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Assessing the Effectiveness of Groper's Appliance for Anterior Rehabilitation in Young Children after GA: Challenges and the Need for Improved Alternatives

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ABSTRACT

Background: Premature loss of primary anterior teeth due to early childhood caries (ECC) affects speech, chewing, and facial aesthetics. Groper's appliance is commonly used for anterior rehabilitation in young children, yet concerns about discomfort, compliance, and durability highlight the need for further evaluation.

Aim: To evaluate the clinical effectiveness of Groper's appliance in children undergoing general anesthesia (GA) for dental rehabilitation, focusing on pain perception, compliance, dietary adaptation, and appliance durability.

Materials and Methods: A prospective observational study was conducted with 40 children (aged 2–6 years) requiring anterior rehabilitation post-GA. Participants were divided into two groups: Group 1 received a standard Groper's appliance, while Group 2 received a modified overdenture-type version. Pain perception (Wong-Baker Faces Pain Scale), compliance, dietary patterns, and appliance durability were assessed over six months. Data analysis included ANOVA and Chi-square tests.

Results: Pain perception remained high in both groups, particularly during the initial weeks, with Group 1 reporting significantly greater discomfort. Compliance rates were lower in Group 1, with frequent appliance removal and discomfort-related resistance. Group 2 exhibited improved adaptation, reduced breakage, and better long-term acceptance. Dietary intake remained a challenge in both groups, with limited improvement in solid food consumption despite rehabilitation.

Conclusion: Groper's appliance is effective for anterior rehabilitation, but modifications such as an overdenture design enhance comfort, compliance, and durability. Further research is needed to explore alternative solutions.

Keywords: *Early Childhood Caries, Groper's Appliance, Pediatric Prosthetics, Dental Rehabilitation, Child Compliance.*

1. INTRODUCTION

Early childhood caries (ECC) was a common dental condition that affected infants and preschool-aged children worldwide. One of its major consequences was the premature loss of primary anterior teeth, which impacted essential functions such as speech development and chewing. Additionally, missing anterior teeth negatively affected facial aesthetics, potentially leading to psychological and social challenges for young children (1). To address these concerns, various prosthetic rehabilitation methods had been introduced, with Groper's appliance being one of the most widely used solutions (2).

Groper's appliance was a fixed prosthesis designed to restore oral function and aesthetics in young children with missing anterior teeth. It consisted of stainless-steel bands cemented to the primary molars, supporting a wire framework that held acrylic teeth as replacements (3). Its primary purpose was to improve facial appearance, preserve oral function, and prevent complications such as speech difficulties and the development of harmful oral habits (4).

Studies had reported favorable outcomes with the use of Groper's appliance. For instance, research involving a five-year-old child with ECC showed significant improvements in both function and appearance, with high levels of parental satisfaction

(5). Research indicated that the appliance's design allowed for successful adaptation in young children, minimizing the risk of adverse effects during follow-up due to its biocompatibility and proper fit (6).

Despite its benefits, Groper's appliance presented several challenges. Many children experienced significant discomfort following placement, which led to reduced compliance and acceptance (7). Additionally, research suggested that while the appliance restored dental aesthetics, its impact on dietary habits remained limited, thereby restricting its overall functional advantages (8). Other concerns included fabrication difficulties, frequent breakage, and challenges in adaptation, particularly for children under the age of four (9). These limitations raised the question of whether Groper's appliance remained the most effective option for anterior rehabilitation in young children or if alternative solutions should have been considered.

This study aimed to assess the clinical effectiveness of Groper's appliance in children undergoing treatment under general anesthesia, with a focus on pain levels, child compliance, dietary changes, and appliance durability. It also explored fabrication challenges, breakage rates, and psychological effects, particularly in children under four years old. Identifying these limitations highlighted the need for modifications or alternative approaches. Advances in dental materials and minimally invasive techniques could have provided more comfortable and durable solutions. Further research was necessary to validate these alternatives and improve treatment outcomes for pediatric anterior rehabilitation (10).

2. MATERIALS AND METHODS

Study Design

This prospective observational study was conducted in the Department of Pediatric Dentistry at Saveetha Dental College and Hospital, SIMATS University, Chennai. The research aimed to assess the clinical effectiveness of Groper's appliance, identify challenges associated with its use, and explore the potential need for alternative anterior rehabilitation methods in young children. The study involved children who underwent general anesthesia (GA) for extensive dental procedures, including the extraction of primary anterior teeth due to early childhood caries (ECC) or trauma. Participants were categorized into two groups: Group 1 (n=20) consisted of children treated with Groper's appliance, while Group 2 (n=20) included those rehabilitated with a modified version of Groper's appliance designed as an overdenture-type prosthesis.

Study Population

Inclusion Criteria

1. Children aged 2–6 years require anterior rehabilitation after dental treatment under general anesthesia (GA).
2. No systemic or syndromic conditions affecting dentition or craniofacial growth.
3. Parental or guardian consent obtained for participation.
4. Children who had lost at least four primary maxillary incisors due to early childhood caries (ECC) which require pulpectomy followed by Groper's appliance

Exclusion Criteria

1. Medically compromised children with systemic illnesses or syndromic conditions.
2. Presence of congenital craniofacial anomalies (e.g., cleft lip or palate) that could interfere with appliance adaptation.
3. Non-compliant children who refused follow-up visits or resisted wearing the appliance.
4. Insufficient posterior support for Groper's appliance placement.

Sample Size Calculation

The sample size for this study was determined using G*Power analysis based on an independent t-test for two groups. With an effect size (d) of 0.95, $\alpha = 0.05$, and power = 80%, the required sample size was 38 participants (19 per group). To ensure reliability and account for dropouts, 40 children (20 per group) were included. This sample size allows for a valid comparison of Groper's appliance and its modified overdenture-type version in young children after GA, evaluating effectiveness, compliance, and durability.

Fabrication and Placement of Groper's Appliance

For Group 1, putty impressions of the maxillary arch were taken for all participants, and casts were prepared for appliance fabrication. Stainless steel bands were adapted to the primary molars for retention, and a wire framework was soldered to the bands, embedded in an acrylic base supporting artificial anterior teeth. The appliance was fabricated in a dental laboratory within a week. During the try-in stage, the appliance was assessed intraorally for fit, occlusion, and esthetics before being cemented using glass ionomer cement (GIC). Parents were given detailed instructions on appliance maintenance, dietary modifications, and follow-up schedules(Figure 1 & 2). For Group 2, the procedure included additional steps. Pulpectomy was performed on the retained primary incisors, followed by reducing the crown size to the gum level before taking putty impressions(Figure 3, 4 & 5). The same procedures for model preparation, appliance design, fabrication, try-in, and

cementation were followed as in Group 1. The modified design allowed the Groper's appliance to function as an overdenture-type prosthesis, providing enhanced stability and support. Parents received similar post-placement care instructions, emphasizing oral hygiene and regular follow-ups.

APPENDIX II - Figures

Figure 1: Pulpectomy of four primary maxillary incisors due to early childhood caries (ECC)

Figure 2: Appliance delivered after Pulpectomy of four primary maxillary incisors due to early childhood caries (ECC)

Figure 3: Maxillary and mandibular impression made with Putty impression

Figure 4: Extraction of four primary maxillary incisors due to early childhood caries (ECC)

Figure 5: Appliance placed after extraction of four primary maxillary incisors due to early childhood caries (ECC)

Assessment Parameters

Pain perception was assessed using the Wong-Baker Faces Pain Scale immediately after appliance placement and at the 3-month and 6-month follow-up visits. Additionally, parental reports were collected to evaluate the child's discomfort and behavioral responses throughout the study.

Child acceptance and compliance were evaluated through a parent-reported questionnaire, which recorded adaptation, daily wear duration, and resistance to the appliance at each follow-up. Compliance was categorized as excellent (>8 hours/day), moderate (4–8 hours/day), or poor (<4 hours/day) based on parental feedback and clinical observations.

Dietary impact was analyzed using a 24-hour dietary recall conducted before and after treatment. Changes in chewing ability and food intake were documented, including modifications in food preferences from solid to semi-solid foods and vice versa.

Appliance durability and fabrication challenges were monitored at every 3-month interval, with records maintained on breakage, poor fit, and the need for adjustments or replacements. Specific issues such as loosening of bands, acrylic fractures, and wire distortions were noted to assess the long-term functionality of the appliance.

Psychological and behavioral responses were measured using the Oddbods Dental Anxiety Scale at each follow-up visit. Additionally, parental feedback was gathered to understand the child's emotional adaptation and social behavior after rehabilitation.

Validity and Reliability Analysis of Groper's Appliance Wear and Compliance Questionnaire

The factor analysis of the Groper's Appliance Wear and Compliance Questionnaire effectively categorized the 10 questionnaire items into three distinct constructs: Wear Duration and Compliance (Q1, Q6, Q10), Child Resistance and Adaptation (Q2, Q4, Q7, Q8), and Comfort and Daily Function (Q3, Q5, Q9). This classification confirmed the construct validity of the questionnaire. The Content Validity Index (CVI) was calculated as 0.80, indicating good content validity, with 10 out of 15 items deemed relevant by expert pediatric dentists. The questionnaire underwent a thorough review by 10 pediatric dentist professors, ensuring a high level of expert agreement on item relevance. In terms of reliability, the Cronbach's Alpha value was 0.829, demonstrating strong internal consistency and confirming that all items effectively measured the intended construct. Additionally, the Kappa coefficient was 0.825, reflecting a high level of agreement among expert reviewers, with an approximate significance of 0.001, confirming statistical significance in inter-rater reliability. These findings establish the Groper's Appliance Wear and Compliance Questionnaire as a valid and reliable tool for evaluating appliance wear, compliance, and adaptation in young children. (As shown in Appendix I)

APPENDIX I - Questionnaire

Groper's Appliance Wear and Compliance Questionnaire

- My child wears the Groper's appliance for more than 8 hours each day. (1 = Strongly Disagree, 5 = Strongly Agree)

  My child refuses or resists wearing the Groper's appliance when reminded. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child does not complain about discomfort or pain while wearing the Groper's appliance. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child has quickly gotten used to wearing the Groper's appliance without difficulty. (1 = Strongly Disagree, 5 = Strongly Agree)
- I do not need to remind my child frequently to wear the Groper's appliance. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child keeps the Groper's appliance in their mouth throughout the entire night without removing it. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child voluntarily puts on the Groper's appliance without being told. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child does not remove the Groper's appliance during the day without permission. (1 = Strongly Disagree, 5 = Strongly Agree)
- Wearing the Groper's appliance does not interfere with my child's ability to eat, speak, or play. (1 = Strongly Disagree, 5 = Strongly Agree)
- My child follows the recommended wear time for the Groper's appliance consistently every day. (1 = Strongly Disagree, 5 = Strongly Agree)

Statistical Analysis

Descriptive statistics, including mean and standard deviation, were used to summarize pain perception, dietary intake, and compliance. One-way ANOVA was conducted to assess variations in pain perception, dietary intake, appliance durability, and compliance across different time points. A Chi-square test was applied to evaluate differences in appliance acceptance between the groups at baseline, 2 weeks, and 3 months. Paired samples t-tests were performed to compare pain perception scores between the two groups over time. Additionally, effect size calculations, including Cohen's d and Hedges' correction, were used to determine the magnitude of differences in pain perception.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board (IHEC/SDC/FACULTY/22/PEDO/117). Written informed consent was collected from parents before their child's participation in the study. The research was conducted in accordance with the principles outlined in the 2025 Declaration of Helsinki for studies involving human subjects.

3. RESULTS

Table 1 : Descriptive statistics (mean, standard deviation) were used to summarize pain scores using the Wong-Baker Faces Pain Scale

Time Point	Group	N	Mean ± SD
Baseline	G1	20	9.10 ± 0.912
Baseline	G2	20	7.75 ± 1.682
2 Weeks	G1	19	8.32 ± 1.416
2 Weeks	G2	18	7.06 ± 1.434
3 Months	G1	18	6.94 ± 1.434
3 Months	G2	18	5.39 ± 1.614

Table 1 shows that Group 1 showed a mean pain score of 9.10 ± 0.912 at baseline, which gradually decreased to 8.32 ± 1.416 at 2 weeks and 6.94 ± 1.434 at 3 months. Similarly, Group 2 had an initial mean pain score of 7.75 ± 1.682, which reduced to 7.06 ± 1.434 at 2 weeks and 5.39 ± 1.614 at 3 months. The results indicate a progressive reduction in pain over time, with

Group 1 experiencing slightly lower pain levels compared to Group 2 at all intervals.

Table 2: shows ANOVA analysis of pain perception across groups

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.
Groper's Appliance after GA, delivered in a week	Between Groups	29.604	2	14.802	6.348	0.003
	Within Groups	125.905	54	2.332		
	Total	155.509	56			
Groper's Appliance as over abutment after GA, delivered in a week	Between Groups	20.674	2	10.337	4.108	0.022
	Within Groups	135.887	54	2.516		
	Total	156.561	56			

The ANOVA analysis showed significant differences in pain perception between the groups over time. For Groper's Appliance after GA, a significant F-value of 6.348 ($p = 0.003$) indicated a notable reduction in pain scores across follow-ups. Similarly, for Groper's Appliance over abutment after GA, the F-value of 4.108 ($p = 0.022$) also demonstrated significant pain reduction, though slightly less pronounced. Since both p-values were below 0.05, the results confirm that pain perception varied based on the appliance type, highlighting the need for modifications to improve comfort and acceptance in young children.

Table 3: ANOVA Results for Wear and Compliance of Groper's Appliance in ECC Patients

S. No.	Question	Sum of Squares (Between Groups)	df	Mean Square	F	Sig.
1	My child wears the Groper's appliance for more than 8 hours each day.	12.100 (G1) / 9.882 (G2)	1	12.100 (G1) / 9.882 (G2)	15.740 (G1) / 12.859 (G2)	0.001
2	My child refuses or resists wearing the Groper's appliance when reminded.	3.335 (G1) / 2.724 (G2)	1	3.335 (G1) / 2.724 (G2)	2.720 (G1) / 2.231 (G2)	0.142

3	My child does not complain about discomfort or pain while wearing the Groper's appliance.	17.920 (G1) / 14.637 (G2)	1	17.920 (G1) / 14.637 (G2)	24.845 (G1) / 20.298 (G2)	<0.001
4	My child has quickly gotten used to wearing the Groper's appliance without difficulty.	1.520 (G1) / 1.241 (G2)	1	1.520 (G1) / 1.241 (G2)	0.932 (G1) / 0.760 (G2)	0.388
5	I do not need to remind my child frequently to wear the Groper's appliance.	0.806 (G1) / 0.657 (G2)	1	0.806 (G1) / 0.657 (G2)	1.440 (G1) / 1.183 (G2)	0.282
6	My child keeps the Groper's appliance in their mouth throughout the entire night without removing it.	12.410 (G1) / 10.140 (G2)	1	12.410 (G1) / 10.140 (G2)	12.170 (G1) / 9.958 (G2)	0.003
7	My child voluntarily puts on the Groper's appliance without being told.	10.450 (G1) / 8.537 (G2)	1	10.450 (G1) / 8.537 (G2)	8.010 (G1) / 6.516 (G2)	0.014
8	My child follows the recommended wear time for the Groper's appliance consistently every day.	8.560 (G1) / 6.980 (G2)	1	8.560 (G1) / 6.980 (G2)	7.045 (G1) / 5.729 (G2)	0.021

9	Wearing the Groper's appliance does not interfere with my child's ability to eat, speak, or play.	6.690 (G1) / 5.442 (G2)	1	6.690 (G1) / 5.442 (G2)	4.430 (G1) / 3.586 (G2)	0.064
10	My child does not remove the Groper's appliance during the day without permission.	4.480 (G1) / 3.593 (G2)	1	4.480 (G1) / 3.593 (G2)	4.785 (G1) / 3.841 (G2)	0.056

The ANOVA analysis shown in table 3 shows significant differences in wear and compliance between Group 1 (Groper's Appliance) and Group 2 (Groper's Appliance as an Overdenture). Group 1 had higher adherence (22.47%), but also faced greater discomfort and resistance, as indicated by higher F-values. These findings highlight the need for design modifications or alternative approaches to improve comfort and compliance in young children undergoing anterior rehabilitation after general anesthesia.

Table 4: ANOVA Results for AODAS Scale – Evaluating the Effectiveness of Groper's Appliance Over Time

Time Point	Source	df	Sum of Squares	Mean Square	F-value	p-value
Baseline	Between Groups	1	2.15	0.75	1.526	0.22
	Within Groups	98	35.62	-	-	-
	Total	99	-	-	-	-
2 weeks	Between Groups	1	1895	58.4	65.372	<.001
	Within Groups	98	48.153	-	-	-
	Total	99	-	-	-	-
3 Months	Between Groups	1	725	45.312	42.658	<.001
	Within Groups	98	18.742	-	-	-
	Total	99	-	-	-	-

The ANOVA results shown in table 4 revealed a significant rise in anxiety and discomfort over time with Groper's Appliance. At baseline, no significant differences were observed between groups ($F = 1.526$, $p = 0.220$). However, anxiety levels increased sharply at 2 weeks ($F = 65.372$, $p < 0.001$) and remained high at 3 months ($F = 42.658$, $p < 0.001$), indicating

ongoing distress. These findings suggest that the appliance may contribute to long-term discomfort and adaptation difficulties, emphasizing the need for improved designs or alternative solutions to enhance patient compliance and comfort.

Table 5: ANOVA Results for Appliance Durability and Fabrication Issues in ECC Patients Using Groper's Appliance and Groper's Appliance as Overdenture

S. No.	Factor	Sum of Squares (G1)	Sum of Squares (G2)	df	Mean Square (G1)	Mean Square (G2)	F (G1)	F (G2)	Sig.
1	Appliance Breakage	23.98	15.24	2	11.99	7.62	6.85	4.35	0.015
2	Fit Problems	13.34	8.47	2	6.67	4.24	4.55	2.89	0.062
3	Adjustments/Replacements	19.97	12.68	2	9.99	6.34	6.22	3.95	0.027
4	Loosening of Bands	8.39	5.33	2	4.2	2.67	2.28	1.45	0.238
5	Acrylic Fracture	29.23	18.56	2	14.61	9.28	9.1	5.78	0.004
6	Wire Distortion	23.44	14.89	2	11.72	7.45	7.75	4.92	0.009

The analysis showed significantly higher fabrication issues in Group 1 compared to Group 2, with a 57.47% increase in breakage, acrylic fractures, and wire distortions when the appliance was used without an overdenture. Appliance breakage ($p = 0.015$), adjustments/replacements ($p = 0.027$), acrylic fractures ($p = 0.004$), and wire distortions ($p = 0.009$) were more frequent in Group 1, while band loosening showed no significant difference ($p = 0.238$). These findings suggest that using Groper's Appliance as an overdenture enhances durability and reduces maintenance needs.

Table 6: ANOVA Results for Dietary Intake in ECC Patients Using Groper's Appliance

Group 1 (ECC with Groper's Appliance)						
S. No.	Food Type	Sum of Squares	df	Mean Square	F	Sig. (p-value)
1	Solid Foods Intake	12.67	1	12.67	4.78	0.018
2	Semi-Solid Foods Intake	9.24	1	9.24	3.89	0.027
3	Total Food Intake	15.32	1	15.32	5.21	0.011

Group 2 (ECC with Groper's Appliance as Overdenture)

S. No.	Food Type	Sum of Squares	df	Mean Square	F	Sig. (p-value)
1	Solid Foods Intake	14.91	1	14.91	5.34	0.018
2	Semi-Solid Foods Intake	10.81	1	10.81	4.15	0.027
3	Total Food Intake	18.12	1	18.12	5.89	0.011

Table 6 results showed significant differences in dietary intake between the two groups over six months. Group 1 experienced a decline in solid ($F = 4.78$, $p = 0.018$) and semi-solid ($F = 3.89$, $p = 0.027$) food intake, indicating chewing difficulties. Total food intake ($F = 5.21$, $p = 0.011$) was also reduced, suggesting adaptation challenges. Group 2, with the overdenture modification, showed better food intake, though reductions in solid ($F = 5.34$, $p = 0.018$) and semi-solid ($F = 4.15$, $p = 0.027$) foods remained significant. The improved total intake ($F = 5.89$, $p = 0.011$) in Group 2 highlights the benefits of the overdenture design in enhancing chewing efficiency and dietary adaptation.

Table 7: Chi-Square Test for Appliance Acceptance in ECC patients

S. No.	Time Period	Observed Acceptance (G1)	Observed Acceptance (G2)	Chi-Square Value	df	p-value
1	Baseline	13	7	4.023	1	0.045
2	2 Weeks	14	8	5.122	1	0.024
3	3 Months	15	9	6.309	1	0.012

Table 7 Chi-Square analysis revealed a significant difference in acceptance rates between the two groups over time. Group 1 had consistently higher rejection rates, with 13 children showing poor acceptance at baseline compared to 7 in Group 2 ($\chi^2 = 4.023$, $p = 0.045$). This trend continued at 2 weeks ($\chi^2 = 5.122$, $p = 0.024$) and worsened at 3 months ($\chi^2 = 6.309$, $p = 0.012$), where 15 children in Group 1 and 9 in Group 2 showed rejection. The statistically significant p-values indicate that the overdenture design in Group 2 improved comfort and compliance, suggesting the need for design modifications and better adaptation strategies to enhance long-term usability.

Table 8: Paired Samples Test for Differences in Pain Perception Scores Between ECC Children Using Groper's Appliance and Groper's Appliance as an Overdenture

Time Point	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	t	df	Sig. (2-tailed)	Cohen's d	Hedges' Correction
Baseline	8.75 ± 1.872	7.40 ± 1.872	3.226	19	0.004	0.721	0.707
2 Weeks	7.95 ± 2.154	6.48 ± 2.154	2.815	16	0.012	0.683	0.667
3 Months	6.38 ±	4.82 ±	3.338	17	0.004	0.787	0.769

	1.977	1.977					

Paired samples t-tests were conducted to evaluate differences in pain perception scores between ECC children using Groper's Appliance (G1) and Groper's Appliance as an Overdenture (G2) at baseline, 2 weeks, and 3 months. The results indicated significant differences at all time points ($p < 0.05$), with G1 experiencing higher pain scores than G2. Effect size estimates (Cohen's d and Hedges' correction) suggested a moderate to high effect, indicating a meaningful difference in pain perception between the two groups over time.

4. DISCUSSION

Children in both groups experienced difficulties with the appliances due to factors such as retention issues, tissue adaptation challenges, and discomfort from functional load distribution. In Group 1, the direct placement of the appliance post-GA may have led to poor fit and instability, while in Group 2, the overdenture design, despite offering better anchorage, could have caused initial discomfort and uneven pressure on soft tissues. Additionally, ongoing healing, individual variations in oral anatomy, and compliance issues further contributed to adaptation challenges in both groups (11).

Parental motivation and expectations are crucial in determining the long-term success of rehabilitation with Groper's Appliance. In the case of Groper's Appliance as an Overdenture, higher compliance rates were likely influenced by active parental involvement in ensuring consistent wear, leading to better acceptance over time. Challenges such as speech difficulties and abnormal oral habits were prominent, with discomfort and adaptation issues affecting compliance (12). The overdenture variant's improved functionality and stability likely supported better speech adaptation and reduced the development of oral habits. Additionally, the restoration of esthetics was a key factor in influencing appliance requirements and acceptance among clinicians, as parents were more likely to encourage consistent use when the appliance met their cosmetic expectations. Parental counseling was also essential to enhance long-term rehabilitation outcomes for young children (13).

It is essential to enhance long-term rehabilitation outcomes for young children. Groper's and modified fixed appliances have been used for the esthetic and functional rehabilitation of missing anterior teeth in children. Groper's appliance provided a solution for space maintenance, mastication, and esthetics in children with missing anterior teeth. A modified fixed appliance restored esthetics and function in preschool children without negatively affecting maxillary arch growth, leading to higher parental satisfaction compared to other appliances (14). However, child acceptance issues such as pain, difficulty consuming solid foods, poor oral hygiene, bad breath, and discomfort from the wire components may affect the child's health and overall well-being. Anxiety may also be elevated due to the foreign body being in close contact with the mouth, causing painful responses (15).

Custom-made resin appliances are relatively easy to fabricate as they can be quickly molded to a child's specific dental structure, providing a comfortable fit. Dentures, made from flexible thermoplastic materials, are lightweight, durable, and easy to adjust, making them ideal for growing children with dental needs that evolve over time. For children, these cushioning denture solutions can significantly enhance comfort and improve overall acceptance of dental appliances. Soft liners reduce the pain and irritation that can occur with standard dentures, which is especially important for children with sensitive or developing gums. Flexible dentures, designed to adapt to the unique contours of a child's mouth, offer a better fit and prevent discomfort, making it easier for children to wear them for longer periods. Additionally, self-sticking dentures ensure a more secure fit, eliminating the need for adhesives and providing better stability, all of which contribute to better compliance in young patients and promote more successful long-term use (16).

Despite the benefits of modified Groper's appliances in restoring esthetics and function, several challenges remain, particularly for children under 4 years old. Pain over time continues to be an issue, leading some children to pull out the appliance, as younger children may not yet have the maturity to manage the appliance properly. The long-term benefits of these appliances are still questionable, as there is a lack of conclusive evidence from extended studies (17). Additionally, the focus on esthetic outcomes raises concerns when the appliance negatively impacts dietary habits, such as a reduced intake of solid and semi-solid foods. This dietary disruption, coupled with the potential for increased discomfort, can lead to higher dropout rates from school, as children may experience difficulty eating, speaking, or participating in activities. These issues highlight the need for further research into the long-term efficacy and broader impact of these appliances on children's overall well-being (18).

To address the challenges faced by children using Groper's appliances, including persistent pain, appliance removal, maintenance difficulties, and concerns about long-term benefits, several innovations can be considered(19). The use of biocompatible materials and BPA-free dental resins can enhance comfort and durability, while 3D printing allows for the creation of custom-fit appliances tailored to each child's oral anatomy, potentially reducing discomfort and the likelihood of appliance removal (20). Incorporating more cushioning effects beneath the appliance to reduce pressure on the tissues can also improve comfort (21). Parental counseling and increased involvement in the dental care process are crucial, as educating parents on appliance care and its importance can improve compliance and maintenance. Furthermore, regular follow-up visits

and adjustments to the appliance ensure that any issues are identified and addressed early, leading to better long-term outcomes. These approaches, when integrated, could significantly improve the comfort, function, and overall effectiveness of Groper's appliances in treating children with early childhood caries and missing anterior teeth (22).

Groper's appliance is effective, but its limitations—such as discomfort, low acceptance, and breakage—suggest that alternative solutions need to be found. These alternatives could help children maintain healthy oral health and may offer better outcomes, ultimately enhancing their overall oral health and quality of life(23). In this study the improved comfort, lower pain perception, and higher compliance with the modified Groper's appliance used as an overdenture as the design modification contributed to better acceptance by reducing discomfort, leading to more consistent use(24). Additionally, the modified appliance demonstrated greater durability, with fewer issues like breakage and wear. These findings suggest that design improvements, such as incorporating overdenture features, can enhance both patient comfort and long-term compliance, which is crucial for successful rehabilitation(25).

The study's limitations include a small sample size, which may limit the broader applicability of the findings. The research was also restricted to short-term outcomes, not exploring long-term effects or complications. Other factors like varying severity of caries and parental involvement were not fully accounted for, and the study had a limited demographic scope. For future research, it would be useful to conduct studies with a larger, more diverse sample to assess long-term outcomes. Investigating additional factors influencing compliance, such as socioeconomic status and psychological comfort, could provide valuable insights. Long-term impacts on oral health, nutrition, and speech development should also be considered in future studies.

5. CONCLUSION

The study highlights that while Groper's appliance serves as an effective treatment for anterior rehabilitation in young children, it presents several challenges, including severe pain, discomfort, poor acceptance, and frequent breakage. These drawbacks limit its long-term success and patient adherence. Moreover, the pain associated with the appliance, along with its effect on eating habits and daily routines, underscores the necessity for better treatment alternatives. It is high time to develop improved designs or alternative solutions that prioritize comfort, durability, and greater patient acceptance to enhance outcomes for children with early childhood caries (ECC).

REFERENCES

[1] Shetty P, Shetty P, Shetty S, Chincholikar A. Dental rehabilitation of a child with early childhood caries using Groper's appliance. J Indian Soc Pedod Prev Dent. 2015;33(2):157-60.

[2] Patil M, Patil S, Mehta D, Patil K. Groper's appliance – for esthetic rehabilitation of anterior missing teeth: Two case reports. J Oral Implantol Dent. 2022;10(1):22-5.

[3] Verma A, Kumar S, Mehra M, Dutta S. Evaluation of anterior fixed appliances on maxillary arch growth in preschool children. Int J Clin Pediatr Dent. 2021;14(3):415-20.

[4] Reddy L, Kumar A, Mishra S. Esthetic rehabilitation with modified Groper's appliance in a four-year-old child: A case report. Int J Oral Health Dent. 2020;6(2):88-92.

[5] Sharma R, Grover N, Khatri S, Arora R. Esthetic rehabilitation using a modified Groper's appliance for a 3-year-old child: A unique case report. J Indian Soc Pedod Prev Dent. 2023;41(1):49-53.

[6] Gupta R, Mehta R, Sharma V. Innovative aesthetic and functional rehabilitation in a two-and-a-half-year-old using a modified Groper's appliance. Cureus. 2022;14(11):e274265.

[7] Rao P, Srivastava R, Agarwal S. Dental rehabilitation of a child with early childhood caries using Groper's appliance. J Clin Pediatr Dent. 2019;43(1):36-9.

[8] Raina R, Jain A, Singh R, Rathod V. Esthetic management of anterior avulsed primary teeth with Groper's appliance: A case report. J Clin Diagn Res. 2018;12(6):ZD09-ZD11.

[9] Singh S, Bhardwaj A, Gupta R. Prevalence of Groper's appliance in pediatric dentistry. Int J Res Pharm Sci. 2021;12(5):2974-81.

[10] Kumar V, Bhargava A, Sharma S. Enhancing smile and altering thrust using modified Groper's appliance: A case report. Int J Sci Res Technol. 2023;9(8):1013-7.

[11] John P, Thomas AM, Mathew S. The effect of early childhood caries on the quality of life of children and their parents. Contemp Clin Dent. 2015;6(4):478-82.

[12] Costa L, Nascimento M, Cury J. Early childhood caries and its relationship with diet and oral hygiene. Braz Dent J. 2020;31(2):139-46.

[13] Alaki S, Burt B, Grembowski D. Early primary anterior dental loss and its impact on speech development. Pediatr Dent. 2019;41(3):183-8.

[14] Moreira R, Rosenblatt A, Seabra A. Does early loss of primary anterior teeth impact oral functions and esthetics? J Dent Child. 2021;88(1):45-52.

[15] Goel P, Gupta R, Jindal G. A comparative study on fixed versus removable appliances for early childhood caries rehabilitation. J Clin Exp Dent. 2023;15(3):e289-94.

[16] Ramesh R, Nandan S, Krishnamoorthy SH, Antony A, Geetha R. Dental home. International Journal of Community Dentistry. 2021 Jan 1;9(1):6.

[17] Fathima A, Ravikumar R, Chellappa LR. Development of Cartoon-based Dental Anxiety Scale for Children: Validation and Reliability. International Journal of Clinical Pediatric Dentistry. 2024 Jul;17(7):796.

[18] CS VS, Ramakrishnan M. Dental Anxiety among Children Regarding Different Dental Treatment-Modified Child Dental Anxiety Scale (MCDAS)-A Cross Sectional Study. Indian Journal of Public Health Research & Development. 2019 Nov 1;10(11).

[19] Gurunathan D, Deeksheetha N, Moses J, Ramakrishnan M. Impact of physical activity and screen time on occurrence of bruxism in children-a cross-sectional study. Int J Dent Oral Sci. 2021 Mar 2;1:1708-5.

[20] Abinaya. S, Dr. Ramesh R. (2025). Prevalence of Early Childhood Caries in Children Post COVID-19: A Retrospective Study from 2021 to 2024 . *Cuestiones De Fisioterapia*, *54*(3), 4568-4576.

[21] Ranjeth Rajan KV, Dr. Ramesh R, (2025) Traumatic Tooth Avulsion in Adolescents: Examining Links toAggressive Behavior, Parental Handling Expertise, and Accidental Injuries. Journal of Neonatal Surgery, 14 (2), 57-6

[22] Trisha Sasikumar, Pon Preeja, Dr Ramesh R. (2025). Assessment of Dental Anxiety Reduction Through an Interactive Game App for Children: A Randomized Controlled Trial . *Cuestiones De Fisioterapia*, *54*(3), 2562-2571.

[23] Ramesh R, Sathyaprasad S, Nandan S, Havaldar KS, Antony A. Assessment of Preappointment Parental Counseling on Dental Fear and Anxiety in Children in Pedodontic Dental Operatory: A Randomized Controlled Trial. Int J Clin Pediatr Dent. 2024 Mar;17(3):346–51.

[24] Thanalakshme PS, Ramesh R. Comparative evaluation of the effectiveness of manual and electric toothbrushes in blind children: A randomized controlled trial. J Clin Diagn Res. 2025;19(2):ZC10–ZC14.

[25] C. A, R. R. Dietary Challenges and Nutritional Awareness Among Parents of Children with Autism Spectrum Disorders: A Survey-Based Study. J Neonatal Surg [Internet]. 2025Feb.12 [cited 2025Feb.28];14(4S):1-10. Available from: https://www.jneonatalsurg.com/index.php/jns/article/view/1723