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Pain perception as a result of orthodontic treatment with metal braces.

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Abstract

Introduction: The aim of the study was to obtain information regarding occurrence, duration and intensity of pain post strap-up of metal braces as also to examine the interaction between patient's age, gender, pain perception and pain relief medication.

Materials and Methods: A cross sectional study comprising of 200 subjects (Males – 100 nos. and females – 100 nos.) aged 18-40 years were recruited. A questionnaire comprising of ten questions was given in a print format to the patients who had their upper and lower dental arches strapped up with metal braces. They were asked to complete the questionnaire with either a "yes" or "no", the intensity, duration and region of pain as also whether they undertook any pain relief medication and whether the orthodontic treatment affected the quality of their everyday life. Chi-square test was done using SPSS version 26.

Results: Gender did not play a role in the perception of pain. The perception of pain was high in the age group (21-25 years) in comparison to other age groups. Initial perception of pain was evidenced in the first 2 hours in majority of patients while in the others it was until 24 hours.

Conclusions: The present study indicated that large percentage of patients experienced their initial pain after 2 hours of insertion of metal braces, more so in the anterior teeth region and that significant number of them undertook self-medication. However, the pain quotient did not affect their daily life activities in any way.

Keywords: Pain perception; metal braces; orthodontic treatment; self-medication.

Introduction

The goals of orthodontic treatment involve not only improvement in aesthetics but also functionality of the orofacial region. Adequate measures need to be implemented to prevent, timely intercept and effectively correct the existent malocclusion. Orthodontic tooth movement occurs subsequent to application of a mild force subjected to not only the teeth but also the surrounding periodontal structures. Resorption and apposition of alveolar bone should occur concomitantly to help maintain the integrity of the periodontal structures.[1] Orthodontic tooth displacement causes the periodontium and dental pulp to experience particular inflammatory reactions that trigger the release of different biochemical mediators, which results in discomfort.[2] It has been surmised that the periodontal ligament's altered blood flow may be the causative factor responsible for the pain quotient and perceptions of discomfort experienced by orthodontic patients.[3]

Fixed appliances are used for positioning the teeth accurately. These appliances offer better control and to a large extent remove the need for patient compliance. Patient cooperation throughout the treatment is also deemed necessary.[4] In contrast, psychogenic pain occurs by concurrent psychological factors that are directly related to the individual in question or the environment in which they reside. There is not a physiological root of psychogenic pain, which is determined by the patient's psycho-emotional state.[5] These appliances can bring about various other types of tooth movement including, bodily movement, rotation, tipping, intrusion, extrusion and root movement. Therefore, fixed appliance are very versatile and can be used to treat all kinds of malocclusion. Orthodontic forces are also influenced by the material characteristics of the appliances (super elasticity and shape memory effect of arch wires, elastomeric ligatures, etc.), the unique aspects of their composition, and their interactions with the dento-maxillary system.[6]

Orthodontic treatment with metal braces may cause pain and discomfort for the patients. Intensity and duration of pain are important factors associated with orthodontic therapy. When braces or other orthodontic appliances are first placed in the mouth, some discomfort or pain is experienced, which soon disappears as time passes. Appliances may initially irritate the lips, cheeks or tongue. The responses of patients to fixed orthodontic appliances have been discussed in a number of studies. According to these research studies, discomfort starts a few hours after the application of an orthodontic force and lasts for around five days.[7] In some of the cases oral hygiene becomes more difficult. Plaque and food debris tends to accumulate more around the attachments, which makes cleaning of the teeth more difficult for the patients. Fear of pain is one of the most important reason that could cause the patient to discontinue the treatment or avoid treatment.[8] Pain during orthodontic therapy is thus a common presenting complaint. Patients often describe and experience pain, stress, pressure, and soreness of the teeth after bonding of fixed orthodontic appliances. As orthodontists, we usually communicate to the patient that treatment approaches may cause some uneasiness. However, it cannot be denied that orthodontists must apply their best professional judgement and examine each case separately and choose the optimum treatment option (pharmacological or non-pharmacological) depending on the patient's pain threshold level.[9]

The aim of the study was thus to obtain information regarding the occurrence, duration and intensity of pain post strap-up of fixed appliance as also to examine the interaction between patient’s age, gender, perception of

pain, use of pain killers and whether the orthodontic treatment affected their daily life activities.

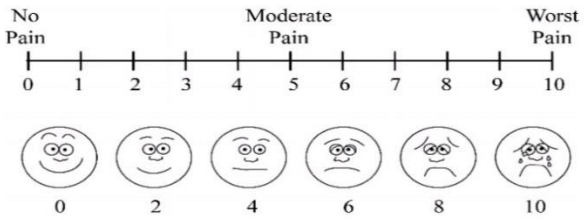
Materials and Methods

This cross-sectional study was done on 200 patients (100 males and 100 females) selected via convenient sampling from the outpatient department of Orthodontics and Dentofacial Orthopedics of Sree Balaji Dental College and Hospital, Chennai, India. The Institutional Ethical Committee reviewed and approved the study design. The study subjects were those who were strapped up with upper and lower fixed metal braces. The inclusion criteria were subjects in the age range of 18-40 years undergoing orthodontic treatment with upper and lower metal braces and those who required removable appliances, functional appliances or headgear therapy were excluded from the study.

A questionnaire comprising of ten questions in print format in both English and in the local vernacular language was given to the patients undergoing treatment with upper and lower metal braces. The respondents were asked to complete the questionnaire regarding the intensity, duration and area of pain occurrence experienced by them. The reported discomfort following the placement of orthodontic fixed appliances (metal braces) in relation to sex, age and position of the tooth in the arch was assessed. The patient's pain perception and its intensity was assessed using the numerical rating scale (Visual Analog Scale) provided along with the multiple-choice questionnaire and representing Question 7. Other expected outcomes included pain-related information, such as the most painful time following the treatment, when the pain was the worst, whether they needed painkillers, and how their everyday life was affected was also recorded. Statistical analysis was done using SPSS software version 26 and chi-square test was carried out. P <0.05 was considered as statistically significant.

Questionnaire

1. Name:
2. Age:
3. Gender:
   A. Male
   B. Female
4. Have you got pain? A. Yes B. No
5. When do you perceive the initial pain after insertion of fixed appliance?
   A. After 2hrs
   B. At the end of day 1
   C. From day 2 to 7
   D. On the 7th day
   E. On the 14th day
6. Pain was more intense:
   A. During the day
   B. At night
   C. During the day and night
7. Mention the level of the perceived pain on a numerical scale from 0 to 10 (0 being no pain and 10 being extremely painful).



8. In which part do you feel the pain?
   A. Front teeth region
   B. Back teeth region
9. Have you consumed any tablets for pain relief?
   A. Yes
   B. No
10. Has your daily life been affected?
   A. Yes

B. No

Results

Gender

The sample included 200 patients (100 males and 100 females) (Table 1).

Age

The age of the patients was divided into four groups, 18 to 20 years (28%), 21 to 25 years (48.5%), 26 to 30 years (23%) and >30 years (0.5%) (Table 2 and Figure 1).

Initial pain perception

The questioning was made to determine when the patient initially experienced discomfort following the insertion of the appliance. According to statistical analysis, 36% (72 patients) of them had pain after two hours, 35% (70 patients) at the end of day 1, 23.5% (47 patients) from day 2 to day 7, 4.5% (9 patients) on day 7, and 1.0% (2 patients) on day 14. Majority of the patients perceived the initial pain after two hours following the insertion of the appliance. This was also statistically significant (*P*= .002) (Table 3, Table 3a), (Figure 2).

Intensity of pain

Analysing the level of pain experienced by patients undergoing orthodontic treatment it was revealed that 24% (48 patients) experienced intense pain at night, 48.5% (97 patients) experienced pain during the day, and 27.5% (55 patients) experienced pain both during the day and night. Most participants (97 patients) evaluated their pain during the day (Table 4).

Perception of pain on a numerical scale from 0 to 10

The statistical analysis showed significant number of them (59 patients) chose severe pain, while the majority of patients (112) selected moderate pain (Table 5).

Region of pain

Table 6 and (Figure 3) shows 15.5% (31 patients) had pain in the posterior region and 84.5% (169 patients) had pain in the anterior region. The pain perceived at front teeth region was greater than the back teeth region. The *P* value of .018, denoted that it was also statistically significant that greater percentage of patients experienced pain in the front teeth region (Table 6a).

Consumption of pain relief medication

Analysis of consumption of pain relief medication after the insertion of fixed metal braces revealed that 60% (120 patients) didn't take medication to relieve the pain and 40% (80 patients) took medication for pain. (*P*=.023) denoted that it was also statistically significant that significant number of the patients (120 respondents) did not take self-medication to relieve pain (Table 7, Table 7a, Figure 4).

Effect of pain on daily life

Table 8 shows that daily life activity has been affected for 38% (76 patients) and for 62% (124 patients) daily life activity was not affected. The analysis showed that majority of the patients did not report any such effects (Table 8, Figure 5).

Discussion

This study involved 200 patients (100 males and 100 females) who answered a questionnaire on how much pain they felt following the insertion of fixed upper and lower metal braces. Patients were given the questionnaire form at the initial appointment following the insertion of the upper and lower arch wires. It was observed that the pain was initially perceived by an equal number of patients, 2 hours and 24 hours post insertion of the fixed appliance.

Scientific studies note that, normally, pain intensity increases with time from 4 hours to 24 hours following orthodontic procedures but decreases to normal after the first week. This time period has been reported to be the most painful.[10] According to other studies, pain perception begins a few hours after the orthodontic

forces are applied (with the arch wire ligation to the brackets) and lasts for about five days.[11]

Patients were instructed to select their own medications after the insertion of orthodontic appliances. Aspirin and Algocalmin were not recommended as they have been reported to impair tooth movement.[12] The patients chose their medicine based on previous experiences with relief from pain. Researchers state that orthodontic treatment does induce discomfort prompting patients to use analgesics for the relief of pain in the days subsequent to each orthodontic appointment.[13] Regarding the consumption of pain relief medication in this study majority of patients did not take pain killers.

The data of our study suggested that the anterior teeth had greater pain quotient than the posterior teeth, which is consistent with the findings of previous researchers.[14] Other studies[15] have suggested that pain from fixed appliances and its interference with daily life activities are the main causes of treatment discontinuation. Although not statistically significant, it was found in the present research that the metal braces did have an impact on the daily life activities of 38% of the total number of patients assessed.

With a mean pain score of 5.76 and a range of 5 to 7, the majority of patients experienced moderate pain.[16] Similar findings are reported in this study, where most patients reported moderate discomfort on a scale of 4 to 6.

Pain management entails employing particular verbal and nonverbal strategies to help the patient improve their ability to deal with pain.[17] Over the past few years, research into the mechanics of pain has advanced remarkably. The visual analogue scale (VAS), which measures sensory pain intensity, shows how simple it is to apply a non-invasive evaluation technique. Its drawback is the one-dimensional description of pain, which is quite complex and has many more specifics, even in regular social activities like playing sports, hanging out with friends, going to school, etc.[18] One of the psychological topics that is most frequently investigated is interpersonal relationships. Social psychology is concerned with how one person interacts with others.[19]

Other researchers, like Nandi et al.[20], have shown that postoperative discomfort is more common in women. There have been several theories put forth to explain this, one of which[21] is based on the biological variations between the sexes. These include variations in the reproductive organs, which include hormonal alterations linked to altered levels of serotonin and noradrenaline as well as a rise in the frequency of pain during the menstrual cycle.[22] In some circumstances, ethical practices affect how people perceive suffering.[23] However, one study[24] revealed that the mean pain values peaked only on the first night and were frequently higher during the day than at night, which contributed to sleeplessness in some 18 % of patients. However, in our study the majority of the patients experienced pain more so during daytime rather than at night.

This study therefore sheds light on the need to educate the patients seeking orthodontic treatment regarding the pain quotient which is but a transient phase of orthodontic treatment. This initial pain perception would soon dissipate within a week and thus should not discourage any enthusiastic orthodontic patient from seeking orthodontic treatment.

Conclusions

- Majority of the patients showed moderate pain followed by severe pain.
- The most painful period of initial pain was perceived after 2 hours of insertion of metal braces.

- The pain perceived in the front teeth region was greater than the back teeth region.
- A significant number of patients took self-medication, while majority of them did not take any self-medication.
- Large percentage of patients did not report any such changes that could affect their daily life activities.

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Tables

Table 1: Distribution of patients by gender.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	100	50.0	50.0	50.0
	Male	100	50.0	50.0	100.0
	Total	200	100.0	100.0	

Table 2: Distribution of patients by age group.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-20	56	28.0	28.0	28.0
	21-25	97	48.5	48.5	76.5
	26-30	46	23.0	23.0	99.5
	31-40	1	.5	.5	100.0
	Total	200	100.0	100.0	

Table 3; Distribution of patients depending on the initial pain perceived after the insertion of fixed appliance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	After 2hrs	72	36.0	36.0	36.0
	At the end of day 1	70	35.0	35.0	71.0
	From day 2 to 7	47	23.5	23.5	94.5
	On the 7th day	9	4.5	4.5	100.0
	On the 14th day	2	1.0	1.0	95.5
	Total	200	100.0	100.0	

Table 3a. Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.257[a]	8	.002
Likelihood Ratio	25.339	8	.001
N of Valid Cases	200		

Table 4. Intensity of pain.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	At night	48	24.0	24.0	24.0
	During the day	97	48.5	48.5	72.5
	During the day and night	55	27.5	27.5	100.0
	Total	200	100.0	100.0	

Table 5. Perception of pain on a numerical scale from 0 to 10.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1- 3 - mild	19	9.5	9.5	9.5
	10- worst	10	5.0	5.0	14.5
	4- 6 moderate	112	56.0	56.0	70.5
	7-9 severe	59	29.5	29.5	100.0
	Total	200	100.0	100.0	

Table 6: Region of pain.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Back teeth region	31	15.5	15.5	15.5
	Front teeth region	169	84.5	84.5	100.0
	Total	200	100.0	100.0	

Table 6a. *P* value

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.088[a]	3	.018
Likelihood Ratio	12.158	3	.007
N of Valid Cases	200		

Table 7. Consumption of pain relief medication.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	120	60.0	60.0	60.0
	Yes	80	40.0	40.0	100.0
	Total	200	100.0	100.0	

Table 7a. P value

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.511[a]	3	.023
Likelihood Ratio	9.759	3	.021
N of Valid Cases	200		

Table 8: Effect of pain on daily life.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	76	38.0	38.0	38.0
	No	124	62.0	62.0	100.0
	Total	200	100.0	100.0	

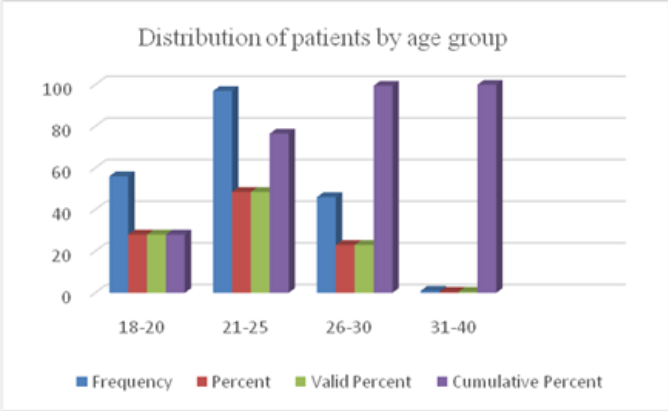

Figure 1: Distribution of patients by age group.

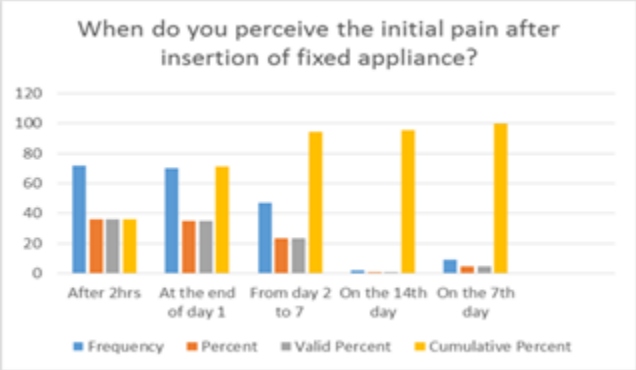

Figure 2: Distribution of patients depending on the initial pain perceived after the insertion of metal braces.

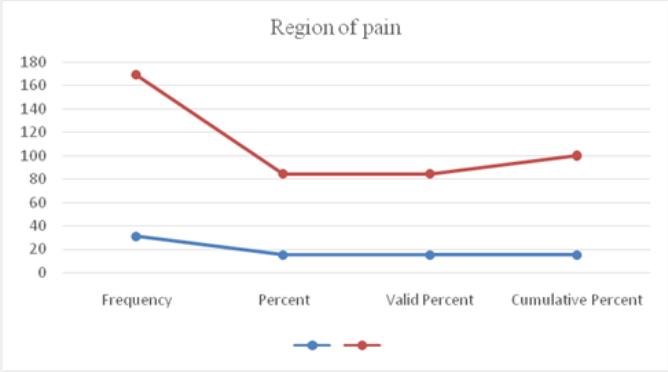

Figure 3: Region of pain.

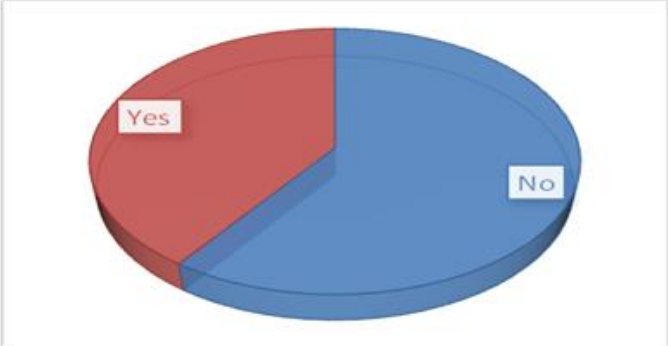

Figure 4: Consumption of pain relief medication.

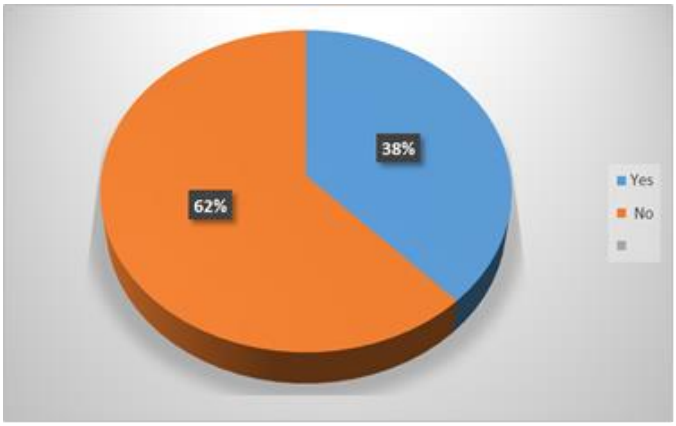

Figure 5: Effect of pain on daily life.