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Frequency Of Perforation Management In Mandibular Molars With Furcation Involvement - A Retrospective Study

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Abstract:

A Major Complication Of Endodontic And Restorative Treatments Is Accidental Perforation Of The Pulp Chamber Floor. A Perforation In The Furcation Area Is A Potential Risk Factor For Extension Of Pulpal Inflammation Into The Periodontium And Formation Of Advanced Furcation Defect With Severe Loss Of Clinical Attachment And Interradicular Bone. Therefore, The Management Of Advanced Furcation Defects Remains A Challenging And Enigmatic Task For The Clinician. The Main Objective Of This Study Was To Evaluate Perforation Repair In Furcal Involving Mandibular Molars In Patients Under 50 Years Of Age. The Current Study Is An Institutional Based Retrospective Study Performed Over Reviewing 86,000 Case Records. A Total Of 24 Subjects Who Underwent Furcal Perforation Repair In Relation To Mandibular Molars Under 50 Years Of Age Were Chosen For The Study Out Of 6475 Subjects Who Had Undergone Root Canal Treatment In Various Teeth. Patients With Other Than Perforation Repairs And Medically Compromised Were Excluded. Once The Data Was Obtained, Analysis Was Done By Descriptive And Inferential Statistics Using Spss By Ibm Version 20. From This Current Study, It Was Found That, Out Of 24 Patients, 13 Males(54.2%) And 11 Females(45.8%) Have Undergone Perforation Repair Treatment. Highest Incidence Of Perforation Repair Was Seen In Tooth Number 36 (41.67%). Patients In The Age Group Of 41-50 Years Had The Highest Incidence Of Perforation Repair In Relation To Mandibular Molars. Adequate Knowledge, Experience And Clinical Skill Enables Good Management Of Furcal Perforations.

Keywords : Furcation Repair; Mandibular Molars; Perforation Repair

Introduction:

The Study Of Root And Canal Anatomy Has Endodontic Significance. Moreover, The Morphology Of Pulp Systems Varies Greatly In Different Races And In Different Individuals Within The Same Race (Ahmed *Et Al.*, 2007). The Mandibular Molar Has Been Reported With Various Root Canal Anatomy Having Three Roots , Two Roots, And Even A Single Root With A Single Canal (Curzon, 1973). A Perforation Is A Communication Between The Root

Canal System And The Supporting Tissues Of The Tooth Or Oral Cavity (Fuss And Trope, 1996). Furcal Perforations Occur Due To Severe Iatrogenic Complications And May Lead To Tooth Loss. Perforation May Occur During Preparation Of The Post Space Access Cavities And Also Due To Extension Of Internal Resorptions Into The Periradicular Tissues. The Complication Of The Furcal Perforation May Lead To Inflammatory Reactions And Cause Irreversible Damage To The Adjacent Tooth, Which Leads Further To The Loss Of The Permanent Teeth. Iatrogenic Perforations Are The Main Reason For This Complication (Seltzer, Sinai And August, 1970). Furcal Perforations Can Also Occur By Non Iatrogenic Means Which Includes Internal Resorption And Caries Development. The Consequences Of Root Perforations Or Furcal Perforations Depend On Its Location, Size, Period Of Impairment, Leading To Complication Of The Periodontal Tissues Irreversibly, Resulting In Tooth Loss ('Root Canal Perforation: A Quick Review', 2018) .

One Of The Factors Influencing The Prognosis Of Furcal Perforations Is The Period Of Time Elapsed Since The Occurrence Of The Perforation, As The Possibility Of An Infection In The Wound Site Increases With The Passing Time. Immediate Sealing Of Perforations Enhances The Repair Process Due To The Reduced Possibility Of Bacterial Contamination Of The Defect (Holland *Et Al.*, 2007; Roberts *Et Al.*, 2008). Depending On The Particular Characteristics Of The Furcal Perforation, It Can Be Managed By Either Non Surgical Or Surgical Means . With Early Diagnosis, Repair Is Well Performed With A Material That Can Provide Proper Sealing Ability And Good Biocompatibility. Among Different Materials, Mineral Trioxide Aggregate (Mta) Is Indicated To Seal Perforations (Hamad, Tordik And Mcclanahan, 2006). The Successful Treatment With Mta Lies On Properties Such As Biocompatibility, Low Cytotoxicity, Bactericidal , Periodontal Tissue Regeneration And Potential To Induce Sealing (Arens And Torabinejad, 1996) (Ford *Et Al.*, 1995).

During Root Canal Treatment, The Most Common Reason For The Perforation Was Attempting To Negotiate Calcified Canals, Calcification Occurs Typically In Aged Teeth, Traumatized Teeth, Periodontally Compromised Teeth Or Teeth With Extensive Restorations . Furcal Perforations Usually Occur During Access Cavity Preparations In Cases Where The Normal Anatomy Is Often Severely Distorted (Ibarrola, Biggs And Beeson, 2008). While It Will Be Impossible To Eliminate All The Iatrogenic Errors In Endodontics, With High Precision And Efficiency, A Reduction In The Frequency Of Operator Error Can Be Achieved. Previously Our Team Has A Rich Experience In Working On Various Research Projects Across Multiple Disciplines The (Somasundaram *Et Al.*, 2015; Hafeez And Others, 2016; Krishnan *Et Al.*, 2018)(Choudhari And Thenmozhi, 2016; Dhinesh *Et Al.*, 2016; Gurunathan And Shanmugaavel, 2016; Sneha And Others, 2016; Govindaraju And Gurunathan, 2017; Kumar And Rahman, 2017; Felicita And Sumathi Felicita, 2018; Saravanan *Et Al.*, 2018; Vijayakumar Jain *Et Al.*, 2019; Wu *Et Al.*, 2019; Palati *Et Al.*, 2020; Paramasivam, Vijayashree Priyadharsini And Raghunandhakumar, 2020).The Purpose Of This Study Was To Evaluate The Frequency Of Perforation Repairs Performed In Mandibular Molars With Furcation Involvement In Our Institution.

Materials And Methods:

Study Setting

The Current Study Is An Institutional Based Retrospective Study Performed At A Private Dental College.

Ethical Approval

The Necessary Approvals Were Obtained From The Institutional Ethical Committee - Sdc/Sihec/2020/Diasdata/0619-0320.

Data Collection And Tabulation

All The Case Records And Treatment Records Were Obtained From The Patient Management Software And The Data Collected Was Cross Verified By An Examiner To Avoid Any Missing Case Records. A Total Of 86,000 Case Sheets Were Verified For Root Canal Treatment Data And In Which 6475 Subjects Have Undergone Root Canal Treatment In Various Teeth. Out Of 6475 Cases, 24 Subjects Who Underwent Perforation Repair In Relation To Mandibular Molar Under 50 Years Of Age Were Chosen Carefully Verifying The Data And History. All The Data Collected Was

Formatted And Tabulated Using Microsoft Excel (Version - 2020). The Dependent Variable Was Furcal Perforation During Endodontic Therapy.

Inclusion Criteria

The Inclusion Criteria Was Patients Under 50 Years Undergoing Root Canal Treatment With Furcal Perforation In Relation To Mandibular Molars.

Exclusion Criteria

The Exclusion Criteria Was Missing Or Incomplete Data And Also Eliminated Cases That Were Not Approved By The Concerned Faculty In The Hospital.

Statistical Analysis

The Statistical Analysis Was Performed Using Ibm Spss (Version - 24). Descriptive Statistics Was Performed To Present The Age Distribution, Gender Distribution Of Patients And The Tooth Involved. Chi Square Test Was Done, To Associate Between Age Groups And Tooth Groups.

Results And Discussion:

In The Present Study Which Included 24 Patients, 45.83% (11) Females And 54.17% (13) Males Have Undergone Perforation Repair In Relation To Maxillary Molars (Figure 1). The Most Common Tooth With Furcal Perforation And Repair Was 36 (41.67%), Followed By 46 (29.91%), 37 (16.67%) And 47 (12.50%) (Figure 2). Out Of 24 Patients Who Had Undergone Perforation Repair In Relation To Mandibular Molars, The Age Group Commonly Associated Were 41-50 Years (66.67%), Followed By 31-40 Years (20.83%) And 20-30 Years (12.50%) (Figure 3). Patients In The Age Group Of 41-50 Years, The Frequency Of Perforation Repairs Seen In 36 Was (33.33%), 46 (16.67%), 47 (12.50%) And 37 (4.17%). Patients In The Age Group Of 31-40 Years, The Frequency Of Perforation Repairs Seen In 37 And 46 Was (8.33%) And 36 With (4.17%). Patients In The Age Group Of 20-30 Years, The Frequency Of Perforation Repairs Were Seen In 36, 37 And 46 With (4.17%). Results Show The Highest Incidence Of Perforation Repairs Was Seen In The Age Group Of 41-50 Years In 36 (33.33%) Compared To Other Age Groups (Figure 4). No Significant Association Was Seen Between Age Groups And Tooth Groups. Chi-Square Test Was Performed And Was Found To Be Statistically Not Significant ($P = 0.438$; $P > 0.05$).

Furcal Perforation Is An Undesirable Problem That May Occur During Root Canal Treatment Or Post Preparation. Similarly, A Risk Of Perforation May Arise During Removal Of Affected Tissue In A Patient With Caries Involving The Pulpal Chamber (Kratchman, 2004). In Either Case, The Situation Must Be Quickly Addressed, Which Is Important, As Immediate Treatment Will Help Ensure A Positive Prognosis. From The Results Obtained In This Study, 54.17% Of Males And 45.83% Of Females Had Undergone Perforation Repair In Relation To Mandibular Molars Under 50 Years Of Age Of Which The Most Common Teeth For Perforation Repair Was Found To Be 36 (41.67%). It Was Also Seen That Patients In The Age Group Of 41-50 Years Had The Highest Incidence For Undergoing Perforation Repair.

Most Of The Posterior Teeth Requiring Endodontic Treatment Have Had Extensive Restorative Treatment And The Existing Occlusal Anatomy May Have No Clinical Relevance To The Position Of The Underlying Chamber. In A Study Conducted By Behnia Et Al (Behnia, Strassler And Campbell, 2000; Kratchman, 2004), Where Age In Relation To The Treatment Was Tabulated. It Showed That The Individuals In The Age Group Of 60-70 Years Had The Highest Rate Of Perforation Recorded Which Was In Correlation With Our Study. In Another Study Conducted By Al Shammari Et Al (Al-Shammari, Kazor And Wang, 2001), He Suggested That Even In A Group Of Young Individuals, Perforation Repair Cases Were Recorded At (59.7%) Which Was In Contrast To Our Results, Where Age Groups Of 21-30 Years Were The Least.

In The Mandibular Arch, Kvinnsland Et Al Found That The First Molar Was The Tooth That Was Frequently Perforated Which Was In Correlation With Our Study As 36 Had The Highest Incidence Of Perforation (Kvinnsland *Et Al.*, 1989; Fuss And Trope, 1996). It Is Also Probable That This Tooth Is The Most Heavily Restored Tooth In The Mandible. Menzez Et Al Said That Anatomical Aspects Increase The Perforation Rate (Menezes *Et Al.*, 2004).

However There Are Only A Few Reports About Perforation In Primary Teeth, Whereas A Lot Of Cases In Permanent Furcal Perforation.

Reconstruction Of The Lost Attachment Via Regeneration Of The Periodontal Component Is Essential In The Repair Of The Perforated Area. Several Studies Have Been Published That Demonstrate The Ability Of Different Materials To Repair Furcal Perforations. However In Recent Years, There Has Been A Shift From Conventional To Regenerative Endodontic Therapy (Bakhtiar *Et Al.*, 2017). Stem Cell Based Tissue Regeneration For Perforation Repair And Through A Biomimetic Approach, Will Have The Potential To Open A New Era And Strategies In Endodontic Tissue Engineering Therapy (Alsanea *Et Al.*, 2011). Prevention Of Such Iatrogenic Errors Can Be Achieved By Proper Preoperative Evaluation Of The Case Which Includes A Few Considerations Such As Position Of The Roots Of The Tooth, Relationship Of The Crown To The Root, Rotation Of The Tooth In The Arch, The Relationship Of The Incisal Edge Or Cusp Tip To The Long Axis Of The Root (Moreinis And Abel Moreinis, 1979).Our Institution Is Passionate About High Quality Evidence Based Research And Has Excelled In Various Fields ((Pc, Marimuthu And Devadoss, 2018; Ramesh *Et Al.*, 2018; Vijayashree Priyadharsini, Smiline Girija And Paramasivam, 2018; Ezhilarasan, Apoorva And Ashok Vardhan, 2019; Ramadurai *Et Al.*, 2019; Sridharan *Et Al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *Et Al.*, 2020; Mathew *Et Al.*, 2020; R *Et Al.*, 2020; Samuel, 2021)

Conclusion:

Within The Limitations Of The Study, It Was Concluded That Furcation Perforation Repair Of Mandibular Molars Was Performed Most Commonly In The Right Mandibular First Molar Teeth. Among The Patients Who Had Perforation Repair, Majority Of Them Were Females And The Commonly Involved Age Group Was 41-50 Years.

Author Contribution

Roghith Kannan Carried Out The Retrospective Study, Collection And Analysis Of Data And Drafted The Manuscript. Dr Adimulapu Hima Sandeep Designed The Study And Participated In Data Analysis Verification And Drafting The Manuscript. Dr Revathi D Aided In Supervision And Appraisal Of The Manuscript.

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Conflict Of Interest

No Conflict Of Interest

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Graphs:

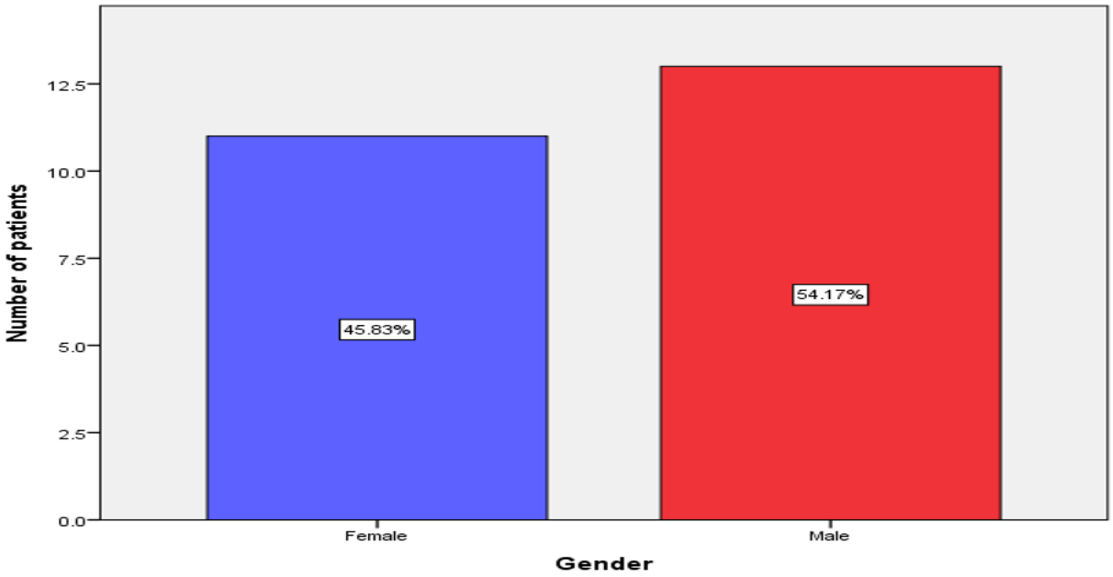

Figure 1: Bar Graph Depicts The Frequency Of Males And Females Who Had Undergone Perforation Repair In Relation To Mandibular Molars. X Axis Represents The Gender Of Patients And Y Axis Shows The Number Of Patients Undergone Perforation Repair. The Results Show The Highest Number Subjected To Perforation Repair In Relation To Maxillary Molars Was Seen In Males (Red) 54.17% Compared To Females (Blue) 45.83%.

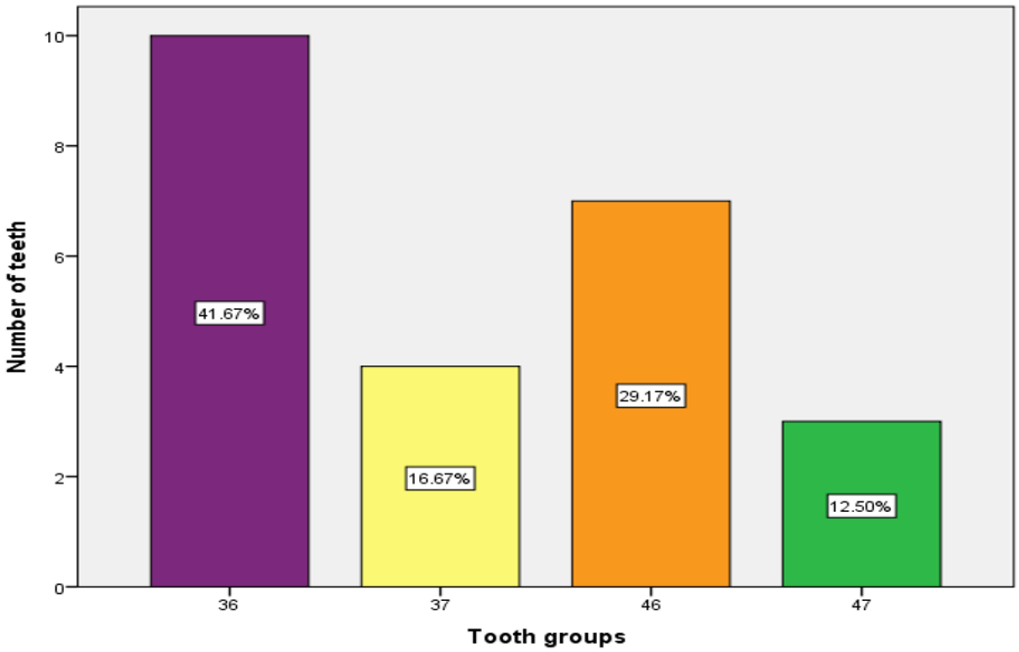

Figure 2: Bar Graph Depicts The Frequency Of Various Tooth Groups Involved In Perforation Repair. X Axis Shows The Various Tooth Groups Involved In Perforation Repair And Y Axis Shows The Number Of Teeth. The Results Show The Highest Incidence Of Perforation Repair Was Seen In 36 With 41.67% (Purple).

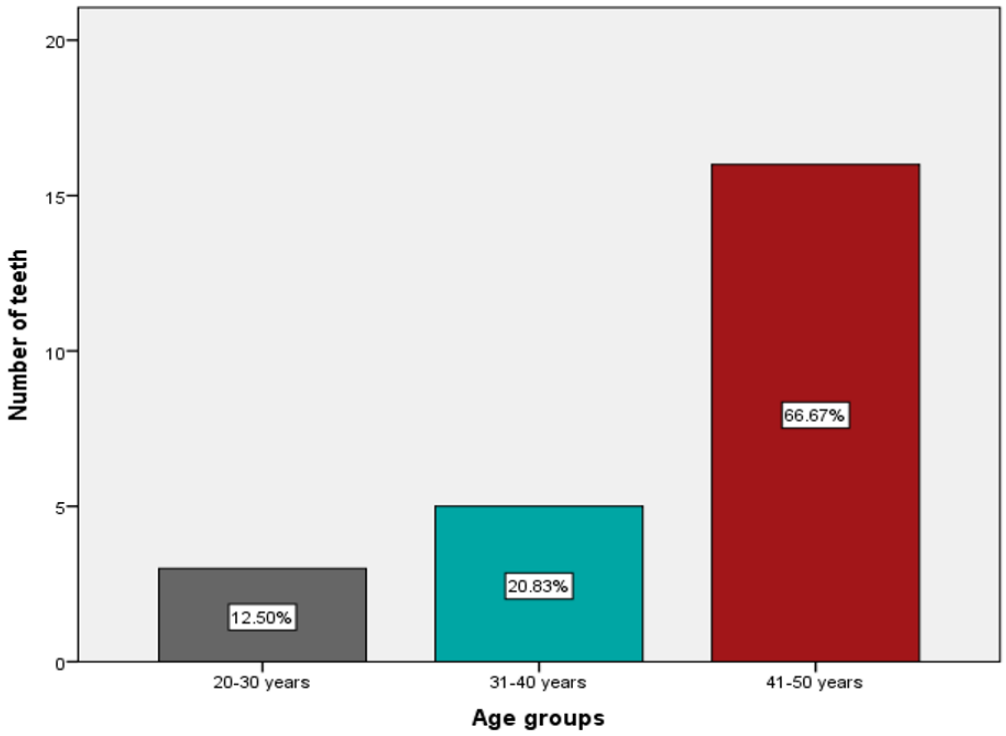

Figure 3: Bar Graph Depicts The Frequency Distribution Of Age Groups Involved In Perforation Repair In Relation To Mandibular Molars. X Axis Shows The Various Age Groups Involved In Perforation Repair In Relation To Mandibular Molars; Y Axis Shows The Number Of Teeth. The Results Show That The Perforation Repair Was Common In The Age Group Of 41-50 Years With 66.67% (Brick Red).

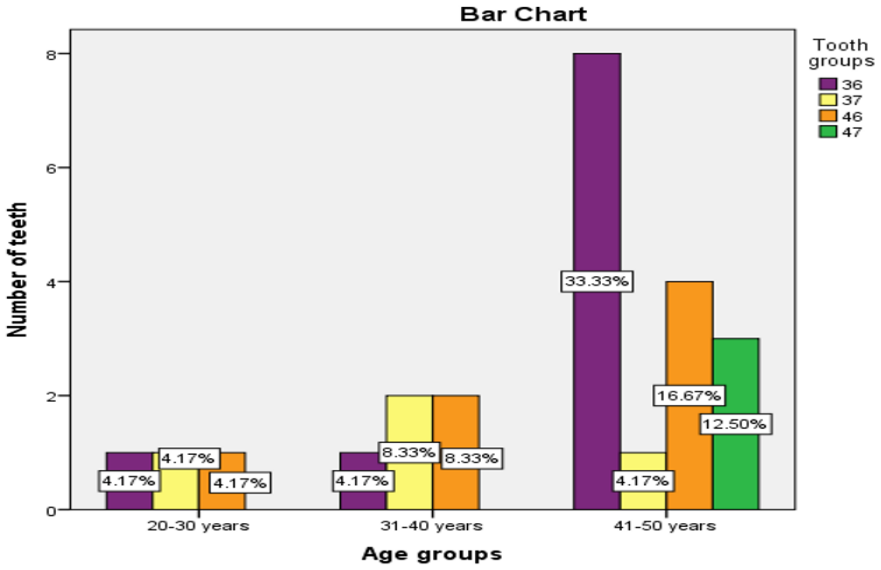

Figure 4: Bar Graph Depicts The Association Between Various Age Groups And Teeth Involved With Perforations. X Axis Represents The Various Age Groups And Y Axis Shows The Number Of Teeth. Chi-Square Test Was Performed And There Was No Statistically Significant Association Between Age And The Teeth Involved. (Pearson Chi Square Value: 5.869; Df:6; P-Value: 0.438 > 0.05). However, Perforation Repair Was Common Among The Age Group Of 41-50 Years In Relation To 36 (33.33%, Purple).