

The Incidence of Oral Ulcers, Lacerations, Bracket Bond Failure and Perceived Pain during Fixed Orthodontic Mechanotherapy

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Abstract

The present study observes the occurrence of oral ulcers, lacerations, bracket bond failure and pain in 42 patients undergoing corrective orthodontic treatment. The data was compared before treatment (T0) and 30 days onto the treatment (T1). 26.19% patients had oral ulcerations and lacerations during treatment; 23.80% experienced noticeable pain on chewing caused by the fixed appliance. High number of bracket bond failures were observed in mandibular arch. Mandibular premolar had highest bracket bond failure incidence. These factors affects the treatment time, cost and compliance of the patient if not addressed immediately.

Keywords

Bracket Bond Failure, Oral Ulcers and Lacerations, Pain Perception.

INTRODUCTION

Orthodontic treatment aims to correct dentoalveolar malocclusions to restore dentofacial esthetics and function. The most accepted method to achieve these goals is the use of fixed appliances. Problems encountered in fixed orthodontics is bond failure, oral ulcers, lacerations and pain.

Studies have been conducted to show the effect of dental arch (maxillary or mandibular) and the region (anterior or posterior) on orthodontic bracket failure rate, with greater failure rates being reported in the mandibular arch and the posterior region [1,2,3]. Baricevic et al. reported that orthodontic brackets tended to cause mucosal erosions and desquamations whereas archwires caused ulcerations[4]. Pain may occur in association with traumatic impact on the surrounding mucosa and the application of force on teeth. It was found that if pain is present, the intensity of the pain generally peaks 48 to 72 hours after the fixed orthodontic appliance is bonded[5,6]. Virtually any stage of orthodontic treatment has the potential to cause pain. Fear of pain can be a deterrent to individuals starting orthodontic treatment.[7] Hence, present study concern with the trauma, bracket bond failure and perceived pain.

AIM AND OBJECTIVES

Aim: To quantify and qualitatively access failures in fixed orthodontic treatment during first 30 days.

Objective: The objective of this study is to check

- A) Oral ulcers
- B) Lacerations
- C) Bracket bond failure
- D) Pain on chewing

REVIEW OF LITERATURE

Kvam E 1989 investigated the frequency of oral ulcers and pain in 79 adult's orthodontic patients. Only four of all patients had never had oral ulceration during treatment, but 83% of the patients characterized the trouble as minor. About 47% of the patients said that ulcers caused by the fixed appliance were the most annoying part of the treatment and 38% said that activation of the appliance caused the most discomfort[5].

Baricevic M et al 2011 examined the frequency of oral mucosal lesions in wearers of orthodontic appliances in comparison to children with malocclusion. Gingival inflammation, erosion, ulceration and contusion were the most common findings in orthodontic patients. The severity of gingival inflammation was in correlation with oral hygiene status; the poorer oral hygiene, the more severe gingival inflammation was. Better oral hygiene status was found in children during orthodontic treatment than in children with malocclusion[4].

Mainali A 2013 observed that most common oral ulceration encountered during orthodontic treatment was traumatic ulceration which was managed by symptomatic measures. There was a statistically significant difference in the method of education to the patients among national and international orthodontists[8].

Shenoy N et al 2013 observed that pain and discomfort are the frequent side-effects of the orthodontic therapy with fixed appliances. The people who experience orthodontic pain are likely to self-medicate with non-prescription pain relievers before seeing the dentist. It is imperative for an orthodontist to address questions that might arise in a clinical setting from the viewpoint of the clinicians and the patients/parents. This article will provide an overview of the current management strategies which are employed for alleviating orthodontic

pain[9].

Rakhshan H, Rakhshan V 2015 conducted study to assess the intensity and duration of pain and discomfort caused by active orthodontic treatment. This descriptive cross-sectional study examined 67 patients (22 men, 45 females; age range: 18–32 years) undergoing fixed orthodontic treatment. Patients were interviewed after the active treatment stage to assess their perceived pain and discomfort at different sites during different activities by a visual analogue scale. They concluded that pain and discomfort occur for more than 4 weeks after beginning fixed orthodontic treatment. Changing diets to incorporate softer foods is recommended to alleviate pain[10].

Sayar G 2016 aimed his study to evaluate the differences in pain perception and chewing sensitivity between extraction and non-extraction patients. He concluded that no difference in the pain perception was observed between the extraction and non-extraction patients during the 7 days after arch wire placement[11].

Wishney M 2016 reviewed the potential risks of orthodontic therapy along with their evidence base. The risks of orthodontic treatment include periodontal damage, pain, root resorption, tooth devitalization, temporomandibular disorder, caries, speech problems and enamel damage. These risks can be understood to arise from a synergy between treatment and patient factors[12].

Naqvi N. Z, Shaikh S, Pasha Z, 2019 conducted study to evaluate the clinical bond failure rate of orthodontic brackets bonded with green glue: two-way color changes adhesive and transbond XT adhesive paste. They observed that the bond failure rate was 5.00% and 4.44% for green glue and transbond XT group. No significant difference was found in the bond failure rate between transbond XT and Green gloo group. No significant difference was found in the bond failure rate between the two groups, in relation to right and left side and the type of teeth[24].

Sakrani H et al 2021 conducted a study is to determine frequency of bracket bond failure in relation to age, gender, most commonly involved tooth and quadrant. They

concluded that females were more affected by the bracket bond failure as compared to the males along with the second premolar being the most commonly associated tooth during an active orthodontic treatment[14].

Khan H et al 2021 conducted study to estimate the bracket failure rate and the related factors for the long term. This study included 150 nonsyndromic orthodontic patients undergoing fixed appliance therapy for the last two years. The same patients were followed for 7 months. Different variables related to bracket failure were evaluated. They concluded that the bracket failure rate was 6.4%, with most bracket failure occurring in the first 6 months after bonding with individual difference. There was more incidence of bond failure in an increased overbite, adolescents, lower arch, posterior teeth, and lighter alignment wires[15].

Therkildsen M.N, Sonnesen L 2021 conducted a study to investigate bite force, occlusal contact and pain in orthodontic patients with moderate-to-severe malocclusion, but not in patients with minor malocclusion. The purpose of this study was to investigate changes in bite force, teeth in occlusal contact and pain in orthodontic patients with minor crowding before orthodontic treatment (T0), after bonding (T1), during treatment (T2), post-treatment (T3) and during retention (T4)[16].

METHODOLOGY

Sample Selection

Sample of total 42 patients (10 males and 32 females) with age ranging from 12 to 28 years and in which corrective orthodontic treatment is required were selected.

Each patient was examined before starting of orthodontic treatment (T0) and 30 days onto the treatment (T1) for evaluation of -

- A) Oral ulcers
- B) Lacerations
- C) Bracket bond failure
- D) Pain on chewing

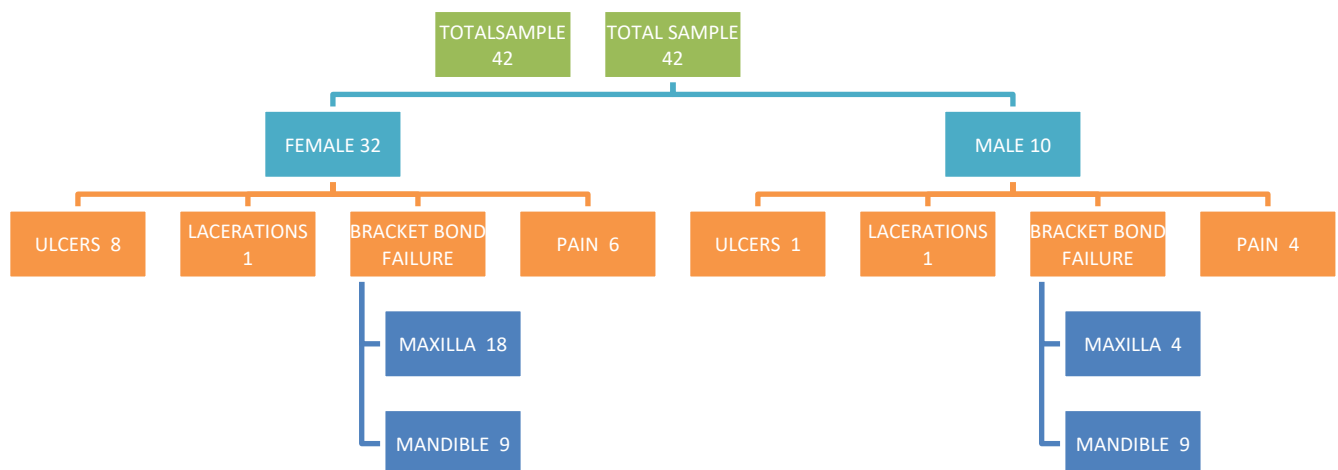




Figure 1 - Oral ulcer can be seen laceration



Figure 2- Oral 3 days after fixed orthodontic mechanotherapy

INCLUSION CRITERIA	EXCLUSION CRITERIA
1. Age between 12 - 28years	1. Age >28years and <12years
2. Presence of malocclusion	2. Absence of any malocclusion
3. Absence of any mucosal lesion	3. Previous orthodontic treatment
4. First visit for orthodontic treatment and no extractions for 30days	4. Presence of any mucosal lesion
5. No surgical procedures conducted during	5. Incidence of flourosis and any other morphological abnormality
6. Ideal morphology of the enamel	6. Systemic disease and drug intake
7. Absence of any systemic disease and drug intake	

Oral ulcers and lacerations (Table 3)

Using a questionnaire the frequency of oral ulceration and laceration experienced by 42 patients 30 days onto the fixed appliances was recorded by me and my instructors. Mostly ulcerations were noticed 48-72hours after the treatment was started. Frequent location of the occurrence of ulcerations in males and females was compared.

Lacerations

Lacerations of the lip can cause devastating cosmetic defects if not

properly and meticulously repaired. A misalignment by as little as 1mm of the vermilion border or "white line" can be easily noticed by the casual observer.

Questionnaire for the patient- (Table 1)

- i. Mouth ulcers and lacerations before treatment (description included)- yes/no/do not know
- ii. Alteration of mouth ulcers and lacerations after ftxed appliances- no alteration/less now/ worse now

Bracket bond failure (Table 4)

To evaluate the occurrence of debonding in the patients, in this study, gender with debonding of brackets, specific teeth on which debonding occurred and arch where debonding most commonly occurred is being compared.

Pain on chewing (Table 5)

Pain and discomfort were defined as feelings of pressure, tension, soreness of the teeth, and/or any other oral pains or feelings of disturbance (Krishnan, 2007; Ngan et al.,1989).

Pain perception is evaluated using questionnaire and the Visual Analog Scale (VAS). The VAS enables the patients to indicate the precise intensity of their pain. To indicate the pain intensity, patients mark a point on a 100 mm horizontal line, corresponding to their pain intensity. It provides the maximum opportunity to each

patient to express a personal response. VAS data are usually recorded as the number of millimeters on a line ranging from 0 to 100 [8]. In most studies, VAS was used to evaluate pain perception because it is a rating scale with minimum constraints [9]

Questionnaire for the patient- (Table 2)

- i. Are you able to chew properly? Yes/no
- ii. Are you able to speak properly? Yes/no
- iii. Any difficulty in jaw and tongue movements? Yes/no

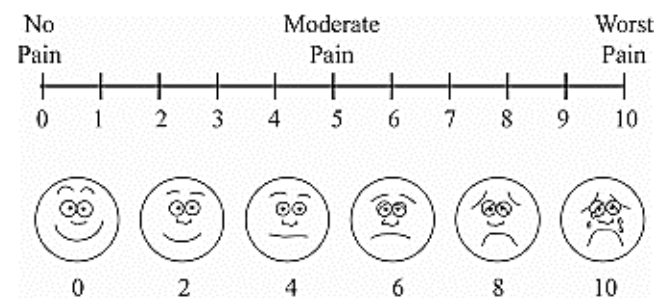


Figure 3- Visual Analog Scale (VAS) used for pain assessment in this study

All the patients were asked to mark a point on a 10 cm horizontal line, corresponding to their pain intensity. The patients were advised to mark their response early in the morning to avoid the possible effects of medication on pain perception. The VAS questionnaire was reported to be the most reliable scale for evaluating subjective experiences.

Therefore, VAS questionnaire was used to evaluate pain perception in this study. Most commonly pain was experienced by patients during the first 7days onto the treatment.



Figure 4- Bonding of the debonded mandibular premolar bracket at T1

Table 1- Frequency of the occurrence of oral ulcers, lacerations of the patients at T1

QUESTIONS ASKED	RESPONSE	MALE	FEMALE
ULCERS AND LACERATIONS BEFORE TREATMENT	YES		
	NO	10	32
	DO NOT KNOW		
ALTERATION OF MOUTH ULCERS AND LACERATION AFTER FIXED APPLIANCE	NO ALTERATION		
	LESS NOW		
	WORSE NOW	2	9



Figure 5- Pain on chewing checked, asking patient to chew non sugar chewing gum for 1-2minutes

Table 2- Pain response of the patients at T1

QUESTIONS ASKED	RESPONSE	MALE	FEMALE
ARE YOU ABLE TO CHEW PROPERLY	YES		
	NO	3	7
CAN YOU SPEAK PROPERLY	YES		
	NO	1	3
DIFFICULTY IN JAW AND TONGUE MOVEMENT	YES		
	NO		

STATISTICAL ANALYSIS

The data was tabulated in Microsoft Excel and analysed with SPSS V.24 software. The variables have been expressed with frequency and percentage. Chi square test was used for the comparison between the groups. The p value <0.05 is considered as statistically significant.

Table 3. Comparison of bond failure in maxilla between male and female

Gender		Incisor	Canine	Premolar	Molar	Chi square value	P value
		Male	N 1 % 14.2	1 14.2	3 42.8		
Female	N 3 % 5.8	1 11.7	11 58.8	6 23.5			

Table 4. Comparison of bond failure in mandible between male and female

Gender		Incisor	Canine	Premolar	Molar	Chi square value	P value
		Male	N 0 % 0	1 10	7 70		
Female	N 2 % 6.8	1 3.4	20 68.9	6 20.6			

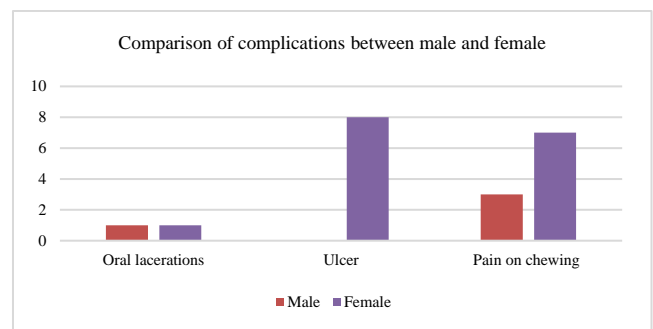
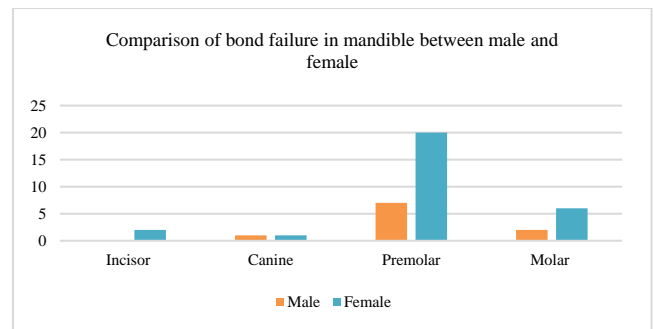
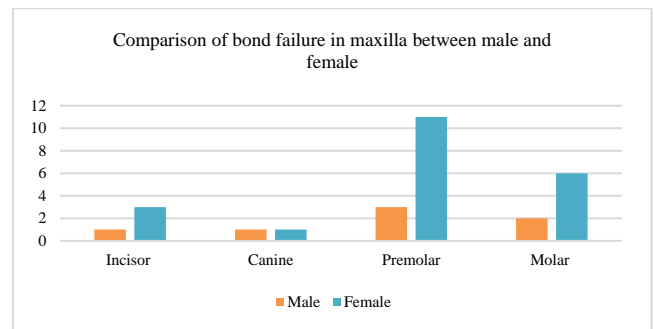


Table 5. Comparison of complications between male and female

Complications		Oral lacerations	Ulcer	Pain on chewing	Chi square value	P value
Male	N	1	0	3	3.958	0.138
	%	25	0	75		
Female	N	1	8	7		
	%	6.25	50	43.75		

RESULT

The difference in bond failure rate between the males and females were found statistically non-significant ($p > 0.05$). Bracket bond failure in maxilla is being observed in 22 (52.38%) patients among which 4 (18.18%) male and 18 (81.82%) female whereas in mandible 32 (76.19%) patients among which 9 (28.19%) male and 23 (71.88%) female. It is being observed that in both maxilla and mandible bracket bond failure is most commonly seen in premolars.

Among 42 patients oral ulcers and laceration is seen in 11 (26.19%) patients caused by fixed appliance. Among these 2 male (18.18%) and 9 (81.82%) female respondents ulcerations is seen on the tongue (45.45%) and lower lip (36.36%), while laceration in buccal mucosa (18.18%). Most of the patients complained of ulcerations, lacerations 48-72 hrs after treatment started which gets subsided by symptomatic treatment.

A total of 10 (23.80%) patients, 4 (40%) males and 6 (60%) females reported with pain. The duration of the pain regularly lasted for only 2-3 days for most of the patients. About few had pain for more than 3 days.

DISCUSSION

All questions related to oral ulcers, lacerations and perceived pain were based on knowledge of facts by the patient as it has been shown by NORHEIM & HELOE [21] that this type of information has a high degree of stability and constancy in contrast to that dealing with patients' attitudes.

It was shown by JONES [25] that for those suffering severe discomfort, the highest scores were attained within the first 3 days, peaking especially at night. Such problems are especially

marked in the first stages of treatment.

Most of the bracket failures (68.9%) were reported on posterior teeth, especially the lower premolars. These results agree with previous studies that reported more bracket failures on posterior teeth than anterior teeth and more failure on lower second premolars [22,23,24].

The higher incidence of bracket failure rate was in the mandibular arch compared to the maxillary arch. This could be due to the more effect of masticatory forces in the lower arch, impact from the upper teeth cusps, and poor bonding

due to inadequate moisture control.

CONCLUSIONS

1. Reasonable number of lacerations seen in 2-3 days.
2. Ulcerations seen on 5-7th day, they were also of minimal incidence.
3. In 70% patients bracket bond failure was seen usually on 4th -8th day.
4. Perceived pain was seen 48-72 hours after the treatment started.

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