CASE REPORT

# Altered anatomy in a case with a buccally impacted maxillary canine tooth

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**Abstract**

Bilateral dissections of maxilla were performed in a human adult cadaver head, male, aged 53 years. After the en block removal of the soft tissues in the oral and infraorbital regions, the antero-lateral surface of maxilla was exposed and also the vestibular aspect of the upper alveolar process. An oblique labially impacted right upper canine was evidenced, completely submucosal: its apex was tangent to the maxillary sinus floor, while the superior side of the apical part of the root was in close relation with the floor of the laterally expanded inferior nasal meatus. Superior and adjacent to the neck of that impacted canine a follicular cyst was evidenced and the antral wall presented distally to the apex of the impacted canine a dehiscent area, where the antral mucosa was only covered by an incomplete thin bony lamella. The incisors on that side were present but no resorption was identified at their level. Within the anterior border of the wall separating the maxillary sinus, small, and the inferior nasal meatus, the nerve for that impacted canine was coursing; the nerves for the upper incisors were initially located within the antero-lateral wall of the inferior nasal meatus. Although small, the maxillary sinus presented a supero-medial recess above the enlarged inferior nasal meatus and lateral to the normally-sized middle nasal meatus.

***Keywords*:** maxilla, teeth, alveolar nerve, maxillary sinus, nasal fossa.

## Introduction

Surgical management of unerupted teeth depends upon a thorough understanding of anatomic, physiologic and pathologic factors [1].

Tooth structure develops in a well-regimented fashion. However, tooth eruption may be perturbed either by intrinsic or environmental factors. Teeth may become impacted when they fail to erupt or develop into the proper functional location. As such, impacted teeth are considered nonfunctional, abnormal and pathological [2].

With the exception of the maxillary and mandibular third molars, the maxillary canine is the most commonly encountered impaction. In North America, palatally located impactions appear to predominate over labially impacted canines and occur more frequently in women. Because the general dentist is often the first dental care provider to come in contact with patients with impacted canines, knowledge about this common dental anomaly is essential to provide proper preoperative planning and comprehensive therapy [3].

We could not find any available references on the anatomical relations of the impacted maxillary canine tooth as resulted from dissections so we considered indicate to communicate a case encountered in the dissection room, of a maxillary impacted canine tooth, detailing the altered topographical relations that occurred.

## Material and Methods

Bilateral dissections of maxilla were performed in a human adult cadaver head, male, aged 53 years, Caucasian.

After the en block removal of the soft tissues in the oral and infraorbital regions, the antero-lateral surface of maxilla was exposed and also the buccal aspect of the upper alveolar process. Only the infraorbital nerve and its external branches were dissected and kept in the dissection.

On the right side, an upper impacted canine was evidenced, while on the left side the corresponding tooth was erupted and normally placed. The external morphology of the maxilla was documented and then the bony walls were removed to demonstrate the maxillary sinus, the nasal fossa, and their topography as related to the impacted canine. While removing the bony walls, the anterior superior alveolar nerves were evidenced and kept in place.

## Results

After removing the soft tissues covering the maxilla, we evidenced unilaterally, on the right side, an oblique labially impacted upper canine, with straight apex, completely submucosal. The upper arcade presented on that

side with both incisors, central and lateral (we did not evidence resorptions of the roots of these teeth), that impacted canine, a radicular rest of the first premolar and the upper first molar (Figures 1–3).

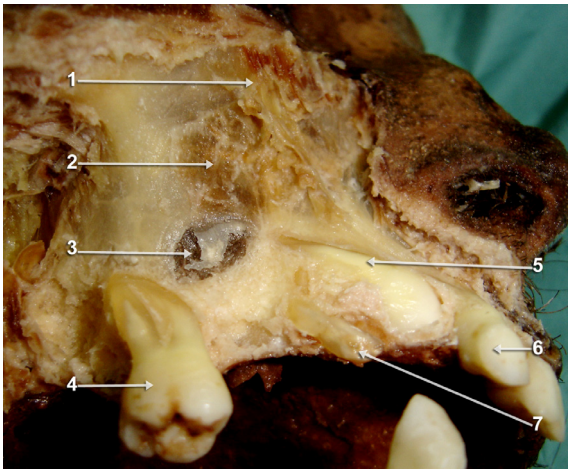


**Figure 1** – ***First stage of dissection, after the en block removal of the soft tissues in the right oral and infraorbital regions. 1. Infraorbital nerve, at the infraorbital foramen; 2. Canine fossa attached at its upper part the levator anguli oris muscle; 3. Bony dehiscence of the antral wall, exposing the antral mucosa and incompletely covered by a thin bony lamella; 4. Maxillary first molar; 5. Horizontally labially impacted upper canine; 6. Upper lateral incisor; 7. Radicular rest of the first upper premolar.***

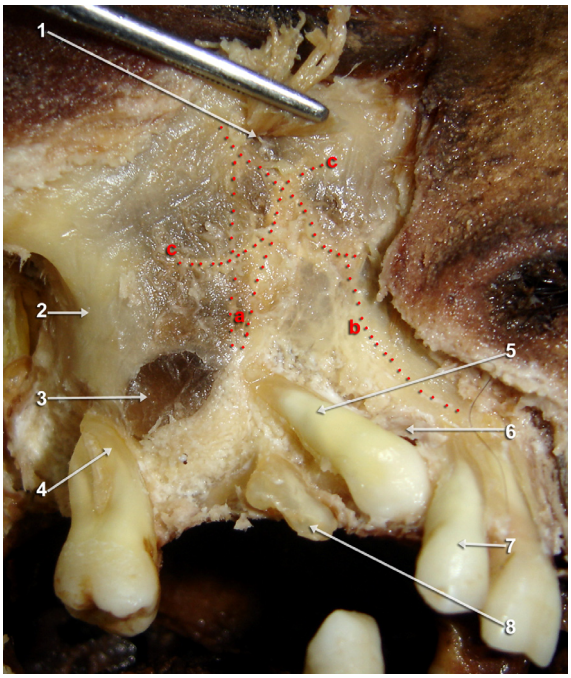


**Figure 2** – ***The bony wall of the maxilla cleaned allowed the evidence of the anterior superior alveolar nerves (red dots): (a) for the impacted canine; (b) for the incisors; (c) the antral branches. 1. Infraorbital nerve, at the exit in the infraorbital foramen; 2. Zygomaticoalveolar crest; 3. Anterior antral wall dehiscence, after removing the covering lamella; 4. Upper molar, with the mesiovestibular root curved distally, over the distovestibular root; 5. Horizontally labially impacted upper canine; 6. periodontal cyst; 7. Upper lateral incisor; 8. Rest of the upper first premolar.***

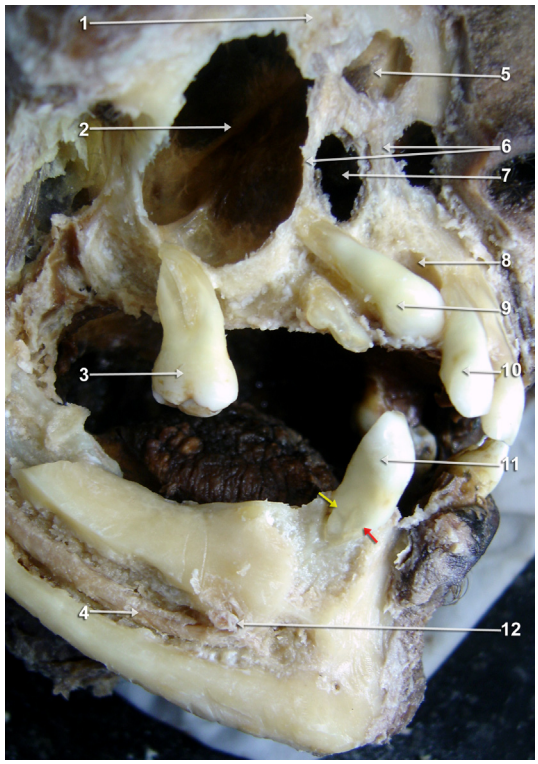


**Figure 3** – ***The topography of the upper impacted canine related to the cavities. 1. Infraorbital foramen; 2. Maxillary sinus; 3. Upper first molar; 4. Inferior alveolar bundle; 5. Supero-medial recess of the maxillary sinus, at the level of the middle nasal meatus; 6. Anterior superior alveolar nerves; 7. Inferior nasal meatus; 8. Periodontal cyst; 9. Horizontally labially impacted upper canine; 10. Upper lateral incisor; 11. Lower canine, presenting two roots: mesiovestibular (red arrow) and distolingual (yellow arrow); 12. Foramen mentale.***

Distally to the apex of the impacted canine (IC) a bony dehiscence of the antral wall was evidenced, the antral mucosa being covered at that level only by an incomplete thin bony lamella (Figure 1). Superior to that dehiscence and also to the apex of the IC the insertion of the levator anguli oris muscle on the canine fossa was also evidenced (Figure 1). The infraorbital foramen was located on a vertical drawn through the apex of the IC, at 19.4 mm. superior to it. Within the anterior wall of the maxilla the anterior superior alveolar nerves were evidenced, initially on the infero-lateral side of the infraorbital canal and then descending into the bony wall, towards the apices of the IC and the upper incisors; also antral branches were observed leaving these nerves (Figure 2). As it was proven later by dissection, the nerves for the IC coursed at the anterior border of the wall separating the maxillary sinus and the inferior nasal meatus while those for the upper incisors were located within the antero-lateral wall of that enlarged inferior nasal meatus (Figure 3). So, while the apex of the IC was tangent at the floor of a relatively small maxillary sinus, the supero-medial side of its unique root: (a) distally faced the floor of the inferior nasal meatus and (b) mesially was in contact with a follicular cyst evidenced during the dissection of the alveolar process (Figures 2 and 3). While the inferior nasal meatus appeared enlarged, the middle

nasal meatus seemed to be normally developed, corresponding laterally to a supero-medial recess of the maxillary sinus that presented the system of drainage of the sinus (Figure 3). Dissection of the mandible at the same specimen also revealed the presence of a right lower canine presenting two fused roots, one buccal and the other lingual (Figure 3).

## Discussion

Any permanent tooth may become impacted; however, the maxillary canine, with the exception of the third molars, seems to be the most frequently impacted tooth. There are four treatment options for impacted teeth: observation and follow-up, intervention, relocation or extraction [4]. All of these involve a comprehensive approach of the impacted maxillary canine, based upon a good anatomical knowledge.

Ectopic positioning and impaction most often affect the third molars, second premolars, and canines, possibly because these are the last teeth to erupt [5].

As for occurrence, the buccally impacted maxillary canines seem to be more frequent and to prevail in female patients [6].

The region of the maxillary canines corresponds to an area of embryological risk, presenting a variety of malformations: clefts, hypodontia, supernumerary teeth, *dens invaginatus*, increased morphological variability, tooth impaction, etc. [7].

The most common causes of canine impactions are usually the result of one or more factors such as a long path of eruption, tooth size-arch length discrepancies, abnormal position of the tooth bud, prolonged retention or early loss of the deciduous canine, trauma, the presence of an alveolar cleft, ankylosis, cystic or neoplastic formation, dilaceration of the root, supernumerary teeth, and odontomas [8].

In our case, the apex of the impacted canine extended deep into the maxilla bone and its axis was almost parallel to the floor of the nose. In such cases, the prognosis of a good inclination of the canine at the end of treatment is poor [9].

As referred to the work of Szarmach IJ *et al.* (2006), who documented 82 patients with a diagnosis of unilateral or bilateral impaction of 102 permanent maxillary canines, our specimen, male, aged 53 years, corresponds to group age IV and its vestibular location was determined to appear in 4.90% of cases. Right-side locations were less frequent than left-side locations [10].

The close relations of such impacted permanent upper canines, as that one we report here, with the maxillary sinus and nasal fossa, justify the possible extension routes in case of infection (pericoronitis, cellulitis, abscess formation, pulpal/periapical pathology) and recommends caution if extraction is decided and performed. Except the episodes of infection, extraction of such permanent impacted teeth may be decided if caries, cysts or root resorptions are observed. Preparations have to be considered, such as instrumentary and materials, prior to such interventions, for the unwanted eventuality of opening the maxillary sinus.

Currently, stimulating dental eruption by means of surgical exposure and subsequent orthodontic assistance is the most prevailing treatment option for impacted maxillary canines. It is referred to as "guided eruption" or, more commonly, "surgical exposure" [11]. When the canine is in buccal position, the scarce availability of attached gingiva calls for closed techniques or apical repositioning flap procedures; for the later, Pascual Gil JV *et al.* (2008) introduced certain modifications in order to improve the technical outcomes [11].

If surgical treatment is decided for such labially (buccally) impacted upper canine, an imagistic evaluation – better seems to be the 3D evaluation – must be performed in order to evidence the patient's dental–antral and dental–nasal topography that may be altered. In our case, the apical part of the root was intercalated between the maxillary sinus and an expanded inferior nasal meatus and so, the risk of penetration during extraction (if performed) was high. Therefore, the anatomical basis provided by the present case may be useful as correlate while evaluating the imagistic documentation of such patients, for preoperative planning.

It is important to maintain the maxillary canines within the arch not only for aesthetic reasons, but also because of their involvement in lateral excursive movements, which, in many individuals, are primarily achieved by canine guidance.

From an educational viewpoint it appears indicate that, at least in dental medical faculties, the students to be trained not only for a good knowledge of the normal anatomy of maxilla and mandible but also for an anatomical-based comprehension of the altered topographical relations in case of occurrence of impacted teeth.

## Conclusions

A detailed anatomical knowledge of teeth impaction anatomy appears as indispensable for both practical and educational purposes.

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