INTRODUCTION

The understanding of root canal system of tooth plays a key role for the success of endodontic treatment. Dentists must have sufficient knowledge of normal internal anatomy of a tooth and its possible different internal morphological variations for better outcome of endodontic treatment. The main objective of endodontic treatment is thorough shaping and cleaning of all pulp spaces and its complete obturation with an inert filling material. The failure of the dentist to locate a canal is one of the major reasons for lower success rate. Maxillary second premolar is one of the most difficult tooth to be treated endodontically. There are many factors i.e. the various pulp cavity configurations, the number of root canals, the number of roots, the direction and longitudinal depressions of the roots, and the difficulties in visualizing the apical limit by radiographs, make endodontic treatment of the maxillary second premolars challenging for dentist.

Various case reports have been published and reported three canals in the maxillary second premolars. Vertucci performed a research on the root canal morphology of different teeth and reported three canals in 1% of two hundred extracted maxillary second premolars.

These studies were performed on teehs of Nigerians, Chinese, North American, Turkish, and Indian populations; relating that different races and geographical areas show different canal morphology.
and percentage proportion for different canal types. There is no local published report undertaken, and the rationale of this study was to conduct a report recording the frequency of three canals of the maxillary second premolars in local population, and to compare them with other researches. This could help in successful treatment planning and endodontic treatment of the maxillary second premolars in local population.

METHODOLOGY

One hundred and fifty extracted permanent maxillary second premolars were collected from the Dental Outpatient’s Department of Liaquat University of Medical and Health Sciences Hospital, Hyderabad / Jamshoro, private dental clinics, and government and private hospitals in district Hyderabad from January 2007 to June 2007. No information was collected regarding reason for their extraction or the age and gender of the patients. Teeth with incompletely formed roots, fracture, deep caries, and metallic restorations were excluded from this study. The teeth were kept in 10% formalin after removing stains and calculus using an ultrasonic scaler. Access cavities were prepared using No. 2 round bur in a high speed hand piece. Then pulp chambers were irrigated with 2.5% sodium hypochlorite solution to dissolve pulp tissues for 12 hours and soaked in an ultrasonic bath for 20 minutes. The teeth were then bathed under running tap water for 2 hours and dried overnight. For staining of teeth, with a 27 gauge needle methylene blue dye was injected into the root canal spaces coronally, and flooded throughout the pulp space by vacuum suction apically. Then teeth were dried with air and kept in 5% nitric acid solution for decalcification. Everyday teeth were kept in fresh acid solution for five days and the end point of decalcification was determined by periodic radiographs. The traces of solution were removed by bathing under running water and dried. Then teeth were dehydrated using increasing concentrations of ethanol (70%, 95%, 100%) for one day. Lastly the teeth were made clear by dipping in methyl salicylate. The cleared teeth were examined under operating microscope under 7.5 x magnification for the presence of the three canals.

RESULTS

Data were analyzed in Statistical Package for Social Sciences (SPSS) version-17. Frequencies and percentages were calculated for three canals. Chi-square test was used to interpret the results of the study.

Out of 150 extracted permanent maxillary second premolars, 72% showed one canal and 26% showed two canals. Only 2% demonstrated three canals of the total sample (n=150) Fig 1.

DISCUSSION

Variations in root canal system create a lot of problems during endodontic treatment. An understanding of the architecture of the root canal system prior to endodontic treatment is an essential prerequisite for successful root canal treatment. The failure in locating the canal is major reason of recurrence of endodontic infection after obturation.

Various studies have been conducted and reported three canals between 0.3% and 2% in the permanent maxillary second premolars.

Several methods have been used to study the root canal morphology of the permanent maxillary second premolars including decalcification and clearing, radiography, sectioning, microscope, and computer tomography. All above methods may have shortcomings. In this study, clearing technique was used to determine the frequency of three canals in the maxillary second premolars.

In 1984, Vertucci FJ found three canals in 1% of 200 maxillary second premolars using decalcification and clearing technique. The finding of an in vitro study conducted in Brazilian population by Pecora JD and others (1992) using decalcification and clearing technique revealed that three canals were found in 0.3% of 300 maxillary second premolars. Sert S and Bayirli GS (2004) conducted in vitro study in Turkish population using clearing technique and reported three canals in 3% of 200 maxillary second premolars. The finding of another in vitro study conducted by Kartal N and others (1998) using clearing technique revealed that 0.6% had three canals of total 300 sample size.

Bellizzi R and Hartwell G (1985) conducted in vivo study and reported 1.1% had three canals in total subjects. Vertucci F and others (1974) conducted study and found three canals in 2% of total investigated maxillary second premolars.

In the present study, 2% (3 out of 150) of the total sample had three individual canals. This finding is equal to the finding of the study conducted by Vertucci F and others, but lower than studies conducted by Vertucci FJ, Bellizzi R and Hartwell G, Pecora JD and others, and Kartal N and others but higher than studies conducted by Sert S and Bayirli GS.
There are very few cases of the maxillary second premolars with three canals and three independent roots.\(^3,^{11}\)

Several factors are linked to differences in the results of the conducted studies such as study design (in vitro versus in vivo), classification systems, sample size, racial divergence, technique of canal identification (sectioning, clearing, radiographic examination), ethnic background of tooth sources and patient’s age.\(^30\)

For the success of endodontic treatment, a comprehensive knowledge of root and canal morphology, detailed interpretation of periapical radiographs, proper access cavity preparation and a detailed exploration of the interior of the tooth are essential prerequisites.\(^3\)

During access cavity preparation, the outline of the pulp chamber floor usually point out the number of canals.\(^8\)\(^9\) Moreover, to find out additional canal, a suspected tooth requires access cavity modification, better visualization and manual exploring of the pulp chamber with a small size pre-curved file.\(^8\)

Most of times, the presence of three canals is noted only when patient complain of continuing postoperative pain after endodontic treatment. So, even in quite small frequency of three canals dentists must evaluate its presence clinically and radiographically during endodontic treatment.\(^9\)

Dentists must be aware of variations in root canal anatomy in the maxillary second premolars and be competent to apply this information in clinical and radiographic interpretation.\(^11\)

**CONCLUSION**

For the success of endodontic treatment understanding of normal root canal morphology along with its variations are basic prerequisites. Careful interpretation of angled radiographs together with access modification and examination of the floor of the pulp chamber under magnification can play a significant role for endodontic treatment of complex root canal anatomy.

**REFERENCES**