Objective: 1) Determine the incidence of separated instruments during nonsurgical endodontic procedures in a dental school setting; 2) determine the survival rate for teeth having a separated instrument. Methods: A retrospective data analysis from electronic dental records in a dental school practice was performed. The database was searched for nonsurgical endodontic procedures between January 2011 and October 2021. Inclusion criteria included: any patient undergoing a nonsurgical endodontic procedure, follow up exam or odontogram, subsequent endodontic therapy or extraction code for the treated tooth. Cases were defined as those patients with a separated instrument occurrence during the nonsurgical endodontic procedure. Tooth survival was defined as an asymptomatic, functioning tooth post-instrument separation. The final analysis included 55 cases; seven of the teeth were excluded from survival analysis because the separated instruments were removed.

Results: 12,577 cases met the criteria. Of these cases, 55 had an instrument separated from root canals, they add additional risks that could reduce successful outcomes. Prevention is crucial to clinical success.

Introduction

Many instruments are used during root canal treatment. While both hand and rotary files make up the majority of the instruments, burs, barbed broaches, and ultrasonic tips are also used. All of these instruments can separate in the root canal system potentially impacting treatment outcomes. While there are many methods to attempt removal of separated instruments from root canals, they add additional risks that could reduce successful outcomes. Prevention is crucial to clinical success.

Methods

This study protocol was registered, reviewed and approved by the ECU Institutional Review Board under the number 21-001864.

Data was collected from the ECU School of Dental Medicine’s electronic dental record (aXium). Any charts having any nonsurgical endodontic CDT code recorded between 2011 and October 2021 were included. Inclusion criteria included: nonsurgical endodontic code entry, an odontogram entry for the treated tooth, subsequent endodontic therapy or extraction codes for the treated tooth. Initially 12,577 cases met the criteria. Of these cases, 55 had an instrument separation occur. Seven cases were eliminated due to successful removal of the separated file. As a result, 48 cases were available for survival analysis. Survival was defined as an asymptomatic, functioning tooth post-instrument separation.

While many separated instrument papers highlight a lower success rate for teeth with a pre-existing radiculolucency, our data set exhibited no difference between the two groups. Age was not an outcome predictor in our study. However, the average age of patients having a failed outcome was 58.7 years suggesting an older age may have a role in both incidence of instrument separation and tooth survival.

The significant association between gender and survival curves must be interpreted with caution as the sample size and number of failures is extremely small. Upon reviewing this clinical data, our impression is that the crown-down, apex-up instrumentation protocol and single use of rotary instruments advocated by our school is both predictable and safe.

A major challenge faced by our team was trying to extract data from 10 different dental treatment facilities that have no standardized separated instrument reporting protocol or chart entry template. As a result, there was great variation in the amount of data recorded by clinicians. A standard treatment record template for all endodontic procedures along with a standard chart entry documenting all significant data points would greatly facilitate future research.

Conclusions

Within the confines of this exploratory, retrospective study analyzing 12,577 cases, we found a 0.43% overall incidence rate of separated instruments, all of which were endodontic files. Of the 55 teeth having a separated instrument occurrence, the endodontic file was retrieved in 7 instances while another 11 cases were bypassed. Of the 55 teeth having a separated instrument, 28% of the tooth survived for the length of the study. The combined survival rate was 88%.

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