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Perception of Pain by a Sample of Patients Undergoing Orthodontic Treatment in Sulaimani City

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الخلاصة

الاهداف: ان المعالجة التقويمية للاسنان تعرف كطريقة مؤلمة بين المرضى ، فهم يشعرون خلال المعالجة التقويمية بدرجات متفاوتة من الالم من المراحل البدائية للفحص الى نهاية عملية المعالجة ،ان اهداف هذه الدراسة هو اكتشاف تحمل المرضى لالام المعالجة التقويمية باستخدام جهاز التقويم الثابت من خلال مقارنة سلكان قوسيان مختلفان في الحجم . **المواد وطرائق العمل :**مجموعة الدراسة تكونت من ٦٠ مريضا(٢٦ ذكر و ٣٤ انثى) مع متوسط عمر (١٧.٥) سنة و (٢٠.٥) سنة بالتعاقب .استخدام اسلاك قوسية اما بحجم (٠،٠١٤ انج)او (٠،٠١٦ انج) ومع اختيار عشوائي للمرضى . يوجه المرضى بملئ اسئلة معدة للدراسة لمدة خمسة ايام متعاقبة بعد البدا باستخدام السلك القوسي البدائي وبعد تحفيز السلك القوسي ب (اربع ساعات، ٦ ساعات ، ٢٤ ساعة ، اليوم الخامس) .اعراض شدة الالم (ضعيف ،خفيف ،متوسط ،شديد ،شديد جدا) تقاس بالترابط مع (العض على مواد صلبة ومرنة، الحساسية للطعام والشراب الحار والبارد ،مضغ الطعام ، تثبيت الاسنان الامامية والخلفية سوية ،الخدود ،الشفاه،اللسان) وتقيم .**النتائج :**لايوجد اختلافات معنوية في المجاميع العمرية في مجموعتي الاسلاك القوسية ،تحسس الالم كان معنويا بالنسبة للاناث مقارنة بالذكور وكذلك كان اكثر في الاسنان الامامية من الاسنان الخلفية ،كان هناك زيادة تدريجية في النسبة المئوية لمستوى الالم خلال اول ٢٤ ساعة من استخدام السلك القوسي والبقاء على نفس المستوى في اليوم الثاني ومن ثم يقل حتى اليوم الخامس . الاحساس بالالم بتثبيت الاسنان الامامية خلال الساعات البدائية القليلة الاولى في كلتي المجموعتين للاسلاك القوسية ومن ثم يقل في الساعات اللاحقة. **الاستنتاجات**:لايوجد تمييز عمري في الاحساس بالالم بالنسبة لمجموعتي الاسلاك القوسية وكذلك لايوجد ارتباط معنوي بالنسبة للوقت مع بداية الاحساس بالالم الذي يحس مع اختلاف احجام استخدام الاسلاك القوسية البدائية ومن ثم شدة الالم الذي يحس يقل مع الوقت ،الالم الذي يحس يكون اكثر على الاسنان الامامية منه في الاسنان الخلفية وكذلك تحسس الالم للاناث اكثر منه من الذكور

ABSTRACT

Aims: Orthodontic treatment is known as a painful procedure among patients. They feel varying degrees of pain during orthodontic treatment from the stage of initial examination till the end of the treatment. The aims of this study are to explore pain experience among patients undergoing orthodontic treatment with the fixed appliances by comparing two different arch wires sizes. **Materials and Methods**: The study group consisted of 60 patients (26 males, 34 females) with a mean age of 17.6 years and 20.5 years consequently. Insertion of either 0.014 or 0.016-inch wire was by random selection of patients. Patients were asked to fill out a series of questionnaires for five consecutive days after the insertion of orthodontic initial arch wire, and after the arch wire activation for 4 hours, 6 hours, 24 hours, and till 5 days. The intensity (weak, mild, moderate, severe, and intensive) of the pain symptoms in connection with ten items (Biting on a hard/soft food, sensitive to hot or cold food/drink, mastication of food, fitting anterior and fitting posterior teeth together, cheeks, lips, and tongue pain) have been evaluated. **Results**: No significant differences were found between age groups, and between the two arch wire groups. Pain perception was more significant in females than in males and the pain perceived at the anterior teeth was greater than posterior teeth. Pain percentage level increased gradually till reaching the peak within 24 hours after the insertion of arch wire and retained the same level in the 2nd day, then decreased till the 5th day. Perceptions of pain by fitting anterior teeth were exactly the same within the period of the first few hours in both arch wire groups, and decreased over the following hours. **Conclusion**: No age discrimination was found for perception of pain in the two different arch wire groups, with no significant correlation for the time with initial pain that perceived after the insertion of two different initial arch wire sizes then the intensity of pain reduced over the time. Pain was perceived as being greater at the anterior than the posterior teeth and females experienced more pain than males.

Keywords: Pain, arch wire, orthodontic, fixed appliance

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INTRODUCTION

The International Association for the Study of Pain (IASP) has defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [(1)]. Orthodontic treatment is always taken as a painful procedure by patients even before the start of the treatment [(2,3)]. It is reported that 95% of the orthodontic patients experience varying degree of pain during orthodontic treatment [(2,4)]. It is also reported that patient's main cause of deterring from orthodontic treatment is pain [(5.6)]. However, the intensity of pain differs from one patient to another. It depends upon age, gender, race, emotional state as well as the cultural background [(3,4)]. A survey rated pain as the greatest dislike during treatment and fourth among major fears and apprehensions prior to the orthodontic treatment [(7)].

Orthodontic treatment starts from the stage of initial examination till the date of de-bonding. It includes major events like extraction of few teeth, separator placement, bonding and banding, arch wire placement and activation as well as deboning [(8)]. So, patients are exposed to pain stimuli throughout the orthodontic treatment. Being responsible clinician, orthodontists should know the painful effects of each procedure and know the measures to mitigate post-procedural pain. There are several studies which have shown that pre-procedural administration of analgesics significantly reduces the post- procedural pain [(9,10),]

Pain, induced by orthodontic treatment, generally could be categorized as mild and short lasting. However, some patients do experience severe pain, even to the extent that mastication of food and tooth brushing might be impaired [(11)]. Orthodontic appliance induced pain is one of the main reasons that discourage patients from seeking orthodontic treatment and it may negatively affect patient cooperation [(12,13)]. Pain is a subjective response, which shows large individual variations. It is dependent upon factors such as age, gender, individual pain threshold, the magnitude of the force applied, present emotional state and stress, cultural differences, and previous pain experiences [(9,14-17)]. In adolescent patient sample, low motivation for orthodontic treatment, elevated dental anxiety level, and low activity temperament characterized patients reporting more pain [(18)].

Aims of this study

- ✓ To explore pain experience among patients undergoing orthodontic treatment with fixed appliances by different sizes of wires during 5 days after the appliance insertion.
- ✓ To examine the extent of which the sensitivity of the teeth to cold or hot food/drink might be affected by orthodontic treatment.
- ✓ To evaluate the perception of pain in males and females after insertion of different sizes of arch wire groups versus periods.

MATERIALS AND METHODS

This study was done in Sulaimani City/Iraq on a sample comprised of 60 patients (26 males, 34 females). All patients treated in the Orthodontic clinics in Sulaimani city with the age ranged for the males 14-21 years and 14-33 years for the females. There was no exclusion for any type of malocclusion even for the cases of crowding.The study was done by filling a specific case sheet designated by Ngan *et al*.[9],with some modifications according to the study and also translated into Kurdish Language. It included a series of questions regarding the intensity of pain as (weak, mild, moderate, severe, and intense). Nitinol arch wires 0.014 or 0.016 inch with 0.022-inch Edgewise appliances were used in all patients.

All patients have been asked to fill out a longitudinal series of questionnaires for five consecutive days after the insertion of orthodontic initial arch wire and after the arch wire activation at 4 hours, 6 hours 24 hours, and till 5th day. The intensity of the pain symptoms in connection with ten items have been evaluated, namely: biting on a hard/soft food, sensitivity to hot or cold food/drink, mastication of food, fitting anterior and fitting posterior teeth together, cheeks, lips, and tongue. All statistical analyses were performed with SPSS for Windows version 20.0 (SPSS Inc., Chicago, IL, USA) statistical software package. *P* value was used to evaluate the statistical significance of the differences in prevalence between groups. *P* value of ≤ 0.05 was considered statistically significant and Microsoft Office Excel was used for mean, percentages, and standard deviation values, while the Friedman statistical test applied for nonparametric values.

RESULTS

In the light of conducted study, the results were found after calculating the meticulous data, which have been collected throughout this research. Regarding age differences, it iwas found that the age is not statistically significant in the perception of

pain. The findings were evaluated without age discrimination.There were no statistically significant differences in perceived effort depending on which type of wire (0.014 and 0.016 Inch) when P = .628 as shown in Table (1). The percentage of pain perception was more in females than in males as shown in Table (2), with a significant difference between them, *P*-value is less than 0.05 as in Table (3).

Table (1): Percentage of pain perception by both groups of arch wires.

Test Statistics[a]		
Chi-Square	Asymp. Sig.	Result
.235	.628	No significant

P= .628

Table (2): Percentage of pain perception by gender.

Data	No pain %	Pain %
26 Males (0.014+0.016 inch groups)	59.12	40.88
34 Females (0.014+0.016 inch groups)	50.27	49.73
Females 0.014 inch	54.56	45.44
Males 0.014 inch	53.33	46.67
Females 0.016 inch	45.45	54.55
Males 0.016 inch	64.08	35.92

Table (3): Statistical significance test for males and females.

Statistical significance test	t-test	*P* value
Males vs. females	-3.326	0.006

$P \leq 0.05$

According to Table (4) and Figure (1) females, it was showed that the pain level commenced by the two different sizes of arch wire within the period of 4 hours tended to increase gradually till reaching its peak within first 24 hours of the arch wire insertion and then declined until the 5^{th} day. The pain perception of male with 0.014 inch nitinol arch wire was similar to female, while for 0.016 inch it was different because within the first period of 4 hours, the pain reaches its peak then decreases gradually till

the fifth day. Regarding the pain regions, both arch wire groups pain perception by fitting anterior teeth were exactly the same within the period of the first few hours. This decreased over the following hours and the pain perceived at the anterior teeth was greater than that at posterior teeth as in Table (5) and Table (6).

Table (4): Percentages of pain perception by gender and arch wire groups versus periods.

Duration	Male's 0.014 inch wire (%)	Female's 0.014 inch wire (%)	Male's 0.016 inch wire (%)	Female's 0.016 inch wire (%)
4 Hour	52.50	42.78	57.14	41.25
6 Hour	55.83	47.78	52.86	55.00
1st Day	61.67	57.22	46.43	66.25
2nd Day	49.17	51.67	32.86	66.25
3rd Day	42.50	45.00	25.00	57.50
4th Day	35.83	38.89	20.00	50.00
5th Day	29.17	34.44	17.14	45.00

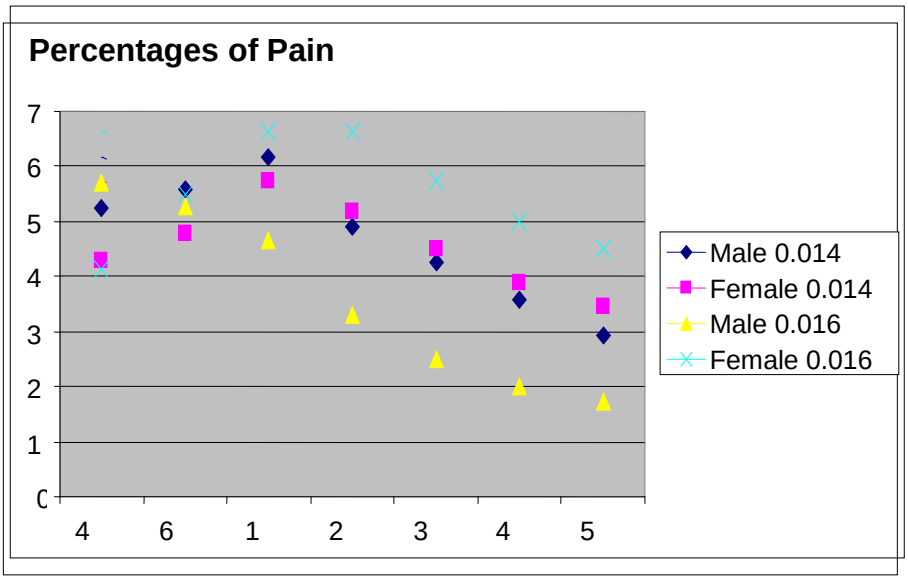

Figure (1)**:** Percentages of Pain perception by gender and arch wire groups versus periods

Table (5): Percentage of pain of fitting anterior teeth and mean pain intensity scores versus wire sizes and time.

Duration	0.014 inch group (30 patients)				0.016 inch group (30 patients)			
	%	N	Mean	SD	%	N	Mean	SD
4 hours	66.67	20	4.00	4.58	66.67	20	4.00	4.18
6 hours	70.00	21	4.20	2.28	80.00	24	4.80	6.42
1st day	80.00	24	4.80	2.59	66.67	20	4.00	5.70
2nd day	73.33	22	4.40	3.44	63.33	19	3.80	5.22
3rd day	60.00	18	3.60	1.52	46.67	14	2.80	2.59
4th day	46.67	14	2.80	0.84	40.00	12	2.40	2.61
5th day	40.00	12	2.40	1.52	30.00	9	1.80	1.79

% Percentage of total responding, N number of responding answering "Yes". SD standard deviation

Table (6) Percentage of pain of fitting posterior teeth and mean pain intensity scores versus wire sizes and time

Duration	0.014 inch group (30 patients)				0.016 inch group (30 patients)			
	%	N	Mean	SD	%	N	Mean	SD
4 hours	50.00	15	3.00	5.10	46.67	14	2.80	5.22
6 hours	63.33	19	3.80	5.26	53.33	16	3.20	5.02
1st day	76.67	23	4.60	4.62	40.00	12	2.40	4.34
2nd day	50.00	15	3.00	2.92	33.33	10	2.00	2.45
3rd day	50.00	15	3.00	3.08	36.67	11	2.20	2.28
4th day	36.67	11	2.20	2.17	26.67	8	1.60	0.89
5th day	33.33	10	2.00	2.55	26.67	8	1.60	2.19

% Percentage of total responding to pain, N number of responding answering "Yes". SD standard deviation

The comparison between fitting anterior versus posterior teeth with both genders and arch wire sizes was statistically analyzed by d Friedman test which described in Table (7).

Table (7) Statistically significant difference of fitting anterior via posterior teeth according to gender and arch wire types.

Test Statistics[a]				
Comparison	Type	Chi-Square	Asymp. Sig.	Result
Fitting Front via Fitting Back	0.014 Inch wire	7.000	.008	Significant [*1]
Fitting Front via Fitting Back	0.0.016 Inch wire	7.000	.008	Significant [*2]
Fitting Front via Fitting Back	Male	3.571	.059	No significant [*3]
Fitting Front via Fitting Back	Female	7.000	.008	Significant [*4]

There was a statistically significant difference in perceived effort depending on fitting frond or back teeth for both arch wire sizes (0.014, 0.016 inches) *P* = 0.008, .059 respectively. There was no significant difference in perceived effort depending on fitting front or back teeth in male *P* = 0.008, while females showed statistically significant difference *P*= 0.008. There is no conspicuous difference in pain percentage between two different sizes of arch wire groups except for biting on hard food, mastication of food, and fitting front teeth as explained in Figures (2,3). Overall, the level of pain intensity in females was more than in males as in Table (8).

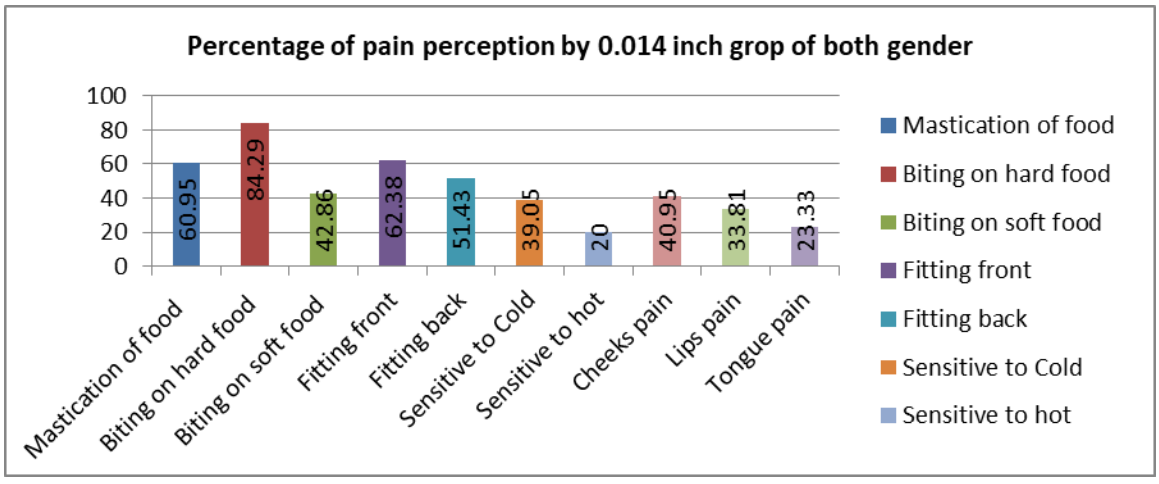

Figure (2): Pain perception of 0.014-inch groups versus pain types and regions

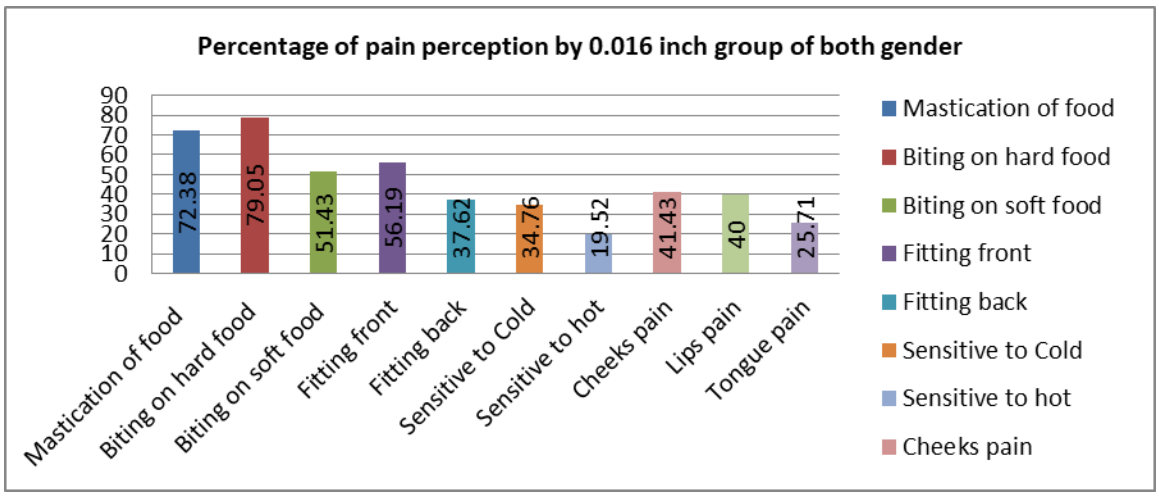

Figure (3): Pain perception of 0.016-inch groups versus pain types and regions

Table (8): Percentage of pain intensity versus gender and arch wire groups.

Pain Level	Percentage % Female 0.014 Inch wire	Female 0.016 Inch wire	Male 0.014 Inch wire	Male 0.016 Inch wire
Weak pain	18.25	29.64	28.93	22.14
Mild pain	12.62	11.43	12.26	7.65
Moderate pain	8.49	6.79	3.57	3.88
Severe pain	3.97	5.00	0.60	1.84
Very severe pain	2.06	1.61	1.31	0.41

DISCUSSION

Space analysis was not included in the assessment as no correlation found between pain and severity of crowding [19].Several studies showed that orthodontic treatment is frequently associated with pain [20,21]. In agreement with these studies, the present investigation indicates moderate degrees of pain associated with different archwires with high percentage of patient respondent of pain perception. The sensation of pain occurs during orthodontic tooth movement due to the inflammatory reactions in the periodontium and dental pulp which will stimulate various biomechanical mediators to be released [22].Following ligation of the arch wires, the patients started to feel uncomfortable and perceived pain. Clinically and statistically, it was expected that there would be a difference between the pains perceived by those in whom different sized wires were inserted. However, no statistically significant difference was found between the initial pain reported by the 0.014 and 0.016 inch groups. Jones [23] in a study of

pain perceived following the insertion of initial arch wires, reported that some patients had great pain for the first few days. In this study, although not statistically significant, pain peaked at 24 hours in both groups following arch wire ligation. This finding is in agreement with other studies [4, 24]. Bergius *et al.*, [25] reported girls experience frequently higher degrees of pain than of boys. Scheurer *et al.*, [4] results were in agreement with this. Feinmann *et al.*, [26] reported that pain is related to gender. This study reported gender dimorphism for pain during different orthodontic procedures. In this study, significant difference was found between pain and gender, which is in agreement with the above study findings.The data show considerably higher percentage of pain perception for the anterior teeth than of posterior teeth, in agreement with the results of other investigators [9,4]. This may be explained by the fact that during the levelling phase the anterior teeth are often more involved and incisors have smaller root surfaces than molars. In addition to this, biting while eating might be the reason for the higher pain perceived in the anterior teeth.

CONCLUSIONS

1. No age discrimination was found for perception of pain in the two different archwire groups.
2. No significant correlation was found for the time at which initial pain was perceived after the insertion of two initial arch wires of different sizes. In both groups, the initial pain was perceived within the first four hours.
3. The intensity of pain reduced over time, as the patient gets adapted to the appliance
4. Pain was perceived as being greater at the anterior than the posterior teeth.
5. The results of this study showed that pain was perceived after the insertion of two wires of different sizes used for initial alignment. Either of these can therefore be chosen as the initial arch wire depending on the mechanics used by the orthodontist.
6. Females experienced more pain due to fixed appliances as compared to males.

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