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Original Research

Comparing the impact of three denture adhesives on mandibular complete denture retention in diabetic patients

[1]Nishtha Mangla, [2]Nishtha Bhardwaj, [3]Aditi Singh, [4]Pooja Kesarwani

[1]BDS, Swami Devi Dyal Hospital and Dental Collage, Panchkula, Haryana, India;
[2]BDS, Dr. Harvansh Singh Judge Institute of Dental Science and Hospital, Chandigarh, India;
[3]4th Year BDS, Sarjug Dental College and Hospital, Darbhanga, Bihar, India;
[4]BDS, Rama Dental College Hospital and Research Centre, Kanpur, Uttar Pradesh, India

ABSTRACT:
Background: An Examination Comparing The Impact Of Three Different Denture Adhesives On The Secure Fit Of Lower Complete Dentures Among Individuals With Diabetes. **Methods**: In This Prospective Observational Research, Conducted At The Institute's Department Of Prosthodontics, Crown & Bridge, And Implantology, We Enlisted 60 Male Patients Who Were Completely Edentulous. Their Ages Ranged From 39 To 59 Years. We Utilized A Universal Testing Machine To Quantify The Forces Needed To Dislodge The Dentures. The Study Assessed The Retention Of Mandibular Complete Dentures Under Two Conditions: Without Adhesive And With The Application Of Three Distinct Denture Adhesives, Following A 2-Months Adaptation Period. **Results**: The Fittydent Adhesive Exhibited Notably Higher Dislodgement Values Compared To The Other Adhesives At 2-Hour Intervals. Through The Paired Student's T-Test, We Found A Highly Significant Difference ($P < 0.0001$) In Retention Levels For All Adhesive Types Compared To The Adhesive-Free Scenario Across All Time Intervals. **Conclusion**: In Summary, Our Study Leads To The Conclusion That The Use Of Denture Adhesives Enhances The Retention Of Complete Dentures. Notably, The Fittydent Adhesive Paste Demonstrated Superior Effectiveness In Enhancing Retention When Compared To The Protefix And Corega Adhesive Creams. Consequently, The Application Of Denture Adhesives Contributes To Increased Patient Satisfaction.
Keywords: Denture Adhesives, Mandibular, Diabetic Patients

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Corresponding author: Nishtha Mangla, BDS, Swami Devi Dyal Hospital and Dental Collage, Panchkula, Haryana, India

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INTRODUCTION

The Primary Objective Of Prosthetic Dentistry Has Consistently Been The Enhancement Of Retention And Stability, Crucial Factors That Directly Impact The Performance Of Removable Dental Prostheses. Those Who Wear Complete Dentures Frequently Encounter Issues Related To Varying Degrees Of Prosthesis Looseness, Leading To Complaints Of Discomfort, As Well As Potential Reductions In Masticatory Function And Speech Difficulties. Edentulous Patients Receiving Complete Dentures Often Report Experiencing Both Functional Disruptions And Psychological Distress [1,2].According To The Definition Provided By Zarb Et Al., The Term "Denture Adhesive" Encompasses Commercially Available, Safe-To-Use, Water-Soluble Substances That Are Applied To The Tissue-Contacting Surface Of Dentures. The Primary Purpose Of These Adhesives Is To Enhance Retention, Stability, And Overall Function Of The Dentures .[3]The Composition Of The Majority Of Denture Adhesives Remains Relatively Uniform. Stafford Et Al. Conducted A Study Identifying The Primary Components Of These Adhesives[4,5]. These Ingredients Can Be Categorized Into Three Main Groups. The First Group Comprises Substances That Demonstrate Swelling, Gelling, Or Dissolving Properties In Water, Resulting In Varying Degrees Of Viscosity. Examples Of Constituents In This Group Include Karaya Gum, Tragacanth Gum, Pectin, Gelatin, Methyl Cellulose, Hydroxymethyl Cellulose, Sodium Carboxymethyl Cellulose, As Well As Synthetic Polymers Like Polyethylene Oxide, Acrylamide, And Acetic Polyvinyl. The Second Group Involves Materials With Properties Acting As

Antiseptics, Antibacterials, And Antifungal Agents. Examples Include Hexachlorophene, Sodium Tetraborate, Sodium Borate, And Ethanol. The Third Group Encompasses Additional Components Serving As Fillers, Preservatives, Plasticizers, Flavorings, And Wetting Agents. In The Early Stages, Denture Adhesives Were Primarily Crafted From Vegetable Gums Like Acacia, Tragacanth, Or Karaya. These Gums Had The Ability To Absorb Water, Forming A Mucilaginous Layer Between The Denture-Bearing Tissue And The Denture Base. However, They Were Highly Soluble In The Mouth, Limiting The Effectiveness Of The Adhesive To A Relatively Short Duration[6].Denture Adhesives Serve Various Purposes In Dentistry, Finding Indications In A Range Of Clinical Scenarios. They Are Commonly Used During The Trial Phase Of Denture Fitting, For Patients Requiring Immediate Or Transitional Dentures, And In Cases Of Reconstruction Or Pre-Prosthetic Surgery. Additionally, Denture Adhesives Provide Psychological Support To Denture Wearers, Accommodate Compromised Oral Anatomies, Assist Physically Or Mentally Challenged Patients, Alleviate The Discomfort Of Xerostomia (Dry Mouth), And Support The Stability Of Osseointegrated Dental Implants.[6,7,] However, Certain Contraindications Should Be Considered, Making Them Unsuitable For Patients With Open Mouth Sores, Ill-Fitting Dentures, Known Allergies To Denture Adhesives, Or Damaged Dentures With Issues Like Broken Parts, Missing Flanges, Or Sectional Fractures. Despite Being Widely Accepted By Patients, The Dental Community Remains Cautious In Endorsing Over-The-Counter Denture Adhesive Products, With Ongoing Debates Surrounding Their Effectiveness, Recommended Usage, And Biocompatibility[8-10].

MATERIAL AND METHODS

This Prospective Observational Study Was Conducted Following Approval From Both The Protocol Review Committee And The Institutional Ethics Committee. The Research Involved A Cohort Of 60 Male Individuals Who Were Completely Edentulous, With Ages Spanning From 39 To 59 Years. The Inclusion Criteria For This Study Were Carefully Established To Ensure The Selection Of Suitable Participants. Firstly, Individuals With Controlled Type 2 Diabetes Were Included In The Research, Provided They Had Not Previously Worn Dentures. Furthermore, Patients Were Required To Possess Well-Rounded Mandibular Ridges Characterized By Firm And Healthy Mucosal Tissue, With No Indications Of Inflammation Or Flabbiness. Additionally, Normalcy In Terms Of Jaw Relationships, Tongue Size, And Temporomandibular Joint Function Was An Essential Criterion For Inclusion. These Stringent Criteria Helped Ensure That The Study Focused On A Specific Group Of Individuals Who Met The Necessary Health And Anatomical Prerequisites For The Research. The Exclusion Criteria For This Study Involved The Exclusion Of Two Specific Groups: Smokers And Patients Experiencing Xerostomia (Dry Mouth). All Participants Were Required To Provide Informed Consent Before Proceeding With Any Treatment. Subsequently, A Heat-Cured Acrylic Resin Complete Denture Was Individually Fabricated For Each Patient Using Standard, Conventional Methods[11,12].Patients Were Instructed To Wear And Adapt To Their New Dentures Over A Period Of One Month, As Part Of The Adaptation Phase. During This Study, Two Small Metal Tubes, Each With A Diameter Of 3 Millimeters, Were Strategically Positioned Just Beneath The Premolars Within The Mandibular Denture. These Metal Tubes Were Then Securely And Consistently Connected To Two Pins Located On A Horizontal Metallic Arm, Which Was Subsequently Affixed To A Universal Testing Machine. Following A 1-Month Adaptation Period For The Patient, Specific Instructions Were Provided For The Testing Phase[13,14]. The Patient Was Asked To Assume An Upright Seated Position, With Their Chin Firmly Supported By A Chin Rest On The Testing Machine. The Horizontal Bar Was Rigidly Linked To The Denture. Gradually, A Vertical Dislodging Force, Measured In Newtons, Was Applied By The Universal Testing Machine, With The Aim Of Assessing The Point At Which The Denture Became Dislodged. In This Study, The Testing Protocol Involved Conducting The Test Three Times To Ensure Accuracy, And The Average Of The Recorded Values Was Calculated During The Follow-Up Period. The Assessment Of Mandibular Complete Denture Retention Began After A 1-Month Adaptation Phase Without The Use Of Any Adhesive, Which Served As The Control Baseline.

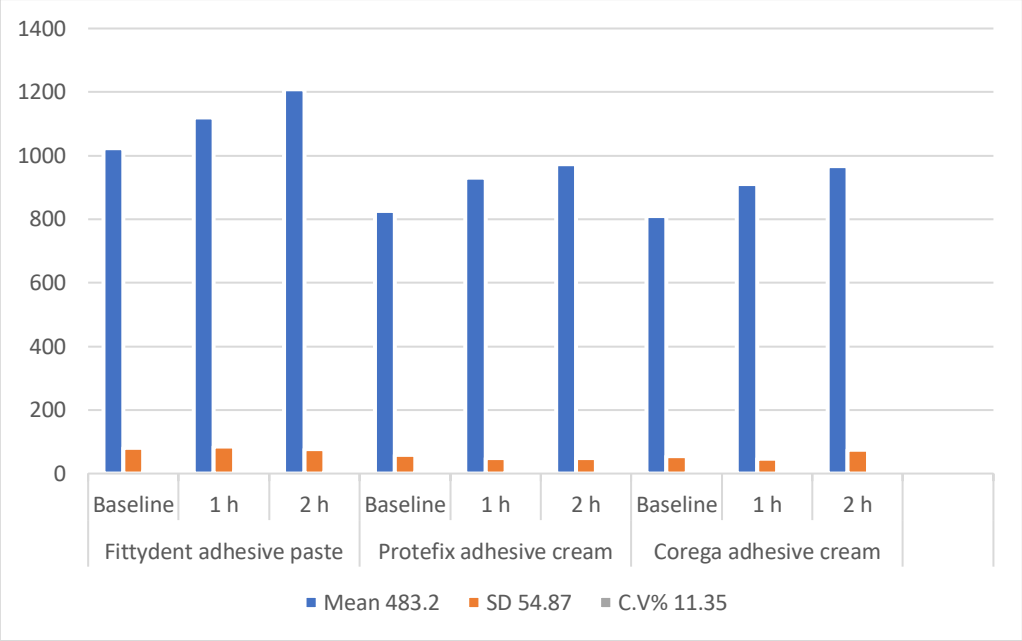
Subsequently, The First Adhesive Was Applied, And The Average Retention Values Were Recorded After 20 Minutes, 1 Hour, And 2 Hours. After Cleaning The Denture And Storing It In Water On The Second Day, The Second Adhesive Was Applied, And Retention Measurements Were Taken After The Same Time Intervals. This Process Was Repeated For The Third Adhesive On The Third Day, And The Respective Average Records Were Documented After The Specified Time Intervals. Once The Measurements Were Completed, The Small Metal Tubes Used For Testing Were Carefully Removed, And The Denture Underwent A Polishing Procedure Before Being Returned To The Patient For Regular Use. This Comprehensive Testing Procedure Allowed For A Thorough Evaluation Of The Retention Capabilities Of The Mandibular Complete Dentures With Different Adhesive Applications.

RESULTS

Al-Abdulla And Khamas, In Their Study, Observed And Analyzed The Dislodgement Forces Of A Poorly Fitted Mandibular Complete Denture. They Noted That Without The Application Of Any Denture Adhesive, The Mean Dislodgement Force Was At A Certain Level. However, With The Use Of Denture

Adhesives, There Was A Noticeable Increase In The Mean Dislodgement Forces. Furthermore, Their Findings Indicated That As The Duration Of The Experiment Increased, The Denture Adhesives Demonstrated An Even More Pronounced Improvement In Denture Retention[14,15]. This Suggests That The Use Of Denture Adhesives Not Only Increased Denture Retention But Also Showed A Positive Correlation With The Duration Of Their Application, Ultimately Enhancing The Performance Of Poorly Fitted Mandibular Complete Dentures.

FIG 1: Mean Dislodgement Forces In Grams Of Poorly Fitting Mandibular Complete Dentures Without Adhesive And At Various Time Intervals With The Use Of Denture Adhesives



The Fittydent Adhesive Stood Out With Notably Higher Dislodgement Values When Compared To The Other Denture Adhesives, Particularly After The 2-Hour Time Intervals. This Significant Difference Was Validated Through The Application Of A Paired Student's T-Test, Revealing A Highly Significant Statistical Result With A P-Value Less Than 0.0001. This Finding Indicated A Substantial Improvement In Denture Retention For All Types Of Adhesives Compared To Scenarios Where No Adhesives Were Used Across All The Observed Time Intervals.[16,17]Furthermore, The Study Employed Student's Paired T-Test To Make Precise Comparisons Between The Dislodgement Values Of The Three Distinct Denture Adhesives – Fittydent, Protefix, And Corega – At Various Time Intervals. The Results From These Comparisons Helped Provide A Comprehensive Understanding Of How Each Adhesive Performed Over Time And Relative To One Another In Terms Of Denture Retention. The Study's Results Unveiled A Highly Significant Difference, Denoted By A P-Value Less Than 0.0001, When Making Comparisons Between Fittydent And Protefix Denture Adhesives, As Well As Between Fittydent And Corega Denture Adhesives. These Findings Emphasize The Distinct Impact And Effectiveness Of Fittydent Compared To The Other Two Adhesives In Terms Of Denture Retention. However, Notably, There Was No Statistically Significant Difference Observed, Indicated By A P-Value Greater Than 0.05, When Comparing The Denture Retention Between Protefix And Corega Adhesive At The Baseline, 1-Hour, And 2-Hour Time Intervals. This Lack Of Significant Difference Implies That, In These Specific Time Intervals, Protefix And Corega Adhesives Displayed A Similar Level Of Denture Retention.

DISCUSSION

Retention Is A Crucial Aspect Of Denture Performance, Not Only For Functional Purposes But Also For The Psychological Well-Being Of Denture Wearers. When A Denture Can Easily Become Dislodged During Speech Or Chewing, It Can Lead To Significant Embarrassment And Even Psychological Distress. Retention Is Influenced By A Variety Of Factors, Including Adhesion, Cohesion, Surface Tension At The Interface, Mechanical Locking Into Undercuts, Peripheral Sealing, Atmospheric Pressure, And The Function Of Orofacial Musculature. To Address Issues Related To Denture Retention And Stability, Denture Adhesives Are Commonly Employed. In The Current Study, It Was Found That Denture Adhesives Had A Highly Significant Positive Impact On Denture Retention At All Observed Time Intervals ($P < 0.0001$). These Results Align With Previous Research Conducted By Salman, Confirming The Valuable Role That Denture Adhesives Play In Enhancing The Overall Retention

And Stability Of Complete Dentures. This Improvement In Retention Not Only Contributes To Improved Functionality But Also Offers Psychological Benefits By Reducing The Potential Embarrassment And Trauma Associated With Denture Dislodgment During Daily Activities Like Speaking And Chewing. Denture Adhesives Typically Consist Of Two Main Categories Of Components: Vegetable Gums Or Synthetic Polymers, Such As Carboxymethyl Cellulose And Polyvinyl Methyl Ether Maleate. These Ingredients Play A Critical Role In The Adhesive's Function. When The Adhesive Comes Into Contact With Saliva, It Begins To Absorb Water, And The Carboxymethyl Cellulose Component Undergoes A Transformation[18]. It Forms A Hydrated Material With Free Carboxyl Groups, Causing It To Swell Significantly Beyond Its Original Volume. This Swelling Action Serves To Eliminate Any Air Gaps That May Exist Between The Denture Base And The Underlying Tissue, Ultimately Enhancing The Adhesion And Stability Of The Denture. The Hydrated Material Generated By The Adhesive Not Only Expands But Also Adheres To Both The Fitting Surface Of The Denture And The Oral Mucosa. This Adhesive Interaction Serves To Elevate The Viscosity Of Saliva Within The Oral Cavity. These Combined Actions Contribute Significantly To The Enhanced Retention Of Complete Dentures.

Furthermore, The Presence Of Free Carboxyl Groups Resulting From The Wetting Of Adhesives Like Methyl Cellulose Or Hydroxyl Methyl Cellulose Is Critical. These Carboxyl Groups Have The Capability To Form Electrovalent Bonds, Resulting In Stickiness Or The Creation Of Robust Bioadhesive Forces. These Adhesive Forces Play A Pivotal Role In Improving The Overall Stability And Retention Of Dentures, Ensuring A More Secure Fit For Individuals Who Wear Them. The Three Types Of Denture Adhesives Used In This Study Demonstrated An Immediate And Progressive Increase In Denture Retention. Their Effectiveness Consistently Improved From The Baseline Measurement, With The Maximum Level Of Retention Achieved After 2 Hours Of Application. This Enhancement In Retention Was Attributed To The Fact That Saliva Could Not Effectively Flow Into The Space Between The Denture Base And Mucosa, A Phenomenon That Contributed To The Adhesives' Effectiveness. Moreover, As Time Elapsed, The Salivary Flow Decreased, Further Contributing To Improved Retention. Notably, Fittydent Stood Out With Higher Dislodgement Values, And This Difference Was Highly Significant ($P < 0.0001$) When Compared To Both Protefix And Corega Throughout All Observed Time Intervals. In Contrast, Protefix And Corega Exhibited No Statistically Significant Difference ($P > 0.05$) When Compared To Each Other Across All The Time Intervals. These Findings Highlight The Superior Retention-Enhancing Qualities Of Fittydent Compared To The Other Two Adhesives, Which Displayed Similar Retention Levels In This Study.

CONCLUSION

In Conclusion, Our Study Demonstrates That The Use Of Denture Adhesives Significantly Enhances The Retention Of Complete Dentures. Among The Three Types Of Adhesives Tested, Fittydent Adhesive Paste Emerged As The Most Effective In Improving Denture Retention When Compared To Protefix And Corega Adhesive Creams[19]. These Findings Underscore The Valuable Role Of Denture Adhesives In Enhancing Patient Satisfaction By Providing A More Secure And Stable Fit For Complete Dentures. The Improved Retention Not Only Contributes To Better Functionality But Also Reduces Potential Discomfort And Embarrassment, Thereby Positively Impacting The Overall Well-Being Of Denture Wearers.

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