

# SDF vs. SMART vs. ART Technique: Understanding the Recurrence of Decay and Efficacy of Treatment

Abiodun Oni, DMD.; Jonathan Robitsek, PhD; Nicole Benjamin, BA; Matthew Roland, MS; Jeannine Weiss, DDS, FADSA, FAAHD

Department of Pediatric Dentistry, Jamaica Hospital Medical Center, Queens, New York, USA



## Background

- **Silver Diamine Fluoride (SDF)** is a minimally invasive, interim treatment that is used to help arrest caries. **SDF is a strong fluoride agent that delivers 44,800 ppm of fluoride at once to a tooth<sup>1</sup> (Fig. 1).** It is an interim treatment for patients that exhibit behavioral issues, medical comorbidities, and as a precursor for patients with extensive caries who may need to have definitive treatment completed later.
- **SMART technique (Silver-Modified Atraumatic Restorative Technique) is an interim, two-step treatment technique** in which caries is excavated, an SDF varnish is placed on the pulpal floor, then is restored with RMGI, with a sealant being placed on top<sup>2</sup>.
- **ART (Atraumatic Restorative Technique)** follows the same pattern as SMART, but **does not include SDF** placement on the pulpal floor.
- Research comparing these techniques is limited. This study aims to determine which technique has a higher chance of arresting caries, which **can help clinicians with critical treatment planning for pediatric populations in dentistry.**

## Objective

To determine which preventative treatment has a higher incidence of arresting caries: the SDF, SMART or ART technique.

## Methods

- Retrospective chart review completed with encounters dating from 2022-2025 for patients aged 3-14 yrs old.
- Encounters were drawn from those who received SMART, ART, and SDF treatment.
  - Dental codes used to pull charts include: D2391 & D1354
- **Criteria to be listed as SDF treatment:** Dental code D1354
- **Criteria to be listed as SMART:** Chart note must specify that SDF, then RMGI or GI was placed and cured, then etched, bonded, and sealed over margins of restoration<sup>3</sup>.
- **Criteria to be listed as ART:** Chart note must specify RMGI/GI was placed and cured, then etch, bond, and flowable sealant was placed over restoration **(Fig. 3).**
- For each patient that met the criterion, their radiographs were analyzed from an initial radiograph to the follow up radiograph to confirm whether caries progressed after SDF placement **(Fig. 2).**
- All data were analyzed using R Software (v 4.1.1).
- Mixed logistic regression model assessing the likelihood of caries progression in relation to the usage of SDF vs. either SMART or ART.

## Results & Figures



Figure 1: RivaStar SDF system. This two-step system is primarily used in the JHMC Pediatric Clinic for SDF placement



Figure 2: ART technique on x-ray, placed on #K & #L

	Overall (N=114)
<b>Sex</b>	
Female	61 (53.5%)
Male	53 (46.5%)
<b>Insurance Status</b>	
Private	3 (2.6%)
Public	111 (97.4%)
<b>Year of Initial Contact</b>	
2022	30 (26.3%)
2023	23 (20.2%)
2024	48 (42.1%)
2025	13 (11.4%)
<b>Average # of Teeth Worked on Per Patient</b>	
Mean (SD)	2.22 (1.36)
<b>SDF Used?</b>	
Yes	78 (68.4%)
<b>SMART Used?</b>	
Yes	7 (6.1%)
<b>ART Used?</b>	
Yes	30 (26.3%)

Table 1: Table outlining the patient demographics analyzed for this study.

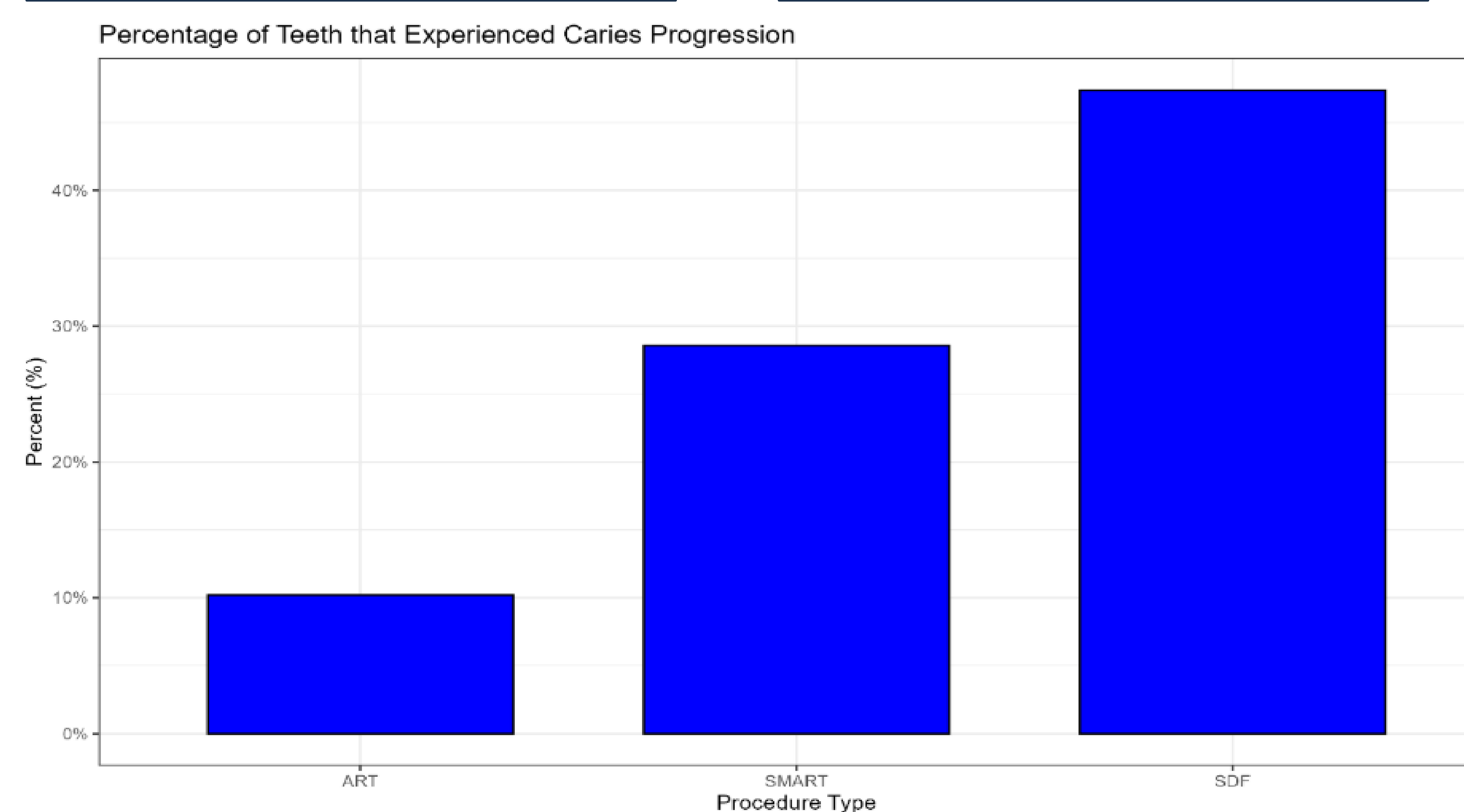


Figure 3: Results comparing caries progression between ART, SMART, and SDF.

## Discussion

- Findings revealed that the ART technique had the lowest incidence of recurrent caries **(Fig. 3).**
- The SMART technique had the second-lowest incidence of recurrent caries.
- SDF proved to have the lowest odds of arresting caries amongst the 3 methods (OR = 0.19, 95% CI = [0.08 – 0.41], p < .001).
- These findings show that proper caries excavation and coverage is key to a successful chance at arresting caries.
- However, there were some limitations to the study, including low prevalence of SMART and ART procedures compared to SDF **(Table 1)** and the procedure types not having specific codes documented within the EMR, requiring manual chart review.
- Caries progression was defined as any development in caries on follow-up.
- Future studies can operationalize caries progression.

## Conclusion

- Our findings revealed **decreased odds of caries progression when using SMART/ART compared to SDF.**
- In conclusion, for dentists, treatment planning interim treatment for children and those with special health care needs, consider completing the SMART or ART technique for higher efficacy of arresting caries.
- Incorporating specific billing or procedure codes for the SMART or ART techniques would benefit future analyses.
- With further study, the findings presented here can yield improved oral-health outcomes for at-risk pediatric populations.

## References

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