Comparative evaluation of time efficiency and patient acceptability of Automatrix and Sectional matrix in pediatric patients

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Abstract- **Background / Introduction: Proper proximal contact creates a food spillway and makes cleaning easier, which helps to reduce food impaction, support underlying periodontal health and plays a major role for the eruption of permanent teeth into normal position. Restorations placed with metal matrices have ideal contacts and increased survival rate.**
Aim: To compare two matrices (Automatrix and Sectional matrix) based on time efficiency and patient acceptability among pediatric patients while performing chair side class II restorations using matrices.
Methodology: Twenty kids between the ages of 5 and 7 who had Class II cavities were chosen. Either the automatrix or the sectional matrix band method was used to restore the cavities. Wong baker face scale was used to assess patients acceptability. Time assessment was conducted for placing the matrix system.
Results: Time required to place sectional matrices was more (3.470 ± 0.7602) than required for automatrix (1.920 ± 0.2394). When the sectional and automatrix were compared, a significant difference was observed for the Wong-Baker's facial pain rating scale ($p < 0.05$). It was found the highest level of pain scores when used the sectional matrix than automatrix system ($p < 0.05$). Children in this study accepted automatrix to be more comfortable than the sectional matrices group.
Conclusion: The automatrix group was more time efficient compared to the sectional matrices group. Based on the patient acceptability automatrix has been found superior to sectional matrix band system.

Index Terms: **Class II restoration, Automatrix, Sectional matrix.**

I.   Introduction:

In restorative dentistry, optimising tooth form has always been a challenging undertaking. The primary goals of the restorative process should be to restore the tooth's appropriate anatomy and preserve the health of the periodontium. Proper proximal contact creates a food spillway and makes cleaning easier, which helps to reduce food impaction and support underlying periodontal health. Proximal contacts interdigitation also plays a major role for the eruption of permanent teeth into normal position.

They also assist in preserving the integrity of the dental arch by dispersing the force throughout the teeth's long axis. An incorrectly repaired contact area will result in food impaction, displacement, lifting forces, and tooth rotation. It will also deflect occlusal contact.[1]

Annual failure rate of proximal restoration in primary teeth (0-29.9%)[2] and poor contour or adaptation of the restoration is the most common cause of failure. Restorations placed with metal matrices have ideal contacts and increased survival rate.[3]

Sectional and circumferential matrix systems are the two types of common matrix systems that are available. Sectional matrices have been employed conventionally to restore proximal contacts for a long period of time Retainerless designs typically provide excellent comfort and visibility, which speeds up quadrant work required for appropriate adaption. Circumfrential automatrix were employed in this investigation.

Compared to permanent teeth, primary teeth have flatter, larger contact regions as well as a noticeable cervical constriction, because of which placing a matrix system becomes more challenging. In addition, children's erratic behaviour and short attention span make it difficult for them to stay quietly for extended periods of time. For youngsters, this necessitates a quick (time measurement) and efficient (comfort scale) system. The aim of this study was to compare two matrices (Automatrix and sectional matrix) based on time efficiency and patient acceptability among pediatric patients while performing chair side class II restorations using matrices to recommend an improved matrix system for paediatric patients.

II. Materials and methods

With approval from the institutional review board and ethical committee, this double-blind interventional clinical study was carried out at the Sathyabama Dental College and Hospital's Department of Paediatric and Preventive Dentistry. The parents or legal guardians of the youngsters were asked for their informed and written approval.

A total of 20 samples were selected among patients aged 5–7 years who had class II cavities on mesial occlusal (MO) surface or distal occlusal (DO) surface of lower and upper primary molars indicated for restoration, which were carried out using Sectional matrix (Custom made) and Auto Matrix (Astek Innovations Ltd., UK) were selected based on following criteria.

INCLUSION CRITERIA

☐Superficial lesions affecting the marginal ridge that do not extend past the proximal line angles and intact adjacent teeth.

☐Patients whose parents provided signed consent to participate in the research.

EXCLUSION CRITERIA

☐Lesions that include pulp and extend below the gingiva.

☐Absence of adjacent tooth.

☐Preshedding mobility.

☐Patients with a compromised health status.

☐Patients whose guardians declined to grant permission.

All of the patients were handled by the lead investigator, and a clinical assistant was called in to help with chit picking. Chits were used to determine which matrix system should be set up first to prevent bias. The samples were split into two groups of 10 at random. Sectional matrix was utilised in group I to restore proximal cavities; Automatrix was employed in group II. Class II cavity was created utilising air rotor and diamond bursts in accordance with established procedures. In the sectional matrix group, matrix band was inserted in accordance with the manufacturer's instructions once the cavity had dried. The sectional matrix (VASA DENTICITY PVT.LTD) was clamped using the sectional matrix clamp after the matrix band was first positioned and maintained in place with the left forefinger [Fig. 1]. This resulted in a tight contact. The grippers were retracted to secure the reel in position for the Automatrix (VASA DENTICITY PVT.LTD) when the reel was inserted into the handle [Fig. 2].

Figure 1   Figure 2

Type IX GIC was used to restore the cavity. Final finishing and polishing was done. Time taken was recorded from the point of isolation till complete verification of placement of matrix system by a blinded investigator using a stopwatch. Wong Baker faces scale is used to compare patients preferability after the restorative procedure with the matrix systems by the same investigator. Radiographs were not used to assess the proximal contacts to prevent radiographic exposure in children. The data obtained were collected and tabulated.

III. STATISTICAL ANALYSIS

Statistical Package for Social Sciences (SPSS) for Windows, Version 23.0 was used to perform statistical analyses. The Mean and Standard deviation was calculated for time duration and pain scale. The Mann-Whitney test was employed to compare the study variables between the two groups. Statistical Significance was fixed at $p \leq 0.05$.

IV. RESULTS

Time required to place sectional matrices was more (3.470 ± 0.7602) than required for automatrix (1.920 ± 0.2394) and Mann- Whitney test shows the result was statistically significant at $p \leq 0.05$ [Table 1]. When the sectional and automatrix were compared, a significant difference was observed for the Wong-Baker's facial pain rating scale from score 4 -10 ($p < 0.05$). It was found the highest level of pain scores when used the sectional matrix than automatrix system ($p < 0.05$). [Table 2].

Table 1 - Comparison of time taken to place sectional matrix and automatrix

	Group	N	Mean	Std. Deviation	P value
Time	Auto-matrix	10	1.920	0.2394	0.001*
	Sectional Matrix	10	3.470	0.7602	

Table 2 - Comparison of patient acceptability to place sectional matrix and automatrix using Wong Baker Faces scale

	Group	N	Mean	Std. Deviation	P value
Pain	Auto-matrix	10	2.60	2.119	0.019*
	Sectional Matrix	10	5.20	2.348	

V. DISCUSSION

A matrix system must be used for direct restoration of a Class II prepared in order to restore form and function. Maintaining a healthy interdental papillae and preventing food impaction are all made easier with a well-managed proximal surface.[7] A challenge for the dental surgeon is to directly restore Class II cavities in the primary teeth. This may be due to the primary teeth's wide and flat contact surface, which makes it difficult to insert a matrix band because there is a possibility that it will slip out. Primary teeth have their pulp horns positioned higher than those of permanent teeth. Therefore, there is a higher risk of pulpal exposure when primary teeth are being prepared for cavities.[8] If not properly restored, Class II restorations in primary teeth do not last very long. According to Innes NPT and Evans DJP, "minimal intervention" techniques assist preserve the tooth's structure and integrity and maintain the maximal dentinal thickness of the pulpal floor, which lowers pulpal exposure. They also lessen some of the negative effects of restorative therapy.[4]

Since the first permanent molar erupts around age 6, the age range of 5 to 7 years was chosen for this study. Physiological gaps close, contacts tighten, and dental caries is more likely to occur as the first molar erupts.

Children's erratic behaviour and short attention span make it difficult for them to stay quietly for extended periods of time, this necessitates a quick (time measurement) and efficient (comfort scale) system to restore proximal cavities, hence mean time required to place the most commonly used sectional matrix was compared with automatrix. As seen in Table 1, the mean operating time in the current investigation was found to be greater in sectional matrices than in circumferential matrices, with a mean of 3.47 minutes for sectional matrices and 1.92 minutes for circumferential matrices. Greater time difference in Sectional matrix might be attributed to the usage of clamps which is absent in automatrix. The findings were completely at odds with those of a previous study by Cho SD, Browning WD, and Walton KS13, in which less time was needed for the practical application of a sectional matrices.[5]

Patients preference was more for circumfrential automatrix which is attributed to the design,flexibility,ability to be contoured in a three-dimensional shape and no clamps usage in case of automatrix while sectional matrix required the placement of tight clamp in the interdental area securing the matrix in place.[6] The automatrix were also preferred compared to sectional matrices because the time consumed for their placement was less. This was also attributed to their convenient design form.

In contrast to sectional matrices, the circumferential matrix was more comfortable, time-efficient, and required less placement time, according to the results. This demonstrates unequivocally that circumferential matrix, when utilised to restore proximal cavities in primary teeth, was a workable matrix technique.

VI. CONCLUSION

The circumferential auto-matrices were more time efficient when compared to the sectional matrices when used in children. Based on the preference auto-matrix has been found superior to sectional matrix band system in primary molars.

The study's conclusions will help choose a matrix system that is more convenient and time-efficient. Nonetheless, further study has to be done on the effectiveness of the matrix systems as well as the viewpoints of patients and dental professionals.

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