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Comparative Evaluation of Patient Comfort and Operator Acceptance of Mouth-Opening Devices in Pediatric Restorative and Endodontic Procedures

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ABSTRACT:
Adequate mouth opening and effective moisture control are essential prerequisites for safe and efficient restorative and endodontic treatment in children. However, achieving this is often complicated by children's limited cooperation and the risk of involuntary or sudden mouth closure, which can pose safety risks to both the patient and the operator. Mouth-opening devices are commonly used to address this challenge, but their acceptability from both the patient's and operator's perspectives has not been well established.This study compared three mouth-opening devices—a mouth prop with ejector, a plain mouth prop, and a mouth gag—in 30 children aged 5–8 years, with 10 children assessed per device group. Each device was used to maintain the operative field during restorative and endodontic procedures. Following the procedure, patient comfort and operator acceptance were evaluated for each device used.The mouth prop with ejector was associated with the highest patient comfort, rated comfortable by 80% of children, followed by the plain mouth prop at 60%. In contrast, the mouth gag was poorly tolerated, with 60% of children rating it intolerable. Operator acceptance showed the opposite pattern: the mouth gag received the highest acceptance (90% high acceptance)These findings highlight a clear trade-off between patient comfort and operator convenience when selecting mouth-opening devices for pediatric dental procedures. Devices that combine mouth opening with saliva evacuation, such as the mouth prop with ejector, may offer a practical balance between these competing priorities.

KEYWORDS: Mouth-opening devices; mouth prop; mouth gag; saliva ejector; pediatric dentistry

I. INTRODUCTION

Surgical field isolation is a fundamental requirement of pediatric dental practice. Adequate and sustained mouth opening allows the operator to achieve the visibility, access, and moisture control necessary for restorative and endodontic procedures, and isolation systems that combine mouth opening with continuous fluid evacuation have been reported to improve both procedural efficiency and patient-reported comfort during restorative treatment[1,2].

Achieving this in children, however, presents a difficulty distinct from adult practice. Limited cooperation whether due to age, anxiety, or fatigue makes it difficult for many children to maintain voluntary mouth opening for the duration of a procedure. Behavior-guidance and physically assistive techniques used to manage this difficulty are not uniformly accepted by children or their parents, and acceptability varies considerably across techniques and age groups[3], underscoring the need for approaches that are both clinically effective and well tolerated.

A related and clinically important concern is the safety risk posed by sudden, involuntary clenching or closure of the mouth during active instrumentation. Such closure endangers both the child, through soft-tissue or dental trauma, and the

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operator, through instrument-related injury. Devices intended to maintain a fixed mouth opening are commonly used to mitigate this risk, although prolonged maximal mouth opening imposed by such devices is not itself free of risk.

Notably, sustained maximal mouth opening with a mouth prop has been shown to narrow the upper airway and may itself pose a respiratory risk, particularly with prolonged use[4], which highlights that the choice and duration of use of a mouth-opening device should be considered as a clinical safety decision and not merely a matter of operator convenience.

Children also present specific anatomical challenges: the smaller oral cavity and restricted access inherent to pediatric anatomy reduce the field of vision available to the operator, compounding the difficulty of working safely and efficiently. Mouth-opening devices help counter this by maintaining a stable, reproducible operative field independent of moment-to-moment patient cooperation, which is particularly valuable during multi-step restorative and endodontic sequences.

Moisture control is equally critical to procedural success. Adequate isolation from saliva is essential for the bonding of restorative materials to tooth structure and for reducing the risk of contamination or re-infection of the operative site. Devices that integrate saliva evacuation with mouth opening, such as a mouth prop with an ejector or comparable isolation systems, may offer a practical means of achieving simultaneous mouth opening and moisture control, with reported benefits including reduced aerosol and splatter generation[1].

Beyond procedural efficiency, patient comfort and behavioral acceptability are increasingly recognized as important outcomes in pediatric dentistry in their own right, influencing not only the immediate treatment experience but also the child's longer-term attitude toward dental care. This creates an inherent tension: devices that are most convenient or stable for the operator are not necessarily the most comfortable for the child, and vice versa. Identifying an appropriate balance between patient comfort, operator convenience, and procedural safety is therefore a relevant question for clinical practice.

Existing literature has examined individual components of this question. A comparative evaluation of parental and dentist perceptions found that a custom-made mouth prop was more acceptable than commercially available props[5], while a comparison of a traditional isolation system against a newer intraoral cheek-and-lip retractor mouth-opener tool reported differences in ease of use for the operator and acceptability for the patient[6]. A systematic review of randomized trials of an integrated mouth-opening/moisture-control (Isolite-type) system similarly reported favorable patient-reported outcomes alongside gains in operator efficiency[7]. Together, this literature suggests that customized or multipurpose mouth-opening devices may offer advantages over conventional props and gags, but direct, within-study comparisons of conventional devices specifically a mouth prop with ejector, a plain mouth prop, and a mouth gag against both patient comfort and operator acceptance in the same pediatric cohort remain limited.

The present study was therefore designed to compare and evaluate a mouth prop with ejector, a mouth prop, and a mouth gag with respect to both patient comfort and operator acceptance in children undergoing restorative and endodontic procedures, in order to inform device selection in routine pediatric dental practice.

II. METHODS

A total of 30 children aged 5–8 years were evaluated, with 10 children assessed per device group. Inclusion criteria comprised children aged 5–8 years who were potentially cooperative but unable to maintain mouth opening for a prolonged duration, or who had limited cooperative ability requiring quadrant-wise restorative procedures; children below 3 years of age, emotionally immature/uncooperative children, and those with temporomandibular joint (TMJ) problems were excluded. Participants were allocated to three groups of 10 each: Group I received a mouth prop with ejector, Group II received a mouth prop, and Group III received a mouth gag.(Figure 1, 2 and 3) The assigned device was used to maintain the operative field during restorative and endodontic procedures, following which patient comfort (categorized as comfortable, tolerable, or intolerable) and operator acceptance (categorized as high, moderate, or low) were assessed. Data were summarized descriptively as frequencies and percentages for each comfort and acceptance category, by device.

III. RESULTS

Thirty children aged 5–8 years were evaluated across three mouth-opening devices (10 children per device). Patient comfort and operator acceptance findings are summarized in Tables 1 and 2, respectively.

Patient Comfort (Table 1)

The mouth prop with ejector was rated comfortable by the majority of patients (8 of 10,

80%), with only 1 tolerable and 1 intolerable rating. The mouth prop was also predominantly rated comfortable (6 of 10, 60%), with 3 tolerable and 1 intolerable rating. In contrast, the mouth gag was predominantly rated intolerable (6 of 10, 60%), with only 1 patient (10%) rating it comfortable and 3 (30%) rating it tolerable — making it the least tolerated of the three devices.

Operator Acceptance (Table 2)

The mouth gag received the highest operator acceptance of the three devices, rated high in 9 of 10 instances (90%), moderate in 1 (10%), and low in none. The mouth prop with ejector received a high-acceptance rating in 7 of 10 instances (70%), moderate in 2 (20%), and low in 1 (10%). The mouth prop received a high-acceptance rating in 6 of 10 instances (60%), moderate in 2 (20%), and low in 2 (20%).

IV. DISCUSSION

This descriptive comparison of three mouth-opening devices used during pediatric restorative and endodontic procedures found that the mouth prop with ejector was associated with the greatest patient comfort, the mouth prop was intermediate, and the mouth gag was the least tolerated device by patients. Conversely, operator acceptance followed a different pattern, with the mouth gag receiving the highest acceptance and no low-acceptance ratings, followed by the mouth prop with ejector and then the mouth prop. This divergence between patient and operator perspectives is the central finding of the study and has direct implications for device selection in clinical practice.

The comparatively high patient comfort observed with the mouth prop with ejector may be attributable to its combination of mouth opening with continuous saliva evacuation, which likely reduces the sensation of pooling saliva and the associated need to swallow or reposition the mouth during treatment. This is consistent with reports that integrating fluid evacuation with mouth-opening/isolation devices improves patient-reported comfort and treatment tolerance[1,7], supporting the premise that simultaneous mouth opening and moisture control rather than mouth opening alone may be an important contributor to patient acceptability.

The higher operator acceptance of the mouth gag, despite its low patient acceptance, is plausibly explained by the greater mechanical stability it provides: by rigidly immobilizing the mouth, the gag maintains the operative field and helps prevent sudden closure over an extended working period, which reduces the operator's need to repeatedly reposition or monitor the device[4]. This stability, however, appears to come at the cost of patient comfort, and the same rigidity that prevents sudden closure has also been associated with a risk of soft-tissue trauma and, with prolonged maximal opening, potential airway effects[4].

These findings illustrate the underlying tension between operator convenience and pediatric patient comfort. A device that is easiest for the operator to use and that best maintains a stable field is not necessarily the device best tolerated by the child, and the reverse also appears true. In terms of procedural access, stability, moisture control, prevention of sudden closure, and safety, no single device evaluated in this study performed optimally across all domains: the mouth gag offered the greatest stability and prevention of sudden closure but at the cost of comfort and possible trauma risk, while the mouth prop with ejector offered the best patient comfort along with a degree of moisture control, with comparatively lower though still favorable operator acceptance than the gag.

These findings are broadly consistent with previously published literature. Lakshmi Kumari et al. reported that a custom-made mouth prop was more acceptable to both parents and dentists than several commercially available mouth props, attributing this to features such as intraoral illumination, customization, and a child-friendly design[5], which parallels the present observation that a device offering an additional functional benefit (in this case, integrated saliva evacuation) was better tolerated than a conventional prop. Similarly, the comparison of a traditional isolation system against a new intraoral cheek-and-lip retractor mouth-opener tool reported differences between the systems in ease of operator use and patient acceptability[6], reinforcing the general finding that operator ease and patient acceptability do not necessarily move in the same direction across isolation devices. A systematic review of randomized trials of an Isolite-type integrated mouth-opening and moisture-control system likewise reported favorable patient-reported outcomes together with gains in operator efficiency[7], which is consistent with the comparatively favorable comfort and acceptance profile observed here for the ejector-integrated prop relative to the plain prop and the gag.

The present study differs from this body of literature chiefly in its direct, within-cohort comparison of three specific devices — a mouth prop with ejector, a mouth prop, and a mouth gag — against both patient comfort and operator acceptance simultaneously, rather than evaluating a

single device or a systematic synthesis of multiple studies. This design allows the trade-off between the two outcome domains to be observed directly within the same group of children, which is a distinguishing feature of the present findings relative to prior single-device or review-level evidence.

Taken together, these observations support the clinical relevance of customized or multipurpose mouth-opening devices that integrate saliva evacuation with mechanical mouth opening. Such devices may offer a practical compromise between the stability historically associated with the mouth gag and the comfort associated with a simpler prop, with potential benefits for both the patient's treatment experience and the operator's ability to maintain a stable, dry operative field during restorative and endodontic procedures.

Maintaining adequate mouth opening and field isolation remains an essential requirement of safe and effective pediatric restorative and endodontic care. In this descriptive comparison, the mouth prop with ejector was associated with the greatest patient comfort, while the mouth gag despite being the least tolerated device by patients achieved the highest operator acceptance. These findings indicate that patient comfort and operator requirements should both be considered when selecting a mouth-opening device, rather than prioritizing operator convenience alone. Multipurpose and customized mouth-opening devices that integrate functions such as saliva evacuation may represent a useful alternative to traditional mouth props and gags, warranting further evaluation in larger, methodologically robust studies before any device can be recommended as universally superior.

Conflict of interest: None
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TABLES

Table 1. Patient comfort associated with different mouth-opening devices (n = 10 per device; N = 30)

Device	Comfortable, n (%)	Tolerable, n (%)	Intolerable, n (%)
Mouth prop with ejector (Group I)	8 (80%)	1 (10%)	1 (10%)
Mouth prop (Group II)	6 (60%)	3 (30%)	1 (10%)
Mouth gag (Group III)	1 (10%)	3 (30%)	6 (60%)

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Table 2. Operator acceptance of different mouth-opening devices (n = 10 per device; N = 30)

Device	High, n (%)	Moderate, n (%)	Low, n (%)
Mouth prop with ejector (Group I)	7 (70%)	2 (20%)	1 (10%)
Mouth prop (Group II)	6 (60%)	2 (20%)	2 (20%)
Mouth gag (Group III)	9 (90%)	1 (10%)	0 (0%)

Figures

Figure 1 : Mouth prop with ejector

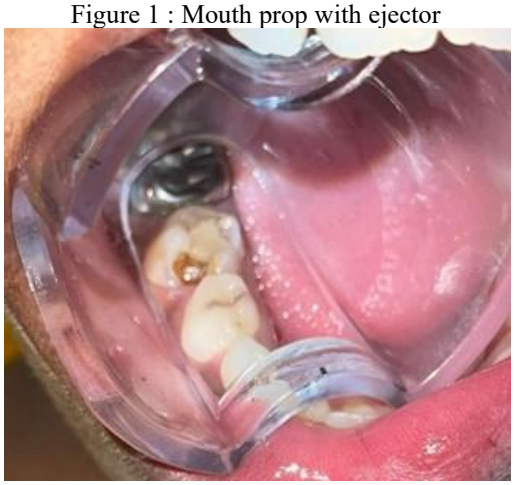

Figure 2 : Mouth prop

Figure 3: Mouth gag