Dentin Hypersensitivity Following Tooth Preparation- A Clinical Study in the Spectrum of Gender

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Abstract

To estimate and compare the incidence of dentin hypersensitivity among men and women in an adult population sample who required replacement of missing tooth/teeth with a fixed partial prosthesis. Study population consisted of 28 subjects, 14 men and 14 women, who visited the OPD for replacement of missing tooth/teeth with a fixed partial prosthesis (FPD). After a clinical examination, the patients were asked to grade their overall sensitivity using a 10 cm Visual Analogue Scale (VAS)4,5 labelled at the extremes with "no pain," at the zero cm end of the scale, and "severe pain," at the 10 cm end of the scale following tactile and thermal stimulation and following tooth preparation. Data was analyzed using descriptive statistics, Mann-Whitney U test and Wilcoxan signed rank test. Women reported more sensitivity than men before (p=0.880) and after tooth preparation (p=0.520). Women were more sensitive than men (p=0.001) on tactile and thermal stimulation before tooth preparation. The results showed that women reported more dentin hypersensitivity than men before and after tooth preparation.

Keywords: *Dentin Hypersensitivity, Tooth Preparation, VAS scale, Pain, Gender Differences*

Introduction

Dentin hypersensitivity following tooth preparation is a frequently encountered oral health problem. Dentin hypersensitivity is a "short, sharp pain arising from exposed dentin in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology".[1] The first part of the definition provides a clinical description of dentin hypersensitivity whereas the second part aids in its differential diagnosis.

Dentin hypersensitivity typically afflicts individuals in the age range of 20-49 years, especially 30-39 years.[2,3] Numerous studies, which have included clinical evaluations by trained examiners through patient-based surveys, have reported prevalence figures in the range of 15-20%.[4,5] However, higher levels, of up to 57% for individuals in general dental practice settings, and up to 98% in patients following periodontal therapy, have been reported.[1,2,6,7] Women are more frequently affected, and at a younger mean age.[8] Dentin hypersensitivity is most commonly observed in the buccal-cervical regions of the canine and pre-molar teeth, sites which are also most susceptible to gingival recession.[1,2]

Although dentin hypersensitivity following tooth preparation is a frequent problem in dentistry yet very rarely documented and limited epidemiological data have been collected so far.

Dentin is a tissue traversed by tubules 0.6–2.0 mm in diameter.[9] When a full crown preparation is performed, approximately 1 to 2 million dentin tubules (30,000 to 40,000 dentin tubules per mm^2) are exposed[10] that can lead to increased dentin permeability and subsequent pulpal irritation. The risk of pulpal damage during and after preparation depends on various factors: heat generated by bur attrition, amount of remaining dentin, dentin permeability, procedures used in the construction of the provisional crowns, quality of the cements used for temporary and final cementation and degree of marginal infiltration.[9]

The hydrodynamic theory suggests that dentin hypersensitivity occurs when an external stimulus, such as cold air, induces a change in fluid flow within the dentin tubules. This, in turn, results in a pressure change across the dentin which activates the nerve response, causing a painful sensation.[11] For the hydrodynamic mechanism to induce pain, the dentin tubules must become exposed, be open at the exposed surface, and patent at the pulp.[11] *Ex*

vivo studies have shown that sensitivity is strongly correlated with the number and diameter of exposed and open dentin tubules.[11]

Gender differences in the awareness of experimentally induced pain are well-known.[12] In contrast, studies on gender differences in dentin hypersensitivity are sparse in the peer-reviewed literature. The present study was designed to estimate and compare the incidence of dentin hypersensitivity among men and women in an adult population sample who required replacement of missing tooth/teeth with a fixed partial prosthesis.

Materials and Method

Subjects: Study population consisted of 28 subjects, 14 men and 14 women, who visited the OPD for replacement of missing tooth/teeth with a fixed partial prosthesis (FPD). The informed consent of all the subjects who participated in this clinical investigation was obtained.

Clinical Assessments: All subjects were given an oral examination to ensure good general health except for the symptoms of dentin hypersensitivity. Detailed clinical and radiographic investigations were performed on all subjects to exclude conditions of teeth, which might have caused pain similar to dentin hypersensitivity. There was at least one vital abutment tooth in each FPD. If an FPD had two vital abutments, only one was chosen, randomly. Each abutment tooth received two stimuli: tactile stimulus and thermal stimulus (water jet at room temperature, 15^0C and 45^0C). Sensitive teeth were identified with an explorer passed cervically over the abutment tooth. Ten minutes following tactile stimulation, dentin hypersensitivity was elicited using a jet of water to approximately the same anatomical feature of the tooth as had received the tactile stimulus.

Assessment of Sensitivity: Immediately following stimulation, the subjects were asked to grade their overall sensitivity using a 10 cm Visual Analogue Scale (VAS)[4,5] labelled at the extremes with "no pain," at the zero cm end of the scale, and "severe pain," at the 10 cm end of the scale. Measurements from the scale were made in millimetres giving a scoring range of 0 to 10. After the VAS was recorded before tooth preparation, the subjects underwent tooth preparation of the abutment teeth for the fixed partial denture. The VAS was recorded immediately after tooth preparation. The data was compiled and subjected to statistical analysis.

Statistical Analysis and Results

Data was analysed on an intention-to-treat basis with the subject and teeth as the unit of statistical analysis. In our study, we expressed the descriptive statistics as mean ± standard deviation (SD), based on the 10- cm VAS. We used the Mann-Whitney *U* test to conduct pairwise comparisons. In addition, we used the Wilcoxan signed rank test to determine the differences between participants' responses to before and after tooth preparation in response to tactile and thermal stimuli. Comparison between men and women showed that women reported more dentin hypersensitivity than men, although results were statistically non-significant (Table 1). Statistically significant results were obtained before (p=0.880) and after tooth preparation (p=0.520) in both the men and women (Table 2). Comparisons between men and women before and after tooth preparation showed statistically highly significant differences (p=0.001) indicating that women were more sensitive than men bon tactile and thermal stimulation and after tooth preparation (Table 3).

Table 1: Descriptive Statistics of comparison of dentin hypersensitivity between men and women before and after tooth preparation, based on the VAS scale

Gender		Before Tooth Preparation	After Tooth Preparation
Female	**Mean**	0.64	3.86
	N	14	14
	SD	1.646	1.657
Male	**Mean**	0.29	3.36
	N	14	14
	SD	0.726	1.216

N= Number of Study Patients
SD= Standard Deviation

Table 2: Mann-Whitney Test- To pairwise compare differences in dentin hypersensitivity between men and women before and after tooth preparation, based on the VAS scale

	Before tooth preparation	After tooth preparation
Mann-Whitney U	96.000	84.500
Wilcoxon W	201.000	189.500
Z	-0.151	-0.643
Significance (2-tailed)	*0.880*	*0.520*

Z= Difference between the values in each group of before and after tooth preparation

Table 3: Wilcoxon Signed Ranks Test – determination of participants' responses to before and after tooth preparation in response to tactile and thermal stimuli

Gender		After Tooth Preparation - Before Tooth Preparation
Female	Z	-3.349
	Significance	*0.001*
Male	Z	-3.329
	Significance	*0.001*

Z= Difference between the values in each group of before and after tooth preparation

Discussion

Much has been written on the subject of dentin hypersensitivity; yet it would seem justifiable to agree that the condition is "an enigma being frequently encountered but poorly understood."

Not many studies are available in literature that have evaluated the incidence of dentin hypersensitivity following tooth preparation. The present study evaluated the hypersensitivity among men and women following tooth preparation.

Epidemiological studies and pain and sensitivity research have shown that women and men experience and cope with pain and sensitivity differently.[13] The search for a mechanistic understanding of observed sex and gender differences in sensitivity is still in its infancy. There are clear indications that multiple factors individually and collectively play a role, yet our recognition and understanding of the individual factors and their complex interaction is minimal at present. These factors include, but are not limited to, genetic, hormonal, social roles, exercise, and information processing in the brain.

Women may experience and report pain differently than men.[14] Although with any medical condition more women tend to present more than men.[15] Hormonal variation, puberty, reproductive status, and menstrual cycle have all been shown to affect pain threshold and perception. In general, women have lower pain thresholds and less tolerance to noxious stimuli.[16]

Sex-related differences in blood pressure are emerging as one potential biological explanation of sex-related differences in pain. Many studies report a continuous, inverse relationship between resting blood pressure and pain sensitivity,[17,18] and women generally have lower resting blood pressure than men.

Stereotypical gender roles and expectations affect pain perception. Men report less pain and have higher thresholds in the presence of a female examiner, an effect that is increased in the presence of an attractive female.[19] The exact opposite was present in women who reported more pain and had lower thresholds with attractive male examiners.[20] Thus, the individual performing the test may produce dramatically different test results without any overt attempt to introduce bias. Differences between men and women have also been attributed to maladaptive coping strategies, such as catastrophizing.

In human studies, there is an enhanced ability to gain a direct verbal report of sensitivity as well as assess other components such as suffering, memory, expectation, and fear. The stimuli used to evaluate sensitivity were tactile evaluation (where an explorer is passed over the sensitive lesion), and thermal evaluation i.e. response to water at water at room temperature and 15°C and 45°C, as thermal tests and cold test in particular have a good correlation to the hypersensitivity symptoms encountered in daily life. The temperatures of 45°C and 15°C had been selected as these were the temperatures at which food and beverages were likely to be frequently consumed.

Conclusion

It was observed that women reported more dentin hypersensitivity than men before and after tooth preparation. Still the multifaceted nature need to be explored.

Conflict of interest: No conflict of interest.

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