齒，第三大白齒。

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