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## Extraction of Impacted Supernumerary Teeth with Navigation System

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Computer-aided navigation system is helpful in maxillofacial surgery with real time instrument positioning and clear anatomic identification. Generally, completely impacted tooth extraction surgery have a high risk by iatrogenic injury such as, adjacent tooth injury, normal anatomical structure injury. This case report describes performing extraction of impacted supernumerary teeth on anterior maxilla by using the navigation system in a 15 years old male patient.

**Key Words** Computer-aided surgery · Navigation surgery · Extraction · Impacted teeth · Supernumerary teeth.

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### Introduction

Before the use of 3-dimensional (3D) images, much of this relied on 2-dimensional (2D) imaging causing many surgical trials and errors (1). Recently, various methods are attempted to reduce the surgical error during actual surgery. In addition, the use of a computer-assisted navigation system (CANS) has been acknowledged to be exceptionally helpful in maxillofacial surgery, as it allows the monitoring of the instrument's movements in real-time (2). Additionally, only using the 3-D images also need to surgeon's experiences, because need to find accurate position of the purposed object or lesion. With treatment planning through computer-based virtual surgery simulation and the development of a surgical guide along with a navigation system that accurately locates the anatomical position can all be used for maxillofacial surgery and enabling a more precise

surgery with reduced surgical time (3).

Conventionally, extraction of the impacted tooth has performed with 2D images and currently, 3D CT images for knowing the accurate location. When extract the tooth, it is very important to know the location of the tooth, approximation to the adjacent teeth, shape of the root, and contour of the covered bone. When extract the completely impacted tooth, one of the hardest procedure is the finding the first entry point to shave the bone, because can't see the tooth directly, only can estimate the location. In this case report, we used 3D navigation system for finding the exact position and entry point for extracting the impacted supernumerary teeth.

### A Case Report

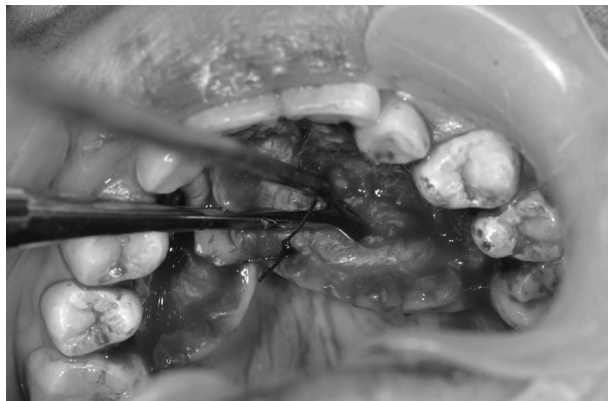
A 15-year old came for extracting two supernumerary teeth

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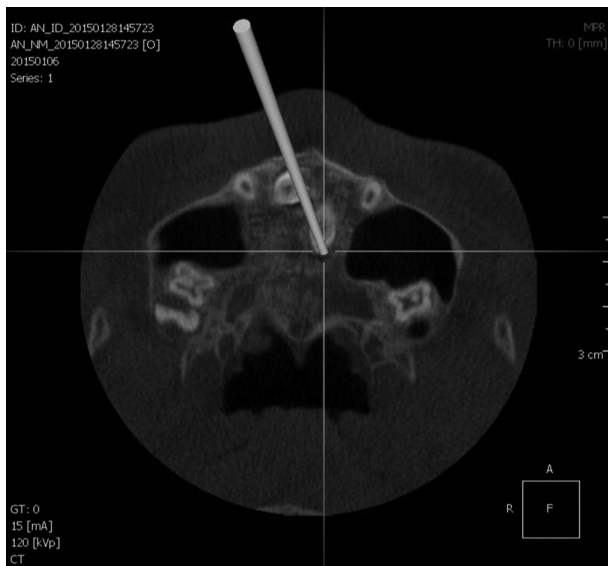
on anterior maxilla area. Two supernumerary teeth were observed on apical area of the upper incisors and close to the nasal floor in panoramic view (Fig. 1). The vitality of the affected teeth was normal through EPT. A facial cone-beam CT was taken for computer-based pre-operative evaluation and application for navigation system (Fig. 2). Under local anesthesia,



**Fig. 1.** Two supernumerary teeth is seen on anterior maxilla area.



**Fig. 2.** Palatal flap was elevated and then applied the navigation probe for detecting the teeth location.



**Fig. 3.** CT shows the 3D position of the impacted tooth with navigation system.

palatal flap was elevated with sulcular incision from #15 to #25. Exposed the palatal bone and applied the navigation system for detecting the tooth location (In2Vision, Cybermed, Seoul, Korea) (Fig. 3). After confirming the tooth location and removed the bone with Piezosurgery for approaching the crown of the impacted tooth with preserving the nasopalatine nerve. And then, extracted the tooth with conventional extraction method (Fig. 4). After extraction, there is no possible complications, such as normal tooth injury, or healing impairments during 1 year follow up (Fig. 5).

## Discussion

Maxillofacial surgery demands high precision, proper function, and esthetics. Also, the use of computer-based surgery on the anatomically complex head and neck area allowed a more precise surgery on a larger scale. The use of 3D images and navigation system has greatly advanced surgeries from previous surgeries using 2D images (2). This technique makes it easier for the dentist or oral and maxillofacial surgeon to perform surgical extraction, and it is able to avoid unplanned bony cuts and adjacent teeth injury. The proposed method is similar to making a surgical guide usually used in implants. However, navigation system can provide the real-time position of the indicated



**Fig. 4.** After extraction of the impacted tooth with minimal removal of the overlying bone.



**Fig. 5.** Panoramic view after extraction.

point, so it is not necessary to make the surgical guide for indicating the entry point to approach the impacted tooth (4). Other geometric features are determined including the position and size of the target tooth for extraction, the angle of the root, the slope, the depth, and the preferred method of drilling. It is also necessary to discuss the surgeon who performs extraction. However, surgical guides can't provide if modifications to the treatment plan are needed to perform the extraction. Optionally, the navigation system can provide this information (5). It has also some disadvantages, such as high price of the system, time consuming preparation step, distance errors. Another limitation is that overall treatment time is prolonged compared to routine extraction performed in dental facilities. However, considering the precise approaching, the navigation system can reduce tissue damage due to trauma, laceration, and unintentional instrument manipulation. The advantage of this procedure is that it compensates the time and cost of acquiring CT data and using a navigation system. The use of the navigation system to improve surgical precision showed high precise extraction is possible by checking the position of the impacted tooth through anatomically checking the instrument's location. In conclusion, extrac-

tion of the impacted tooth with navigation system techniques can provide precise extraction and reduce the possible complications.

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