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Personal and Professional Esthetic Evaluation of Various Root Coverage Procedures: An 18-Month Follow-Up of a Generalized Cairo Recession Type 2 Case

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Abstract

Long clinical crowns, root exposure, and hypersensitivity result from generalized gingival recession, which is the apical displacement of the soft tissue margin beyond the cementoenamel junction, exposing root surfaces across several teeth or quadrants. The multifactorial etiology includes chronic plaque-induced inflammatory periodontal disease, forceful mechanical toothbrushing (toothbrush abrasion), thin gingival morphology, high frenal attachments, occlusal trauma, and orthodontic tooth movement. Complete root coverage (CRC) is typically achievable in Recession Type 1 situations, but remains challenging in Recession Type 2 (RT2) and Recession Type 3 (RT3) sites. In addition to complete failure or partial root coverage, esthetic impairment can also result from CRC accompanied by an irregular gingival margin profile, poor color match, a change in the position of the mucogingival junction, or the presence of scar tissue. The root coverage esthetic score (RES) is an objective means of assessing esthetic outcomes after root coverage procedures, whereas esthetic evaluation is subjective. Additional evidence is provided by including patient-reported outcome measures (PROMs). Both subjective and objective assessment tools, including mean root coverage, CRC, RES, and PROMs, are used to evaluate root coverage using various techniques in the present case involving RT2 and RT3 sites. The double lateral sliding bridge flap with connective tissue graft (CTG) offers a single-stage option by concurrently increasing the width of the attached gingiva and coronally repositioning the gingival margin; however, submerged CTGs can yield the most reliable results.

Categories: Plastic Surgery, Dentistry
Keywords: complete root coverage, connective tissue graft, gingival recession, patient-reported outcome measures, root coverage esthetic score

Introduction

Exposed facial root surfaces frequently cause esthetic concerns that may affect patients' quality of life [1]. The outcome of root coverage procedures is usually quantified by the position of the gingival margin with respect to the cementoenamel junction (CEJ). Complete root coverage (CRC) is achieved when the gingival margin is located at or coronal to the CEJ. Nevertheless, gingival margin position alone may not be adequate to assess the overall treatment outcome. Esthetic impairment may occur not only following complete failure or partial root coverage but also when CRC is achieved with an irregular gingival margin profile, poor color match, alteration in the position of the mucogingival junction (MGJ), or the presence of scar tissue [2].

A five-point ordinal scale (poor, fair, good, very good, and excellent) was used by trained periodontists to evaluate overall esthetic improvement using a before-and-after panel scoring system [3]. The root coverage esthetic score (RES) was introduced to evaluate the overall esthetic outcome following root coverage procedures [2]. Recent consensus papers have emphasized the importance of directly assessing patient-reported perceptions through patient-reported outcome measures (PROMs) [4,5]. Patient-reported outcomes may represent "true endpoints," capturing patients' perceptions of therapy and complementing conventional clinical outcomes [6-9]. Patient esthetic demands have become more stringent; therefore, root coverage procedures should provide soft tissue anatomy comparable to and indistinguishable from adjacent tissues. Bilaminar approaches [10,11] and techniques for treating multiple recession defects have been developed, leading to improved esthetic outcomes. Furthermore, magnification, microsurgical instruments, and microsutures facilitate delicate soft tissue management, enhancing the final esthetic outcome [12]. In the present case, the gold standard modified coronally advanced flap (MCAF) with connective tissue graft (CTG) was performed on one side, while MCAF with platelet-rich fibrin (PRF) was performed on the other side of the maxillary arch. Double lateral sliding bridge flap (DLSBF) and free gingival graft (FGG) procedures were considered in the mandibular arch because of the limited keratinized tissue and shallow vestibule.

Esthetic assessment is subjective, whereas the RES provides an objective method for evaluating esthetic outcomes following root coverage procedures. As described by Cairo et al., the RES evaluates five variables: gingival margin level, marginal tissue contour, soft tissue texture, MGJ alignment, and gingival color [13].

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CRC in Recession Type 1 cases is usually achievable; however, achieving similar outcomes in Recession Type 2 (RT2) and Recession Type 3 (RT3) sites remains challenging because of compromised interproximal bone and tissue support. Furthermore, long-term stability is not frequently evaluated. In the present case, root coverage outcomes in RT2 and RT3 sites treated using different techniques were evaluated through subjective and objective assessment tools, including CRC, RES, and PROMs, with treatment stability assessed over 18 months.

Case Presentation

A 30-year-old female patient presented to the Department of Periodontics with the chief complaint of increasing spacing between her lower anterior teeth, which had gradually developed over the past two years. The patient was systemically healthy and denied any history of deleterious habits, such as tobacco use (smoking or smokeless). However, a tongue-thrusting habit was identified, which may have contributed to the progressive diastema formation. The patient was very concerned about her oral hygiene; overzealous toothbrushing was noted, characterized by horizontal strokes with a medium-to-hard-bristled toothbrush, which may have contributed to the soft tissue recession. Generalized gingival recession was noted in both the maxillary and mandibular arches (Figure *1*).



FIGURE 1: Preoperative view showing generalized RT2 and RT3 recession involving the lower incisors.

RT2: Recession Type 2; RT3: Recession Type 3

According to the 2011 Cairo classification [14], the recession was categorized as RT2, with the exception of the mandibular central incisors, which were classified as RT3. Table *1* displays the precise recession widths (RWs) and recession depths (RDs), as well as keratinized tissue widths (KTW). There were no discernible root surface steps, although the recession was associated with noncarious cervical lesions (NCCLs). Based on the visibility of the probe through the sulcus in the midfacial region, the gingival phenotype was found to be thin. Teeth 31 and 41 exhibited Grade I mobility. The mobility was attributed to occlusal trauma and was addressed through occlusal adjustment, which led to partial stabilization. The vestibular depth was inadequate in the lower anterior region. The proximity of the frenum to teeth 31 and 41 contributed to further gingival recession. Exposed roots create difficult-to-clean spaces where bacteria can hide and accumulate, potentially triggering periodontitis and leading to bone loss. Horizontal alveolar bone loss extending up to the coronal third (C/3) of the root surface worsened the condition, leading to pathologic migration and rotation of tooth 31. Horizontal bone loss was also observed in the upper anterior teeth, as evident on the orthopantomogram (Figure *2*).

Technique	Teeth involved	Time point	Mean RD (mm)	Mean RW (mm)	Mean KTW (mm)	Mean RC (%)
Modified CAF + CTG	11, 12, 13	Baseline	3.4	4.41	3.47	-
		Six months	0.13	0.63	5.43	96.33
		12 months	0.17	0.93	6.57	95.33
		18 months	0.17	0.93	6.57	95.33
Modified CAF + PRF	21, 22, 23	Baseline	4.3	5	3.66	-
		Six months	1.03	2.5	6.2	78.33
		12 months	0.83	1.86	6	82.33
		18 months	2	4	5	54.33
DLSBF + CTG	31, 32, 33	Baseline	3.33	3.73	2	-
		Six months	1.17	3.07	3.9	70.67
		12 months	1.5	2.67	4.07	62.33
		18 months	1.5	2.33	3.73	58.00
FGG	41, 42, 43	Baseline	4.17	3.63	1.49	-
		Six months	2.43	3.6	5	41.67
		12 months	2.17	3.83	5.33	48.33
		18 months	1.83	3.17	5.33	59.33

TABLE 1: Clinical parameters at baseline, six months, 12 months, and 18 months.

CAF: coronally advanced flap; CTG: connective tissue graft; DLSBF: double lateral sliding bridge flap; FGG: free gingival graft; KTW: keratinized tissue width; PRF: platelet-rich fibrin; RC: root coverage; RD: recession depth; RW: recession width

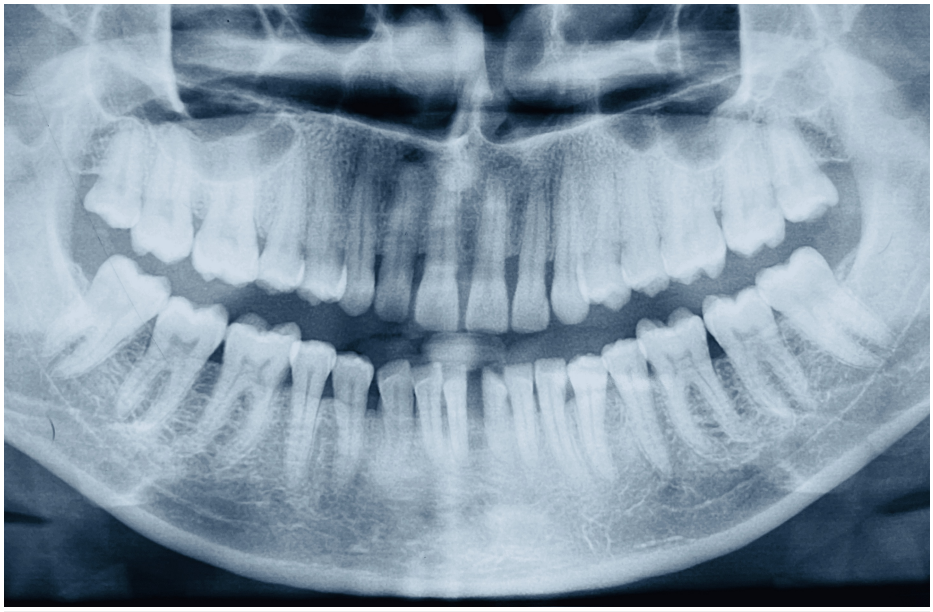


FIGURE 2: Preoperative orthopantomogram showing bone loss in the upper and lower anterior regions.

One month before the respective periodontal surgeries, the patient received Phase I periodontal treatment and an orthodontic referral for the tongue-thrusting habit. In addition, oral hygiene education was provided,

and the patient was instructed in a nontraumatic toothbrushing technique. Furthermore, she was educated on the proper use of interdental brushes for cleaning interproximal areas. At baseline and subsequent follow-up appointments, all assessments were performed by qualified dental specialists.

The periodontal plastic surgery procedures performed were CTG with MCAF for teeth 11-13 (Figure *3*) and PRF with MCAF for teeth 21-23 (Figure *4*) in the maxillary arch. In the mandibular arch, because the vestibule was shallow and the attached gingiva was limited, DLSBF with CTG was performed for teeth 31-33 (Figure *5*), and FGG was performed for teeth 41-43 (Figure *6*). Postoperative instructions included suture removal on the 14th postoperative day, use of an antiplaque mouth rinse for seven to 10 days following treatment, and routine follow-up appointments to evaluate healing and plaque control. Mean root coverage was calculated as a percentage by subtracting the postoperative gingival RD from the preoperative RD, dividing the difference by the preoperative RD, and multiplying by 100. RD, RW, KTW, and mean root coverage were recorded at six, 12, and 18 months. RES, CRC, and overall patient satisfaction were recorded at the six-month follow-up visit, and pain was assessed 48 hours after surgery. The data were tabulated (Tables *1*-*3*).

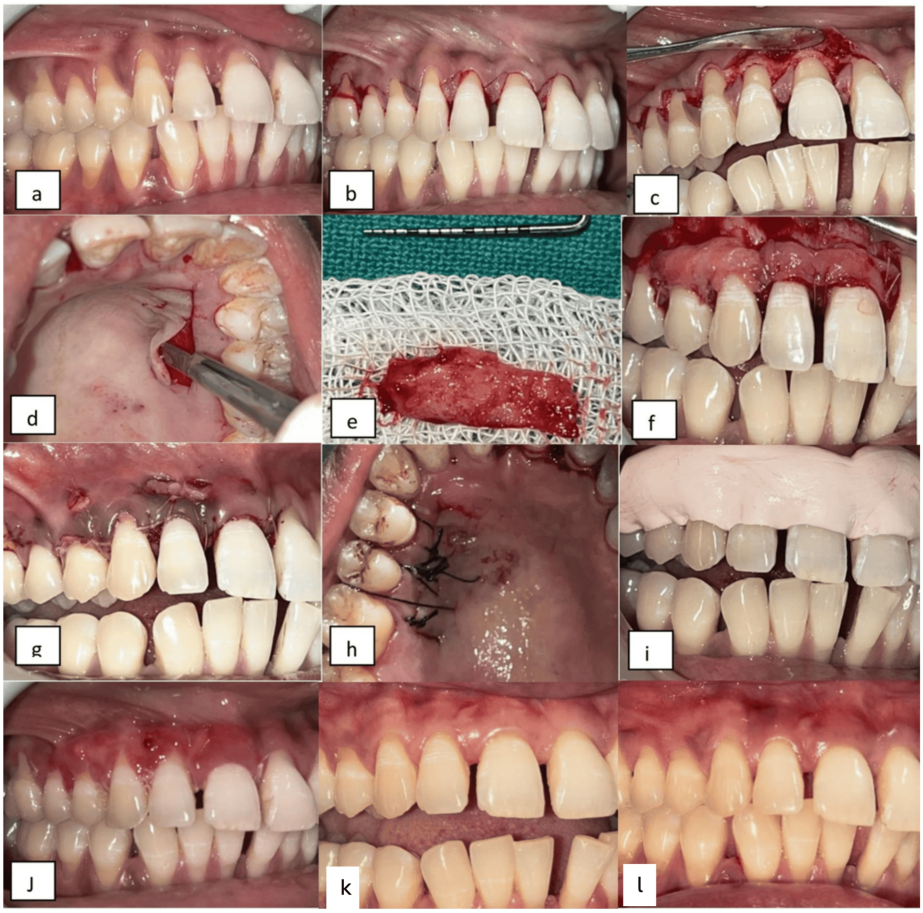


FIGURE 3: MCAF + CTG.

(a) Preoperative view after SRP. (b) Incision for MCAF. (c) Partial-thickness flap raised beyond the MGJ. (d) Procurement of palatal CTG. (e) Procured CTG. (f) Procured CTG split in half and sutured in the desired area. (g) Flap closure. (h) Suturing of the donor site. (i) Periodontal pack placement. (j) Immediately after suture removal. (k) Six-month follow-up. (l) 18-month follow-up.

CTG: connective tissue graft; MCAF: modified coronally advanced flap; MGJ: mucogingival junction; SRP: scaling and root planing

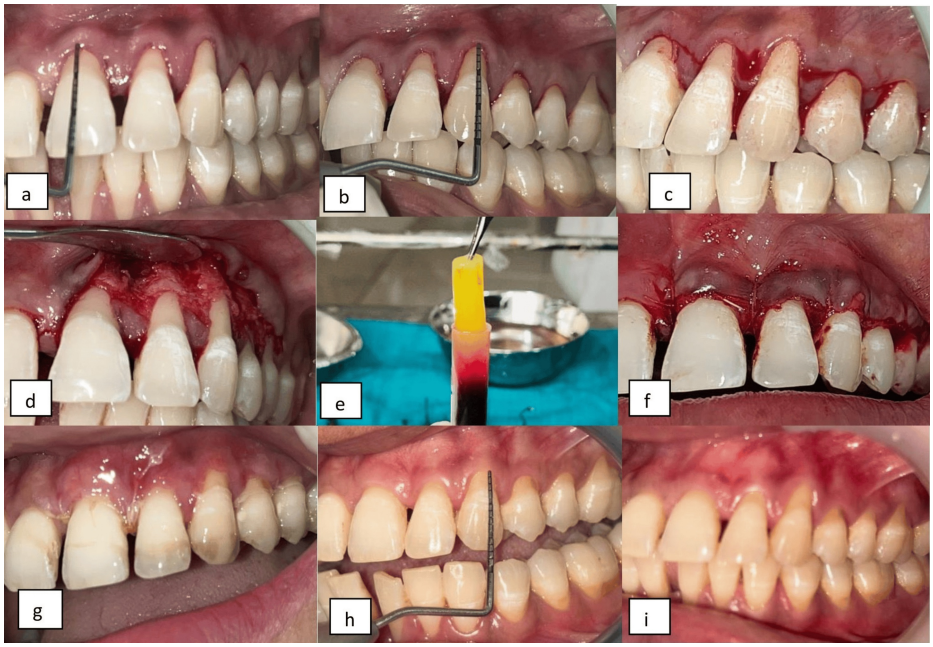


FIGURE 4: MCAF + PRF.

(a) Preoperative view after SRP. (b) Preoperative RD at the canine. (c) Incision for MCAF. (d) Partial-thickness flap raised. (e) Generation of autologous PRF. (f) Placement of PRF and suturing after coronal advancement of the flap. (g) Immediately after suture removal. (h) Six-month follow-up showing CRC of the central incisor and partial coverage of the canine. (i) 18-month follow-up.

CRC: complete root coverage; MCAF: modified coronally advanced flap; PRF: platelet-rich fibrin; RD: recession depth; SRP: scaling and root planing

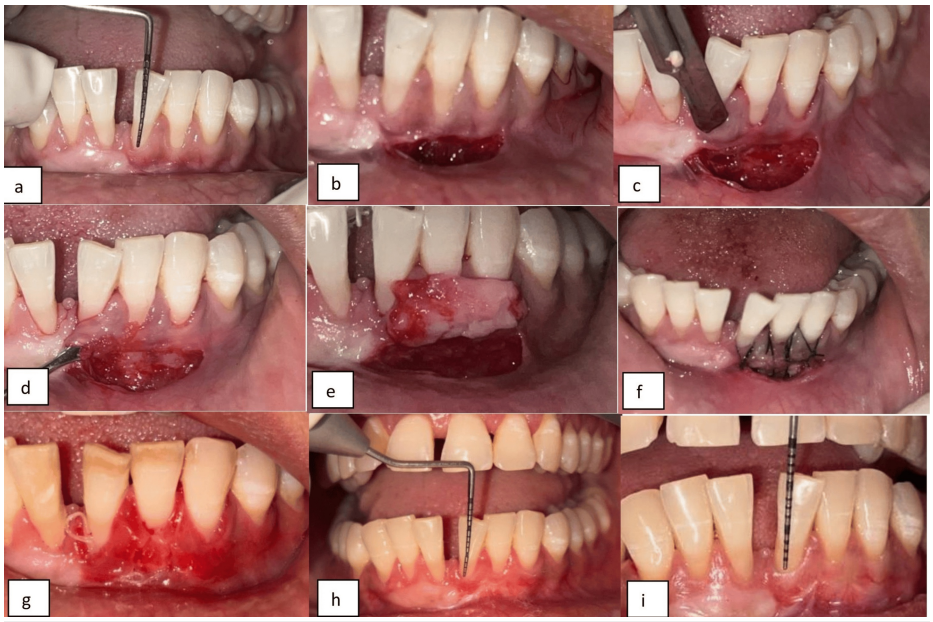


FIGURE 5: DLSBF with CTG.

(a) Preoperative RD. (b) Vestibular incision. (c) Sulcular incision. (d) Elevation of partial-thickness flap. (e) Procured CTG tucked and sutured in the desired area. (f) Suturing of partial-thickness flap. (g) Immediate postoperative view. (h) Six-month postoperative view. (i) 18-month postoperative view.

CTG: connective tissue graft; DLSBF: double lateral sliding bridge flap; RD: recession depth



FIGURE 6: FGG.

(a) Preoperative view after SRP. (b) Preparation of the recipient bed. (c) Procured FGG placed in the desired location. (d) Suturing of the graft. (e) Immediate postoperative view. (f) RD after six months. (g) KTW after six months. (h) RD after 18 months. (i) KTW after 18 months.

FGG: free gingival graft; KTW: keratinized tissue width; RD: recession depth; SRP: scaling and root planing

Technique	Tooth position	GM	MTC	STT	MGJ	GC	RES value	CRC
Modified CAF + CTG	11	6	1	1	1	1	10	Yes
	12	3	1	1	1	1	7	No
	13	3	1	1	1	1	7	No
Modified CAF + PRF	21	6	1	1	1	1	10	Yes
	22	3	1	1	1	1	7	No
	23	3	1	1	1	1	7	No
DLSBF + CTG	31	3	1	1	1	1	7	No
	32	3	1	1	1	1	7	No
	33	6	1	1	1	1	10	Yes
FGG	41	3	0	0	1	0	4	No
	42	3	0	0	1	0	4	No
	43	3	0	0	1	0	4	No

TABLE 2: RES and CRC achieved with various techniques.

CAF: coronally advanced flap; CRC: complete root coverage; CTG: connective tissue graft; DLSBF: double lateral sliding bridge flap; FGG: free gingival graft; GC: gingival consistency; GM: gingival margin; MGJ: mucogingival junction; MTC: mucosal tissue color; PRF: platelet-rich fibrin; RES: root coverage esthetic score; STT: soft tissue thickness

Technique	Tooth no.	Overall satisfaction (0-5)	Pain (VAS, 0-5)
MCAF + CTG	11, 12, 13	5	4
MCAF + PRF	21, 22, 23	5	2
DLSBF + CTG	31, 32, 33	4	5
FGG	41, 42, 43	3	4

TABLE 3: PROMs for different procedures.

CTG: connective tissue graft; DLSBF: double lateral sliding bridge flap; FGG: free gingival graft; MCAF: modified coronally advanced flap; PRF: platelet-rich fibrin; PROM: patient-reported outcome measure; VAS: Visual Analog Scale

The treatment approaches resulted in CRC in the maxillary incisors and more than 50% root coverage in the canines. Although only partial root coverage was achieved in the mandibular anterior teeth, a noticeable increase in KTW was observed, particularly at the sites treated with FGG. The combination of DLSBF and CTG demonstrated improved root coverage outcomes for the mandibular teeth. Patient satisfaction was highest following treatment of the maxillary teeth, reflecting the favorable esthetic outcomes achieved (Figure *7*, Tables *1*-*3*). Among the procedures performed, the second procedure, in which PRF was used instead of a soft tissue graft, was associated with the least postoperative discomfort. Furthermore, all donor sites healed uneventfully, with no reported complications.



FIGURE 7: Six-month postoperative view showing CRC of the upper incisors and partial root coverage of the mandibular anterior teeth.

CRC: complete root coverage

Discussion

Esthetic assessment is subjective and may be influenced by cultural background. However, an objective esthetic evaluation is useful when assessing the outcomes of cosmetic surgery. The RES system is one such tool for comprehensively evaluating the long-term esthetic outcomes of root coverage procedures. RES scores provide an objective means of evaluating various root coverage procedures. Patient-reported outcomes, such as pain experienced and overall satisfaction, provide additional evidence supporting the technique and were therefore included. The present case aims to report the selection of surgical techniques for different anatomical locations and gingival phenotypes and to evaluate the stability of the results over 18 months using both subjective and objective measures.

Although systematic reviews have reported that a six-month evaluation period for root coverage procedures

is considered adequate to allow soft tissue stability and maturation [15,16], it has also been shown that the follow-up period for esthetic evaluations should not be shorter than 12 months [3]. Hence, the patient was followed up for more than a year.

The patient tolerated the procedures well, and no adverse reactions were reported. Healing of both donor and recipient sites was satisfactory. According to the RES system, CRC and the best esthetic results were achieved with CTG and a coronally repositioned flap. However, the greatest increase in KTW was achieved with FGG. DLSBF with CTG is a single-stage procedure for achieving both root coverage and increased KTW. However, randomized controlled trials involving larger samples are required to determine the superiority of one technique over another.

Conclusions

Root coverage endpoints may not always include CRC. To determine the long-term durability of outcomes, more objective evaluation methods, such as RES, should also be considered. PROMs provide additional evidence. Submerged CTGs might yield more consistent results in esthetically demanding areas. However, DLSBF with CTG provides a single-stage alternative in the mandibular anterior region, where reduced attached gingiva and a shallow vestibule frequently complicate root coverage procedures, by concurrently increasing the width of the attached gingiva and coronally repositioning the gingival margin.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Sangita Agarwal

Acquisition, analysis, or interpretation of data: Sangita Agarwal, Sanjum Aasma, Jaishree Borkar, Alka Snehil, Arunkumar P Dodamani

Drafting of the manuscript: Sangita Agarwal, Sanjum Aasma, Arunkumar P Dodamani

Critical review of the manuscript for important intellectual content: Sangita Agarwal, Jaishree Borkar, Alka Snehil

Supervision: Sangita Agarwal

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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