



Characteristics and position of maxillary canine impaction using panoramic radiograph at RSGMP UNHAS: a retrospective study

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ABSTRACT

Objectives: To analyze cases of maxillary canine impaction, emphasizing characteristics, positional forms, and radiographic features.

Materials and Methods: This descriptive study utilized a retrospective and cross-sectional design approach. Samples were obtained through purposive sampling. Secondary data from the Dental Hospital and Education Clinic (RSGMP) at Hasanuddin University from January to December 2023 were used. A total of 43 clinically and radiographically diagnosed cases were included in this study.

Results: This study revealed that patients with maxillary canine impaction were predominantly in the age group of 10–19 years (46.5%), with females comprising 62.8% and males comprising 37.2%, resulting in a male-to-female ratio of 1:1.68. Type II maxillary canine impaction (Yamamoto classification) was the most common case, accounting for 53%.

Conclusion: Radiography was a crucial aid for diagnosing various types of oral lesions, especially those involving bones.

Keywords: Maxillary, maxillary canine impaction, prevalence, radiographic appearance

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INTRODUCTION

Impaction is described as the failure of a tooth to emerge within the expected timeframe of the normal eruption process.⁽¹⁻⁴⁾ Impaction refers to a condition where a tooth is unable to erupt within the expected timeframe of the normal eruption process.⁽²⁾⁽⁵⁾ Impaction occurs when a tooth is prevented from erupting in the mouth normally due to bone, soft tissue, or neighboring teeth.⁽⁶⁾ Maxillary canine eruption disturbances are common clinical problems in the developing permanent dentition. The movements of the erupting maxillary canines are unique and eruption disturbances can be partly explained by their long and complex eruption route.⁽⁷⁾⁽¹⁾ Maxillary canines are considered the cornerstone of the maxillary arch since they serve a pivotal role in the smile's aesthetic appearance and the occlusion's functional aspect.⁽⁸⁾

An impacted tooth is one that fails to erupt and will not attain its anatomical position beyond the chronological eruption date, even after its root completion. Impacted maxillary canines are one of the common problems faced by clinical orthodontists in terms of diagnosis, treatment planning, and treatment management. Early detection of maxillary canine impaction can also decrease the duration, complexity, and cost of treatment.⁽⁹⁾⁽¹⁰⁾ Maxillary canines are the most common teeth suffering from inclusion after

mandibular third molars.⁽¹¹⁻¹³⁾ Prevalence of their impaction ranges from 1% to 4%. There are many studies that have been documented in the literature on why maxillary canine impaction occurs, but guidance and genetics are widely accepted. The maxillary canines develop deep in the jawbone and travel a longer way to erupt into the oral cavity than other teeth. Females are considered to have impacted maxillary canines more frequently than males.⁽¹¹⁾

There is no single or unique reasons for maxillary canine impaction previous studies in literature regarding the cause of maxillary canine impaction shows that dental discrepancy or lack of space, presence of hard and soft tissue pathologies are considered as etiological factors Elimination of etiological factors results in the auto correction or spontaneous eruption of maxillary impacted canines.⁽⁹⁾ The eruption of the permanent canines located in the maxillary bone begins when the crowns are ready and root development starts. On average, the permanent maxillary canines erupt into the oral cavity between the ages of 10–12 years (Haavikko 1970), but with a normal deviation of several years (Hurme 1949; Hägg and Taranger 1986). When a maxillary canine erupts normally into the oral cavity, the root is usually almost complete (Nolla 1960; Haa-vikko 1970). The manner of eruption of a maxillary canine

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is thought to be highly influenced by lateral incisor guidance (Broadbent 1941; Becker et al. 1981; Brin et al. 1986) as well as genetics (Peck et al. 1994; Baccetti 1998; Peck 2009) and the space available in the dental arch (Jacoby 1983).⁽¹⁾

For many years, the treatment of impacted canines has sparked interest among general dentists and specialists, including orthodontists, periodontists, pediatric dentists, and oral surgeons.⁽⁷⁾ Treatment of impacted teeth is essential, both aesthetically and functionally. Among the treatment options for impacted canines, surgical and orthodontic treatment options may be evaluated separately or as a combination.⁽⁹⁾

Early diagnosis of impacted canines is possible through clinical examination combined with radiographic examination. Orthopantomography (OPT), lateral cephalography, posteroanterior cephalography, single-tooth radiograph, as well as Computed Tomography (CT) and Cone-Beam Computed Tomography (CBCT) are the radiographic methods used for diagnosis. CBCT is the method that can accurately determine the positions of impacted maxillary canines.⁽¹¹⁾ The panoramic radiograph, although it does not have the same level of detail as a periapical film, has the advantage of being simple and fast, offering a good scan of the teeth and jaws, from one joint to another.⁽¹¹⁾ Each radiological method presents advantages and disadvantages. Panoramic radiography remains the most commonly used diagnostic aid in clinical cases where there is a suspicion of dental impaction of permanent canines, because of its ease of interpretation, low cost, and low radiation.⁽¹¹⁾

MATERIALS AND METHODS

This descriptive research utilized a retrospective approach and a cross-sectional research design. The sample was collected using a purposive sampling method, which included all patients with maxillary canine impaction registered in medical records and having panoramic radiographic results at the Dental and Oral Hospital (RSGM) of Hasanuddin University. This study used secondary data obtained from the Dental and Oral Hospital of Hasanuddin University for the period of January 2023 to December 2023 by reviewing medical records and radiographs available in the departmental archives. A total of 48 cases were initially identified by applying inclusion and exclusion criteria. The inclusion criteria were patients aged between 13 and 59 years, with panoramic radiographic images showing adequate contrast and detail with minimal or no distortion. The exclusion criteria included patients over 60 and panoramic radiographs with significant artifacts or blurring that interfered with image interpretation. Based on these criteria, 43 cases that had been clinically and radiographically diagnosed were included in the study. Panoramic radiographs formed the basis of this research. All radiographs and images were taken using standard techniques and processed under standard conditions. The descriptive data of these patients were evaluated and compared with previously documented data in

the literature. The collected data included age and gender, which are characteristic data of maxillary canine impaction at RSGM Hasanuddin University, and panoramic radiographic images for the localization of impaction according to Yamamoto's classification.

Yamamoto Classification

The Yamamoto classification is a system for categorizing maxillary canine impaction based on the orientation of the long axis of the maxillary canine relative to the occlusal plane. **Type I:** vertical impaction of the maxillary canine, almost perpendicular to the tooth axis, located between the maxillary lateral incisor and the first premolar. When the impacted tooth is on the labial side, it may erupt and be inclined downward and labially. If sufficient space is available, especially for younger patients, a natural eruption may occur. When the impaction occurs on the palatal side, surgical treatments such as fenestration and traction are more challenging compared to labial impaction. **Type II:** The crown is more mesially inclined than the occlusal plane. Tooth rotation is rare, but the root of the lateral incisor often undergoes resorption. When the degree of resorption is high, the lateral incisor must be extracted before inducing a canine eruption. If the lateral incisor root is free from resorption, the crown of the lateral incisor needs to be tilted distally before inducing a canine eruption. In some cases involving maxillary canine impaction, the lateral incisor may be extruded. **Type III:** The crown is inclined more distally relative to the occlusal plane. The presence of an impacted canine may coincide with the formation of the premolar root, resulting in a curved or short premolar root because the canine bud forms slightly. **Type IV:** Horizontal impaction of the canine with the crown positioned mesially. In the maxilla, the canine often lies horizontally with the crown facing mesially. While some mandibular canines move contralaterally beyond or across the midline, long-term follow-up is necessary. **Type V:** Horizontal impaction of the canine with the crown positioned distally. Many impacted teeth are located in the anterior part of the maxillary sinus floor with the crown pointing distally. As with Type VI impaction, previous cases have reported impacted teeth moving into the jawbone. Therefore, long-term follow-up is required. **Type VI:** The crown of the impacted canine faces the orbital fossa. An inverted impacted tooth is located in the anterior wall of the maxillary sinus with the crown pointing towards the medial angle of the eye on the nasal process of the maxilla. Tooth eruption under the eyelid has also been reported. Typically, the tooth can be left untreated, but when the tooth erupts into the maxillary sinus or nasal cavity, infection may occur, indicating the need for extraction. **Type VII:** Labio-palatal (ectopic) impaction of the canine with the crown positioned buccally. Labio-lingual (palatal) or displaced/misplaced impaction is relatively rare. In malpositioned cases, it is difficult to relocate the canine and lateral incisors with orthodontic

treatment. Therefore, eruption is often induced without changing the position of these teeth, which are malpositioned in the dental arch. From an embryological perspective, some premolars replace the adjacent canines. Early treatment is

recommended when rotation of the tooth bud is needed before inducing the eruption process. Data were processed using Microsoft Excel and presented as tables and distribution diagrams.

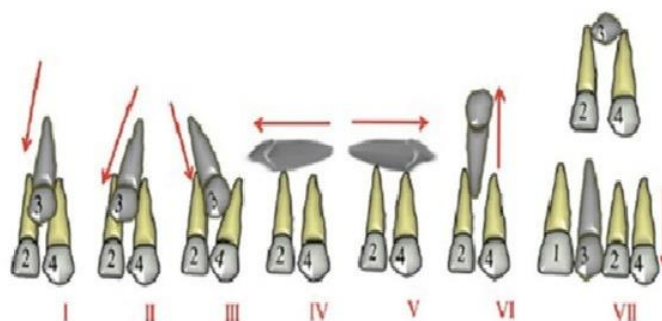


Figure 1. Classification of Impacted Canines.^[14]

RESULTS

Records of 43 patients diagnosed with maxillary canine impaction were retrieved from the archives of RSGM Hasanuddin University, spanning the period from January 2023 to December 2023, were retrieved from the archives of RSGM Hasanuddin University.

ranged from 13 to 59 years old. Most patients were under 60 years old (97.6%). The age group with the highest incidence was between 13 and 19, making up 46.5% of the cases (Figure 2). Only one patient (3.4%) was in the 50–59 age group. The male-to-female ratio was 1:2, with 16 males (37.2%) and 27 females (62.8%) (Figure 3).

Age and Gender

The ages of the patients at the time of diagnosis

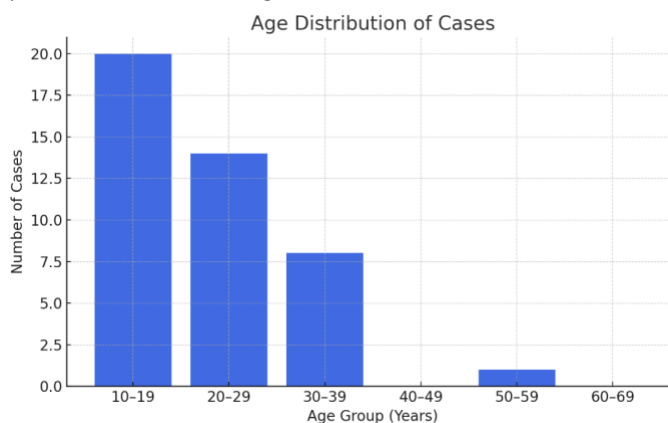


Figure 2. Shows the age distribution

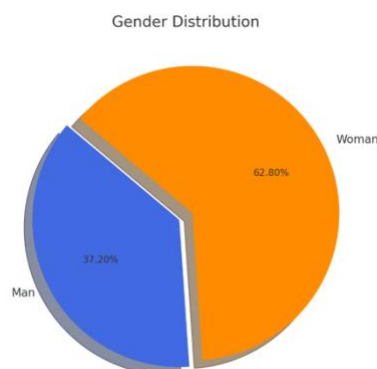


Figure 3. Shows the gender distribution

Characteristics and Position

Among the 43 cases, all were affected in the maxilla and involved bilateral impaction in 3 cases (6.9%). According to the Yamamoto classification, maxillary canine impaction was categorized as follows: Type I in 9 cases (20.9%), Type II in 23 cases

(53.4%), which constituted the majority, Type III in 2 cases (4.6%), and Type IV in 8 cases (18.6%). (Figure No cases were found in Type V or Type VI. There were 3 cases of maxillary canine impaction accompanied by suspected odontoma (6.9%).

Table 1. Type of Maxillary Canine Impaction according to Yamamoto

Type Maxillary Canine Impaction (Yamamoto)	Total Case	%
Type I	9	20.9
Type II	23	53.4
Type III	2	4.6
Type IV	8	18.6
Type V	0	0
Type VI	0	0
Type VIII	1	4.6

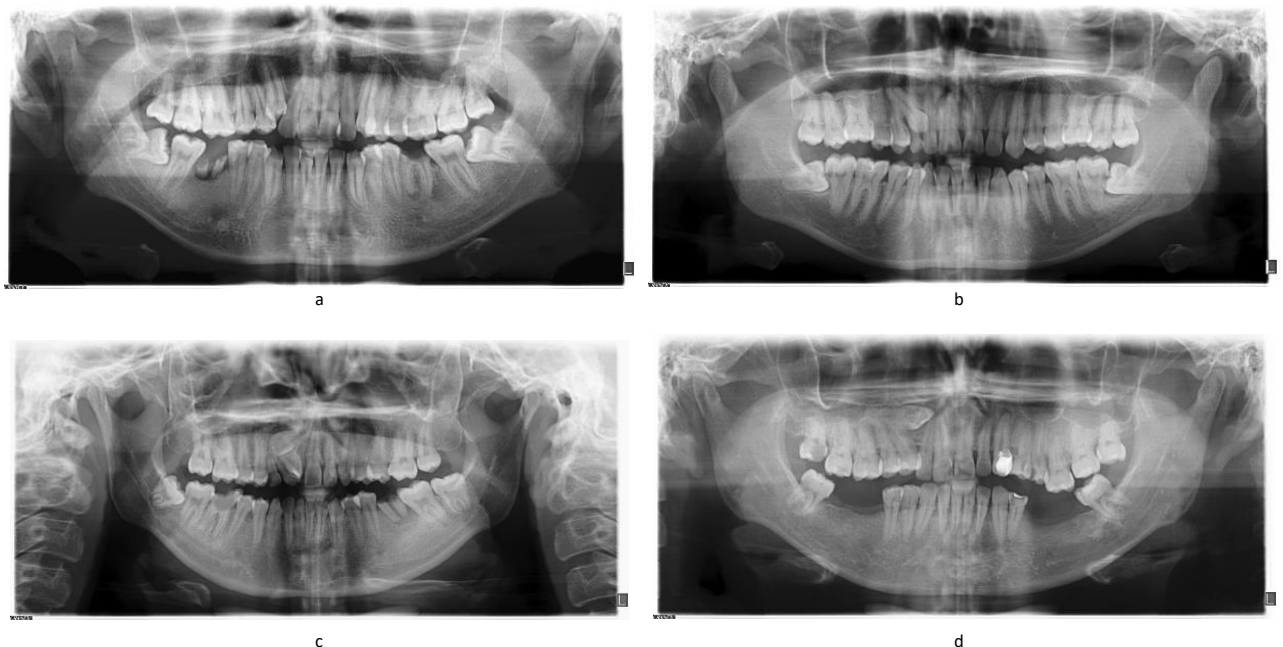


Figure 4. Yamamoto types commonly found at RSGMP UNHAS. a) Type 1; b) Type 2; c) Type 3; d) Type 4.



Figure 5. Impaction Type II maxillary canine impaction accompanied by a suspected odontoma

DISCUSSION

The clinical diagnosis of maxillary canine impaction is mainly done based on clinical and radiographic evaluation.⁽⁹⁾ Panoramic radiograph gives a prediction of palatal canines in 80% of patients. In diagnosing canine impaction, panoramic radiographs are used as an additional source of information, along with other methods. Overlapping canine and lateral incisor in panoramic radiographs after the root completion in the incisor may be a sign of eruptive disorders of the canine, an indication of starting preventive measures to prevent impaction. In the early diagnosis of impaction, panoramic radiographs are essential, which help prevent impaction. Previous studies in the literature gave certain findings for identifying impacted canines in panoramic view. The impaction of teeth has been studied by many authors, and various terminologies have been given in the literature to define impaction, including delayed eruption, primary retention, submerged teeth, and impacted teeth.⁽¹⁵⁾ In this research, the archives of RSGM Hasanuddin University provided records for 43 patients with impacted maxillary canines from January 2023 to December 2023.

In the present study, the prevalence of impacted canines maxillary among the age group was estimated to range from 13 to 59 years old. Most patients were under 60 years old (97.6%). The age group with the highest incidence was between 13 and 19, making up 46.5% of the cases. The basis of this study was to exclude those under 13 years old because, in the early stages of maxillary canine root development and while the lateral incisor is incomplete, some degree of overlapping and marked inclination of the maxillary canine can be considered part of the normal eruption pattern at the age of 8.5-10.5 years.⁽¹⁾ Thus, more cases are found in the age group of 13-19 years. In this study, it was found that the frequency in females was higher compared to males, which is consistent with the research of several experts who state females are considered to have impacted maxillary canines more frequently than males.⁽¹¹⁾

Characteristics found in this study include a higher prevalence of type II impaction, Yamamoto, and the presence of complex odontomas surrounding the impacted upper canine, which is especially notable.

Odontomas are developmental malformations of dental tissues classified as hamartomas. According to the World Health Organization (WHO), a compound odontoma is characterized by a more orderly representation of all dental tissues compared to complex odontomas, where the lesion contains numerous tooth-like structures. Although these structures do not typically resemble teeth found in normal dentition, they consist of enamel, dentin, cementum, and pulp arranged similarly to a normal tooth. In this study, odontomas accompanying the impaction of the maxillary canines were observed at ages 13 and 21 years, which aligns with findings by Bedoya, MM, and Park JH. Odontomas can manifest at any age and in any

location within the oral cavity, but are most frequently detected during the second decade of life, typically around 14.8 years on average. The presence of cysts and tumors can alter the eruption pathway and lead to tooth transmigration.⁽¹⁶⁾ This is also consistent with the description obtained in this study.

CONCLUSION

Maxillary canines are important for aesthetic appearance, dental arch formation, and bite function. In orthodontic practice, impacted upper canines can present clinical difficulties, which vary based on the severity of the impaction.

The clinical diagnosis of maxillary canine impaction is primarily based on clinical and Radiographic evaluations. Each radiological technique has its own advantages and disadvantages. Panoramic radiography is the most frequently used diagnostic tool in cases of suspected dental impaction of permanent canines due to its ease of interpretation, low cost, and minimal radiation exposure.

The most frequently observed classification type at RSGMP UNHAS is Yamamoto's Classification Type 2, and an odontoma accompanying the impaction is found in only one case in this study.

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FOOTNOTES

All authors have no potential conflict of interest to declare for this article. All procedures conducted were in accordance with the ethical standards.

REFERENCES

1. Ristaniemi J, Rajala W, Karjalainen T, Melaluoto E, Iivari J, Pesonen P, et al. Eruption pattern of the maxillary canines: features of natural eruption seen in PTG at the late mixed stage—Part I. *Eur Arch Paediatr Dent* [Internet]. 2022;23(2):223–32. Available from: <https://doi.org/10.1007/s40368-021-00650-1>.
2. Mohammed AK, Sravani G, Vallappareddy D, Rao AR, Qureshi A, Prasad AN. Localization of Impacted Canines-A Comparative Study of Computed Tomography and Orthopantomography. *J Med Life*. 2020;13(1):56–63.
3. Alshehri A, Hakami Z, Marran K, Qaysi A, Shabi M, Bokhari A. Unilateral vs Bilateral Maxillary Canine Impaction: A Cone-Beam Computed Tomography Study of Patterns and Associations. *J Contemp Dent Pract*. 2023;24(1):22–8.
4. Alfaleh W, Al Thobiani S. Evaluation of impacted maxillary canine position using panoramic radiography and cone beam computed tomography. *Saudi Dent J* [Internet]. 2021;33(7):738–44. Available from: <https://doi.org/10.1016/j.sdentj.2020.03.014>.
5. Alshalawi IA, Alnahad DM, Ardah HI, Aboelmaaty WM, Alrejaye NS. Evaluation of maxillary transverse dimensions in individuals with a unilaterally impacted canine. *J Orthod Sci*. 2024;13(1):1–7.
6. Cicek O, Gurel T, Demir Cicek B. Investigation of the Relationship of Impacted Maxillary Canines with Orthodontic Malocclusion: A Retrospective Study. *Children*. 2023;10(6): 1.
7. Bedoya MM, Park JH. A review of the diagnosis and management of impacted maxillary canines. *J Am Dent Assoc*. 2009;140(12):1485–93. Available from: <http://dx.doi.org/10.14219/jada.archive.2009.0099>.

8. Ismail AF, Sharuddin NFA, Asha'Ari NH, Ali MAM, Zainol IZ, Alotaibi LH, et al. Risk Prediction of Maxillary Canine Impaction among 9-10-Year-Old Malaysian Children: A Radiographic Study. *Biomed Res Int.* 2022;2022(1):1–8.
9. Madhavan R, Sundareswaran S. Maxillary Canine Impaction: Diagnosis and Guidelines for Assessment of Impaction. 2021;20(4):7–12.
10. Shin JH, Oh S, Kim H, Lee E, Lee SM, Ko CC, et al. Prediction of maxillary canine impaction using eruption pathway and angular measurement on panoramic radiographs. *Angle Orthod.* 2022;92(1):18–26.
11. Dinu Ș, Todor L, Zetu IN, Păcurar M, Porumb A, Milutinovici RA, et al. Radiographic methods for locating impacted maxillary canines. *Rom J Morphol Embryol.* 2022;63(4):599–606.
12. Altan A, Çolak S, Akbulut N, Altan H. Radiographic features and treatment strategies of impacted maxillary canines. *Cumhuriyet Dent J.* 2020;23(1):32–7.
13. Kolokitha OE, Balli D, Zarkadi AE, Gizani S. Association between maxillary canine impaction and other dental anomalies: radiological study of a mixed dentition children's cohort from an orthodontic clinic. *Eur Arch Paediatr Dent [Internet].* 2023;24(3):401–7. Available from: <https://doi.org/10.1007/s40368-023-00798-y>.
14. Alassiry A. Radiographic assessment of the prevalence, pattern and position of maxillary canine impaction in Najran (Saudi Arabia) population using orthopantomograms – A cross-sectional, retrospective study. *Saudi Dent J [Internet].* 2020;32(3):155–9. Available from: <https://doi.org/10.1016/j.sdentj.2019.08.002>
15. Jain S, Debbarma S. Patterns and prevalence of canine anomalies in orthodontic patients. *Med Pharm Reports.* 2019;92(1):72–8.
16. Mazur M, Di Giorgio G, Ndokaj A, Jedliński M, Corridore D, Marasca B, et al. Characteristics, Diagnosis and Treatment of Compound Odontoma Associated with Impacted Teeth. *Children.* 2022;9(10):1–13.