

Assessment of Alignment Efficiency, Pain Experience and Pain in Mastication in Self-Ligating vs Conventional Bracket: A Comparative Study

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ABSTRACT

Background: Self-ligating brackets (SLBs) are believed to provide certain clinical advantages over conventional brackets (CBs), including lower frictional resistance, enhanced alignment efficiency, and reduced pain during orthodontic treatment. However, existing literature presents inconsistent findings regarding these benefits.

Aim: To compare alignment efficiency, overall pain perception, and pain experienced during mastication between self-ligating and conventional bracket systems during the early stages of orthodontic therapy.

Materials and Methods: A prospective clinical study was conducted on 20 patients undergoing orthodontic treatment, who were equally divided into two groups: self-ligating brackets (n = 10) and conventional brackets (n = 10). Alignment was assessed using Little's Irregularity Index at baseline (T0) and after four months (T4). Pain perception was measured using the Visual Analog Scale (VAS) at specified time intervals following appliance placement over a four-month period. Pain during mastication was evaluated using a similar VAS-based method. Statistical analysis included paired t-tests, independent t-tests, and repeated measures ANOVA, with a significance level set at $p < 0.05$.

Results: Significant improvement in alignment was observed in both groups over the study period ($p < 0.001$). However, the self-ligating bracket group demonstrated a significantly greater reduction in irregularity scores and superior alignment efficiency compared to the conventional bracket group ($p < 0.05$). Pain intensity was highest immediately after appliance activation and progressively decreased over time in both groups. Across all time points, patients treated with self-ligating brackets reported lower VAS pain scores, with statistically significant differences between groups ($p < 0.05$). Pain during mastication was consistently higher than pain at rest in both groups but remained significantly lower in the self-ligating group.

Conclusion: Self-ligating brackets exhibited improved alignment efficiency and were associated with reduced pain perception, both under resting conditions and during mastication, when compared to conventional brackets in the early phase of orthodontic treatment. These findings indicate that SLBs may enhance patient comfort while improving treatment outcomes.

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Introduction :

Dr. Edward Angle introduced the term "bracket" with the Ribbon Arch appliance in 1916¹. Stolzenberg first

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described self-ligating edgewise bracket more than 70 years back. Self-ligating brackets (SLB) and conventional brackets are two types of brackets systems used in orthodontics, while the SLB use a built-in lock system for securing base wire into bracket slot. Conventional brackets depend upon ligature wires or modules. This basic difference is thought to cause change in frictional levels in both systems hence affecting the alignment as well as pain experience. The clipping mechanics allows greater mobility and potentially resulting in smoother movement.¹ It is believed that minimal frictional force from different designs of self-ligating brackets leads to quicker alignment of teeth, thereby reducing total treatment duration. Studies have also reported a reduced treatment time by 4 months in SLB due to increased alignment efficiency.²

Approximately 90–95% of patients report some level of discomfort or pain after applying fixed appliances and they also feel pain after monthly return visits during long-term treatment³. The basis of this difference lies in their biomechanical difference between the two bracket system.

Biomechanics : Friction in orthodontic sliding mechanics generates resistance to tooth movement, thereby reducing the efficiency of alignment. Increased friction necessitates the application of higher retraction forces, which may impose additional stress on anchorage units. This elevated stress can result in undesirable tooth movement in regions intended to remain stable. Therefore, effective control of frictional forces is essential to enhance treatment efficiency, reduce treatment duration, and minimize adverse effects.⁷

The inbuilt lock of SLB minimizes binding and notching between the bracket slot and archwire, thereby promoting a more controlled and efficient sliding mechanism. Consequently, tooth movement occurs with reduced resistance, resulting in a more predictable and potentially faster alignment phase.

With no exception, orthodontic pain is perceived as discomfort, dull pain and hypersensitivity in affected teeth : Orthodontic pain, with a prevalence of 72%–100%,^{1–2,5} is perceived as soreness, pressure and tension in the affected teeth. Pain commonly begins within a few hours of appliance activation, peaks around 24 hours, then gradually subsides as adaptation occurs.

Mechanism of orthodontic pain

Initiation & Peripheral Mechanisms

Mechanical force applied to a tooth → movement of the dental root within the alveolar bone and compression/tension of the periodontal ligament (PDL) On the compression side: PDL vessels become occluded → local ischemia/hypoxia.

Hypoxia and anaerobic metabolism lead to accumulation of protons (H^+) → local acidosis.

Acidosis stimulates acid-sensing ion channels (e.g., ASIC3) on sensory (nociceptive) nerve endings in the PDL.

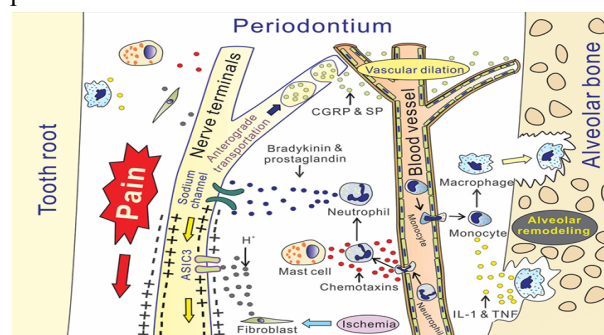
Inflammatory and immune cells (mast cells, leucocytes: neutrophils, monocytes) are recruited due to vascular changes and tissue stress.

These cells release mediators:

Bradykinin, prostaglandins (e.g., PGE_2) → directly activate and sensitize nociceptors.

Cytokines (e.g., IL-1, TNF- α) → amplify inflammation and pain signalling.

Neurogenic inflammation: sensory nerve endings themselves release neuropeptides like substance P (SP) and calcitonin gene-related peptide (CGRP) which further dilate vessels and amplify inflammation and pain.



Fig⁵: orthodontic pain mechanism

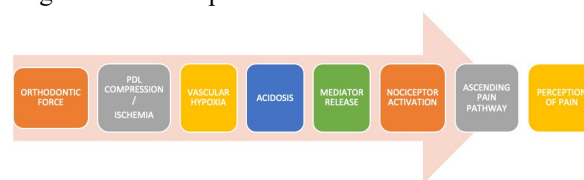


Fig: flowchart of orthodontic pain mechanism simplified

Conventional and self-ligating fixed appliances cause reater initial discomfort due to an increased inflammatory response and sensitized nociceptors.

Pain During Mastication

Pain during mastication is a common symptom following fixed orthodontic therapy its primarily experienced after appliance activation, especially within the first few days. Studies evaluating the influence of orthodontic appliances on masticatory

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function have indicated that treatment-related pain is a significant factor affecting patient acceptance of orthodontic therapy. This discomfort is primarily experienced during the initial placement or activation of the appliance. Consequently, patients often modify their dietary habits by consuming softer foods and only infrequently require analgesics for pain management¹⁰. The discomfort is usually acute after bracket or archwire placement, peaks during functional activities such as chewing and biting, and can significantly disrupt masticatory efficiency for harder foods in the short term. Study has reported that CB patients showed constant pain, whereas SLB patients showed pain associated with biting and chewing.⁷

Pain exacerbates from pressure and movement imparted to teeth, leading to periodontal ligament inflammation and altered sensory nerve response during chewing and mastication.

Studies report pain on mastication can be most intense pain perceived during orthodontic therapy, with higher discomfort during initial period post-appliance activation.

The pain is often self-limiting, reducing markedly by 5th or 6th day, with most patients regaining masticatory function as tissue adaptation occurs.

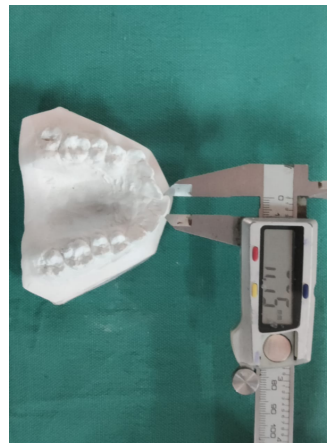
Materials and methods:

The study was done as a prospective clinical study with patients from department of orthodontics and dentofacial orthopaedics . For the purpose of study 20 patients were taken , 10 of which undergoing treatment with conventional brackets and 10 with self-ligating brackets.



Fig: Self ligating bracket Conventional bracket
Pic credits: dept. of Orthodontics ,PDA , Bhopal

Assessment of alignment efficiency was done using little's irregularity index and compared at start of treatment (T-0) and at end of 4 months (T-4).



T-0
4

T-

For the purpose of pain assessment Visual Analogue Scale (VAS) was used for describing the pain at time of insertion and following days. The VAS is considered as the most reliable and accurate tool in evaluation of subjective experiences such as pain (Jones and

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Richmond, 1985; Jones and Chan, 1992) For the assessment of pain experienced at mastication a similar VAS scale was prepared and the response was recorded for a continued period of 4 months .

Pain assessment form (VAS)

Name of Patient: _____ Age: _____
 Gender: _____ Type of bracket used: _____
 Month of treatment: _____

Pain at:

Time of insertion (0 hour)

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

4 hours later

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

24 hours later

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

3 days later

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

7 days later

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

Pain assessment form (VAS)

Name of Patient: _____ Age: _____
 Gender: _____ Type of bracket used: _____
 Month of treatment: _____

Pain on chewing/biting:

Day 1:

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

Day 2

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

Day 3

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

Day 7

Visual Analogue Scale

Choose a Number from 0 to 10 That Best Describes Your Pain

No Pain 0 1 2 3 4 5 6 7 8 9 10 Unbearable Pain

ASK PATIENTS ABOUT THEIR PAIN

INTENSITY—LOCATION—ONSET—DURATION—VARIATION—QUALITY

Result

RESULT AND OBSERVATION

1. LITTLE'S IRREGULARITY INDEX

Table 1.1: Comparison of Little's Irregularity Index and Alignment Improvement Between Self-Ligating and Conventional Brackets (n=20)

Group	N	Baseline (T0) Mean ± SD	4 Months (T4) Mean ± SD	Improvement (T0-T4) Mean ± SD	Within-group p-value	Between-group p-value
Self-ligating brackets	10	4.60 ± 2.18	0.50 ± 0.80	4.10 ± 1.10	11.620	0.001*
Conventional brackets	10	5.10 ± 2.22	2.10 ± 1.90	3.00 ± 0.90	9.450	0.001*
Between-group t-value		-0.508	-2.340	2.620		
Between-group p-value		0.618	0.031*	0.017*		

*Significant at p < 0.05

Fig 1: Comparison of Little's Irregularity Index and Alignment Improvement Between Self-Ligating and Conventional Brackets (n=20)

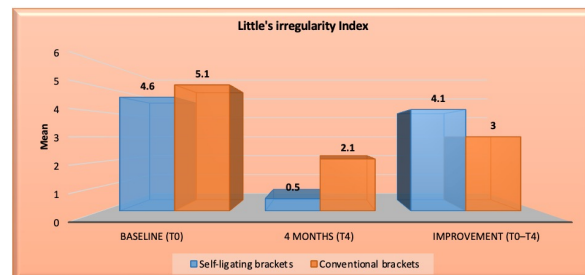


Table 1 compares the Little's Irregularity Index between the self-ligating bracket group and the conventional bracket group at baseline and after four months of treatment.

Within-group comparison

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Within each group, a paired t-test was used to compare the irregularity index at baseline (T0) and after four months (T4). In the self-ligating bracket group, the mean irregularity index decreased from 4.60 ± 2.18 at baseline to 0.50 ± 0.80 after four months, showing a mean improvement of 4.10 ± 1.10 . This reduction was statistically significant ($t = 11.620$, $p = 0.001$), indicating that self-ligating brackets produced a significant improvement in dental alignment over the treatment period.

Similarly, in the conventional bracket group, the mean irregularity index decreased from 5.10 ± 2.22 at baseline to 2.10 ± 1.90 after four months, with a mean improvement of 3.00 ± 0.90 . This reduction was also statistically significant ($t = 9.450$, $p = 0.001$), showing that conventional brackets also resulted in significant alignment improvement during the study period.

Between-group comparison

When the two groups were compared using an independent t-test, there was no significant difference in the baseline irregularity index ($p = 0.618$), indicating that both groups had similar initial crowding before treatment.

However, after four months of treatment, the self-ligating bracket group showed a significantly lower irregularity index compared to the conventional bracket group ($p = 0.031$). In addition, the overall improvement in alignment was significantly greater in the self-ligating bracket group ($p = 0.017$).

Overall, both orthodontic bracket systems significantly improved dental alignment over four months. However, the self-ligating bracket group demonstrated greater reduction in irregularity and better alignment improvement compared to the conventional bracket group, suggesting that self-ligating brackets may provide more efficient alignment during the early stages of orthodontic treatment. (Table 1, Figure 1)

2. PAIN SENSATION EXPERIENCE (VAS)

Table 2: Comparison of VAS Pain Scores at Different Time Intervals Between Self-Ligating and Conventional Orthodontic Brackets Over Four Months of Treatment

Month	Day	Self-Ligating Bracket (Mean \pm SD)	Conventional Brackets (Mean \pm SD)	Time Group	Time \times Group Interaction p-value
1	Time of Insertion (0 Hours)	6.10 \pm 1.90	7.40 \pm 1.80	0.001* (33)	0.001* (38)
	4 Hours Later	5.20 \pm 2.10	6.40 \pm 1.90		
	24 Hours Later	4.40 \pm 2.30	5.60 \pm 1.80		
	3 Days Later	3.20 \pm 2.10	4.30 \pm 1.60		
	7 Days Later	2.10 \pm 1.70	3.00 \pm 1.20		
	30 Days Later	1.50 \pm 1.20	2.50 \pm 1.10		
2	Time of Insertion (0 Hours)	5.90 \pm 1.80	7.00 \pm 1.70	0.001* (35)	0.001* (41)
	4 Hours Later	5.00 \pm 2.20	6.00 \pm 1.80		
	24 Hours Later	4.10 \pm 2.40	5.00 \pm 1.70		
	3 Days Later	3.00 \pm 2.00	3.90 \pm 1.50		
	7 Days Later	2.10 \pm 1.70	3.00 \pm 1.20		
	30 Days Later	1.50 \pm 1.20	2.50 \pm 1.10		

Month	Day	Self-Ligating Bracket (Mean \pm SD)	Conventional Brackets (Mean \pm SD)	Time Group	Time \times Group Interaction p-value
1	Time of Insertion (0 Hours)	6.10 \pm 1.90	7.40 \pm 1.80	0.001* (33)	0.001* (38)
	4 Hours Later	5.20 \pm 2.10	6.40 \pm 1.90		
	24 Hours Later	4.40 \pm 2.30	5.60 \pm 1.80		
	3 Days Later	3.20 \pm 2.10	4.30 \pm 1.60		
	7 Days Later	2.10 \pm 1.70	3.00 \pm 1.20		
	30 Days Later	1.50 \pm 1.20	2.50 \pm 1.10		
2	Time of Insertion (0 Hours)	5.90 \pm 1.80	7.00 \pm 1.70	0.001* (35)	0.001* (41)
	4 Hours Later	5.00 \pm 2.20	6.00 \pm 1.80		
	24 Hours Later	4.10 \pm 2.40	5.00 \pm 1.70		
	3 Days Later	3.00 \pm 2.00	3.90 \pm 1.50		
	7 Days Later	2.10 \pm 1.70	3.00 \pm 1.20		
	30 Days Later	1.50 \pm 1.20	2.50 \pm 1.10		

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	7 Days Later	2.00 ± 1.50	2.80 ± 1.20			
Month 3	Time of Insertion (0 Hours)	5.50 ± 2.00	6.80 ± 1.70	0.001*	0.029*	0.318 (1.21)
	4 Hours Later	4.60 ± 2.10	5.70 ± 1.80			
	24 Hours Later	3.90 ± 2.20	4.80 ± 1.60			
	3 Days Later	2.70 ± 1.90	3.60 ± 1.40			
	7 Days Later	1.70 ± 1.40	2.40 ± 1.10			
	Month 4	Time of Insertion (0 Hours)	5.20 ± 2.10	6.40 ± 1.80	0.001*	0.034*
4 Hours Later		4.30 ± 2.20	5.40 ± 1.90			
24 Hours Later		3.70 ± 2.10	4.60 ± 1.70			
3 Days Later		2.60 ± 1.80	3.40 ± 1.30			
7 Days Later		1.80 ± 1.40	2.40 ± 1.10			

	Late r				
	7 Days Later	1.60 ± 1.30	2.20 ± 1.00		

*Significant at $p < 0.05$

Figure 2: Comparison of VAS Pain Scores at Different Time Intervals Between Self-Ligating and Conventional Orthodontic Brackets Over Four Months of Treatment

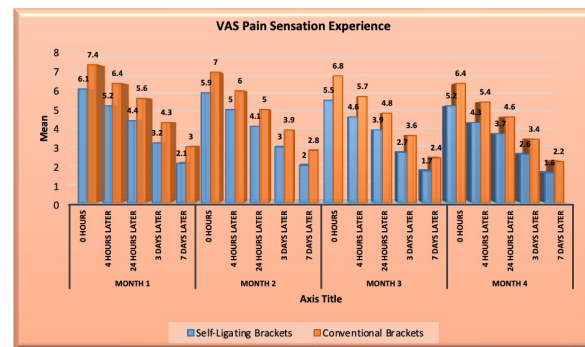


Table 2 compares pain perception in general between patients treated with self-ligating and conventional orthodontic brackets over four months using the Visual Analog Scale (VAS). In both groups, pain scores were highest immediately after appliance insertion and gradually decreased over time, with the lowest scores recorded on the seventh day. The repeated-measures analysis showed a significant time effect ($p = 0.001$) in all months, indicating that pain levels significantly reduced with time following appliance activation. When the two groups were compared, the self-ligating bracket group consistently demonstrated lower mean VAS pain scores than the conventional bracket group at almost all time intervals across the four months. The group effect was statistically significant, suggesting that patients treated with self-ligating brackets experienced significantly less pain overall compared to those treated with conventional brackets. Although the time \times group interaction was not statistically significant, the trend observed across different time points indicates that self-ligating brackets may provide improved patient comfort and reduced pain perception during orthodontic treatment. (Table 2, Figure 2)

3. VAS PAIN SCORES (DURING MASTICATION)

Table 3: Comparison of VAS Pain Scores Between Self-Ligating and Conventional Brackets Over Four Months)(n=20)

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Month	Day	Self-Ligating Brackets (Mean ± SD)	Conventional Brackets (Mean ± SD)	Time Effect (Day)	Group Effect (F)	Time × Group Interaction (F)
Month 1	Day 1	6.80 ± 1.60	8.20 ± 1.10	0.001*	0.041*	0.332 (1.12)
	Day 2	6.10 ± 1.55	7.40 ± 1.30			
	Day 3	4.90 ± 1.80	6.10 ± 1.40			
	Day 7	2.70 ± 1.60	3.80 ± 1.20			
Month 2	Day 1	6.30 ± 1.90	7.40 ± 1.60	0.001*	0.048*	0.418 (0.96)
	Day 2	5.60 ± 1.70	6.60 ± 1.50			
	Day 3	4.10 ± 1.80	5.20 ± 1.40			
	Day 7	2.20 ± 1.30	3.00 ± 1.10			
Month 3	Day 1	5.40 ± 1.80	6.80 ± 1.50	0.001*	0.032*	0.274 (1.33)
	Day 2	4.50 ± 1.70	5.90 ± 1.40			
	Day 3	3.40 ± 1.60	4.70 ± 1.30			
	Day 7	1.90 ± 1.20	2.70 ± 1.00			
Month 4	Day 1	5.10 ± 1.90	6.40 ± 1.60	0.001*	0.039*	0.352 (1.08)
	Day 2	4.20 ± 1.70	5.50 ± 1.40			

Day 3	3.20 ± 1.60	4.30 ± 1.30		
Day 7	1.70 ± 1.10	2.40 ± 0.90		

*Significant at p < 0.05

Figure 3: Comparison of VAS Pain Scores Between Self-Ligating and Conventional Brackets Over Four Months

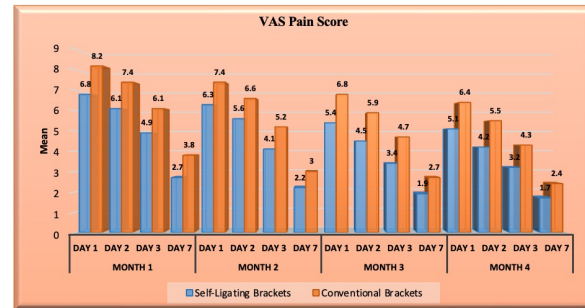


Table 3 presents the comparison of pain experienced during mastication between patients treated with self-ligating brackets (SLB) and conventional brackets (CB) over a four-month period. Pain was assessed using the Visual Analog Scale (VAS) at different time intervals following appliance activation (Day 1, Day 2, Day 3, and Day 7).

Overall, a statistically significant reduction in pain over time was observed in both groups. In each month, the time effect was highly significant (p = 0.001), indicating that pain levels changed significantly across the days following activation. In both groups, the highest pain scores were recorded on Day 1, followed by a gradual reduction on Day 2 and Day 3, with the lowest pain levels on Day 7. This trend confirms that orthodontic pain is most intense immediately after activation and subsides progressively within a week.

Between-group comparison revealed that patients treated with self-ligating brackets consistently reported lower mean VAS pain scores compared to those treated with conventional brackets at all evaluated time points across the four months. The group effect was statistically significant in each month (p < 0.05), indicating that self-ligating brackets are associated with significantly less pain during mastication.

The time × group interaction was not statistically significant, suggesting that although the magnitude of pain differed between the two groups, the overall pattern of pain reduction over time remained similar in both groups.

When comparing pain experienced during mastication with pain under normal (resting) conditions, it is evident that pain scores during mastication were

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comparatively higher in both groups at all time points. This indicates that functional loading of teeth during chewing exacerbates orthodontic pain due to increased pressure on periodontal tissues. However, despite this increase, the relative difference between the two bracket systems remained consistent, with self-ligating brackets demonstrating lower pain levels than conventional brackets under both conditions.

In summary, both bracket systems exhibited a similar pattern of decreasing pain over time; however, self-ligating brackets were associated with significantly lower pain scores during mastication. Additionally, pain during mastication was higher than pain under normal conditions, highlighting the influence of functional forces on patient discomfort. These findings suggest that self-ligating brackets may provide improved patient comfort during both routine activities and functional loading such as chewing. (Table 3, Figure 3)

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics. Descriptive statistics were calculated and presented as mean \pm standard deviation for VAS pain scores at different time intervals. The normality of the data distribution was assessed using the Shapiro–Wilk test. Intragroup comparisons of pain scores at different time intervals were performed using the Paired t-test, while intergroup comparisons between self-ligating and conventional bracket groups were analyzed using the Independent samples t-test. In addition, changes in pain scores across multiple time points were evaluated using Repeated Measures ANOVA to assess the effect of time, group, and time \times group interaction. A p-value of <0.05 was considered statistically significant.

Discussion:

During recent years Self ligating brackets have gained popularity due to their efficiency in alignment as well as reduced chair side time for the clinicians .Treatment duration as well as pain during orthodontic treatment has been constant area of concern for patient often discouraging them from opting treatment . The idea of increased alignment efficiency as well as reduced pain in self ligating bracket due its reduced friction has been an interest of study to various authors.

Harradine et al have suggested a reduced treatment time by 4months when using self- ligating brackets.²

Ehsani et al reported reduced friction and faster rate of tooth movement in turn decreases treatment time with self -ligating brackets⁶.

Jahanbin et al in their comparative study between self-ligating and conventional bracket concluded that during four month period faster alignment was seen with self-ligating bracket .⁷

In our study it was found after a period of 4 months self-ligating bracket group demonstrated greater reduction in irregularity and better alignment improvement compared to the conventional bracket group. This contemplates better alignment efficiency seen in early treatment months which can further help reduce treatment time.

While some studies have mentioned that there were no significant differences in pain experience with self-ligating and conventional bracket systems, but in contrast, others reported that patients treated with conventional appliances experienced higher levels of discomfort than self-ligating appliances during initial alignment. The aim of this study was to investigate differences in the degree of discomfort experienced during the initial phase of orthodontic therapy

Some studies report that self-ligating brackets might result in lower pain intensity during initial alignment phases, while others find no significant difference, highlighting individual variability and the influence of appliance design.⁴ It has been well documented that orthodontic pain begins 12h after applying orthodontic force, peaks after 1 day, gradually diminishes 3–7 days thereafter and returns to baseline levels after 1 month.⁵

As SLBs are considered to reduce friction ,they allow lighter forces to act and hence potentially reduces pain in the pulp and periodontal ligament.⁷

Pringle et al. conducted a study to evaluate pain perception associated with two fixed orthodontic bracket systems, namely Damon3 self-ligating brackets and Tru Straight CB conventional brackets, during the initial stage of tooth movement. Their findings demonstrated that patients treated with Damon3 self-ligating brackets experienced lower mean maximum pain intensity and significantly reduced overall pain levels compared to patients treated with Tru Straight CB brackets.⁸

In our study , the self-ligating bracket group consistently showed lower mean VAS pain scores than the conventional bracket group at almost all time intervals across the four months. The group effect was also found statistically significant, suggesting that patients treated with self-ligating brackets experienced

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significantly less pain overall compared to those treated with conventional brackets.

For the purpose of pain comparison on mastication not many earlier research has been studied. This comparison was done in our study again using the VAS scale and it was found that both bracket systems exhibited a similar pattern of decreasing pain over time; however, self-ligating brackets were associated with significantly lower pain scores during mastication. It was also noticed that during mastication the pain experienced was more at mastication than at regular intervals indicating masticatory load lead to increase pain .

Conclusion

Both self-ligating and conventional orthodontic brackets demonstrated significant improvement in dental alignment over the four-month treatment period. However, the self-ligating bracket group exhibited a greater reduction in Little's Irregularity Index, indicating more efficient alignment compared to the conventional bracket group.

With respect to pain perception, patients treated with self-ligating brackets consistently reported lower VAS pain scores both during mastication and at rest (resting conditions) across different time intervals when compared to those treated with conventional brackets. In both groups, pain was highest immediately following appliance activation and gradually decreased over time under both conditions.

Overall, the findings indicate that while both bracket systems are effective in achieving alignment, self-ligating brackets provide the advantages of enhanced early alignment efficiency along with reduced pain during mastication and at rest. Therefore, self-ligating brackets may be considered a more favorable option in terms of both treatment efficiency and patient comfort during the initial phase of orthodontic therapy.

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