

# Prevalence of Impacted and Transmigrated Canine in a Dental Yemeni Population; a Radiographic Study

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## Abstract

**Objectives:** The study aimed to evaluate the prevalence and patterns of impacted and transmigrated canine and associated pathologies in a dental population. **Methods:** The panoramic radiographs of 5531 patients [1820 (32.9%) male and 3711 (67.1%) female] who attended to several dental clinics between August 2018 and January 2019 were retrospectively evaluated. The number, position, impaction and transmigration of canine were noted. An impacted canine was diagnosed to be transmigrated when at least part of its length had crossed the midline. The presence of other coexisting anomalies was also noted. **Results:** A total of 388 patients (7.0%) presented with at least one impacted tooth. The most common impacted canines were in the maxilla among 368 (94.8%) patients, while 51 (13.1%) patients showed impacted canines in the mandible. About 32 (8.2%) patients showed both co-existed maxillary and mandibular canine impaction, while 126 (32.5%) impacted canines were bilateral either in the maxilla or in the mandible. Transmigrated canine was observed among 26 (6.7%) of impacted canine patients. Impaction of other teeth was found among 173 (44.6%) patients. Certain anomalies were co-existed along with canine impaction in 98 (25.3%) patients. Pericoronal radiolucency was the most common am-ong 84 (21.6%) patients followed by dentigrous cyst among 23 (5.9%) patients. Other anomalies were supernumerary teeth among 5 (1.3%) patients, and odontomas in only 1 (0.3%) patient. **Conclusions:** The prevalence of impacted teeth was high, and there was a predilection for impacted teeth in the maxilla. Pericoronal radiolucency was commonly seen in relation to the impacted canines followed by dentigrous cyst.

**Keywords:** Impacted teeth, Radiographic evaluation, Transmigration, Canine.

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## INTRODUCTION

Impacted teeth can be defined as teeth with a delayed eruption or not expected to erupt completely based on clinical and radiographic assessment [1]. Dental impaction may be a consequence of local or systemic factors that contribute to failure of tooth eruption. The local factors include mechanical obstruction (by a supernumerary tooth, cyst, or tumor), insufficient space in the dental arch due to skeletal incongruities (micrognathia), or the premature loss of deciduous teeth, or a tooth-arch size discrepancy. Systemic factors include genetic disorders, previous irradiation of the jaws, and endocrine deficiencies [2]. Any permanent tooth can become impacted; though, third molars, maxillary canines, maxillary and mandibular premolars, and maxillary central incisors are the teeth most frequently involved [3].

The diagnosis and treatment of impacted teeth can be troublesome to dentists and also esthetically and functionally important to the patients [4]. Undiagnosed and untreated cases may ultimately present complex treatment challenges in the areas of orthodontics, endodontics, prosthodontics and restorative dentistry [5]. Impacted teeth could result in dental caries, periapical and periodontal disease, pulp disease, root resorption of the adjacent teeth, and even oral and maxillofacial tumors. There are currently no data on the prevalence of transmigrated canine and associated pathologies in the Yemeni population. The aim of this study was to investigate the prevalence and clinical patterns of impacted canines and transmigrated canine teeth and to report the features of the associated pathologies.

## METHODS

### Study Population and Protocol

The present study was a population-based, retrospective, descriptive study based on the panoramic radiographs and clinical records of 5531 patients [1820 (32.9%) male and 3711 (67.1%) female] who attended to several outpatient dental clinics in Sana'a city (Yemen) between August 2018 and January 2019. The panoramic radiographs were retrospectively evaluated for the purpose of the study. The study was approved by the Institutional Review Board of Faculty of Dentistry, Sana'a University. The incidence of impacted and transmigrated canines was determined. The presence of other teeth impaction and other associated anomalies were also determined.

### Diagnosis of canine impaction and transmigration

The following clinical signs had been suggested to diagnose canine impaction [6]: 1. Delayed eruption of the permanent canine or prolonged retention of the deciduous canine beyond 14–15 years of age; 2. Absence of a normal labial canine bulge; 3. Presence of a palatal bulge; 4. Delayed eruption, distal tipping or migration (splaying) of the lateral incisor.

An impacted canine was considered transmigrated when the tip of the crown of the canine regardless of its length had crossed the midline [7]. The positions (maxillary/mandibular) and locations (right/left) of impacted/transmigrated canine teeth, as well as the other associated anomalies were determined. The positions of mandibular impacted canine teeth were also classified according to Mupparapu's classification [8] as follows: Type 1: Canine positioned mesio-angularly across the midline within the jaw bone, labial or lingual to anterior teeth, and the crown portion of the tooth crossing the midline; Type 2: Canine horizontally impacted near the inferior border of the mandible below the apices of the incisors teeth; Type 3: Canine erupting

either mesial or distal to the opposite canine; Type 4: Canine horizontally impacted near the inferior border of the mandible below the apices of either premolars or molars on the opposite side; and Type 5: Canine positioned vertically in the midline with the long axis of the tooth crossing the midline, irrespective of eruption status.

### Inclusion and Exclusion Criteria

All the panoramic radiographs of the patients who attended to the outpatient dental clinics for evaluation of dental problems during the study period were included in the present study. The radiographs of completely edentulous patients and pediatric patients below the age of 10 years were excluded.

### Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Science software (SPSS, version 15) and Microsoft office Excel 2010 was used for data processing and statistical analysis. Variables were described using frequency distribution. The chi-squared test was used for the assessment of association between the variables studied. The p-value of less than 0.05 was considered significant statistically.

## RESULTS

Evaluation of the panoramic radiographs of 5531 adult patients [males: 1820 (32.9%); females: 3711 (67.1%)] showed a total of 388 (7.0%) patients presented with at least one impacted canine; male patients were 114 (6.26%) and females were 274 (7.38%) patients. Out of 388 impacted canines, 26 (6.7%) patients had transmigrated canines; male patients were 11 (9.6%) and female patients were 15 (5.5%). The distributions of impacted and transmigrated canines according to gender and position are shown in Table-1 and Figure-1.

**Table-1: Distribution of impaction and transmigration according to position**

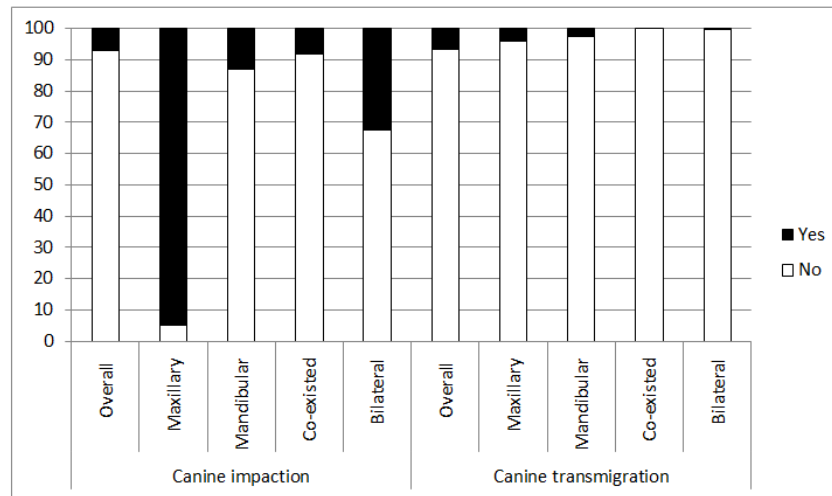
Characteristic	Male	Female	Total
<b>Canine impaction</b>			
Overall	114 (6.26%)	274 (7.38%)	388 (7.0%)
Maxillary	107 (93.9%)	261 (95.3%)	368 (94.8%)
Mandibular	18 (15.8%)	33 (12.0%)	51 (13.1%)
Co-existed maxillary and mandibular	12 (10.5%)	20 (7.3%)	32 (8.2%)
Bilateral maxillary or mandibular	36 (31.6%)	90 (32.8%)	126 (32.5%)
<b>Canine transmigration</b>			
Overall	11 (9.6%)	15 (5.5%)	26 (6.7%)
Maxillary	4 (3.5%)	12 (4.4%)	16 (4.1%)
Mandibular	7 (6.1%)	3 (1.1%)	10 (2.6%)
Co-existed maxillary and mandibular	0 (0%)	0 (0%)	0 (0%)
Bilateral maxillary or mandibular	1 (0.9%)	0 (0%)	1 (0.3%)

Impacted canines were in the maxilla in 368 (94.8%) patients, while 51 (13.1%) patients showed mandibular canine impaction. About 32 (8.2%) patients had co-existed maxillary and mandibular canine

impaction, while 126 (32.5%) patients had bilateral impaction either in the maxilla or in mandible. Transmigrated canines were observed in 16 (4.1%) patients in the maxilla and in 10 (2.6%) patients in the

mandible. Bilateral transmigrating was only observed in 1 (0.3%) patient while no co-existed transmigrating was

observed in the study.



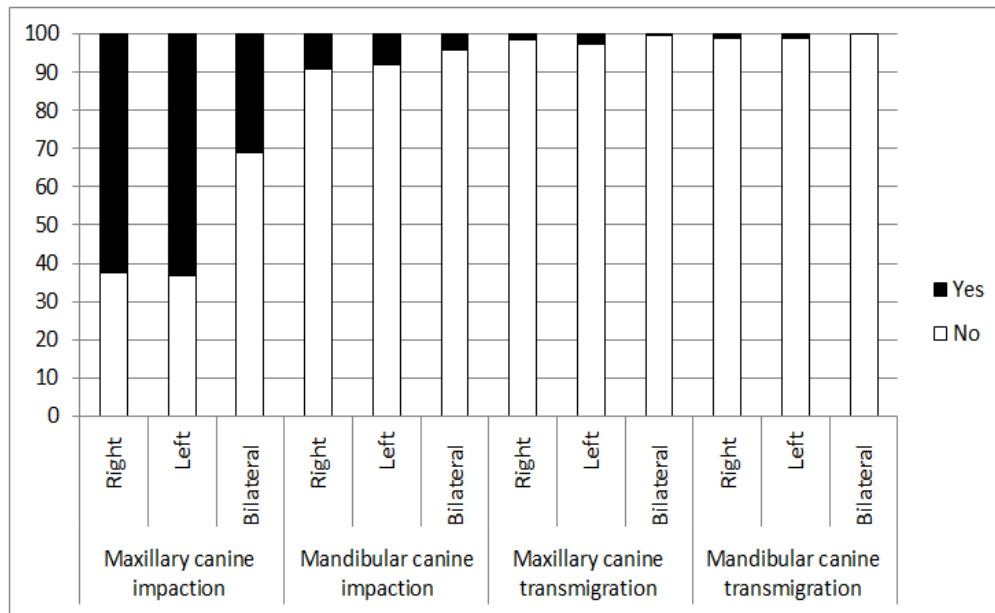
**Fig-1: Distribution of impaction and transmigrating according to position**

In terms of location, impacted canines in 243 (62.6%) patients were in the right maxilla and 245 (63.1%) in the left maxilla, while maxillary canine impaction was found bilaterally among 120 (30.9%) patients. Impacted canines were found in the right mandible among 36 (9.3%) patients and 31 (8%) patients had canine impaction in the left mandible, while 16 (4.1%) patients had bilateral mandibular canine impaction. Similarly, 6 (1.5%) transmigrated canine teeth were found in the right maxilla and eleven

(2.8%) in the left maxilla, while bilateral maxillary transmigrating was observed only in 1 (0.9%) male patient. Five (1.3%) patients with transmigrated canines were found in the right mandible, and 5 (1.3%) in the left mandible while no bilateral mandibular transmigrating was not observed in any patient. The distributions of impacted and transmigrated canines according to gender and location are shown in Table-2 and Figure-2.

**Table-2: Distribution of impaction and transmigrating according to location**

Characteristic	Male	Female	Total
<b>Maxillary canine impaction</b>			
Right	76 (66.7%)	167 (60.9%)	243 (62.6%)
Left	65 (57%)	180 (65.7%)	245 (63.1%)
Bilateral	34 (29.8%)	86 (31.4%)	120 (30.9%)
<b>Mandibular canine impaction</b>			
Right	13 (11.4%)	23 (8.4%)	36 (9.3%)
Left	10 (8.8%)	21 (7.7%)	31 (8%)
Bilateral	5 (4.4%)	11 (4%)	16 (4.1%)
<b>Maxillary canine transmigrating</b>			
Right	1 (0.9%)	5 (1.8%)	6 (1.5%)
Left	4 (3.5%)	7 (2.6%)	11 (2.8%)
Bilateral	1 (0.9%)	0 (0%)	1 (0.3%)
<b>Mandibular canine transmigrating</b>			
Right	3 (2.6%)	2 (0.7%)	5 (1.3%)
Left	4 (3.5%)	1 (0.4%)	5 (1.3%)
Bilateral	0 (0%)	0 (0%)	0 (0%)



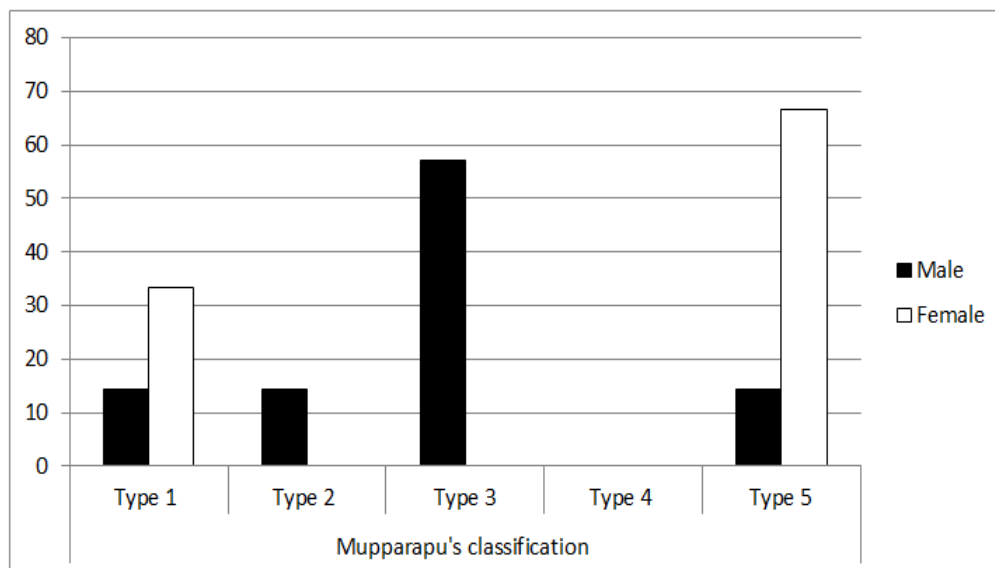
**Fig-2: The distribution of impaction and transmigration according to location**

From the 10 transmigrated mandibular canines; Type 3 position was the most common in 4 (40%) patients followed by type 5 position in 3 (30%) patients and type 1 position in 2 (20%) patients. Type 2

position was found only in 1 (10%) patient while no patient had type 4 position. Results are represented in Table-3 and are graphically illustrated in Figure-3.

**Table-3: Mupparapu's classification of mandibular canine transmigration**

Characteristic	Male	Female	Total
<b>Transmigrated mandibular canine</b>			
Type 1	1(14.3%)	1 (33.3%)	2 (20%)
Type 2	1(14.3%)	0 (0%)	1 (10%)
Type 3	4(57.1%)	0 (0%)	4 (40%)
Type 4	0 (0%)	0 (0%)	0 (0%)
Type 5	1(14.3%)	2 (66.7%)	3 (30%)



**Fig-3: Mupparapu's classification of mandibular canine transmigration**

The prevalence of anomalies that were co-existed along with teeth impaction was 29.1% in 113

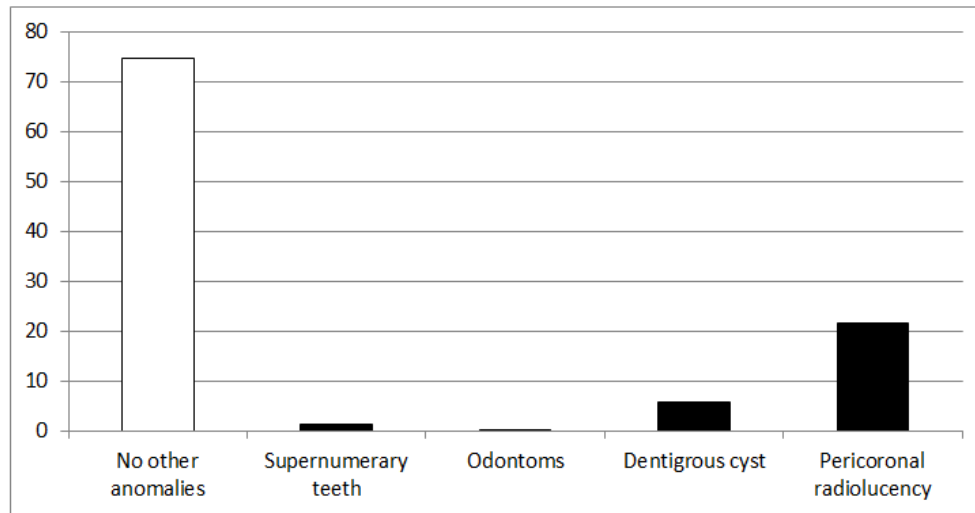
patients. Some patients had several anomalies than one anomaly. From all co-existing anomalies, pericoronal

radiolucency was the most common among 84 (21.6%) patients followed by dentigerous cyst among 23 (5.9%) patients. Other anomalies present were supernumerary

teeth among 5 (1.3%) patients, and odontoms in only 1 (0.3%) patient. The other anomalies are summarized in Table-4 and are illustrated in Figure-4.

**Table-4: Types of other anomalies along with canine impaction/ transmigration**

Characteristic	Frequency (n)	Percent (%)
<b>Gender</b>		
No anomalies	290	74.7%
Supernumerary teeth	5	1.3%
Odontoms	1	0.3%
Dentigerous cyst	23	5.9%
Pericoronal radiolucency	84	21.6%



**Fig-4: Types of other anomalies along with canine impaction/ transmigration**

Besides having canine impaction and/or transmigration, 173 (44.6%) patients had also other teeth impaction; males were 50 (43.9%) and females were 123 (44.9%). Other teeth impaction was found in 103 (26.5%) patients in the maxilla and in 146 (37.6%) patients in the mandible. Co-existed impaction of other

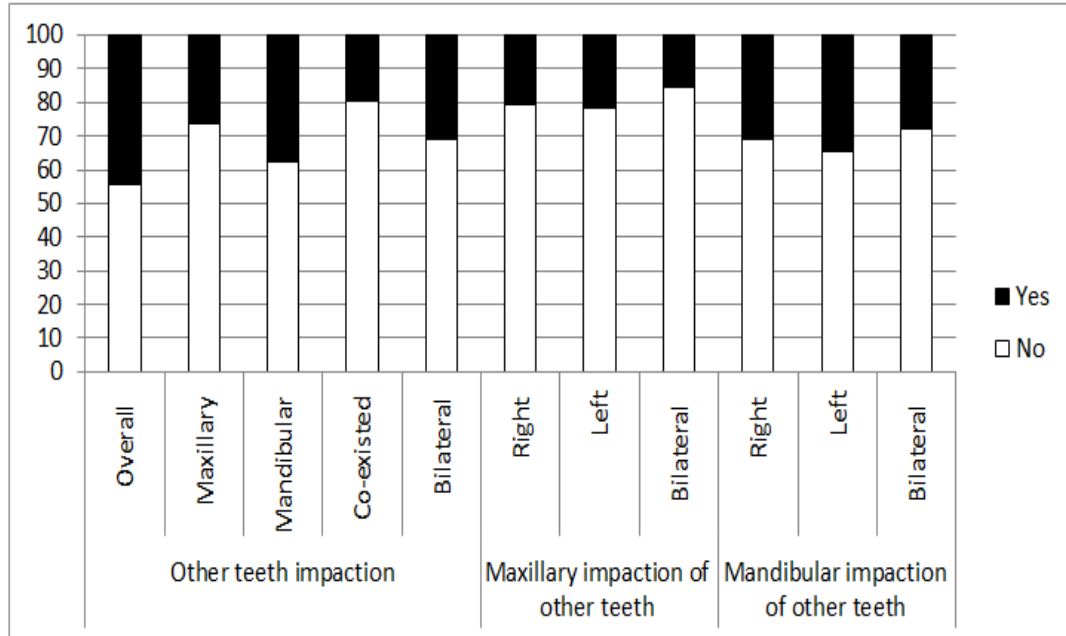
teeth in both maxilla and mandible was found in 77 (19.8%) patients. Bilateral impaction in either maxilla or mandible was found in 120 (30.9%) patients. The distributions of other teeth impaction according to gender, position and location are shown in Table-5 and Figure-5.

**Table-5: Distribution of other teeth impaction according to position and location**

Characteristic	Male	Female	Total
<b>Other teeth impaction</b>			
Overall	50 (43.9%)	123 (44.9%)	173 (44.6%)
Maxillary	32 (28.1%)	71 (25.9%)	103 (26.5%)
Mandibular	45 (39.5%)	101 (36.9%)	146 (37.6%)
Co-existed maxillary and mandibular	27 (23.7%)	50 (18.2%)	77 (19.8%)
Bilateral maxillary or mandibular	34 (29.8%)	86 (31.4%)	120 (30.9%)
<b>Maxillary impaction of other teeth</b>			
Right	25 (21.9%)	55 (20.1%)	80 (20.6%)
Left	27 (23.7%)	57 (20.8%)	84 (21.6%)
Bilateral	20 (17.5%)	41 (15%)	61 (15.7%)
<b>Mandibular impaction of other teeth</b>			
Right	36 (31.6%)	84 (30.7%)	120 (30.9%)
Left	40 (35.1%)	94 (34.3%)	134 (34.5%)
Bilateral	31 (27.2%)	77 (28.1%)	108 (27.8%)

Regarding the location of other teeth impaction, 80 (20.6%) patients had other teeth impaction in the right maxilla, and 84 (21.6%) patients in the left maxilla, while 61 (15.7%) patients had bilateral impaction of other teeth in the maxilla. Other teeth impaction was found in the right mandible among

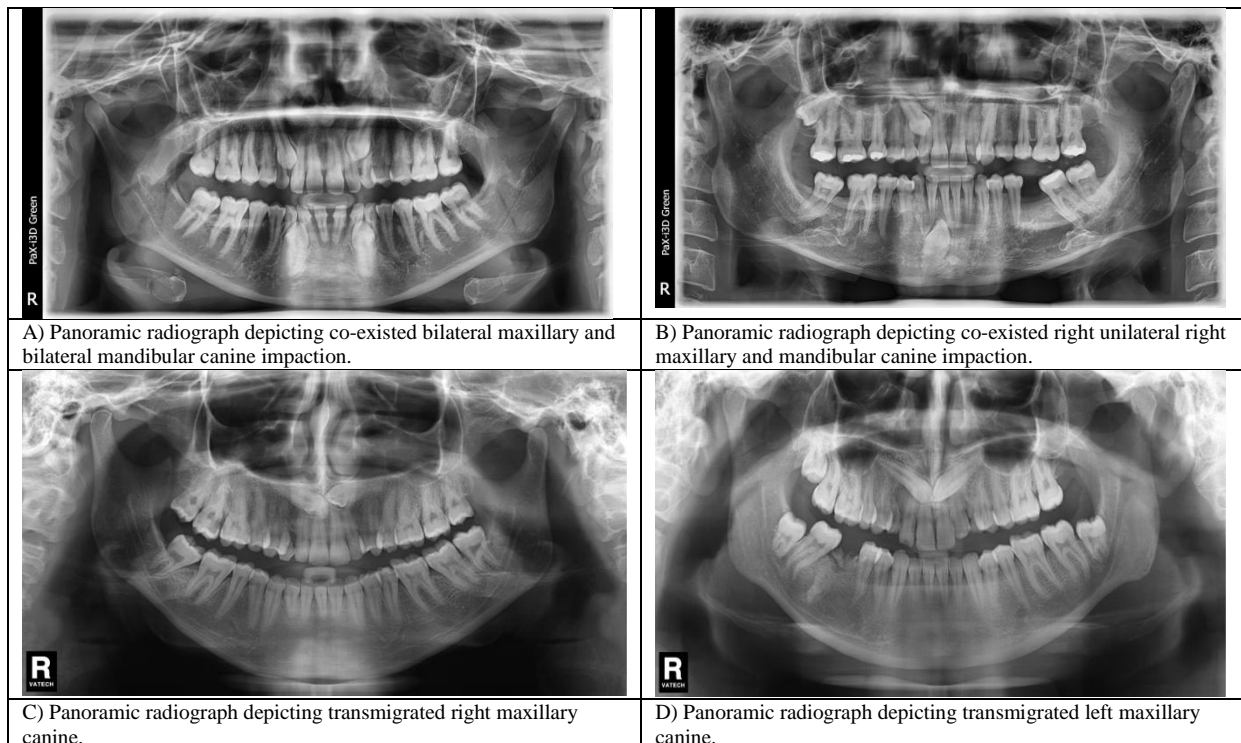
120 (30.9%) patients, and 134 (34.5%) patients had other impacted teeth in the left mandible while 108 (27.8%) patients had bilateral impaction of other teeth in the mandible. No significant difference was also found according to gender for other teeth impaction ( $p > 0.05$ ).



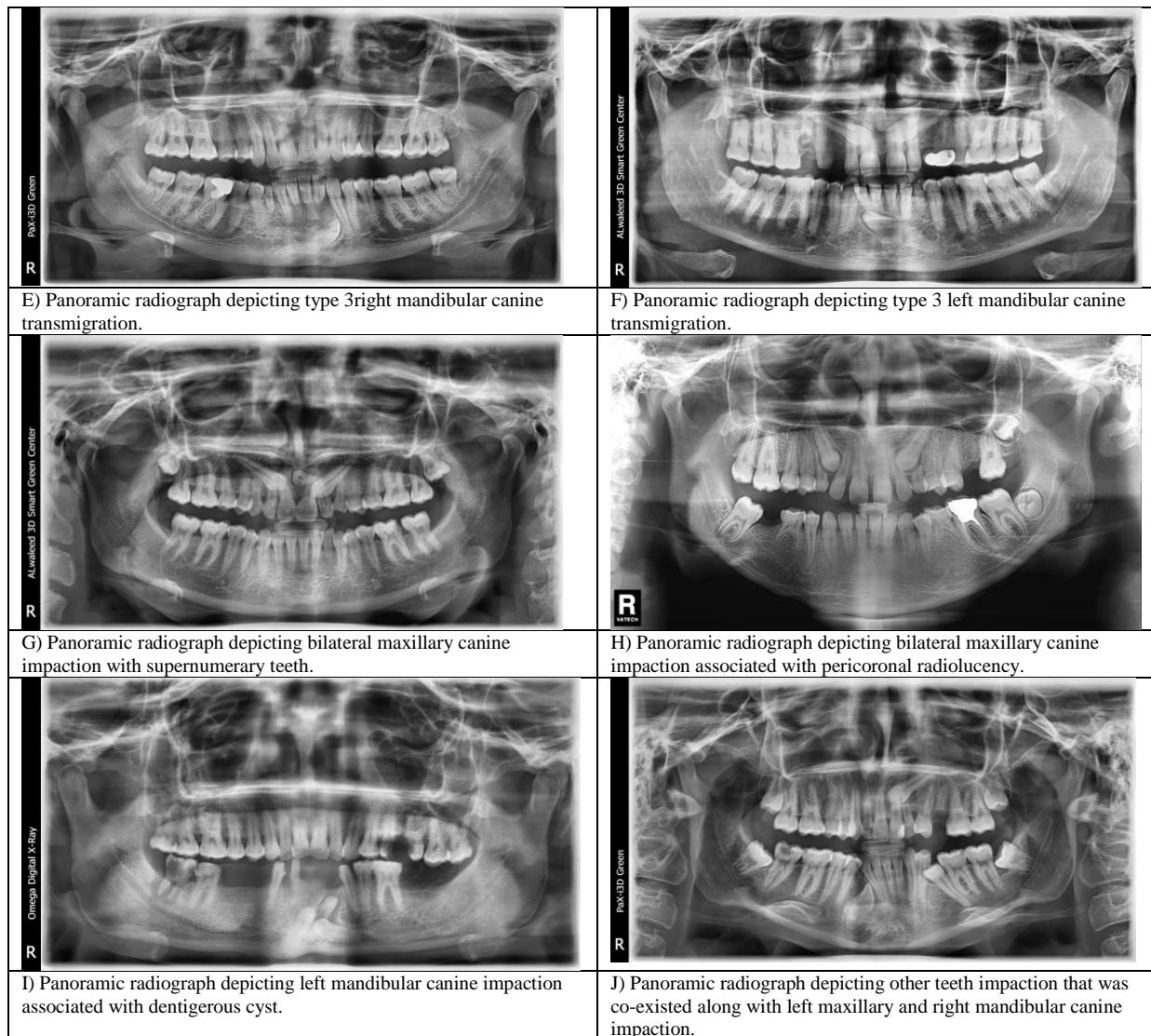
**Fig-5: Distribution of other teeth impaction according to position and location**

Representative panoramic radiograph depicting found maxillary and/ or mandibular canine impaction,

transmigration, and other teeth impaction as well as associated pathologies are illustrated in Figure-6.







**Fig-6: Panoramic radiograph depicting canine impaction, transmigration, and associated pathologies**

## DISCUSSION

Canine impaction is commonly encountered problem in orthodontics. Teeth impaction is frequent phenomenon in the literature [1, 3]. The number of impacted teeth among different populations increases annually and comprise symptomatic and asymptomatic pattern. The panoramic radiographs provide helpful information about all teeth in both arches and surrounding structures for diagnosis and evaluation of impacted teeth. The present study aimed to evaluate the prevalence and patterns of impacted and transmigrated canines, as well as to determine the associated pathologies in a sample of orthodontic Yemeni population. Knowledge of dental anomalies in patients is essential for treatment planning. Traits that may occur more frequently in certain ethnic groups might be considered specific to that population [9]. Awareness of dental practitioners about the ethnic differences in the occurrence of dental anomalies helps in finding them during routine patient examination and could be predictive of normal patterns of tooth development and eruption, thus allowing for prompt intervention to

prevent complications pathology [5]. Mandibular canine impaction and transmigration of differ greatly in incidence, etiology, pathology, associated anomalies, and treatment prospects as compared to maxillary canine impaction [10].

The pattern of teeth impaction seen in the present study was similar to previous reports; with the most common being upper canines in the maxilla followed by other teeth impaction and then lower canine impaction which had shown lower incidence [11, 12]. Several patients had bilateral impacted canines either in the maxilla or in the mandible, and some patients showed both co-existed maxillary and mandibular canine impaction. Canine impaction is one of the anomalies that should be considered by clinicians in detail. Higher prevalence of canine impaction was found in the present study as compared to the literature among different populations. The prevalence of maxillary canine impaction among different populations was reported in the literature between 0.8 and 2.8%, while mandibular canine impaction was relatively rare

[13]. It is well known that maxillary canines take the longest period of development as well as the longest route from the point of formation to the final location in full occlusion. During their development, the crowns of the permanent canines become in close proximity to the roots of the lateral incisors. Thus, the absence of maxillary lateral incisors and variations in the size the teeth roots have been implicated as important etiologic factors of canine impaction [14].

Transmigration of canine teeth is rare entity. In the present study of 5531 patients' panoramic radiographs, and out of 388 cases of impacted canines, 26 cases of canine transmigration were found, revealing an overall incidence of 0.47%. Transmigration was defined when an impacted tooth has crossed the midline more than half of its length, or when an unerupted mandibular canine has moved across the midline without the influence of any pathological entity [15]. Transmigration is also defined as pre-eruptive migration of a tooth across the midline [16]. However, it was noted that it may not be possible deciding whether pathological conditions were responsible for teeth transmigration or not [8]. Therefore, teeth that were associated with odontomas or dentigerous cysts anomalies and were crossing the midline were considered as transmigrated teeth [17, 18].

The etiology and the exact mechanism of tooth transmigration is still unclear, although, number of factors have been suggested [19]. One proposed mechanism for teeth impaction is the rotation of teeth buds. Thus, in the presence of a strong eruptive force, horizontal or mesioangular rotation of the tooth bud may result in transmigration unless the tooth faces a resistance from tooth roots, neighboring anatomic structures or dense bone. Sixteen cases of maxillary of canine transmigration as well as ten cases of mandibular transmigration have been encountered in a total of 5531 patients. The rarity of canine transmigration in the maxilla could be attributed to the shorter distance between the roots of maxillary incisors to the floor of the nasal fossa as well as the larger roots of maxillary incisors, which could play as a barrier for transmigration. In contrast, genetic determinants have been suggested to play important role in mandibular canine transmigration, as there were other associated developmental dental anomalies suggesting genetic origins such as palatally placed canines, hypodontia, and bilateral canine transmigration [20].

Since almost all canine transigrations are asymptomatic, they are usually diagnosed in the routine radiographic assessments [7]. However, some patients complain of pain, swelling, infection or cyst formation resulting from impacted and transmigrated canines. In this study, pericoronal radiolucency was seen in 84 patients while dentigerous cysts were found in 23 patients. It has been reported that the existence of associations between various dental anomalies is

clinically relevant, as early diagnosis of one dental anomaly might indicate an increased risk for others [21].

Regarding the effect of gender, no statistically significant difference was found between males and females as regards both impaction and transmigration, consistent with the results of a previous study conducted in the United States [22].

## CONCLUSIONS

The incidence of teeth impaction and transmigration of maxillary and mandibular canines is frequent among Yemeni patients and more than was previously reported in some populations. Pericoronal radiolucency was commonly seen in relation to the impacted canines followed by dentigerous cyst.

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