

HISTOLOGIC AND RADIOGRAPHIC STUDY OF PATHOLOGIC CHANGE IN COMPLETE IMPACTED THIRD MOLARS DENTAL FOLLICLES

ABSTRACT

Background: Prophylactic extraction of the asymptomatic impacted third molar is routinely practiced in Europe and the United States. The justification for prophylactic extraction includes the need to reduce the risk of pathologic changes such as cysts and tumors. **Aims:** This study aimed to study the histological and radiological changes in the tooth follicles of upper and lower complete impacted 3rd molars - which appeared radiologically normal. **Material and method:** A prospective study included fifty patients aged 20 years and over who were referred to the Oral Surgery Clinic, Faculty of Dentistry, University of Sana'a. Patients had a follicular space between (2.5mm -3mm) as measured by the panoramic X-ray. Then these teeth were removed surgically and the follicle was sent for histopathological examination. **Results:** Most histopathological changes were in dental follicles with a size of <2.5 mm (86%), and only 14% with 2.5 mm - 3 mm. There was statistical significance between the smallest size of dental follicles with the incidence of pathological histological changes ($p = 0.008$). Of the 50 follicular patients, 28% showed HC, nine (64%) had ameloblastoma, four (29%) had a dentigerous cyst, and only one case (7%) had a multicalcified focus with islands of odontogenic epithelium. While 72% of the samples had normal follicles and non-specific chronic inflammatory cells. There is an association between female sex and pathological histological changes (12 females: 2 males, $p = 0.008$), age group 21-25 years (93% HC), with mandibles (65% HC). Regarding angle and histopathological changes, 36% were vertical, 29% mesioangular, 14.2% horizontal and destioangular, and 7.1% buccoangular. **Conclusion:** In conclusion, a high incidence of HC occurred in patients with DF, and it was associated with smaller dental follicle size, most HC was ameloblastoma, followed by dentigerous cyst, while 72% of samples had normal follicles and non-specific chronic inflammatory cells. There is a correlation between female gender, younger age group, and jaw position with HC. Prophylactic extraction of the asymptomatic impacted third molar should be routinely practiced in Yemen, to reduce the risk of pathological changes, especially in females and younger age groups.

Keywords: Dental follicle (DF), histopathological changes (HC), Impacted Third Molars, Oral pathology, Radiographic width, Sana'a, Yemen.

INTRODUCTION

The primitive dental sac, or dental follicle, which originates from odontogenic ectomesenchyme, is part of the tooth germ and is physiologically involved in the formation of cementum, periodontal ligament, and alveolar bone. This fibrous connective tissue usually contains odontogenic cell rests, which could be the source of any pathology like ameloblastoma, ameloblastic fibroma etc., In radiographically appears as thin pericoronal radiolucency, considered normal by some authors when within 3mm of thickness and by others when it is within 2.5mm of thickness^{1,2}. Reports in the literature discuss the prevalence of various cyst and tumour development associated with the asymptomatic follicle of impacted tooth³. Dental follicle may show various histopathological changes during tooth development which may sometimes lead to the development of odontogenic tumours and cysts. Foci of calcification are seen as a normal finding in the stroma of dental follicles³. In the WHO classification of odontogenic tumours, the hard tissue formation has been considered as a sub-classification; however, this parameter has not been much explored in earlier studies on dental follicle. Epithelial-mesenchymal interactions play an important role in odontogenesis and its associated pathologies and therefore in the studies of dental follicle, along with epithelial component emphasis should be laid on mesenchyme as well².

To our knowledge and according to the archive of the Library of the National Information Center in Yemen, which contains a database of more than 13,000 scientific papers and a few of them were in diseases and disorders of teeth⁴⁻¹³, but there is no study in Yemen that was conducted to investigate the histological and radiological changes in the complete impacted 3rd molars dental follicles, and this is the first study in this important topic. Thus this study was carried out to study the histological and radiological changes in dental follicles of the upper and lower complete impacted 3rd molars- which appeared radiographically normal - among Yemeni people, Sana'a city. In detail to determine the incidence of histopathological changes in soft tissues surrounding impacted third molar teeth (pericoronal tissues) among patients 20 years of age and over, and study the need for routine removal of complete impacted third molars under the prophylactic indication, the types of HC, size of dental follicle, and others factors that associated with HC in soft tissues in dental follicles as gender, age of the patients, site (Mandible\ Maxilla), side (Right\ Left), and angulation.

SUBJECTS AND METHODS

A prospective study was conducted to study the incidence of histological and radiological changes in soft tissue

(dental follicles) around the complete impacted 3rd molars (which appeared radiographically normal and no clinical evidence of changes). The study population included patients which had been referred to the clinic of Oral Surgery, Faculty of Dentistry, Sana'a University for extraction of complete impacted 3rd molars in Sana'a City from March 2018 to March 2019.

Inclusion criteria

a) Age of patient 20 years old and over. b) Complete impacted 3rd molars c) Dental follicle space between (< 2.5mm) and (2.5mm - ≤ 3mm). d) No any pathological evidence in panoramic film. e) No any abnormal soft tissue in mucosa which covering the tooth (impacted 3rd molars).

Exclusion criteria

a) Partially impacted 3rd molars. b) Medically compromised patients. c) Dental follicles were ruptured and lost through an aggressive work during extraction of the impacted tooth. d) Associated pathology in panoramic film of the impacted 3rd molars. e) Previous operation or fracture in mandible at the site of 3rd molars.

Clinical works and Data collection

All patients had undergone a clinical assessment and all information was collected in a data collected sheet (case sheet), which that was designed to have a methodological recording. All the panoramic images were done in (Al- Waleed x – ray). The model of machine is Pax i 3D Green 15 x 15 (PHT – 60 CFO), company VATECH, made in South Korea. After panoramic x- ray was taken to the patients, all impacted 3rd molars were classified based on Winter's classification. On the image of impacted 3rd molars two perpendicular lines (AA and BB) were drawn, one of line passed through the center of the crown and the other line passed through the long axis of the tooth. From the point where the two lines intersected, a ruler in digital program was moved to the widest of the follicular space and measurement the size of dental follicle of the complete impacted 3rd molars. Impacted 3rd molars patient who had a follicular space (< 2.5mm) and (2.5mm - ≤ 3 mm) were included in the study.

Reliability of measurement

The observer re-measured the widest space of the follicular space with the same means of measurement mentioned above. A comparison was made between the 1st, 2nd, 3rd measurements to determine the reliability ratio between the three measurements, the results showed that Cronbach's Alpha coefficient was (0.910) which means that all readings were reliable.

Surgical procedure

Surgical site of impacted third molars region was irrigated with normal saline and prepared for the surgical procedure. Infiltration was placed in addition to (I.A.N. B). A scalpel with number 15 blade was used to make incision for the creation of a flap (Triangular flap). A full mucoperiosteal flap was elevated by using a periosteal elevator. Then a straight hand- piece with adequate speed and torque was used to remove bone from occlusal aspect of tooth with copious normal saline irrigation. Bone guttering was done up to cervical line, buccal and distal aspect, buccal cortical plate was removed minimally.

In horizontal impaction, crown was sectioned from the roots in vertical plane. In vertically impacted teeth, the distal aspect of the crown was sectioned and removed first. In the case of distoangular impaction, it was sectioned the distal portion of the crown or complete crown in horizontal plane and then removed. After removal of impacted teeth a proper and adequate debridment was done. Round bur and bone file were used to smoothen any sharper bony edges.

The follicle was enucleated from the socket by using hemostat and periapical curette and then cleaned with normal saline and closure of the flap was done with 3-0 black silk interrupted sutures. Follicular tissue was cleaned with normal saline and sent for histopathology in 10% formalin.

Histopathological procedure

The dental follicle specimens were processed and sections were obtained from the blocks embedded in paraffin. This was done using a rotarymicrotome and stained using Hematoxylin and Eosin stains and montage on slides and viewed under microscope by histopathologist.

Statistical analysis:

Data were reported using appropriate descriptive statistics (including frequency, mean, standard deviation, and P-value). All statistical analyzes of the data were performed using the Statistical Package for Social Sciences (SPSS) version 24 and Excel 2007. They were recorded after data were collected and entered into SPSS for analysis. The Chi-square test was used to investigate the significant differences in the incidence of pathological changes in the tooth follicles of the affected third molars with size ranging from (<2.5 mm) to (2.5 mm - 3 mm), gender and location, side and size of the tooth follicle, and 2007 excels in the other variables (age, places, causes of extraction).

ETHICAL APPROVAL

Ethical approval was obtained from the Medical Research & Ethics Committee of the Faculty of Dentistry, Sana'a University. All data, including patient identification were kept confidential.

RESULTS

Distribution of histopathological changes in dental follicles: Of the fifty dental follicles of complete impacted 3rd molars that were evaluated, fourteen (28%) showed pathological changes and thirty-six (72%)

showed no histological changes and (SD was 0.453) and there was a significant difference ($p= 0.002$) (Figure 1).

Types of histopathological changes in dental follicles of the complete impacted 3rd molars: According to histopathology results, nine (64 %) were ameloblastoma, four (29%) were dentigerous cyst and only one case (7%) was multicalcified focus with islands of odontogenic epithelium, (Figure 2).

Distribution of histopathological changes with size of dental follicles of the complete impacted 3rd molars: In correlation between the size of the dental follicle of the complete impacted 3rd molars, median size was 2.2 mm with (S.D. was 0.462) and Mode was 3mm. Twelve (86 %) of histopathological changes were in dental follicles size (0.5mm- < 2.5 mm), and only two cases (14 %) were in dental follicle size (2.5mm - ≤ 3mm) with significant ($p= 0.008$) (Table 1).

Distribution of histopathological changes in dental follicles with site (Mandible \ Maxilla) and side (Right \ Left): Of the fifty dental follicles from complete impacted 3rd molars,, thirty are dental follicle from the mandible (60%) and twenty dental follicles from the maxilla (40%). Nine (65%) were histopathological changes in the lower jaw - five cases were on the right (36%) and four cases were on the left (29%), while the upper jaw was five (35%) - two cases (14%) were on the right. And three cases (21%) are in the left. There were no statistically significant for site and side ($p> 0.05$) (Table 2).

The distribution of histopathological changes and angulation (Winter's classification):

Five (36 %) of histopathological changes were in vertically complete impacted 3rd molars - three cases (21.4%) in mandible and two cases (14.2%) in maxilla. Four (29 %) were mesioangular – three cases (21.4%) in mandible and only one case (7.1%) in maxilla. While horizontal were two cases and buccoangular was only one case (14.2%) and (7.1%), respectively in mandible only. Destioangular were two cases (14.2%) in maxilla (Figure 3).

Distribution of histopathological changes of dental follicles with gender: A total of the fifty dental follicles of the complete impacted 3rd molars were removed, twelve (86%) of histopathological changes were in female and in male were only two (14 %) , and there was statically significant ($p= 0.008$) (Table 3) .

Distribution of histopathological changes in dental follicles with age groups: Of the fifty dental follicles of the complete impacted 3rd molars included in the study with mean age was (23 years old) , thirteen (93%) of histopathological changes was in age group (21-25 years old) , then only one case (7 %) in age group (26 – 30 years old) . While in other age groups were nil (Figure 4).

Distribution of histopathological changes in the dental follicles with reasons of extractions: Eight cases (57.1 %) were extracted for orthodontic needs, followed by three cases had anchorage loss (mesial collapse) (21.4%), then two cases (14.3%) had T.M.J pain, and only one case (7.1%) for prophylactic (Figure 6).

DISCUSSION

In the present study, the incidence of histopathological changes in dental follicles of complete impacted 3rd molars were fourteen cases (28%) and thirty six cases (72%) were reported no histopathological changes and chronic non- specific inflammatory cells. Most the of histopathological changes were nine ameloblastoma like-lesion (64%), four were dentigerous cyst (28%), and only one case was multicalcified focus with islands of odontogenic epithelium (7%). A similar study was performed by Shaat , ¹⁴ who found that important pathological lesions were diagnosed in (29%) of cases and (71%) were normal follicles, but in his study (57.7%) showed a Dentigerous cyst. , (5%) ameloblastoma and only (0.9%) were odontogenic keratocyst. Yildirm *et al.* ¹⁵ also noted pathology changes (23%) and the remaining specimens (77%) were diagnosed as normal tissue. Of these pathological specimens 14.1% were dentigerous cysts, 6.6% were CCOT and 2.5% were OKC. Also in the study of Haidry *et al.* ¹⁶ found cystic changes in (24%) of radiologically normal ILTMs and 76% were DF normal. Moreover, Dongel *et al.* ¹⁷ in their study of 113 follicle tissue 15.9% cystic changes and 84.1% no cystic changes.

Adesperger *et al.* ¹⁸ that (34%) of dental follicles exhibited squamous metaplasia indicating cystic changes equivalent to those found in Dentigerous cysts. However; in a study by Vignewaran and Shilpa ¹⁹ it was shown that (61.4%) were cysts and tumors and (38.6%) cases were normal with chronic inflammatory cells. In this study, twelve (86%) tooth follicles in size (less than 2.5 mm) had histological changes, while follicle that measured (2.5 mm - 3 mm) only two (14%); similarly in a study of Tambuwala *et al.* ²⁰ noted that the incidence of cystic changes was higher in follicle size between (1 mm - 1.5 mm) (33.3% and 66.7%, respectively), and that follicles of 2 mm were zero. Additionally, Dongol *et al.*, ¹⁷ observed cystic changes were more in follicle size of (0.5mm) (25%) and (20%) in size of (2.5mm), and Adelsperger *et al.*, ¹⁸ showed that (32%) from (34%) of cystic changes were in DF size less than (2.5mm).

With looking to site (mandible \ maxilla) and side (right\ left), the results in this study to fifty dental follicles of the complete impacted 3rd molars were thirty dental follicles from mandible (60%) and twenty from maxilla (40%).Among this study, thirty one cases (62%) in right-side, and nineteen (38%) in left-side. Nine (65%) of histopathological changes were in mandible – Five cases in right-side (36%), and four cases in left-side (29%), while in maxilla five cases (35%) – Two cases (14%) in right-side and three cases (21%) in left-side. Similar in a study done by Seyedmajidi *et al.*, ²¹ found that cystic changes were observed in (55%) follicles of mandibular 3rd molar, while (28%) from maxilla and the incidence of pathological changes in mandible was 1.957 times

more than maxilla. The findings of this study and previous studies showed that the most histopathological changes were in mandible, that may be lower third molar is the last tooth was erupted in oral cavity, also the type of lower jaw bone is compact bone that makes as a physical barrier in the eruption path, in addition the density bone of mandible is more than maxilla.

With consideration to angulation according to Winter's classification, nineteen cases were (38%) mesioangular, then fourteen cases (28%) vertical, nine (18%) were destioangular, seven (14%) were horizontal, and only one case (2%) was buccoangular. Most of changes in this study were in vertical and mesioangular angulation, five cases (36%) and four cases (29%), respectively. Followed by destioangular and horizontal two cases in each one (14.2%) and only one case (7.1%) was buccoangular. Similar a study was done by Şimşek – Kaya *et al.*,²² showed vertical and mesioangular inclined molars a greater tendency toward pathological changes. While in a study was done by Mehrotra and David,²³ found mesioangular impacted molars were associated with higher incidence of cystic changes. Also in Tambuwala *et al.*,²⁰ study they reported that (20%) was mesioangular and (16.7%) vertical impacted 3rd molars were diagnosed as cystic follicle, while other angulation were diagnosed as infected dental follicles.

The finding in this study showed most of histopathological changes in vertical and mesioangular that may be related to failure of impacted third molars of rotation from mesioangular to vertical position in their cycle due to external or internal factors, in addition vertical and mesioangular positions are most common, but causes are still unknown.

With regard to the gender and distribution of histopathological changes. Fifty follicular tissues were obtained, and among this study thirty eight females (76%) and twelve males (24%). Yildirm *et al.*,¹⁵ reported pathological changes were seen mostly in female (74%) and (26%) was male. Also in a study of Şimşek-Kaya *et al.*,²² noted cystic changes were seen in four females (80%) and only one male patient (20%). On the other hand Kotrashetti *et al.*,²⁴ found that the pathological changes in follicles were more in males as compared to females, (90%) males and (47.6%) females. The findings in this study, females were more than males due to the size of female jaw is smaller than male and that makes no enough space for eruption of the 3rd molars which leads to impacted of the tooth or retained in jaw for a long time, or may be gender differences in hormones influencing the growth of the epithelial lining.

In the current study; of the total fifty dental follicles of the complete impacted 3rd molars, thirty nine (76%) in age group (21-25y), then age group (26-30y) and (31-35y) were four (8%) to each one, two cases (4%) in age group (36-40y), and only one (2%) in age group (41-45y). Among them, thirteen (93%) of histopathological changes were in age group (21-25 y). This result is similar to Vignesaaran and Shilpa¹⁹ study where they found that peak incidence of pathologies occurred between the age group (20-30 y) and lowest incidence of pathology (10%) occurred in the oldest age group.

With regard to the reasons of extraction, we found twenty one (42%) for orthodontic treatment, twelve (24%) due to pain in T.M.J., nine (18%) due to anchorage loss (mesial collapse), and eight (16%) for prophylactic. Among this study histopathological changes were found in eight orthodontic patients (57.1%), then three cases (21.4%) and two cases (14.3%) in patients had anchorage loss (mesial collapse) and T.M.J pain, respectively, and only one case (7.1%) for prophylactic. Shaat,¹⁴ found the reasons for removal were orthodontic treatment, pain and destruction of adjacent tooth. Naves *et al.*,²⁵ and Palma *et al.*,²⁶ in their study most common reasons for orthodontic treatment. Dongel *et al.*,¹⁷ in their study the most common cause of extraction of the impacted mandibular third molars was recurrent pericoronitis (84.1%), followed by carious second molar (6.2%) and prophylactic (3.5%). Whereas Kotrashetti *et al.*,²⁴ for prophylactic and orthodontic needs (before treatment, after treatment and during the course of orthodontic treatment).

CONCLUSION

In conclusion, a high incidence of HC occurred in patients with DF, and it was associated with smaller dental follicle size, most HC was ameloblastoma, followed by dentigerous cyst, while 72% of samples had normal follicles and non-specific chronic inflammatory cells. There is a correlation between female gender, younger age group, and jaw position with HC. Prophylactic extraction of the asymptomatic impacted third molar should be routinely practiced in Yemen, to reduce the risk of pathological changes, especially in females and younger age groups.

AUTHOR CONTRIBUTION

This study was carried out by Shafiqah Mohammed Haidra Masdoose for Oral and Maxillofacial Surgery MSc degree under the supervision of Assistant Professor Akram Thabet Nasher, Oral and Maxillofacial Surgery department, Faculty of Dentistry, Sana'a University. Other authors analyzed the data and wrote the manuscript, and reviewed it.

ACKNOWLEDGMENTS

The authors would like to acknowledge Sana'a University, Sana'a, Yemen which supported this work.

CONFLICT OF INTEREST

"No conflict of interest associated with this work".

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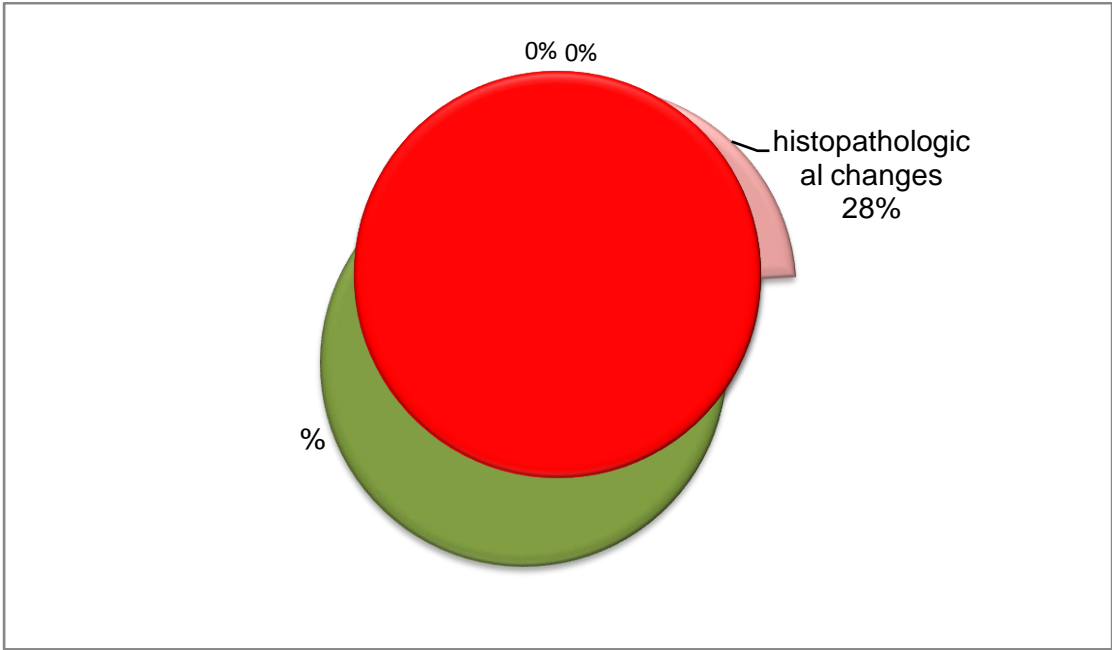


Figure (1) : The distribution of histopathological changes in dental follicles of the complete impacted 3rd molars.

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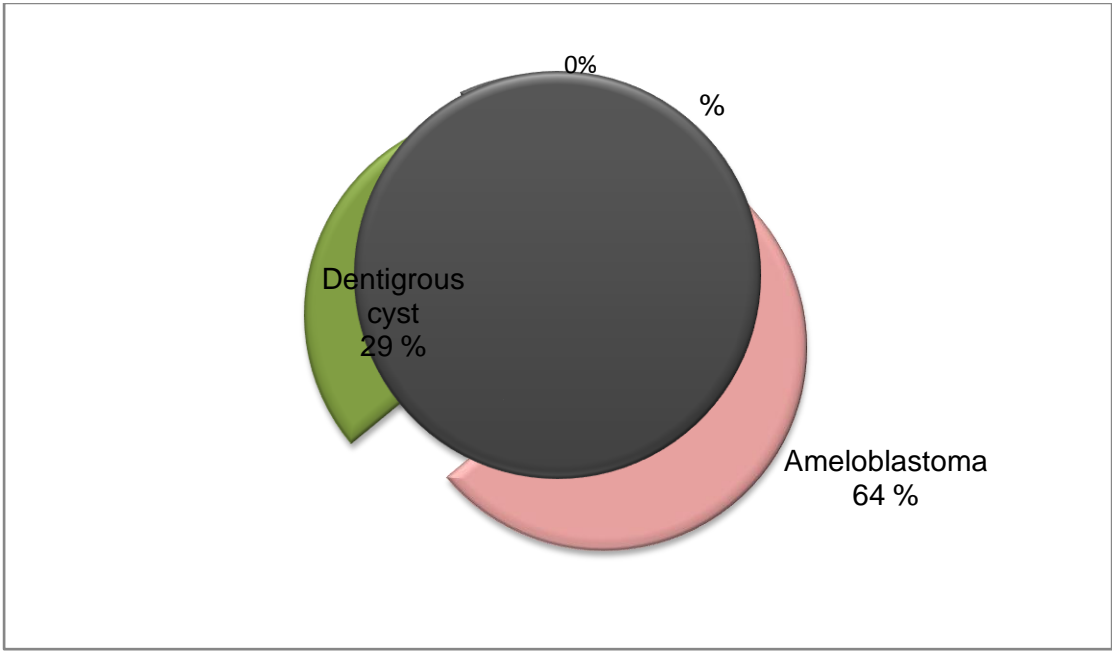


Figure (2) : Types of histopathological changes in dental follicles of the complete impacted 3rd molars

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Table (1) : The distribution of histopathological changes in dental follicles with size					
Size	< 2.5mm		2.5mm - ≤ 3 mm		P – value
	No.	%	No.	%	
Pathological changes	12	86 %	2	14 %	0.008

Table (2) : The distribution of histopathological changes in site (Mandible \ Maxilla) and side (Right \ Left)								
Pathological changes	Mandible			Maxilla		Total		P- value
		No.	%	No.	%	No.	%	
			9	65%	5	35 %	14	100%
	Right	5	36%	2	14%	7	50%	1
	Left	4	29%	3	21%	7	50%	

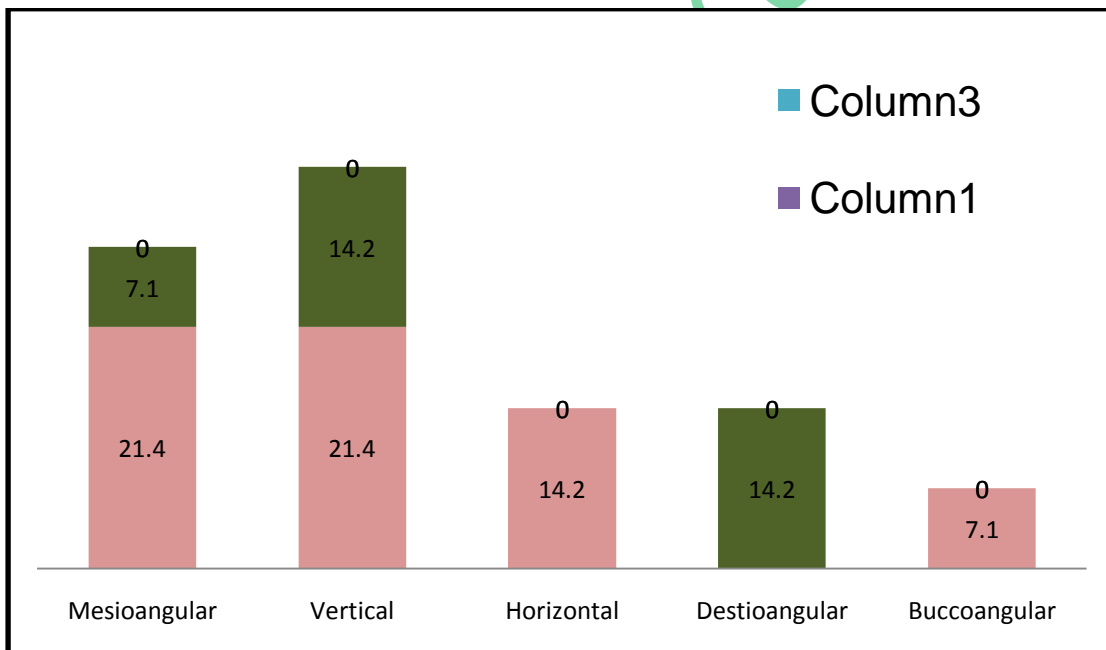


Figure (3) : The distribution of histopathological changes and angulation of impacted 3rd molars (Winter's classification) in both jaws

Table (3) : The distribution of histopathological changes in dental follicles of the complete impacted 3 rd molars with gender :			
Gender	Histopathological changes		
	Number	%	P- value
Females	12	86 %	0.008

Males	2	12 %	
Total	14	100 %	

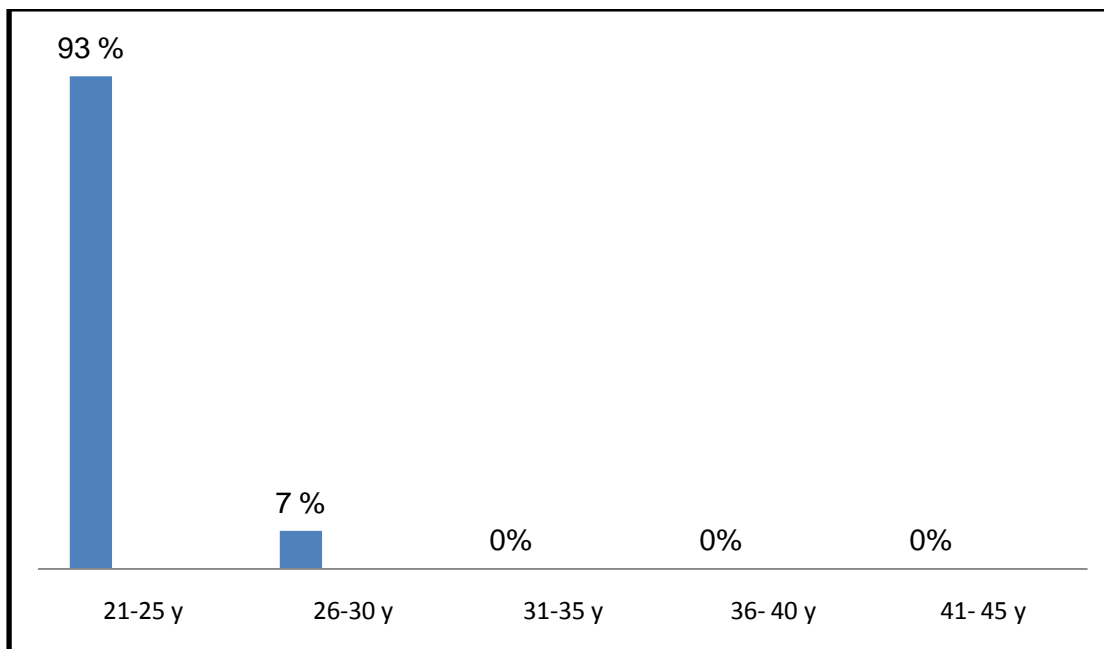


Figure (4) : The distribution of histopathological changes in dental follicles with age groups

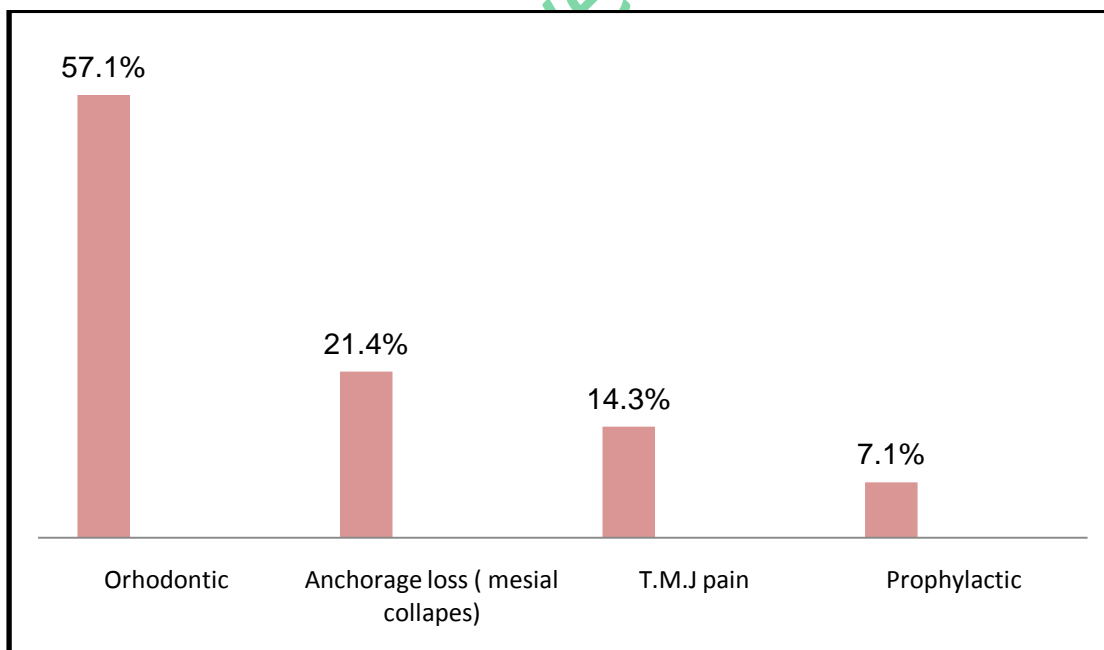


Figure (6) : Distribution of histopathological changes in dental follicles with reasons of extractions