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The Effect Of 3 Different Types Of Denture Adhesives On The Efficiency Of Well-Fitted Complete Dentures In Patients With Different Arch Forms – An In Vivo Study

Dr. Shubham Chelkar[1], Dr. Prashanth Shetty[2], Dr. Shruti Pocchi[3], Dr. M krishna kumari[4], Dr. Arindam Dalal[5], Dr. Lakshmi Dudala[6]

[1]Senior Lecturer, Department of Prosthodontics, Triveni Institute of Dental Sciences Hospital & Research Centre, Bilaspur, Chhattisgarh.

[2]HOD & Professor, Department of Prosthodontics, Triveni Institute of Dental Sciences Hospital & Research Centre, Bilaspur, Chhattisgarh.

[3]Senior Lecturer, Department of Prosthodontics, RRK Dental College, Akola, Maharashtra.

[4]Senior Lecturer, Faculty of Dentistry, AIMST University Malaysia.

[5]Senior Lecturer, Department of Prosthodontics, Triveni Institute of Dental Sciences Hospital & Research Centre, Bilaspur, Chhattisgarh.

[6]Senior Lecturer, Department of Prosthodontics, Triveni Institute of Dental Sciences Hospital & Research Centre, Bilaspur, Chhattisgarh.

Abstract: ***Objective****: This study aimed to evaluate the effect of three commercially available denture adhesives—Fixon powder, Fittydent cream, and Polygrip strips—on the functional performance and retention of well-fitted complete dentures in patients with varying maxillary arch forms (square, ovoid, and tapered). The primary metric was bite force until denture dislodgement (BFDD), complemented by subjective assessments of comfort, speech, mastication, and clinician evaluation.*

Materials and Methods*: A total of 30 edentulous patients were divided into three groups based on their arch form. Over a four-week period, denture performance was evaluated under four conditions: without adhesive (Week 1), with Fixon powder (Week 2), with Fittydent cream (Week 3), and with Polygrip strips (Week 4). Bite force was recorded using a strain gauge bite force transducer. Patient satisfaction and clinician evaluations were recorded at each interval. Data were analyzed using one-way ANOVA.*

Results*: All three adhesives improved denture retention compared to baseline (no adhesive). Fittydent cream demonstrated superior retention and patient satisfaction across all arch forms, with the highest BFDD values recorded in square arch patients. Ovoid and tapered arch forms also showed notable improvement, though the tapered group had comparatively lower scores due to limited surface contact area.*

Conclusion*: Denture adhesives significantly enhance the functional performance of complete dentures, with Fittydent cream offering the most promising results. Arch form plays a crucial role in baseline denture performance, and adhesives can compensate for anatomical limitations, particularly in tapered arches.*

Keywords*: Denture adhesives, complete denture, bite force, arch form, denture retention, denture stability*

INTRODUCTION

Edentulism remains a globally prevalent condition, particularly among the elderly population, significantly impacting oral function, aesthetics, and quality of life[1]. Complete denture therapy continues to be the principal modality of prosthodontic rehabilitation for such individuals. However, the success of this therapy largely depends on the retention and stability of the prostheses, which are governed by a multitude of anatomical and mechanical factors[2]. Among these, the maxillary arch form—commonly categorized as square, ovoid, or tapered—plays a crucial role in the seating, adaptation, and resistance of the denture to dislodging forces[3].

Square arch forms provide a broader and more uniform basal seat, which facilitates enhanced retention and support for complete dentures. The increased surface area ensures greater tissue contact, contributing to improved stability, even distribution of masticatory forces, and reduced dislodgement during function. In contrast, ovoid arch forms

provide a moderate surface area and balanced load distribution, while tapered arches are narrower in both anterior and posterior regions, presenting clinical challenges in achieving an effective peripheral seal and denture stability[4].
To address these challenges, denture adhesives are frequently employed as adjunctive aids. adhesives function by establishing a cohesive and adhesive interface between the denture base and the oral mucosa, thereby enhancing resistance to dislodging forces such as tension, shear, and compression[5].
The market offers several over-the-counter denture adhesives, including Fixon powder, Fittydent cream, and Polygrip strips, each differing in their chemical composition, viscosity, solubility, application method, and duration of effectiveness[6–7]. Their efficacy is often influenced by intraoral conditions, including salivary flow, mucosal resilience, and particularly the patient's arch form[8].
This study was designed to objectively and subjectively evaluate the role of these three denture adhesives in patients with varying maxillary arch forms. The primary objective was to quantify improvements in denture retention through measurement of bite force until denture dislodgement (BFDD), supplemented by patient-reported outcomes and clinical assessments. The goal was to determine the most effective adhesive for each arch form category, thereby aiding in evidence-based clinical decision-making for edentulous patients.

MATERIALS AND METHODS

This prospective in vivo study was conducted in the Department of Prosthodontics, Triveni Institute of Dental Sciences, Hospital and Research Centre, Bilaspur, Chhattisgarh. Ethical clearance was obtained from the institutional review board, and all participants provided informed consent. Thirty completely edentulous patients with well-fitting maxillary and mandibular dentures were enrolled. Dentures were evaluated and approved using the Kapur Index, with a minimum sum score of 6 (retention + stability). Patients with systemic disorders, xerostomia, neuromuscular issues, or misfit dentures were excluded. Patients were divided into three equal groups based on maxillary arch form, determined by clinical examination and stone cast measurements using the method described by Kawabe (fig1)

Group 1: Square Arch Form – Where the distance between canines is wider and posterior ridge are more parallel than the other types, and in addition, the curvature of anterior ridge is mild .
Group 2: Ovoid Arch Form – Where the distance between the canines is narrower and the curvature of the anterior ridge is more than square arch form.
Group 3: Tapered Arch Form – Where the distance of canines is narrower and the curvature of the anterior arch is more severe than other arches

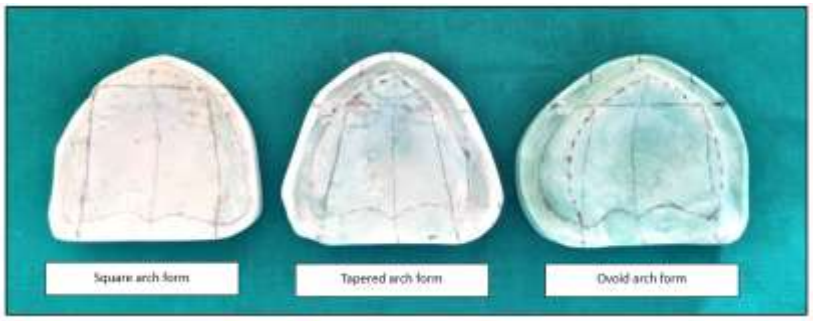

Fig 1- Different types of Arch form

Denture Adhesives Used:(fig 2)

- Fixon Powder (ICPA Health Products Ltd.) – A zinc-free adhesive powder.
- Fittydent Cream (Dr. Reddy's Laboratories) – A bio adhesive water-insoluble cream.
- Super Polygrip Strips (GlaxoSmithKline) – Pre-cut, moisture-activated adhesive strips.

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Fig 2- Different type of adhesive

Examination and Evaluation Timeline:

- **Week 1**: BFDD recorded for denture retention **without use of Adhesive**
- **Week 2**: BFDD recorded for denture retention **with Fixon powder** applied daily. (fig 3)
- **Week 3**: BFDD recorded for denture retention **with** Fittydent cream used as per manufacturer instructions. (fig 4)
- **Week 4**: BFDD recorded for denture retention with Polygrip strips applied daily (fig 5)

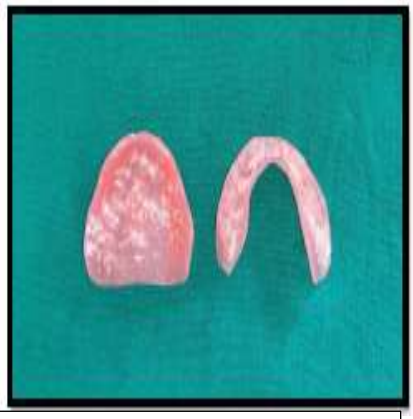

Fig 3 -Application of Fixon powder

Fig 4- Application of Fittydent paste

Fig 5- Application of Super Poligrip adhesive

Bite force until denture dislodgement

In this study, bite force measuring device is customized as strain gauge transducer-based bite force sensor (Monad Electronics, Gujarat (fig 6) . This device provides an objective assessment of the maximum occlusal force exerted by

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the patient while wearing dentures under different conditions**.**Each week, bite force until denture dislodgement (BFDD) was recorded using a **strain gauge transducer** positioned in the incisor region of the maxillary denture (fig 7) . Patients were instructed to bite down on the sensor with maximum force until the denture showed signs of dislodgement. Each patient underwent three bite force measurements under different conditions: Each patient underwent three trials per adhesive type; the average value was recorded (fig 8).

Fig 6- Strain gauge- bite sensor

Fig 7- incisal bite on strain gauge sensor

Fig 8 – measurement of BFDD with different adhesive

Subjective Evaluation:
Patients completed a Visual Analog Scale (VAS) questionnaire evaluating:

1. Retention- by asking the patient to rate how well the denture stays in place during daily use on a scale from 0 (very loose) to 5 (extremely retentive).
2. Chewing ability- by asking patients to rate their ability to chew various foods (soft, medium, hard).

3. Speech clarity; by asking patients to read aloud a paragraph with sibilants and fricatives (e.g., "She sells seashells...").
4. Comfort; VAS scoring by patient based on general comfort throughout the day.
5. Confidence- by asking about willingness to eat in public, smile, or socialize.

Clinician Evaluation:

1. **Condition of the Denture** – The clinician examines the **physical integrity** of the denture, checking for **any signs of wear, fractures, porosity, or surface roughness** that could affect retention, comfort, or hygiene.
2. **Stability of the Denture** – The **denture's resistance to movement** under functional and parafunctional forces is assessed. The clinician evaluates for **horizontal and vertical dislodgement** while the patient performs activities like chewing and speaking.
3. **Intraoral Basal Seat Examination** – The supporting tissues, including the **residual ridge, mucosa, and denture-bearing areas**, are inspected for **redness, irritation, pressure sores, or any signs of soft tissue trauma** caused by denture misfit.
4. **Phonetics Assessment** – The clinician evaluates the patient's **speech clarity and pronunciation**, focusing on **fricative and sibilant sounds** to determine if the denture affects articulation. Any **lisping, whistling, or altered speech patterns** are noted to ensure proper adjustments if required

Statistical Analysis:

Data were compiled and analyzed using SPSS version 20. One-way ANOVA was used to compare BFDD and subjective scores across the groups and weeks. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

The mean BFDD (bite force in denture dentate) values varied across the three maxillary arch forms —square, ovoid, and tapered—following the application of different denture adhesives. Among the adhesives evaluated, Fittydent cream consistently demonstrated the highest increase in bite force across all arch forms when compared to baseline values. In the square arch form, the mean baseline BFDD was recorded at 1.95 kgf, which increased to 3.62 kgf following the application of Fittydent cream. Similarly, for the ovoid arch form, baseline values of 1.82 kgf rose to 3.21 kgf post-application. The tapered arch form, which initially recorded the lowest mean baseline value of 1.54 kgf, showed an increase to 2.89 kgf with Fittydent cream. (Table 1) Polygrip strips demonstrated moderate enhancement in bite force across all arch forms but were consistently less effective than Fittydent. On the other hand, Fixon powder resulted in the least improvement in bite force in all arch configurations. Inter-group comparison within the same adhesive across the different arch forms revealed no statistically significant differences in bite force values ($p > 0.05$), suggesting that while adhesives improve bite force, the variation among different arch forms within a given adhesive group is not statistically meaningful (Table 1).

Patient Feedback:Patient-reported outcomes were assessed across all adhesive groups irrespective of arch form using a Visual Analogue Scale (VAS) to evaluate overall perceptions of retention, chewing efficiency, and comfort. Results show Fittydent scored highest in retention, chewing, and comfort (mean VAS score > 4.5). Polygrip followed, with Fixon showing the most frequent complaints regarding reapplication and slippage.

Clinician Observations:on clinician observation , Fittydent yielded superior mucosal adaptation and phonetic performance. Square arch patients required fewer adjustments, whereas tapered arch patients benefitted most from adhesive usage due to initial instability

Groups	Arch Forms	Mean	SD	F Value (ANOVA)	p Value
Without Adhesive	Squared	1.40	0.28	1.434	0.256
	Tapered	1.37	0.17		

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	Ovoid	1.25	0.14		
Fixon	Squared	2.18	0.15	0.880	0.426
	Tapered	2.15	0.10		
	Ovoid	2.10	0.14		
Fittydent	Squared	3.03	0.33	0.167	0.847
	Tapered	3.03	0.23		
	Ovoid	2.97	0.21		
Polygrip	Squared	2.70	0.34	0.049	0.952
	Tapered	2.68	0.24		
	Ovoid	2.72	0.25		

Table 1. Comparison of Bite Force Between Various Arch Forms

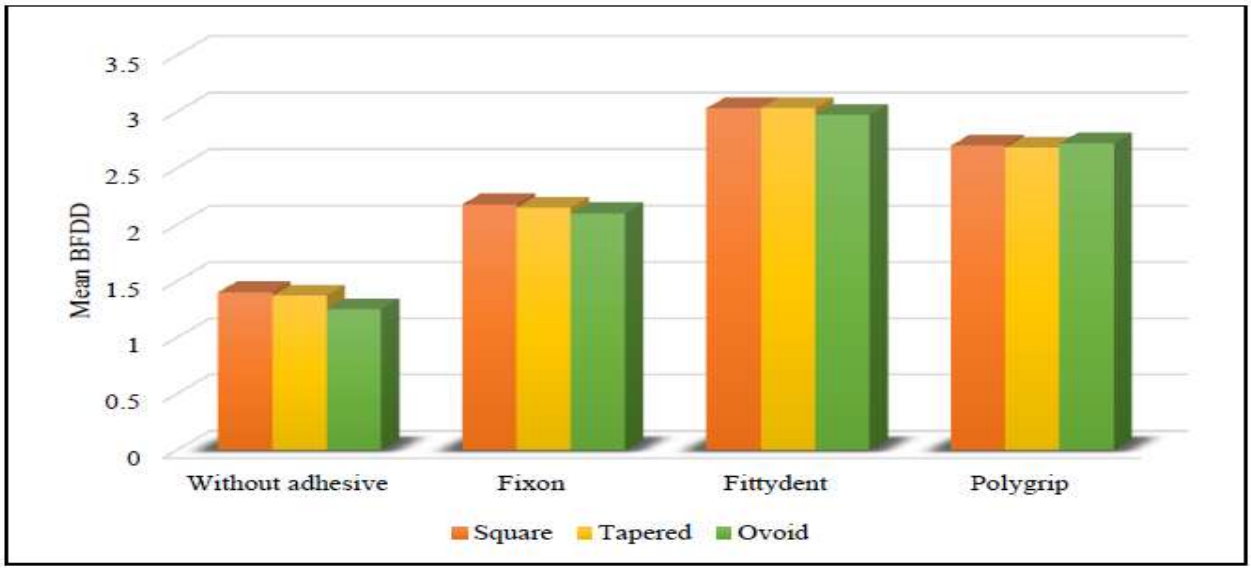

Chart 1. Comparison of bite force between various arch

Parameter	Fixon Powder	Fittydent Cream	Polygrip Strips
Retention	3.2	4.8	4.1
Chewing	3.0	4.7	4.0
Speech	3.1	4.6	3.9

Comfort	2.9	4.8	4.0
Confidence	3.0	4.9	4.1

Table 2- Patient Feedback (Mean VAS Score out of 5)

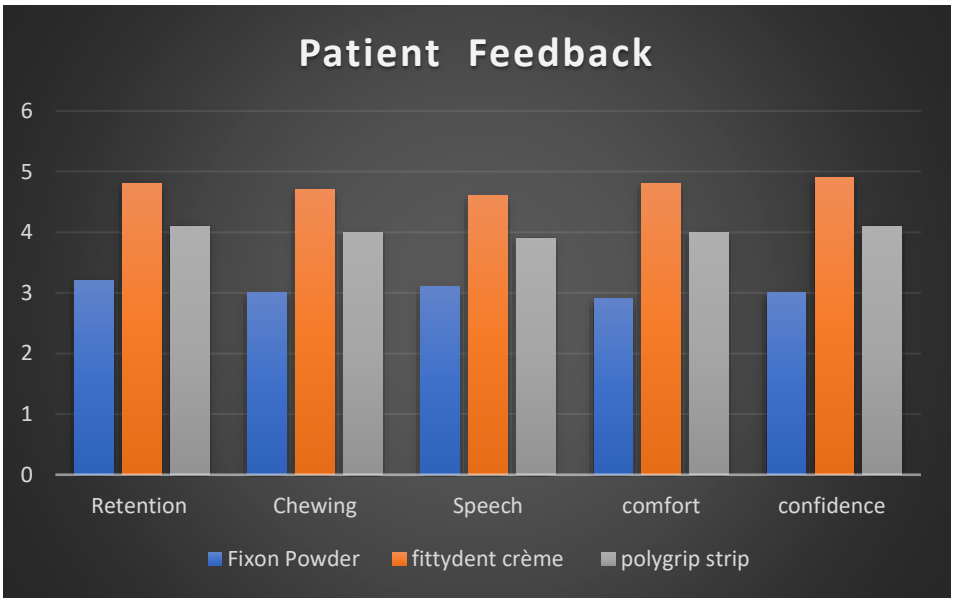

Chart 2 . Patient feedback using different adhesive

Parameter	Fixon Powder	Fittydent Cream	Polygrip Strips
Condition of the Denture	4.2	4.3	4.2
Stability of the Denture	3.5	4.5	3.7
Intraoral Basal Seat Examination	3.5	4.5	3.9
Phonetics Assessment	3.7	4.2	4.0

Table 3- Clinician Observations:(Mean VAS Score out of 5)

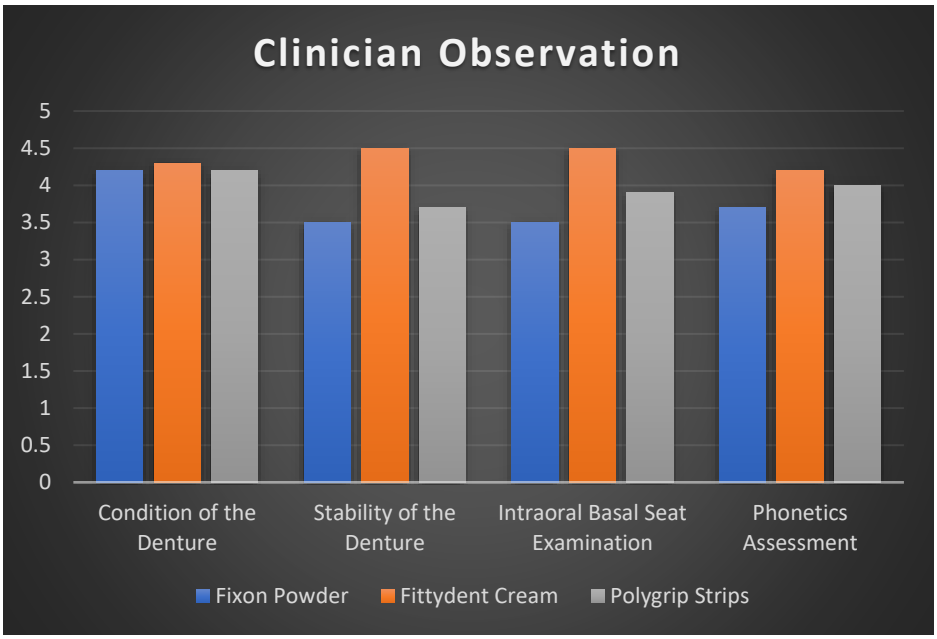

Chart 3- Clinician Observations:(Mean VAS Score

DISCUSSION

This study confirms the significant role of denture adhesives in enhancing the functional performance of complete dentures, particularly in improving retention, stability, and overall patient satisfaction. One of the primary influences on denture retention is arch form—with square arches offering superior support due to greater surface area, while tapered arches often require adhesive support due to limited basal seat[13–15]. The role of surface area is critical: a broader and flatter ridge in square arches provides more contact between the denture base and oral tissues, allowing better mechanical and adhesive retention[16]. Tapered arches, being narrow and sharply contoured, reduce the area for bonding and therefore depend more on adhesive assistance. Another vital factor is teeth setting configuration. Broader occlusal tables in square arches distribute occlusal forces more evenly, improving denture balance. In tapered arches, posterior teeth must often be set more narrowly, increasing tipping forces and destabilization. Proper adhesive use compensates for these limitations[17]. Among the adhesives tested, Fittydent cream stood out with the best results due to its PVA-based, water-insoluble formula that maintains retention throughout the day[18]. Its uniform coverage and lasting bond gave it a clear advantage. In contrast, Fixon powder, while cost-effective, showed reduced efficiency due to its granular texture and need for frequent reapplication[19]. Polygrip strips, although convenient, were limited by incomplete coverage and performed moderately[20]. Overall, adhesive choice should be guided by patient anatomy and functional demand. Particularly in compromised cases like tapered arch forms, high-performance adhesives like Fittydent significantly improve retention, comfort, and confidence[21].

Clinical Significance

Understanding the role of arch form in prosthetic retention allows clinicians to preemptively prescribe suitable adhesives. Square arches provide inherent retention advantages, but even they benefit from additional adhesive

support. Patients with tapered or ovoid arches, which naturally offer less resistance to dislodgement, may experience improved quality of life and functionality through adhesive use, especially Fittydent cream.

CONCLUSION

Within the limitations of this study, it can be concluded that:

- Denture adhesives significantly enhance denture retention, comfort, and patient satisfaction.
- Fittydent cream outperforms Fixon powder and Polygrip strips in all evaluated criteria.
- Adhesives are especially beneficial in overcoming anatomical limitations and should be considered part of routine denture care.

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