

Atraumatic Restorative Technique and its Application in Early Childhood Caries

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Abstract

Background: Early Childhood Caries (ECC) is a prevalent dental condition that affects infants and preschoolers, characterized by rapid decay of their deciduous teeth. It is common in children with poor bottle-feeding habits and is often observed in the maxillary anterior teeth and molars. If left untreated, the disease progresses from initial white-spot lesions to complete tooth crown destruction.

Objectives: This study aims to compare the success rate of Atraumatic Restorative Technique (ART) and conventional techniques in managing Early Childhood Caries.

Materials and Methods: A randomized control trial (RCT) was conducted at Rehman College of Dentistry with 121 children under 6 years diagnosed with ECC. They were randomly allotted to ART and Conventional groups. Data was collected on pain, restoration failure, and patient experience, with follow-up after 1–3 months.

Result: 105 participants completed the study. ART was associated with a higher satisfaction rate (91%) compared to conventional methods (67%). Postoperative pain was reported by 6 patients in the ART group and 27 in the conventional group. A total of 32 restorations failed, with 5 ART restorations and 27 conventional restorations dislodging. Statistical analysis showed a significant difference in patient experience between the two techniques ($p = 0.003$).

Conclusion: ART is a more effective and patient-friendly approach for managing Early Childhood Caries, offering higher patient satisfaction. ART is recommended as a preferable treatment option for young children with ECC.

Keywords: Early Childhood Caries, Atraumatic restorative technique, Conventional Technique, Restoration

Introduction

Early Childhood Caries refers to wide-spread and rapidly growing cavities in the teeth of infants and preschoolers.¹ ECC is contemplated to be the most recognized disease of infancy and childhood, being prevalent in many children worldwide. It is most commonly found in children with ill-suited bottle-feeding habits.² In most bottle-fed children, ECC is mostly located in deciduous anterior maxillary teeth and the deciduous molars. The first evidence of ECC in the mouth is the initiation of a white-spot lesion along the margin or edge of gingiva in the maxillary deciduous incisors. If the disease process is not intercepted, progression of caries into the crown of the tooth occurs ultimately leading to destruction of the entire crown.³

Early childhood caries persists as a significant issue in both developed and developing nations, with developing countries being particularly affected and experiencing an epidemic-like prevalence.⁴ These findings align with those of India (44%), Australia (49%), and Korea (56.5%). In contrast, Turkey had a high prevalence of ECC, at 70%. Conversely, the prevalence of ECC was controlled in Africa (10.5%), Saudi Arabia (26%), and Japan (32%).⁵ In underprivileged groups of population, the American Dental As-

sociation recognizes ECC as a noteworthy public health issue which is widespread throughout the general child population.⁶ Dental caries depends on several factors. It is a pathological process involving different types of bacteria. Nonetheless, other factors such as the socioeconomic status and lifestyle/habits of the child also have an effect on the overall health of the child's oral cavity.⁷ To intercept the formation of ECC in children, good oral hygiene habits should be determined and the child's subjection to Fluoride should be increased whereas association with refined foods and sugars in the diet should be reduced.³ Liquids that contain sugars that are easily fermented (e.g. milk, baby formula, soft drinks, juices) pose a greater threat of causing dental caries because of extended exposure of sugars in the liquid to cariogenic bacteria found on the surface of teeth.⁸

The atraumatic restorative treatment (ART) approach was introduced in Tanzania 25 years ago.⁹ ART, a minimally invasive care approach, aims to prevent dental caries and halt its progression. It has emerged as a crucial caries management concept, enhancing the quality and accessibility of oral care worldwide. ART comprises two key components: sealing caries-prone pits and fissures and restoring cavitated dentine lesions using sealant-restorations. The application of an ART sealant involves the careful insertion of a high-viscosity glass ionomer into the pits and fissures under gentle finger pressure.¹⁰ ART restoration involves creating enough access to the cavity to remove soft, completely demineralized (decomposed) carious tooth tissues using hand instruments. Afterward, the cavity is restored with an adhesive dental material that simultaneously seals any remaining pits and fissures that could pose a risk.¹¹ ART is a promising approach for treating children suffering from early childhood caries. It results in smaller cavities and high acceptance of preventive and restorative care by children because local anesthesia is seldom needed and only hand instruments are used.¹²

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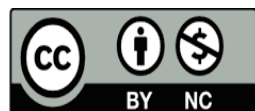
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Atraumatic Restorative Treatment (ART), initially developed to aid dental care delivery in underserved communities lacking electricity and running water, is now recognized for its applicability to various subpopulations globally.¹³ While the conventional approach involves administering local anesthesia and using rotary instruments to remove dental caries, the ART approach primarily relies on removing affected dentine using hand instruments alone, often without the need for local anesthesia. It also involves restoring the prepared cavity with a glass-ionomer cement. ART is particularly suitable for very young children, where cooperation for the standard approach may be limited. Additionally, it can reduce dental anxiety among children, which can help facilitate appropriate future dental attendance behaviors.¹⁴ Therefore, we will be comparing the success rate of ART and conventional technique in the management of early childhood caries.

To help the dentist choose the better of the two procedures for management of pedodontics patients, as there is still varied opinion between these two procedures.

It was the first type of this study in the region and can help in establishing future guidelines for Pedodontics tooth management

To assess the success rate of Atraumatic Restorative Technique in terms of participant experience, pain and restoration failure compared with conventional technique as a treatment approach for Early childhood caries.

Materials and Methods

The study was conducted at the Pediatric Dentistry Department of Rehman College of Dentistry over the period of 1 year. The target population were children aged 6 years, who were diagnosed with Early childhood caries. The inclusion criteria included those cases in which the caries was extending to dentine and the cavity was accessible to hand instruments, this was in addition to the 6 years of age and diagnosed cases of early childhood caries. The exclusion criteria included uncooperative patients who were not susceptible to treatment, having caries extended to the pulp chamber and patients exhibiting pain, pus discharge or showing systemic effects of infection i.e. fever, lethargy etc. The study design was Randomized Control Trial study and the sample size was 121, which was calculated by G power with effect size of 0.55 and 95% confidence interval. The sampling technique was convenience sampling. The variables that were studied and compared were Pain (pre and post op), restoration failure (post op) and the participant experience. The test used was paired sample t test. The software used for data analysis was R. The Intervention was Atraumatic restorative technique, and it was compared with the conventional technique of treating ECC. P value ≤ 0.05 was considered statistically significant. Visual Analogue scale was used to check for the pain status.

After getting approval from the ethical committee of RCD, Ref No 2020-09-057 and consent from the patients, this study was carried out in Rehman college of dentistry's paediatric department. Patients were selected on the basis of inclusion criteria. Baseline measures and data was assessed through clinical examination and parent report/questionnaire. Treatment was provided in a hospital setting and a random selection (computer generated) was carried out to allocate the patients in their respective groups. 3 months of follow up was done to assess the variables i.e pain, restoration failure and participant experience.

Atraumatic restorative technique was performed by using a hand instrument (excavator) to eliminate the carious tooth structure, followed by restoration with Glass ionomer cement. The instrument used in ART was a pointed spoon ex-

cavator with a diameter of 1 or 1.5 mm to eliminate the soft caries. It was performed by a single operator.

Conventional technique was performed by using a high-speed handpiece, with irrigation and round diamond burs of distinct diameters and cavity filled with Glass ionomer cement.

Results

This study was conducted over a period of 1 year at the Pediatric department of Rehman College of Dentistry. The study included 121 children belonging to both genders, where 48 were males and 73 were females. Gender distribution is shown in the Table 1.

All the subjects did not complete their treatment, 105 subjects (86.8%) completed their treatment whereas the remaining 16 (16.2%) did not complete their treatment who were excluded as shown in Table 2. They didn't show up for the review. A total of 53 subjects were provided with ART restorations while the remaining 52 were provided conventional restorations.

The experience of the patient with the type of restoration was stratified by applying chi-square test keeping p value < 0.05 significant. Strong statistical association was revealed with p value = 0.003, shown in table 2.

Postop follow up revealed that some restorations were dislodged. A total of 32 restorations dislodged, out of which only 5 were ART and the rest 27 were the conventional restorations shown in Table 3.

Table 4 reveals that postoperatively, 6 subjects who had been provided with ART restorations complained of pain, whereas 27 children who received conventional restorations complained of pain.

Discussion

The conventional restorative procedure has been carried out previously with mixed results. So, a new technique was needed to follow up and improve the prognosis in the de-

Gender	Frequency N	Percentage %
Male	48	39.7
Female	73	60.3
Total	121	100.0

Table 1: Frequency of gender distribution

Experience	Type of Restoration				
	ART	Conventional	Total	Chi square value	P value
Good	48	35	83	8.573 ^a	.003
Bad	5	17	22		
Total	53	52	105		

Table 2: Experience stratified according to the type of restoration.

Type of Restoration				
		ART	Conventional	Total
Post Pain	No Pain	47	25	72
	Pain Present	6	27	33
Total		53	52	105

Table 3: Failure of the type of restoration

Type of Restoration		ART	Conventional	Total
Post Pain	No Pain	47	25	72
	Pain Present	6	27	33
Total		53	52	105

Table 4: Categorization of pain with the type of restoration

ciduous teeth.¹⁵ Atraumatic technique is not only much friendlier with the child patient but also very effective. It also tests the decision-making power of the dentist to act preemptively and seal the prone pits and fissures and lesions that extend into the dentine. Case selection is a very important aspect of this process.¹⁶

In our study we compared the two types of treatment being provided to the young children with deciduous dentitions who are prone to early childhood caries. Our results show us that overall experience with the type of the restoration is generally good with ART. Out of the 53 patients only 5 reported having a bad experience. However, with conventional restorative procedures, out of the 52,¹⁷ reported as bad experience and 35 were satisfied. Although it has a 67% of good experience it is still lower than ART which has a good experience of about 91%. So overall patients with ART were much happier as compared to the patients with conventional restorative procedure.

This is also similar to the study conducted by Thiago-Saads Carvalho where they evaluated the fear anxiety and pain related with the ART of restoring teeth.¹⁴ They analyzed past 10 years of research and came to the conclusion that art promotes less discomfort to the patients contributing to a reduction in anxiety and fear.

Furthermore, they also reported that ART also leads to less pain after the treatment as compared to the conventional restoration. This is again in line with our study where we have the results showing that among 53 patients only 6 re-

ported of pain and 47 were happy with the restoration, on the contrary 27 patients among the 52 who had conventional restoration done reported of post operative pain.

This could be because of many factors but majority being the use of rotary instruments doing conventional procedures may cut excessively and inadvertently damage the pulp.¹⁷ In contrast, atraumatic restorative technique as the name implies is atraumatic because hand instruments are used to remove all the carious process, which is in control of the operator and hence less or no pain to the patient.¹⁸

In our study the number of patients who reported with pain were 33 of which only 6 were from the group that had ART and 27 from the conventional group. This shows that ART is not only acceptable to patients it also reduces the post-operative pain that the patients suffer.

The study has reassured and reassessed the advantages of ART as opposed to conventional treatment for the management of early childhood caries. This study proves that it can be used an effective alternate treatment procedure.

The weakness of the study is that it's a single center study. If future researchers can include more data from other institutes, it will give us more data. A future qualitative study can also be done on the patients regarding their experiences on ART.

Conclusion

Atraumatic Restorative Technique is a cost-effective treatment as opposed to conventional fillings. It improves patient satisfaction and experience, along with little to no post-operative pain.

CONFLICT OF INTEREST: None

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References

1. Anil S, Anand PS. Early Childhood Caries: Prevalence, Risk Factors, and Prevention. *Front Pediatr*. 2017 Jul 18;5:157. doi:10.3389/fped.2017.00157 PubMed PMID: 28770188.
2. Olatosi OO, Sote EO. ASSOCIATION OF EARLY CHILDHOOD CARIES WITH BREASTFEEDING AND BOTTLE FEEDING IN SOUTHWESTERN NIGERIAN CHILDREN OF PRESCHOOL AGE. *J West Afr Coll Surg*. 2014;4(1):31. PubMed PMID: 26587516.
3. Farges JC, Alliot-Licht B, Renard E, Ducret M, Gaudin A, Smith AJ, et al. Dental Pulp Defence and Repair Mechanisms in Dental Caries. *Mediators Inflamm*. 2015;2015:230251. doi:10.1155/2015/230251 PubMed PMID: 26538821.
4. Khan I, Raza Javed B, Rizwan Mahmood B, Faiza Awais B, Ayyaz Ali Khan Mp. Frequency of Early Childhood Caries (ECC). *JPDA*. 25.
5. Khan I, Raza Javed B, Rizwan Mahmood B, Faiza Awais B, Ayyaz Ali Khan Mp. Frequency of Early Childhood Caries (ECC). *JPDA*. 25.
6. Vargas CM, Ronzio CR. Disparities in early childhood caries. *BMC Oral Health*. 2006 Jul 10;6(SUPPL. 1):1–5. doi:10.1186/1472-6831-6-S1-S3/METRICS
7. De Castilho ARF, Mialhe FL, De Souza Barbosa T, Puppim-Rontani RM. Influence of family environment on children's oral health: A systematic review. *J Pediatr (Rio J)*. 2013;89(2):116–23. doi:10.1016/j.jped.2013.03.014 PubMed PMID: 23642420.
8. Touger-Decker R, van Loveren C. Sugars and dental caries. *Am J Clin Nutr*. 2003 Oct 1;78(4):881S-892S. doi:10.1093/AJCN/78.4.881S PubMed PMID: 14522753.
9. (PDF) Atraumatic Restorative Treatment: A Review [Internet]. [cited 2025 Feb 9]. Available from: <https://>

www.researchgate.net/publication/367327116_Atraumatic_Restorative_Treatment_A_Review

10. Frencken JE, Peters MC, Manton DJ, Leal SC, Gordan V V., Eden E. Minimal intervention dentistry for managing dental caries – a review: Report of a FDI task group. *Int Dent J.* 2012 Oct 1;62(5):223–43. doi:10.1111/IDJ.12007 PubMed PMID: 23106836.
11. Molina GF, Cabral RJ, Frencken JE. The ART approach: clinical aspects reviewed. *Journal of Applied Oral Science.* 2009;17(spe):89. doi:10.1590/S1678-77572009000700016 PubMed PMID: 21499662.
12. Frencken JE, Leal SC, Navarro MF, Frencken JE, Leal SC, Navarro MF. Twenty-five-year atraumatic restorative treatment (ART) approach: a comprehensive overview. *Clin Oral Investig.* 2012 Oct;16(5):1337. doi:10.1007/S00784-012-0783-4 PubMed PMID: 22824915.
13. Holmgren CJ, Roux D, Doméjean S. Minimal intervention dentistry: part 5. Atraumatic restorative treatment (ART)--a minimum intervention and minimally invasive approach for the management of dental caries. *Br Dent J.* 2013;214(1):11–8. doi:10.1038/SJ.BDJ.2012.1175 PubMed PMID: 23306489.
14. Minimally Invasive Dentistry based on Atraumatic Restorative Treatment (ART) to manage Early Childhood Caries in rural and remote Aboriginal communities: A cluster-randomised trial.
15. Amend S, Boutsiouki C, Bekes K, Kloukos D, Lygidakis NN, Frankenberger R, et al. Clinical effectiveness of restorative materials for the restoration of carious primary teeth without pulp therapy: a systematic review. *European Archives of Paediatric Dentistry* [Internet]. Springer Berlin Heidelberg; 2022. 727–759 p. Available from: <https://doi.org/10.1007/s40368-022-00725-7> doi:10.1007/s40368-022-00725-7
16. Dipalma G, Inchingolo AM, Casamassima L, Nardelli P, Ciccarese D, De Sena P, et al. Effectiveness of Dental Restorative Materials in the Atraumatic Treatment of Carious Primary Teeth in Pediatric Dentistry: A Systematic Review. *Children.* 2025;12(4):1–20. doi:10.3390/children12040511
17. Kitamura C, Nishihara T, Terashita M, Tabata Y, Washio A. Local regeneration of dentin-pulp complex using controlled release of FGF-2 and naturally derived sponge-like scaffolds. *Int J Dent.* 2012;2012. doi:10.1155/2012/190561
18. Abdul Khalek AMG, Elkateb MA, Abdel Aziz WE, El Tantawi M. Effect of papacarie and alternative restorative treatment on pain reaction during caries removal among children: A randomized controlled clinical trial. *Journal of Clinical Pediatric Dentistry.* 2017;41(3):219–24. doi:10.17796/1053-4628-41.3.219 PubMed PMID: 28422591.

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Author Contributions

1. **Natasha Nadeem:** Conceptualization of the study, methodology design, data collection, and manuscript drafting.
2. **Anum Nadeem:** Conceptualization, materials provision, data collection, and data interpretation.
3. **Hajra Safeer:** Methodology design, materials provision, data collection, analysis, and interpretation of results.
4. **Faisal Saeed:** Methodology design, supervision of the study, literature review, and critical review of the manuscript.
5. **Sajjad Ahmad:** Supervision, data interpretation, and literature review.