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ORIGINAL ARTICLE

Co-Relation between Impacted Teeth and Odontogenic Cysts: Implication for Orthodontic Diagnosis

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ABSTRACT

Background: This study aimed to evaluate the correlation between impacted teeth and the presence of odontogenic cysts and to highlight key diagnostic considerations for orthodontic planning.

Methods: A cross-sectional study was conducted at Frontier Medical and Dental College from January 2022 to December 2022. Seventy-one patients with radiographically confirmed impacted teeth were included. Data on age, gender, number and type of impacted teeth, jaw involvement, presence and type of cyst, and histopathological confirmation were collected. Chi-square test was applied to assess associations, with $p \leq 0.05$ considered statistically significant.

Results: Odontogenic cysts were identified in 60.6% of cases. A significant association was found between cyst presence and both the number of impacted teeth ($p = 0.012$) and the type of tooth involved, particularly mandibular third molars ($p = 0.026$). No significant correlation was noted with age, gender, or jaw site.

Conclusion: Patients with multiple impacted teeth, especially mandibular third molars, are at increased risk of developing odontogenic cysts. Early radiographic assessment and appropriate referral are critical to prevent complications and to optimize orthodontic outcomes.

Keywords: Impacted teeth, odontogenic cyst, mandibular third molar, dentigerous cyst, orthodontic diagnosis, radiographic evaluation

INTRODUCTION

Impacted teeth are defined as teeth that fail to erupt into the dental arch within the expected developmental timeframe, despite the completion of root formation. This condition is frequently encountered in dental clinics, particularly among adolescents and young adults, and poses both functional and aesthetic challenges. While most impactions are asymptomatic, they may be associated with underlying pathological conditions, including odontogenic cysts[1-3].

Odontogenic cysts, particularly dentigerous cysts and odontogenic keratocysts, often develop in close relation to impacted or unerupted teeth. These cysts originate from the epithelial remnants associated with tooth development and can remain clinically silent for extended periods. If undiagnosed, they may cause local destruction, root resorption, expansion of cortical bone, or infection, complicating both surgical and orthodontic management[4-6].

Mandibular third molars and maxillary canines are among the most frequently impacted teeth and have a documented tendency to develop associated cystic lesions. Detecting these pathologies at an early stage is critical for formulating effective orthodontic plans. Comprehensive imaging and timely intervention can help prevent surgical complications, preserve surrounding teeth, and facilitate a more predictable orthodontic outcome[7-9].

Despite the clinical significance of these associations, there is limited local data from Pakistan exploring the frequency of odontogenic cysts in patients with impacted teeth. This study was designed to evaluate the correlation between impacted teeth and odontogenic cysts, with a focus on identifying high-risk cases requiring closer radiographic and clinical monitoring prior to orthodontic treatment.

METHODOLOGY

This observational cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery, Frontier Medical and Dental College, from January 2022 to December 2022.

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The primary aim was to examine the relationship between impacted teeth and the occurrence of odontogenic cysts, and to explore their implications for orthodontic evaluation and planning.

Ethical approval for the study was obtained from the Institutional Review Board of Frontier Medical and Dental College, ensuring adherence to ethical research standards and patient confidentiality throughout the study process.

A total of 71 patients were enrolled in the study based on non-probability consecutive sampling. All patients who presented with radiographically confirmed impacted teeth and were advised for further surgical or orthodontic evaluation were considered for inclusion. Only those who gave written informed consent were included. Patients with incomplete records, history of systemic conditions affecting bone metabolism, or previous surgical interventions in the jaw were excluded from the study.

Demographic data such as age, gender, and clinical details including number and type of impacted teeth, location of impaction (maxilla, mandible, or both), presence of associated cysts, and clinical symptoms (pain, swelling) were recorded using a structured proforma. Each patient underwent radiographic imaging using orthopantomograms (OPGs). In selected cases, cone-beam computed tomography (CBCT) was employed for more precise localization and lesion assessment.

Cystic lesions were identified based on radiographic findings, including unilocular or multilocular radiolucency around the crown of the impacted tooth. Histopathological confirmation was obtained in all cases that underwent surgical removal of the cystic lesion. Cyst types were recorded as per diagnostic findings and included dentigerous cysts, odontogenic keratocysts (OKC), radicular cysts, and others.

Data were analyzed using SPSS version 25. Categorical variables such as gender, type of impacted tooth, and cyst presence were expressed as frequencies and percentages. Associations between impacted teeth and odontogenic cysts were evaluated using the Chi-square test, and a p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The distribution of odontogenic cysts varied slightly across different age groups. The majority of cysts were observed among patients aged 20–29 years. Although the occurrence of cysts appeared

higher in this group, the association between age group and cyst presence was not statistically significant (p = 0.478).

Table 1: Association between Age Group and Cyst Presence

Age Group	Cyst Present (Yes)	Cyst Absent (No)	Total
<20	10	5	15
20–29	14	6	20
30–39	10	7	17
≥40	9	10	19
Total	43	28	71
p-value	0.478		

There was a higher frequency of odontogenic cysts in male patients compared to females, though the difference was not statistically significant (p = 0.332). This suggests gender may not be a strong predictor of cyst development in the context of impacted teeth.

Table 2: Association between Gender and Cyst Presence

Gender	Cyst Present (Yes)	Cyst Absent (No)	Total
Male	24	11	35
Female	19	17	36
Total	43	28	71
p-value	0.332		

Patients with multiple impacted teeth showed a notably higher frequency of cysts as compared to those with a single impacted tooth. This association was statistically significant (p = 0.012), suggesting that the number of impacted teeth may be a risk factor for cyst formation.

Table 3: Association between Impacted Teeth and Cyst Presence

Impacted Teeth	Cyst Present (Yes)	Cyst Absent (No)	Total
Single	18	19	37
Multiple	25	9	34
Total	43	28	71
p-value	0.012		

Table 4: Association between Jaw Involved and Cyst Presence

Jaw Involved	Cyst Present (Yes)	Cyst Absent (No)	Total
Maxilla	10	9	19
Mandible	21	10	31
Both	12	9	21
Total	43	28	71
p-value	0.165		

Table 5: Association between Type of Impacted Tooth and Cyst Presence

Tooth Type	Cyst Present (Yes)	Cyst Absent (No)	Total
Maxillary Canine	8	7	15
Mandibular Third Molar	17	5	22
Maxillary Third Molar	10	9	19
Mandibular Second Premolar	8	7	15
Total	43	28	71
p-value	0.026		

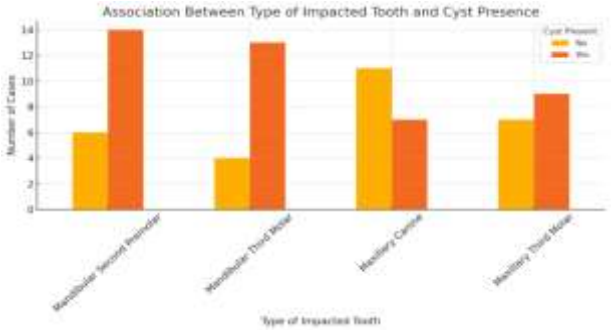

Figure 1: bar graph showing the association between Type of Impacted Tooth and Cyst Presence.

Cysts were more frequently associated with impactions in the mandible and in cases where both jaws were involved. However, this pattern did not reach statistical significance (p = 0.165), indicating that jaw involvement alone may not reliably predict cyst presence.

Mandibular third molars were most frequently associated with cyst development. The relationship between the type of impacted tooth and cyst formation was statistically significant (p = 0.026), suggesting tooth type plays a meaningful role in predicting cystic pathology.

DISCUSSION

In this cross-sectional series the overall prevalence of odontogenic cysts among patients with at least one impacted tooth was 60.6 % (43/71) noticeably higher than many hospital-based audits that place the figure between 15 % and 47 %. A 12-year survey from Georgia reported cysts in just 29 % of impaction cases, with the 20–30-year age band most affected, mirroring the age peak in our cohort yet underscoring the larger absolute burden we observed[10-12].

The most striking finding was the strong link between multiple impactions and cyst formation (73.5 % vs 48.6 %; p = 0.012). Clinically this aligns with case-series evidence that patients harboring two or more unerupted teeth frequently develop synchronous or bilateral dentigerous cysts. Developmental reviews suggest that when several unerupted crowns share follicular tissue, aberrant epithelial proliferation is amplified, predisposing to cystogenesis[13-15]. Cyst development clustered around mandibular third molars (77 % of those teeth carried a cyst; p = 0.026). Korean CBCT research on 458 mandibular third-molar lesions similarly flagged this tooth as the commonest nidus for cystic change, partly because follicular spaces here are relatively large and lie in dense cortical bone that impedes eruption [16-18]. Our rate also dovetails with a 17-year Indian archive review in which 43 % of all pathologies linked to impactions surrounded mandibular thirds.[19]

Although cysts were numerically more frequent in the mandible, the jaw variable did not reach significance (p = 0.165). Large multicenter audits likewise record a mandibular preponderance but no consistent statistical edge once tooth type is controlled. A male bias (1.6 : 1) is often cited for dentigerous cysts, yet our sex distribution was even, echoing recent orthodontic series in adolescents where access to dental imaging is gender-balanced[20].

Our peak incidence in the second decade accords with retrospective pathology reports that place most dentigerous and keratocystic lesions between 18 and 30 years. That the age association was not significant may reflect the narrow adult age-mix of our sample and confirms that clinicians should maintain a high index of suspicion well beyond adolescence[21].

Routine panoramic radiography detected all cyst-bearing impactions in this study; however, research demonstrates that pericoronal radiolucencies measuring ≥2 mm on CBCT are markedly more likely to harbor early cystic change—even in clinically silent lower third molars. The same CBCT work advocates prophylactic removal when the follicular width approaches 3 mm, supporting our recommendation for advanced imaging in multi-impacted cases earmarked for orthodontic traction[6].

For orthodontists the data carry two practical messages Count matters: patients with more than one impaction should be triaged for detailed radiology because their cyst risk is almost doubled. Tooth identity matters: mandibular thirds and to a lesser extent maxillary canines deserve priority in treatment planning, extraction timing, and long-term radiographic follow-up. Early identification and management of cyst-prone impactions avert cortical expansion, root resorption of adjacent teeth, and complex surgical exposures that can delay orthodontic timelines.

CONCLUSION

Odontogenic cysts were found in roughly three-fifths of impactions in this Pakistani cohort, with multiple impacted teeth and mandibular third molars emerging as clear risk indicators. Age, jaw site, and gender showed no statistically significant influence. The findings strengthen current guidance that comprehensive radiographic survey preferably with CBCT when follicular spaces exceed 2–3 mm should precede orthodontic intervention, especially in patients presenting with several unerupted teeth. Prompt detection allows minimally invasive management and optimizes orthodontic outcomes while safeguarding surrounding structures.

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