CHARACTERISTICS AND ETIOLOGY OF RADICULAR CYST — A STUDY

*ASMAT ULLAH KHAN , BDS,MCPS, FCPS. **ZAHOOR QAYYUM, BDS, MCPS, FCPS ***M.UMAR FAROOQ, BDS, MFDS (UK)

ABSTRACT

Radicular cyst is one of the late sequelae of untreated pulpal necrosis often caused by dental trauma and caries. It develops slowly and gradually but symptomlessly, and involves many adjacent sound teeth endangering their vitality and even prognosis. The objectives of this study were to determine the site, age and sex distribution as well as to know the ratio of trauma to caries in the occurrence of Radicular cyst. Fifty (50) patients were included in study after taking history, clinical examination, radiological findings, aspiration test and biopsy report.

38 cases occurred in maxilla while 12 in mandible with ratio 3.1:1. In maxilla, the offended tooth was anterior in all 38 cases. So the favoured site was maxillary anterior teeth. The peak frequency was in 3rd decade with mean age of 23 years. There was slight male predilection as like other international studies. The ratio of trauma to caries was 4.3:1 in both jaws, 10:1 in maxilla and 1:1 in mandible.

The increased ratio of trauma to caries indicates the neglecting attitude of our patients to dental treatment and demands their awareness and education about the untreated dental trauma. This study will help professionals to know the hazards of untreated dental trauma as well as their consequences. It will also help in early diagnosis and management of Radicular cyst to reduce its morbidity.

Key words: Sequelae of pulpitis, periapical cyst, radicular cyst, periapical radiolucencies.

INTRODUCTION

Radicular cyst is the most common Odontogenic cyst that occurs at the apex or lateral to the root of a non-vital tooth. It comprises 70% of all jaw cysts¹. It is most common between the ages of 20 to 60 years². It can arise at any age after tooth eruption but is rare in the deciduous dentition. It can occur in relation to any tooth in the arch, although 60% are found in the maxilla, where there is a particularly high incidence in anterior teeth³. It is included in inflammatory cysts because inflammation in the periodontal ligament is the inciting factor in its formation.

Previous untreated dental trauma and caries result in pulpal necrosis and devitality of the tooth ⁴. The leakage of the irritant products from the pulp to the periodontal ligament result in granuloma formation. Granuloma is the defensive response of the periapical tissue to the leaking pulpal-irritants. Various inflammatory mediators stimulate the proliferation of epithelial rests of Malassez, which are the embryonic remnants of the Hertwig's sheath lying dormant in the periodontal ligament. The epithelial cells proliferate within granuloma and form a mass of epithelial cells. The central cells of the mass get degenerated because of lack of nutrient supply and undergo liquefactive necrosis. Thus a cavity is formed, lined by epithelium, having fluid and is called Radicular cyst.

Radicular cyst remains symptomless clinically, unless it becomes sufficiently enlarged to cause expansion of the cortical plate or it becomes infected. It

- ** SMO, PAEC, General Hospital, Islamabad, e-mail: zahurqayyum@yahoo.com
- *** Resident OMFS, PIMS, Islamabad

 $^{* \}hspace{0.5cm} Senior\,Registrar, OMFS, Pakistan\,Institute\,of\,Medical\,Sciences\,Islamabad, e-mail:\,drasmatktk@yahoo.com$

expands in balloon like fashion. The rate of expansion of radicular cyst has been estimated approximately 5mm in diameter per year ³. In maxilla, it is either buccal/labial or palatal cortical plate, which is expanded while in mandible it is usually the buccal/labial cortical plate which is expanded. The eggshell crackling sensation is elicited on palpation in case of large radicular cyst. The involved tooth (teeth) many exhibit mobility and the adjacent teeth may be displaced. On aspiration, it yields straw-colored fluid (uninfected cyst) that shimmers with cholesterol crystals in light. The fluid contains proteins, breakdown products of epithelial and inflammatory cells, electrolytes and cholesterol crystals. The level of soluble protein is 4-11 g/dl. The average pressure of cystic fluid is about 70 mm H_2O^2 .

Radiologically it appears as well-defined round or oval unilocular radiolucency with radiopaque margin (unless infected) continuous with the lamina dura of the involved tooth. In case of infected cyst, the radiopaque margin on x-rays disappear because of rapid growth of the cyst. The roots of the adjacent teeth are usually displaced and roots of involved tooth are rarely resorbed. However, whether or not cyst formation has occurred, a small apical radiolucency cannot be detected from the radiographic appearance alone.

Radicular cyst is lined by non-keratinized stratified squamous epithelium supported by chronically inflamed fibrous capsule. The lining is irregular and may vary considerably in thickness in newly formed cysts while in established cysts it is more regular in appearance and of even thickness. Breaks in the lining are common. Mucous cells may be found in the epithelium as a result of metaplasia in about 40% cases⁵. In 10% cases, the epithelium also contains hyaline eosinophilic bodies (Rushton bodies) of varying size and shape. The capsule consists of collagenous fibrous connective tissue. During active growth, the capsule is vascular and infiltrated by chronic inflammatory cells adjacent to the proliferating epithelium. With time (mature cyst) the capsule tend to be more fibrous and less vascular and there is reduction in the density of the inflammatory cells infiltration. Multinucleated foreign body type giant cells may frequently be seen in close approximation to cholesterol clefts and hemosiderine within the connective tissue wall².

MATERIALS & METHODS

This study was conducted in Oral and Dental Hospital of Khyber College of Dentistry Peshawar from

Oct 2002 to Aug 2003 in KCD. Fifty patients were selected. The sampling technique non-probability. All patients irrespective of age and sex presented with radiolucent lesions related to the roots of teeth and diagnosed as radicular cysts were included.

EXCLUDING CRITERIA Small periapical radiolucencies which were treated by conservative endodontic treatment. Those radiolucent lesions which were not provisionally diagnosed as radicular cysts. Those lesions, which were provisionally diagnosed as radicular cysts, but not confirmed by histopathology.

The study design was descriptive.

The detailed history was obtained including age, sex, site of lesion, duration of the lesion, previous dental trauma, caries, fillings etc by filling the proforma. The extra-oral and intra-oral examinations were performed. Those patients who gave the history of previous dental trauma were thoroughly examined for the signs and symptoms of the previous dental trauma such as intrusion, extrusion, displacement, discoloration, fracture of tooth or avulsion. The teeth were also examined for caries or restorations. The vitality of involved teeth was also checked. Radiographs (OPG, Periapical, occlusal view) were taken to see the site, size, shape, outline of the radiolucency and its effect on the adjacent teeth. The aspiration was performed and colour of the aspirate noted in the proforma. The provisional diagnosis of the Radicular cyst was made on the basis of history, clinical examination, radiographic picture and aspiration test. This was confirmed by the histopathological report after treatment. The data so collected was evaluated by applying descriptive statistics through spss version 10.0.

RESULTS

In total fifty (50) cases, thirty-eight (38) occurred in maxilla and twelve (12) in mandible. The ratio of occurrence in maxilla to mandible was 3.17:1.

Total	Site	Occurrence	Percentage
	Maxilla	38	76%
50	Mandible	12	24%

TABLE 1: THE PERCENTAGE OF OCCURRENCE OF RADICULAR CYST IN MAXILLA VS. MANDIBLE

SITE (MAXILLA)

In Maxilla, thirty (30) cases were found in anterior teeth while in eight (8) cases both anterior and posterior teeth were involved. The offending tooth in all eight (8) cases was anterior, from where the cyst spread to posterior maxilla involving the posterior teeth also. No case was reported to occur solely in the posterior teeth.

Total	Maxilla	Occurrence	Percentage
	Anterior teeth	n 30	78.9%
38	Anterior + Posterior teet	8 h	21.1%

TABLE 2: THE PERCENTAGE OF OCCURRENCE OF RADICULAR CYST IN MAXILLA

SITE (MANDIBLE)

In mandible twelve (12) cases were reported. Seven (7) cases involved the anterior teeth while five (5) cases involved the posterior teeth.

Total	Mandible	Occurrence	Percentage
	Anterior teeth	1 7	58.33%
12	Posterior teet	h 5	41.671%

TABLE 3: PERCENTAGE OF OCCURRENCE IN ANTERIOR VS. POSTERIOR TEETH OF MANDIBLE

SEX

Twenty-nine (29) radicular cysts were found in males and twenty-one (21) in females.

Total	Sex	Occurrence	Percentage
	Male	29	58%
50	Female	21	42%

TABLE 4: FREQUENCY IN MALE VS. FEMALE

AGE

The peak frequency was in 3^{rd} decade. The Mean age of occurrence was 23.8 years. The average age of radicular cyst occurrence in posterior mandibular teeth was markedly low i.e 11.6 years.

Fig. 1. Shows the peak frequency in 3rd decade

ETIOLOGY The thirty-five (35) radicular cysts were associated with previous dental trauma, eight (8) with caries and in seven (7) cases no identifiable cause was found.

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TABLE 5: SHOWS THE PERCENTAGE OF CAUSES OF RADICULAR CYST IN MAXILLA AND MANDIBLE

ETIOLOGY IN MAXILLA The thirty (30) cases were associated with previous dental trauma and three (3) cases were associated with caries while no cause was found in five (5) cases. The ratio of trauma to caries in maxilla was 10:1.

Total	Cause	Reported Cases	Percentage
	Trauma	30	78.9%
38	Caries	3	7.9%
	Unknown	5	13.2%

TABLE 6: SHOWS THE PERCENTAGE OF CAUSES OF RADICULAR CYST IN MAXILLA

ETIOLOGY IN MANDIBLE In twelve (12) reported cases in mandible, five (5) were associated with previous untreated dental trauma, five (5) with caries and two (2) with no identifiable cause.

Interestingly, five (5) caries associated radicular cysts were located in the posterior teeth while the five (5) trauma associated cysts were located in the anterior teeth of the mandible. The ratio of trauma to caries was 1:1.

Total	Cause	Reported Cases	Percentage
	Trauma	5	41.66%
12	Caries	5	41.66%
	Unknown	2	16.66%

TABLE 7: SHOWS THE PERCENTAGE OF CAUSES OF RADICULAR CYST IN MANDIBLE

DISCUSSION

INCIDENCE OF CYST IN MAXILLA AND MANDIBLE

Bhaskar (1966) in his study of 2308 lesions found that the incidence of cyst in maxilla is 10 times more common than the mandible⁶. This was explained by stating that the maxilla contains far more epithelial debris than mandible³⁷.

Soames and Southam (1985) claimed that 60% of cysts are found in the maxilla, where there is a particularly high incidence related to the anterior teeth. Shear (1983),⁷ in a study of 789 cysts found in African and British patients, noted 60% cysts to be in maxilla.

Staphne (1945) and Mortensen et.al. $(1970)^8$ found the ratio of cyst in the maxilla to those in mandible to be approximately 3:2.

Lalonde and Luebke (1968) had found that radicular cyst to be one and a half time more common in the maxilla 9 .

 $Stockdale\,and\,Chandler\,(1988)\,found\,that\,163\,cyst$ involving maxilla and 23 involving mandible with ratio of 7:1^{10}.

In present study the 76% cyst occur in maxilla and 24% in mandible with ratio of 3.1:1. In author's view the high incidence in maxilla is due to the fact that Maxillary teeth are more prone to get dental trauma than mandibular teeth and increase epithelial debris in anterior maxillary teeth than mandibular teeth.

INCIDENCE OF CYST RELATED TO AGE OF PATIENTS

Shear (1983),⁷ in age distribution analysis of a group of British patients with radicular cysts found the

greatest incidence in the 5^{th} decade. In a group of South African patients the highest incidence was noted in the 3^{rd} decade.

Stockdale and Chaldler (1988) noted the highest incidence in the 4th decade of life. In contrast to the Shear and Stockdale study, in the present study the peak incidence was noted in 3^{rd} decade of life with average age of 23 years. In author's opinion, the difference is due to,

- The untreated childhood dental trauma is the most common cause of the devitality of teeth in our patients than the patients in Western countries.
- The dental trauma is usually ignored for treatment by our patients.
- The dental trauma is not properly managed in our patients.

INCIDENCE OF CYST RELATED TO SEX

Lalonde $(1970)^{11}$ found a slightly higher incidence of cyst in female (52% female and 48% male). In contrast Shear $(1983)^7$ reported a significant higher incidence of cyst in male patients(58%). Stockdale and Chandler (1988), in their study found ,53% males and 46.7% females.

In present study, 58% occur in males and 42% in females.

The increase frequency in males than females is probably due to:

- 1) Males are more actively involve in sports than females and thus more vulnerable to receive sports dental injury in our region.
- 2) Males are aggressive and there is increased interpersonal violence in males than females of our region.

FACTORS CONTRIBUTING TO TRAUMA AS THE MAIN CAUSE OF RADICULAR CYST IN OUR REGION

Most of the population of NWFP lives in rural areas where the dental facilities are very limited both in government hospitals as well as in private clinics. So any patient receiving dental trauma there, is not properly managed. Dental awareness is highly lacking in our society. They take dental trauma very lightly and don't bother to search any treatment for it. Some of our patients receiving dental trauma visit quacks rather than qualified dental surgeons for treatment of dental trauma.

It is the psychology of our patients that when pain is relieved, they overlook the follow up treatment while dental trauma requires long term follow up. Some dental surgeons, although provide first visit emergency treatment to dental trauma patients, but they do not pay attention to evaluate the vitality of the involved teeth and its endodontic treatment.

CONCLUSION

Radicular cyst is a complication of untreated pulpal necrosis. It affects maxilla more than mandible and maxillary anterior teeth are the favoured site. Trauma is the most common cause of Radicular cyst than caries in maxilla (10:1) while in mandible both trauma and caries equally (1:1) contribute in the occurrence of radicular cyst. However, in mandible the trauma is the main cause in anterior teeth while caries is the main factor in posterior teeth.

It is suggested that the awareness should be created in the population that dental trauma in children and adolescent should not be taken lightly. Proper attention should be paid to the treatment of traumatized teeth and follow-ups to prevent later on complications such as radicular cyst. Moreover dental surgeons should treat the dental trauma appropriately such as vitality of traumatized teeth should be checked through regular visits. Those teeth whose vitality is lost should be treated by accurate endodontic treatment.Regular follow-up of restored teeth is recommended.

Further research is needed on this topic.

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