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Analysis of Cervical Abrasions Requiring Rct - A Retrospective Study

Running title : Cervical abrasions requiring RCT

Priadarsini T
Saveetha dental college and hospitals
Saveetha Institute of Medical and Technical Sciences
Saveetha University
Chennai - 77
Email: 151501017.sdc@saveetha.com

Sowmya K
Senior lecturer
Department of Conservative Dentistry and Endodontics
Saveetha Dental College and Hospitals
Saveetha Institute of Medical and Technical Sciences Saveetha University
Chennai-77
Email: sowmyak.sdc@saveetha.com

DhanrajGanapathy
Professor
Department of Prosthodontics
Saveetha Dental College and Hospitals
Saveetha Institute of Medical and Technical Sciences Saveetha University
Chennai-77
Email: dhanraj@saveetha.com

Corresponding author:
Sowmya K
Senior lecturer
Department of Conservative Dentistry and Endodontics
Saveetha Dental College and Hospitals
Saveetha Institute of Medical and Technical Sciences,
Saveetha University
162, PH Road , Chennai-600077
Tamilnadu, India
Email: sowmyak.sdc@saveetha.com

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Abstract:
Cervical abrasion is the wear of the hard tissues in the neck of the tooth, produced by a constant frictional mechanical process. Clinically, cervical abrasion initially appears as a small horizontal groove near the cementoenamel junction. Later , on progression , the walls form a wedge with polished glassy surfaces. These lesions usually have a multi-causal origin. Dental abrasion is most commonly seen at the cervical necks of the teeth, but can also occur in the interdental area from vigorous and incorrect use of dental floss. Toothbrush abrasion has long been held as the prime cause of cervical abrasions. Mild cervical abrasions can be restored , whereas deep cervical lesions have to be treated endodontically or extracted based on the prognosis of the tooth. The aim of the study was to determine the number and teeth distribution of cervical abrasions requiring root canal treatment and to evaluate its association with age and gender. Totally 115 patients who had cervical abrasions with pulpal involvement visiting Saveetha dental College for treatment were included in the study. A total of 173 teeth with cervical abrasions requiring endodontic treatment were identified. Data tabulated in excel sheet and exported to IBM SPSS software version 20.0. The results showed that more than half the teeth affected were the premolars (56.07%). Males and population in the age group 40-60 years had more number of teeth with cervical abrasions requiring root canal treatment. A significant association was found for the type of teeth affected with age (P value- 0.030 >0.05; Fisher's exact test) but not with gender(P value- 0.219 >0.05; Chi square test). Early diagnosis and intervention can prevent the progress of the cervical lesion.

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INTRODUCTION:

Dental abrasion is defined as the wear of teeth by any substance other than the tooth. Cervical region is the most commonly abraded site and these lesions come under the group of non carious cervical lesions (NCCLs) (Shay, 2004). Friction between tooth substrate and any extrinsic agent leads to abrasion. Masticatory or occlusal abrasion is frequently encountered on incisal and occlusal surfaces due to friction from the food bolus (Grippo, Simring and Schreiner, 2004). Toothbrush abrasion is influenced by many factors (Mannerberg, 1960). Horizontal brushing was suggested as causing wear ranging up to three times compared with vertical brushing (Ramamoorthi, Nivedhitha and Divyanand, 2015; Ramanathan and Solete, 2015) . If there is prolonged contact between bristles and tooth surface, the rate of abrasion is increased further (R, Rajakeerthi and Ms, 2019). The force and frequency applied to the brush also play an important role in abrasion. However, the force of brushing varies with the brushing technique, the stiffness of the bristles, age and brushing habits of each specific individual (Siddique*et al.*, 2019). Abrasive lesions are characterized by linear outline, following the path of brush bristles.

In cervical abrasions, wear is located in the neck of the tooth specifically in the cervical third, being able to encompass the proximal, vestibular, lingual or palatal surfaces of the teeth, commonly in canines and premolars (Manly *et al.*, 1965). The high incidence of cervical lesions is due to morphological alterations and histological characteristics of this cervical region. The crown of the tooth becomes more vulnerable to physical and chemical stimuli due to the gradual reduction of the enamel thickness towards the cemento-enamel junction and the density of the enamel surface near the dentino-enamel junction. In addition, the strength of the enamel in the cervical

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third is less due to the direction of the dental rods, which become flat (Krolo and Kovačević, 2015) .
Clinically, the cervical abrasion in its initial state is observed as a small horizontal groove near the cementoenamel junction on the vestibular surface of the crown of the tooth (Björn, Lindhe and Gröndahl, 1966). The peripheries of the lesion are extremely angularly demarcated in comparison to the adjacent tooth surface and the surface is extremely smooth and polished (Noor, S Syed Shihaab and Pradeep, 2016). Probing or stimulation of the lesion can elicit pain (Hussainy*et al.*, 2018; Rajendran*et al.*, 2019). Abrasion can occur in any area, even interdentally due to the incorrect use of dental floss (Radentz, Barnes and Cutright, 1976). Acid erosion has also been implicated in the initiation and progression of cervical lesion in addition to tooth brush abrasion (Kumar and Antony, 2018; Ravinthar and Jayalakshmi, 2018).

Various factors have been postulated for tooth brush abrasion including the usage of hard bristled brushes, too much pressure and high frequency of brushing (Nandakumar and Nasim, 2018; Teja and Ramesh, 2019). The abrasivity of the toothpaste has also been associated with cervical abrasion. Also right handedness is the most commonly associated with cervical abrasion. But there is no evidence that left-sided cervical wear predominates.

Cervical abrasions are becoming an increasingly important factor when considering the long-term health of the dentition. The prevalence and distribution of cervical wear has been assessed in several studies across the world. In fact, its occurrence is steadily increasing (Janani, Palanivelu and Sandhya, 2020). Levitch*et al*. in a review of 15 studies carried out between 1941 and 1991 reported prevalence of cervical abrasions in range from 5% to 85% (Xhonga, 1977; Levitch*et al.*, 1994). Cervical lesions have a higher prevalence of 62% in Trinidad and 49% in Japan and 45% in China (Smith and Marchan, 2008; Takehara*et al.*, 2008; Jiang *et al.*, 2011). According to the present literature available, it is not possible to determine a unique etiological factor, but there is a concern that it is a multifactorial condition (Teja, Ramesh and Priya, 2018; Jose and Subbaiyan, 2020). Cervical abrasions can cause tooth sensitivity, plaque retention, caries incidence, structural integrity, and pulp vitality, and poses challenges for successful restoration (Manohar and Sharma, 2018) . Deep cervical lesions is one of the bacterial tracks that can cause the pulpal infection. They may extend into the pulp cavity and result in infected pulp requiring endodontic treatment although the pulp exposure from cervical lesions is found to be 0-6% (Bergström and Lavstedt, 1979). The aim of the study was to determine the number and teeth distribution of cervical abrasions requiring root canal treatment and to evaluate its association with age and gender.

MATERIALS AND METHODS:

Study Design and setting:

In this cross sectional study, the data of 115 patients having 173 teeth with cervical abrasions requiring root canal treatment were collected from dental records of Saveetha dental college. During data extraction all information was anonymised and tabulated into a spreadsheet. The study was commenced after approval from the institutional review board. The study was commenced after approval from the institutional review board (Ethical approval number : SDC/SIHEC/2020/DIASDATA/0619-0320).

Selection of study population:

Inclusion criteria:

- Pain in the tooth with deep cervical abrasion
- PDL widening associated with deep cervical abrasions
- Periapical lesion associated with deep cervical abrasion

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Exclusion criteria:

- Class 5 dental caries involving pulp
- Cervical abrasions requiring restorations
- Asymptomatic tooth with cervical abrasions

Subjects and Procedures:

Data collected from June 2019 to March 2020 consisted of 115 patients who required root canal treatment for deep cervical abrasions in 173 teeth. The following data retrieved from the dental records: Patient's age, gender and tooth number .

Statistical analysis:

The statistical analysis was done using SPSS software version 20.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics (frequency and percentage) and Inferential statistics (Fisher's exact test for association of age with type of teeth involved and Chi Square test for gender with type of teeth involved) were done. The results were presented in the form of graphs.

RESULTS AND DISCUSSION:

Out of the 173 evaluated in this study, the majority of the teeth (61.27%) belonged to the age group of 40-60 years, 28.32% belonged to age group >60 years and the least (10.40%) belonged to age group <40 years [Figure 1].

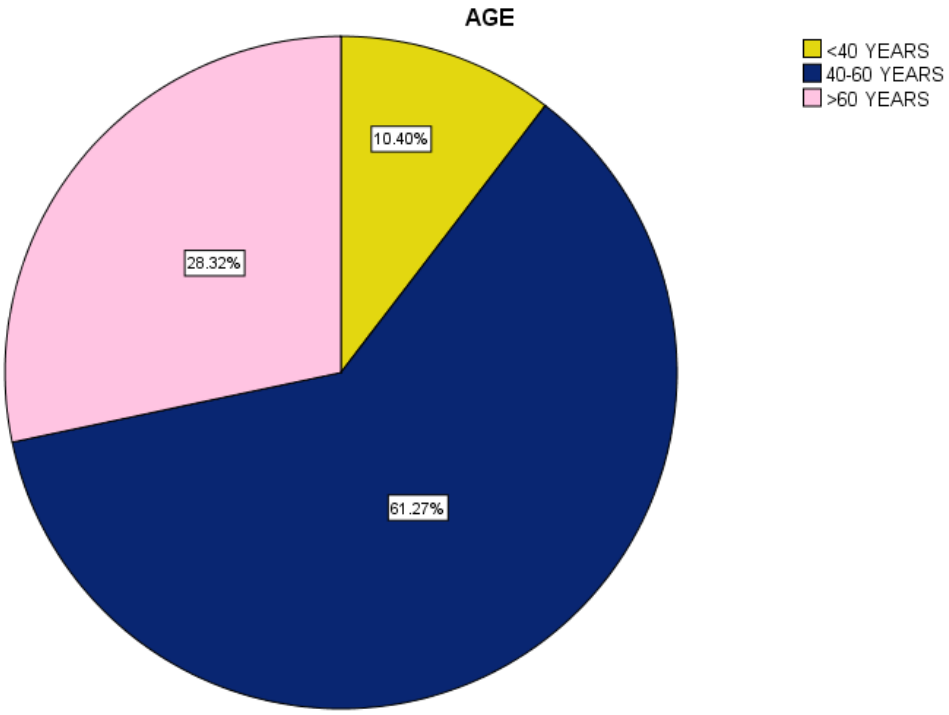

Figure 1 : Pie chart representing the distribution of teeth with cervical abrasions requiring RCT based on age. 61.27% of teeth were in the age group of 40-60 years (Dark blue), 28.32% in the age group >60 years (Pink) and 10.40% in the age group <40 years (Yellow).

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76.88% of the teeth belonged to males and 23.12% to females [Figure 2].

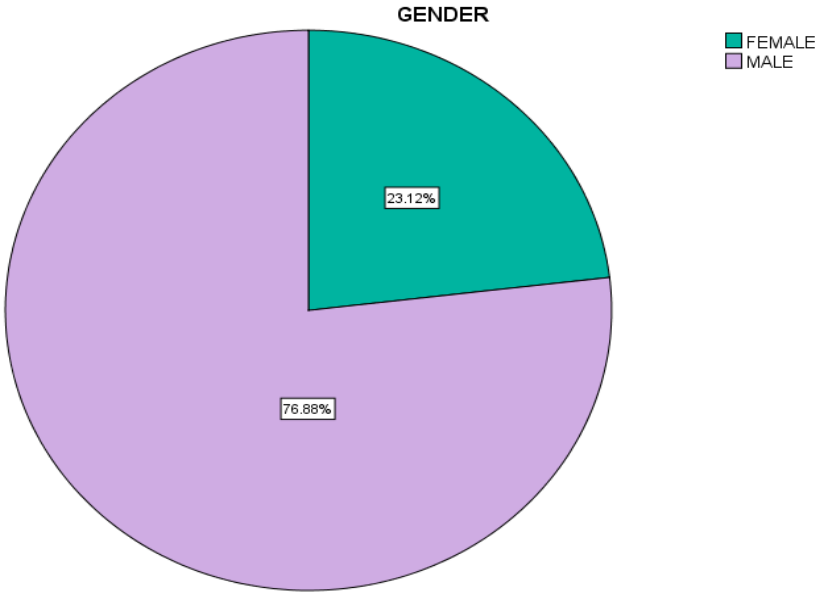

Figure 2 : Pie chart representing the distribution of teeth with cervical abrasions requiring RCT based on gender. 76.88% of the teeth belonged to males (Purple) and 23.12% to females (Teal).

The distribution of teeth with cervical abrasions requiring RCT showed that the more than half of the affected teeth were premolars (56.07%), followed by molars (23.70%) and anteriors (20.23%) [Figure 3].

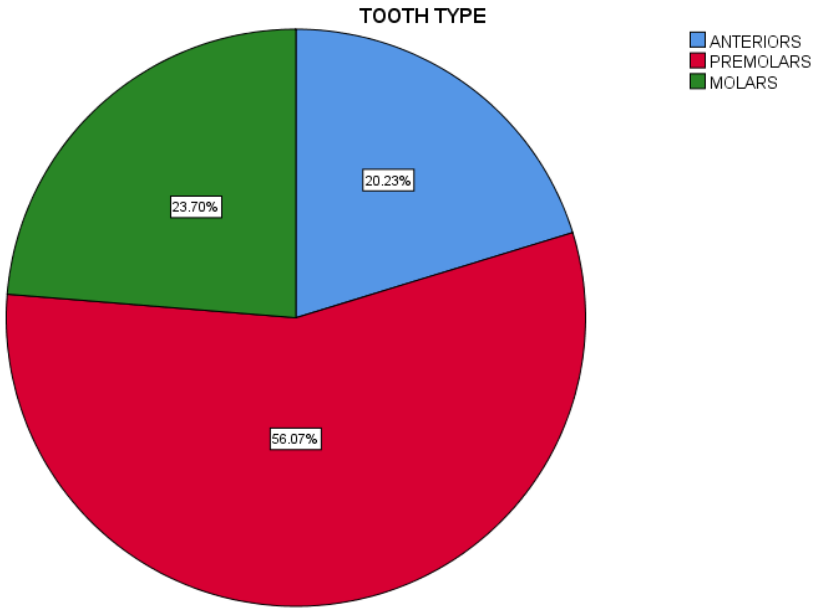

Figure 3 : Pie chart representing the distribution of teeth with cervical abrasions requiring RCT based on tooth type. More than half, ie , 56.07% of the involved teeth were premolars (Red) , 23.70% were molars (Green) and 20.23% were anteriors (Blue).

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A significant association was found between the different age groups and type of tooth involved (P value- 0.030 >0.05; Fisher's exact test). Premolars were affected more than molars and anterior teeth in all the 3 age groups [Figure 4].

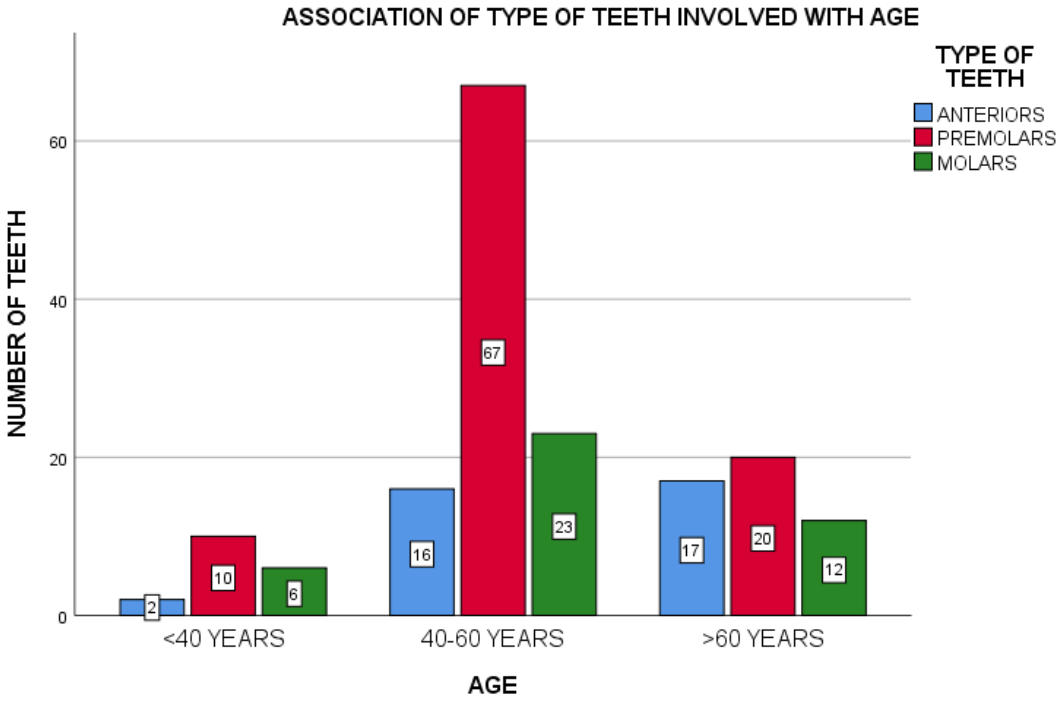

Figure 4 : Bar graph representing the association between age and type of teeth with cervical abrasion requiring RCT. X-axis denotes the age groups and Y axis denotes the number of teeth. Premolars (Red) were affected more than molars (Green) and anterior (Blue) teeth in all the 3 age groups and this association between age and type of teeth affected was statistically significant (P value- 0.030 >0.05; Fisher's exact test).

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No significant association was found between gender and type of teeth affected (P value- 0.219 >0.05; Chi square test) [Figure 5].

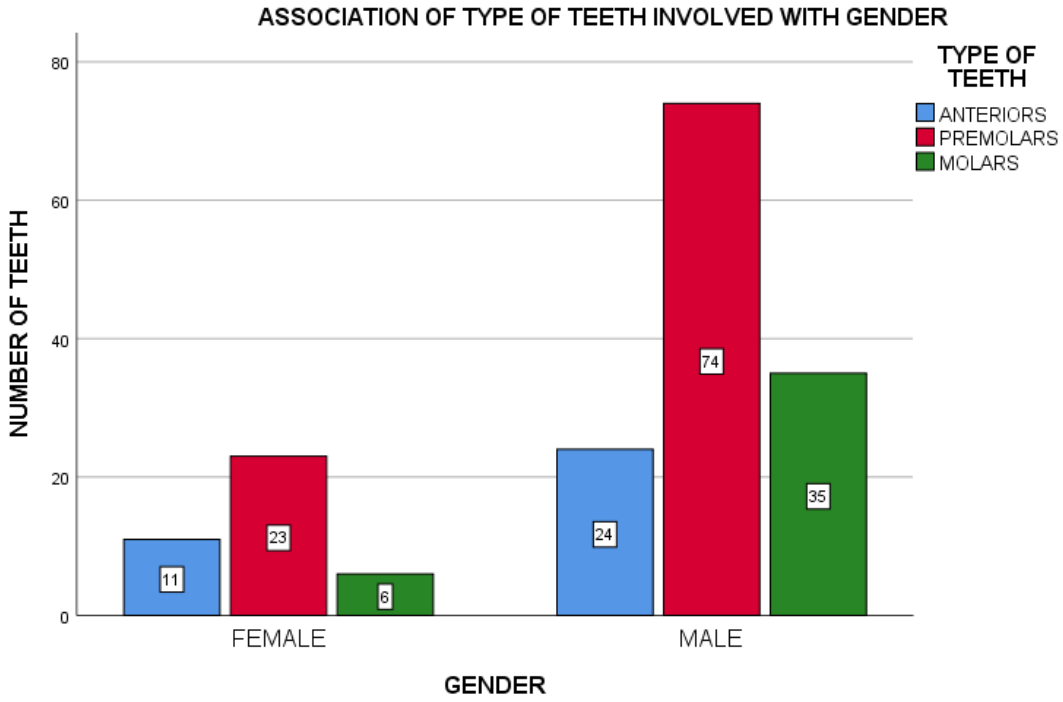

Figure 5 : Bar graph representing the association between gender and type of teeth with cervical abrasion requiring RCT. X-axis denotes the gender and Y axis denotes the number of teeth. Premolars (Red) were the most affected in both males and females. Molars (Green) were affected more than anteriors (Blue) in males whereas in females anterior teeth were affected more than molars. However no significant association was found between gender and type of teeth affected (P value- 0.219 >0.05; Chi square test).

As seen in Figure 1, the maximum number of cervical abrasions requiring RCT was seen in the age group of 40-60 years. It was least in patients less than 40 years of age. There was also a significant association between age and type of tooth involved seen in this study (P value- 0.030 >0.05; Fisher's exact test) [Figure 4]. The prevalence and distribution of cervical wear has been assessed in several studies across the world. It varies from 5% to 85% and increases with age (Lussi*et al.*, 1993; Telles, Pegoraro and Pereira, 2000; Borcic*et al.*, 2004; Wood *et al.*, 2008). This is similar to the findings of previous studies that showed that prevalence of cervical abrasions increases with age (Bergström and Lavstedt, 1979; Levitch*et al.*, 1994; Borcic, Anic and Urek, 2004). The most likely reasons for such distribution is the cumulative effect of large number of etiological factors over a long period of time, larger degree of gingival recession, a smaller number of present teeth and thus a higher occlusal load, loss of the protective mechanisms of the natural dentition, reduced quality and quantity of saliva, structural and microstructural changes in enamel and dentin that are related to the aging process (Kolak*et al.*, 2018).

In this study, 76.88% of the teeth with cervical abrasion inquiring RCT belonged to males and 23.12% to females [Figure 2]. Premolars were the most affected in both males and females. Molars were affected more than anteriors in males whereas the vice-versa was true in females. However no

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significant association was found between gender and type of teeth affected (P value- 0.219 >0.05; Chi square test) [Figure 5]. Similar to our results, a study conducted in Olivine also found increased cervical wear in male miners (Shah, Razavi and Bartlett, 2009). Although it might be expected that males exert greater tooth brushing force than females, no differences have been reported in other studies (Bernhardt *et al.*, 2006).

There are conflicting results regarding which teeth are the most commonly affected. Maxillary premolars and mandibular premolars have been found to be most often affected by cervical wear in previous studies (Bader, McClure and Scurria, 1996). This is similar to the results of study [Figure 3] as the premolars were found to be the most commonly affected (56.07%). Data from the literature suggest that cervical abrasions can occur on any tooth as the enamel is very thin in this region (Walter *et al.*, 2014). But there is a strong predilection for premolars, namely first premolars (Borcic*et al.*, 2004; Bernhardt *et al.*, 2006). The reason for this as suggested by various authors include different theories such as frequent presence of premature occlusal contacts on premolars, limited protective effect by saliva, prolonged and strong abrasive brushing effect because of central position in dental arch, notable difference in cortical bone thickness on the vestibular and oral side of the tooth, cervical stress because of buccal cusps inclination during lateral movements (Katranji, Misch and Wang, 2007).As vigorous brushing and highly abrasive toothpaste have been implicated in the formation and progression of cervical abrasions, electric brushes that contain a sensor that can alert the user when it exceeds the limit of the force allowed may be recommended (Flores, 2018). It should also be noted that tooth brushing could increase cervical abrasion if there are acid substances in the oral environment; where, the erosive agents promote the demineralization of the tooth and facilitate the wear of the tissues, therefore after exposure to acidic foods or gastric fluids should be avoided tooth brushing for at least 1 hour (Mandel, 2005).

The treatment of these lesions can be both conservative and invasive depending on the severity of the lesion. The non-invasive treatment is based on recommendations or individualized instructions to the patient, aimed at: dietary advice, the decrease in the frequency of consumption of certain beverages and foods, the control and management of parafunctional habits, the instruction of right oral hygiene measures, the use of fluorinated products, coupled with possible reconstructive procedures of periodontal nature (Watson and Burke, 2000; Castellanos, 2018). However, when conservative treatment is insufficient and cervical injury compromises the function and aesthetics of the tooth, the restoration of the lesion is necessary; which can be made with various materials of direct use, such as: dental amalgam, conventional ionomeric glass, resin-modified ionomer glass, composite resin modified with ionomeric glass and composite resin (Litonjua*et al.*, 2004). Currently, the most common treatment for these lesions is restoration with composite resin. Therefore, it is also important to consider the impact of abrasion factors on this type of material in the cervical third. De Moraes et al recorded an average loss of 1% in composite resins and even the nanohybrid and microhybrid composites showed similar results, showing lower roughness and loss of material (Moraes*et al.*, 2008). Therefore clinicians must analyze in detail the particular characteristics inherent to the patient and the properties of each restorative material, to select the most appropriate for each case.Identification of the risk factors is important to modify the deleterious habits. Questioning patients about their oral hygiene habits will involve detailed analysis of the technique, frequency, types of toothbrush and toothpaste. However deep cervical abrasions requiring pulp therapy should be treated with a crown after completion of root canal treatment to prevent fracture as the cervical region of an

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endodontically treated tooth is subjected to various forces, irrespective of the restorative material used.

CONCLUSION:

Within the limitations of this study, it can be said that severe cervical abrasions that require root canal treatment are more common in premolars and in males, and the number and severity increases with increasing age. When cervical abrasions are caught at an early stage, they can be easily restored with aesthetic materials preventing the progression of the lesion to involve pulp requiring root canal treatment.

AUTHOR CONTRIBUTIONS:

PriadarsiniT ,DrSowmya K were the main contributors for the concept , design , literature analysis , workshop discussions , drafting and revising the manuscript. Dr. Sowmya K and Dr. DhanrajGanapathy contributed to drafting and revising the manuscript. All authors gave final approval of the version to be published.

CONFLICTS OF INTEREST:

There are no conflicts of interest.

REFERENCES:

1. Bader, J. D., McClure, F. and Scurria, M. S. (1996) 'Case-control study of non-carious cervical lesions', *dentistry and oral …*. Wiley Online Library. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1600-0528.1996.tb00861.x.
2. Bergström, J. and Lavstedt, S. (1979) 'An epidemiologic approach to toothbrushing and dental abrasion', *Community dentistry and oral epidemiology*, 7(1), pp. 57–64.
3. Bernhardt, O. *et al.* (2006) 'Epidemiological evaluation of the multifactorial aetiology of abfractions', *Journal of oral rehabilitation*, 33(1), pp. 17–25.
4. Björn, H., Lindhe, J. and Gröndahl, H. G. (1966) 'The abrasion of dentine by commercial dentifrices', *Odontologiskrevy*, 17(2), pp. 109–120.
5. Borcic, J. *et al.* (2004) 'The prevalence of non-carious cervical lesions in permanent dentition', *Journal of oral rehabilitation*. Wiley Online Library, 31(2), pp. 117–123.
6. Borcic, J., Anic, I. and Urek, M. M. (2004) 'The prevalence of non-carious cervical lesions in permanent dentition', *Journal of oral*. Wiley Online Library. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1046/j.0305-182X.2003.01223.x.
7. Castellanos, A. (2018) 'Clinical evidences of perioesthetic approach for the treatment of gingival recessions associated with non-carious cervical lesions'. doi: 10.26226/morressier.5ac383282afeeb00097a473e.
8. Flores, A. J. A. (2018) 'Cervical abrasion injuries in current dentistry', *J Dent Health Oral Disord Ther*. academia.edu. Available at: http://www.academia.edu/download/56490969/JDHODT-09-00356.pdf.
9. Grippo, J. O., Simring, M. and Schreiner, S. (2004) 'Attrition, abrasion, corrosion and abfraction revisited: a new perspective on tooth surface lesions', *Journal of the American Dental Association* , 135(8), pp. 1109–18; quiz 1163–5.
10. Hussainy, S. N. *et al.* (2018) 'Clinical performance of resin-modified glass ionomer cement, flowable composite, and polyacid-modified resin composite in noncarious cervical lesions: One-year follow-up', *Journal of conservative dentistry: JCD*, 21(5), pp. 510–515.
11. Janani, K., Palanivelu, A. and Sandhya, R. (2020) 'Diagnostic accuracy of dental pulse oximeter with customized sensor holder, thermal test and electric pulp test for the evaluation of pulp vitality - An in vivo study', *Brazilian Dental Science*. doi: 10.14295/bds.2020.v23i1.1805.
12. Jiang, H. *et al.* (2011) 'The prevalence of and risk

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factors for non-carious cervical lesions in adults in Hubei Province, China', *Community dental health*, 28(1), pp. 22–28.

13. Jose, J. and Subbaiyan, H. (2020) 'Different Treatment Modalities followed by Dental Practitioners for Ellis Class 2 Fracture–A Questionnaire-based Survey', *The open dentistry journal*. opendentistryjournal.com. Available at: https://opendentistryjournal.com/VOLUME/14/PAGE/59/FULLTEXT/.
14. Katranji, A., Misch, K. and Wang, H.-L. (2007) 'Cortical bone thickness in dentate and edentulous human cadavers', *Journal of periodontology*, 78(5), pp. 874–878.
15. Kolak, V. *et al.* (2018) 'Epidemiological investigation of non-carious cervical lesions and possible etiological factors', *Journal of clinical and experimental dentistry*, 10(7), pp. e648–e656.
16. Krolo, M. and Kovačević, A. (2015) 'Noncarious Cervical Lessions: From Etiology to Therapy', *Smile Dental Journal*. MENA Co. for Dental Services, 110(2481), pp. 1–5.
17. Kumar, D. and Antony, S. (2018) 'Calcified Canal and Negotiation-A Review', *Research Journal of Pharmacy and Technology*. A & V Publications, 11(8), pp. 3727–3730.
18. Levitch, L. C. *et al.* (1994) 'Non-carious cervical lesions', *Journal of dentistry*, 22(4), pp. 195–207.
19. Litonjua, L. A. *et al.* (2004) 'Effects of occlusal load on cervical lesions', *Journal of oral rehabilitation*, 31(3), pp. 225–232.
20. Lussi, A. R. *et al.* (1993) 'Epidemiology and risk factors of wedge-shaped defects in a Swiss population', *SchweizerMonatsschrift fur Zahnmedizin = Revue mensuellesuissed'odonto-stomatologie = Rivistamensilesvizzera di odontologia e stomatologia / SSO*, 103(3), pp. 276–280.
21. Mandel, L. (2005) 'Dental erosion due to wine consumption', *Journal of the American Dental Association* , 136(1), pp. 71–75.
22. Manly, R. S. *et al.* (1965) 'A METHOD FOR MEASUREMENT OF ABRASION OF DENTIN BY TOOTHBRUSH AND DENTIFRICE', *Journal of dental research*, 44, pp. 533–540.
23. Mannerberg, F. (1960) *Appearance of tooth surface as observed in shadowed replicas in various age groups, in long-term studies, after tooth-brushing, in cases of erosion and after exposure to citrus fruit juice*. Gleerup.
24. Manohar, M. P. and Sharma, S. (2018) 'A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and …', *Indian journal of dental research: official publication of Indian Society for Dental Research*. ijdr.in. Available at: http://www.ijdr.in/article.asp?issn=0970-9290;year=2018;volume=29;issue=6;spage=716;epage=720;aulast=Manohar.
25. Moraes, R. R. de *et al.* (2008) 'In vitro toothbrushing abrasion of dental resin composites: packable, microhybrid, nanohybrid and microfilled materials', *Brazilian oral research*, 22(2), pp. 112–118.
26. Nandakumar, M. and Nasim, I. (2018) 'Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis', *Journal of conservative dentistry: JCD*, 21(5), pp. 516–520.
27. Noor, S. S. S. E., S Syed Shihaab and Pradeep (2016) 'Chlorhexidine: Its properties and effects', *Research Journal of Pharmacy and Technology*, p. 1755. doi: 10.5958/0974-360x.2016.00353.x.
28. Radentz, W. H., Barnes, G. P. and Cutright, D. E. (1976) 'A survey of factors possibly associated with cervical abrasion of tooth surfaces', *Journal of periodontology*, 47(3), pp. 148–154.
29. Rajendran, R. *et al.* (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream

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ISSN: 0193-4120 Page No. 2191 - 2201

Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', *Pesquisa brasileira em odontopediatria e clinica integrada*. SciELO Brasil, 19. Available at: http://www.scielo.br/scielo.php?pid=S1983-46322019000100364&script=sci_arttext.

30. Ramamoorthi, S., Nivedhitha, M. S. and Divyanand, M. J. (2015) 'Comparative evaluation of postoperative pain after using endodontic needle and EndoActivator during root canal irrigation: A randomised controlled trial', *Australian endodontic journal: the journal of the Australian Society of EndodontologyInc*, 41(2), pp. 78–87.
31. Ramanathan, S. and Solete, P. (2015) 'Cone-beam Computed Tomography Evaluation of Root Canal Preparation using Various Rotary Instruments: An in vitro Study', *The journal of contemporary dental practice*, 16(11), pp. 869–872.
32. Ravinthar, K. and Jayalakshmi (2018) 'Recent Advancements in Laminates and Veneers in Dentistry', *Research Journal of Pharmacy and Technology*, p. 785. doi: 10.5958/0974-360x.2018.00148.8.
33. R, R., Rajakeerthi, R. and Ms, N. (2019) 'Natural Product as the Storage medium for an avulsed tooth – A Systematic Review', *Cumhuriyet Dental Journal*, pp. 249–256. doi: 10.7126/cumudj.525182.
34. Shah, P., Razavi, S. and Bartlett, D. W. (2009) 'The prevalence of cervical tooth wear in patients with bruxism and other causes of wear', *Journal of prosthodontics: official journal of the American College of Prosthodontists*, 18(5), pp. 450–454.
35. Shay, K. (2004) 'The evolving impact of aging America on dental practice', *The journal of contemporary dental practice*, 5(4), pp. 101–110.
36. Siddique, R. *et al.* (2019) 'Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi', *Journal of conservative dentistry: JCD*, 22(1), pp. 40–47.
37. Smith, W. A. J. and Marchan, S. (2008) 'The prevalence and severity of non-carious cervical lesions in a group of patients attending a university hospital in Trinidad', *Journal of oral*. Wiley Online Library. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2842.2007.01763.x.
38. Takehara, J. *et al.* (2008) 'Correlations of noncarious cervical lesions and occlusal factors determined by using pressure-detecting sheet', *Journal of dentistry*, 36(10), pp. 774–779.
39. Teja, K. V. and Ramesh, S. (2019) 'Shape optimal and clean more', *Saudi Endodontic Journal*. saudiendodj.com. Available at: http://www.saudiendodj.com/article.asp?issn=1658-5984;year=2019;volume=9;issue=3;spage=235;epage=236;aulast=Teja.
40. Teja, K. V., Ramesh, S. and Priya, V. (2018) 'Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study', *Journal of conservative dentistry: JCD*, 21(6), pp. 592–596.
41. Telles, D., Pegoraro, L. F. and Pereira, J. C. (2000) 'Prevalence of noncarious cervical lesions and their relation to occlusal aspects: a clinical study', *Journal of esthetic dentistry*, 12(1), pp. 10–15.
42. Walter, C. *et al.* (2014) 'The anatomy of non-carious cervical lesions', *Clinical oral investigations*, 18(1), pp. 139–146.
43. Watson, M. L. and Burke, F. J. (2000) 'Investigation and treatment of patients with teeth affected by tooth substance loss: a review', *Dental update*, 27(4), pp. 175–183.
44. Wood, I. *et al.* (2008) 'Non-carious cervical tooth surface loss: a literature review', *Journal of dentistry*, 36(10), pp. 759–766.
45. Xhonga, F. A. (1977) 'Bruxism and its effect on the teeth', *Journal of oral rehabilitation*, 4(1), pp. 65–76.