



Use of Three-Dimensional Technology and Surgical Guide as Facilitators in the Extraction of Supernumerary Teeth

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Abstract

Nowadays, everyone aspires to and seeks out high-quality medical treatment. Fortunately, this is now hassle-free thanks to advancements in artificial intelligence and technology. Let's explore artificial intelligence and its consequences for dentistry and medical care in this essay. People may learn everything there is to know about the procedures, any possible hazards, and helpful aftercare advice thanks to Chat GPT. By having knowledge about what to expect during their in-person visit in order to make an informed decision about undergoing treatment, people who suffer from dental anxiety or fear of going to the doctor might benefit from artificial intelligence technology. Let's start by studying artificial intelligence, chatgpt technology, its discovery, and its application in other healthcare specializations before talking about chatgpt and its applications in dentistry.

Keywords: Artificial Intelligence; Chat GPT; Diagnosis; Technology

Introduction

Here is the text translated into academic English: "supernumerary and unerupted teeth are defined as those that are not clinically present in the oral cavity due to a delay in physiological eruption, and are covered by soft or hard tissue in their adjacent area [1]. Supernumerary teeth are commonly the maxillary and mandibular third molars, maxillary canines, and mandibular premolars, in decreasing

order of frequency [2,3].

Systemic and local factors can cause tooth impaction. Additionally, endocrine deficiencies such as hypothyroidism and hypopituitarism, Down syndrome, and hereditary cleidocranial dysplasia represent systemic etiologies [4-6]. Local factors include prolonged retention of deciduous teeth, lack of space in the dental arch, supernumerary teeth, odontogenic tumors, cleft lip and palate, and incorrect

positioning of dental germs, all of which can interfere with the normal eruption path [4,7,8].

However, supernumerary teeth can arise in various locations within the gnathic bones, and their etiology remains unclear [9,10]. Most of the time, they present with unusual and diverse morphology, making it difficult to classify them or assign dental notations, posing a constant challenge in surgical procedures due to these characteristics [11]. 3D technologies are increasingly aligned with the rehabilitative and surgical treatment of patients and are widely used in areas such as oral and maxillofacial surgery and traumatology, endodontics, implantology, and prosthodontics [12].

Imaging exams using computed tomography have enabled the development of specific software to study the detailed skeletal anatomy of the face, providing an excellent image representation of the medullary and cortical bone, their irregular edges, and the relationship between dental roots and adjacent structures [13,14]. These software tools are used for three-dimensional surgical planning, allowing surgeries to be performed with minimal incisions, resulting in a less traumatic intraoperative experience for the patient and, consequently, a more comfortable postoperative recovery with less pain and swelling [15,16].

Case Report

A 6-year-old male patient, non-syndromic, accompanied by his mother, was referred by the pediatric dentist for

evaluation by a maxillofacial surgeon regarding the complaint of increased diastema between the upper central incisors (Figure 1) and palatal protuberance, close to the incisive and posterior foramen to the tooth 21.

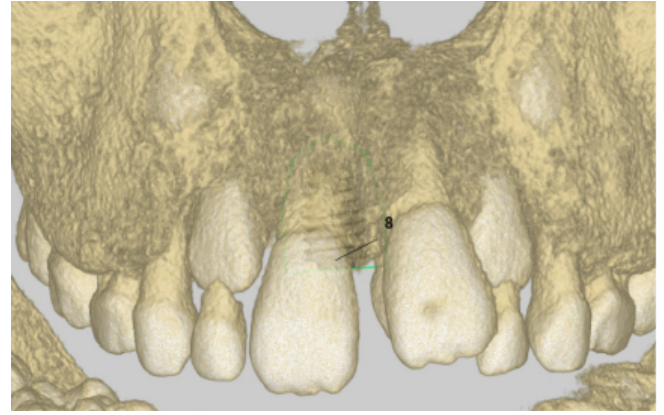


Figure 1: Diastema between upper central incisors.

In a cone beam tomographic examination, two impacted teeth were observed in the anterior region of the palate, one being in close contact with the root apex of tooth 21 and the other at the beginning of a non-physiological eruptive process posterior to the same tooth (Figure 2).

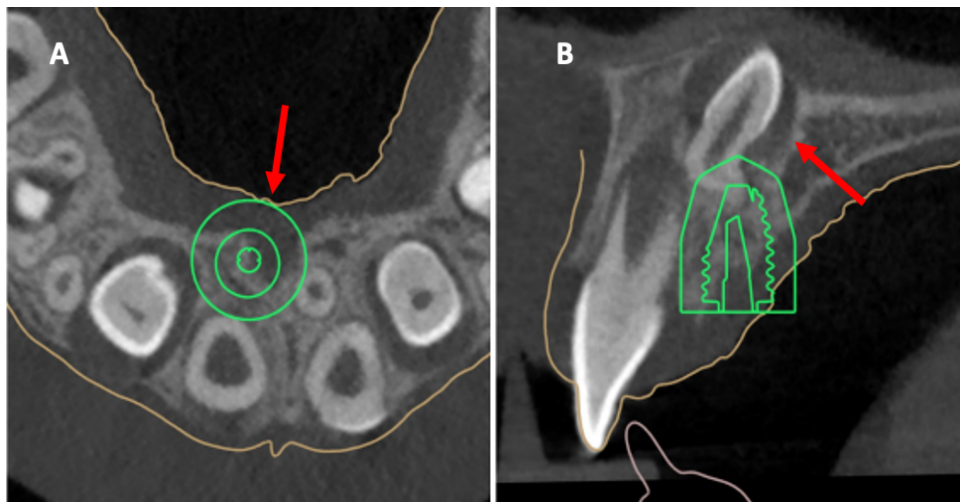


Figure 2: A) Supernumerary tooth posterior to tooth 21 in axial plane. B) Supernumerary tooth in contact with the root apex of tooth 21 in the sagittal plane.

An intraoral scan of the maxilla was performed and crossed with Cone Beam Computed Tomography (CBCT) in the

3Shape software, enabling planning and creation of the surgical guide (Figure 3). Bone visualization, followed by

adaptation of the surgical guide, took place after an envelope-type incision and divulsion of the overlying tissue. Drilling

was performed with a number 8 spherical carbide surgical drill at 2.0 mm apical distance and 1.5 mm radial distance.

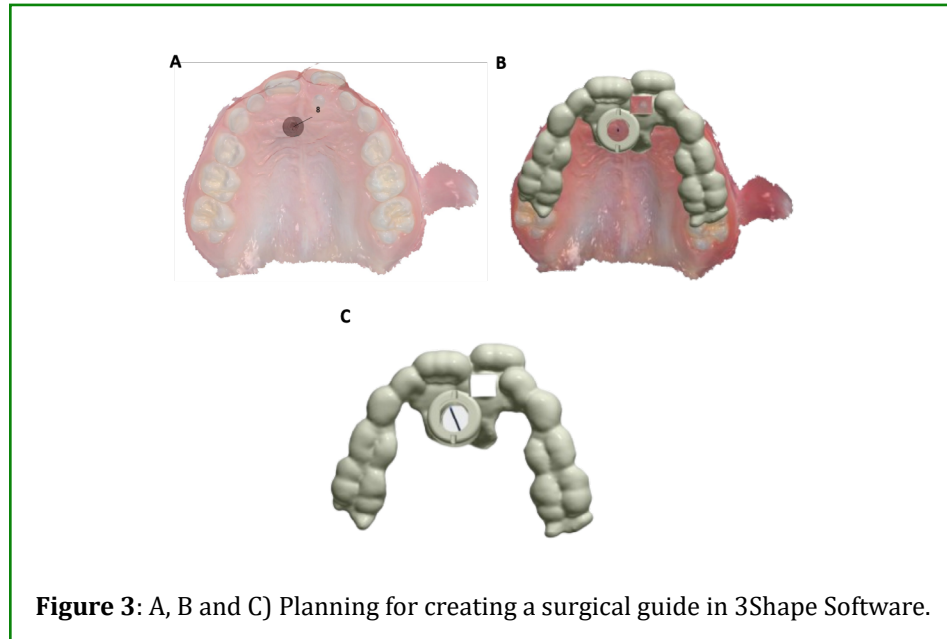


Figure 3: A, B and C) Planning for creating a surgical guide in 3Shape Software.



Figure 4: A) Surgical guide installed after incision and detachment of the periosteum. B) Supernumerary teeth extracted.

Conventional methods for removing supernumerary teeth typically involve traditional surgical procedures. The main conventional methods include traditional surgical extraction: This procedure involves making an incision in the gum with a scalpel, followed by the removal of bone surrounding the supernumerary tooth. The tooth is then extracted using dental forceps. Local anesthesia is generally administered to manage pain during the procedure. The duration of the surgery can vary depending on the location and number of supernumerary teeth. Extraction under sedation or general anesthesia, In more complex cases, or when the patient experiences significant anxiety, the extraction may be

performed under conscious sedation or general anesthesia. Recovery time is often extended, especially following general anesthesia.

Notable Disadvantages of Conventional Methods, traditional surgical extraction is an invasive procedure, involving incisions in the gum and the removal of bone tissue, which can lead to increased postoperative pain, swelling, and discomfort for the patient. There is also a risk of damage to adjacent teeth, nerves, or other critical structures, particularly when the supernumerary tooth is situated near these areas. Postoperative complications, such as

infection, bleeding, and cyst formation, are possible. Healing may be prolonged, and in some cases, a second surgical intervention may be required. Recovery can be lengthy, necessitating rest, dietary restrictions, and follow-up visits. Furthermore, dental surgery can be a significant source of stress and anxiety for many patients, particularly for those undergoing procedures that require general anesthesia or sedation. Complex surgical procedures, especially those performed under general anesthesia, can also be financially burdensome. In conclusion, while conventional methods for removing supernumerary teeth are effective, they come with several drawbacks, including invasiveness, the risk of complications, and extended recovery times. These factors have driven the pursuit of less invasive methods that pose fewer risks to patients.

Discussion

Multiple supernumerary teeth have a low prevalence when not associated with any syndrome, with rates varying between 12% and 23% [17-19]. When they occur in the anterior maxillary region, as in the present case, Neville [18] indicates that 75% do not erupt.

The main syndromes associated with supernumerary teeth include Gardner, Ehlers-Danlos, Apert, Down, and Cleidocranial Dysplasia [18,20], but these were ruled out based on the patient's medical history and evaluation. Advances in software and hardware technology in recent decades have led to the development of auxiliary tools for diagnosis, planning, and surgical treatment [21]. According to Mora, et al. [22], CBCT and other 3D imaging techniques have overcome the limitations of two-dimensional imaging, allowing their application in areas such as endodontics, implantology, orthodontics, pathology, and others that previously relied solely on radiographs for diagnosis and treatment.

In our case, we demonstrated that the use of computerized three-dimensional tools can be beneficial not only in the mentioned specialties but also in the diagnosis and planning of minor oral surgeries, particularly for impacted teeth that require careful analysis of their position and location. Moura, et al. [23] stated that surgeries on impacted teeth can be traumatic, as they often require extensive bone tissue removal, especially when access through regions other than the oral cavity is unfeasible or more invasive, affecting the patient's postoperative recovery. In the present case, before the decision to create a surgical guide, the possibility of extracting one of the supernumerary teeth through the nasal cavity was considered, given its proximity to the nasal floor. This option was ruled out in favor of creating the guide. Another determining factor was the patient's age, as the

process of root formation was still ongoing, which could result in root dilaceration and ankylosis. Ziegler, et al. [21] assert that no standard protocol for removing impacted teeth may vary based on location, size, orthodontic possibilities, and the professional's expertise. This case presents a new alternative for the extraction of impacted and supernumerary teeth in a less traumatic and more precise manner for their location and access.

Conclusion

Multiple supernumerary teeth in the anterior maxillary region are of low prevalence and, when detected in childhood, require monitoring or surgical removal. This article aims to present the use of 3D technology through the association of cone-beam computed tomography with 3Shape software for fabricating a surgical guide as a less invasive and more precise adjuvant technique for the localization and direction of supernumerary tooth removal.

References

1. Hupp JR, Tucker MR, Ellis E (2013) Contemporary Oral and Maxillofacial Surgery-E-book. In: 7th (Edn.), Elsevier Health Sciences.
2. Thilander B, Myrberg N (1973) The prevalence of malocclusion in Swedish schoolchildren. *Eur J Oral Sci* 81(1): 12-20.
3. Dachi SF, Howell FV (1961) A survey of 3,874 routine full-mouth radiographs: II. A study of impacted teeth. *Oral Surg Oral Med Oral Pathol* 14(10): 1165-1169.
4. Raghoobar GM, Boering G, Vissink A, Stegenga B (1991) Eruption disturbances of permanent molars: a review. *J Oral Pathol Med* 20(4): 159-166.
5. Bishara SE, Ortho D (1992) Impacted maxillary canines: a review. *Am J Orthod Dentofacial Orthop* 101(2): 159-171.
6. Levy I, Regan D (1989) Impaction of maxillary permanent second molars by the third molars. *J Paediatr Dent* 5: 31-34.
7. Jacoby H (1983) The etiology of maxillary canine impactions. *Am J Orthod* 84(2):125-132.
8. Moyers RE (1988) Handbook of Orthodontics. In: 3rd (Edn.), Year Book Medical Pub.
9. Nascimento Silva D, Ferraro-Bezerra M, Barbosa Guimarães K, Hernández Cancino CM (2006) Cuartos molares supernumerarios: relato de caso clínico. *Rev*

- Cubana Estomatol 43(1).
10. Stuani AS, Stuani AS, Stuani MBS, Matsumoto MAN (1999) Complications of late diagnosis of mesiodens: literature review and clinical report. *Rev Fac Odontol Univ Fed Bahia* 19: 61-67.
 11. Berthold TB, Benemann E (1996) Tooth number anomaly: anodontics and supranumerary teeth. *Rev Odonto Cienc* 11(22): 101-109.
 12. Vasconcelos BE, Farias RS, Matos JDM, Lima JFM, Castro DSM, et al. (2018) 3D technology and its applications in modern Dentistry systematic review. *Full Dent Sci* 10(37): 1-6.
 13. Van Assche N, van Steenberghe D, Quirynen M, Jacobs R (2010) Accuracy assessment of computer-assisted flapless implant placement in partial edentulism. *J Clin Periodontol* 37(4): 398-403.
 14. Viegas VN, Dutra V, Pagnoncelli RM, de Oliveira MG (2010) Transference of virtual planning and planning over biomedical prototypes for dental implant placement using guided surgery. *Clin Oral Implants Res* 21(3): 290-295.
 15. D'haese J, Van De Velde T, Komiyama A, Hultin M, De Bruyn H (2012) Accuracy and complications using computer-designed stereolithographic surgical guides for oral rehabilitation by means of dental implants: a review of the literature. *Clin Implant Dent Relat Res* 14(3): 321-335.
 16. Soares MM, Harari ND, Cardoso ES, Manso MC, Conz MB, et al. (2012) An in vitro model to evaluate the accuracy of guided surgery systems. *Int J Oral Maxillofac Implants* 27(4): 824-831.
 17. Anegundi RT, Tegginmani VS, Battepati P, Tavargeri A, Patil S, et al. (2014) Prevalence and characteristics of supernumerary teeth in a non-syndromic South Indian pediatric population. *J Indian Soc Pedod Prev Dent* 32(1): 9-12.
 18. Neville BW, Damm DD, Allen CM, Bouquot JE (2009) *Patologia Oral e Maxilofacial*. In: 3rd (Edn.), Rio de Janeiro.
 19. Lara TS, Lancia M, Silva Filho OM, Garib DG, Ozawa TO (2013) Prevalence of mesiodens in orthodontic patients with deciduous and mixed dentition and its association with other dental anomalies. *Dental Press J Orthod* 18(6): 93-99.
 20. Kumar DK, Gopal KS (2013) An epidemiological study on supernumerary teeth: a survey on 5000 people. *J Clin Diagn Res* 7(7): 1504-1507.
 21. Ziegler CM, Klimowicz TR (2013) A comparison between various radiological techniques in the localization and analysis of impacted and supernumerary teeth. *Indian J Dent Re* 24(3): 336-341.
 22. Mora MA, Chenin DL, Arce RM (2014) Software tools and surgical guides in dental-implant-guided surgery. *Dent Clin North Am* 58(3): 597-626.
 23. Moura ABR, Medeiros FLS, Neto APA, Fernandes LV, Ribeiro RA, et al. (2021) Identification and surgical removal of supernumerary teeth: case report. *Arch Health Investig* 10(5): 725-728.