Original Article

# Comparative Evaluation of Autologous Fibrin Glue and Conventional Sutures in the Treatment of Gingival Recession Using Connective Tissue Graft - A Randomised Controlled Clinical Trial


## Abstract

**Background:** The combination of the coronally positioned flap with connective tissue grafting in treating gingival recession defects has been shown to demonstrate the highest success rate. **Aim:** The aim of the present study was to compare and evaluate the efficiency between autologous fibrin glue (AFG) and conventional absorbable sutures in the treatment of marginal tissue recessions using connective tissue grafts (CTGs) and the coronally advanced flap (CAF) technique. **Methods:** Twenty Miller's class I and II recession sites in maxillary or mandibular areas in chronic periodontitis patients were treated as group I (test): CTG + CAF + AFG; and group II (control): CTG + CAF with conventional absorbable sutures. Clinical parameters in both groups were recorded at baseline (t0) and six months (t1) postoperatively in terms of gingival recession height (RH), root coverage esthetic score (RCES), visual analogue scale (VAS), and healing index (HI). **Results:** The RH, RCES, VAS, and HI were significantly reduced at the end of six months compared to baseline ($P < 0.005$) in both groups; however, there was no statistical difference between the groups, indicating the equivalent efficacy of AFG and conventional sutures in healing. **Conclusion:** All the treated sites were found to have appreciable root coverage with satisfactory post-operative healing. Hence, it may be suggested that both AFG and absorbable sutures are equally efficient in post-surgical soft tissue healing.


**Keywords:** *Autologous fibrin glue, connective tissue graft, coronally advanced flap, gingival recession*


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## Introduction

Gingival recession (GR) or soft tissue recession is defined as the displacement of the gingival margin apical to the cementoenamel junction (CEJ) of a tooth or the platform of a dental implant.[1] This condition is associated with the loss of periodontal tissues, including gingiva, periodontal ligament, root cementum, and bone at dental sites as well as the loss of mucosa and bone around dental implants. The prevalence is ranging from 40–100% depending on both the population and the methods of analysis.[2] Recession has been found more frequently on buccal surfaces than on other aspects of the teeth.[3] Although GR is not considered a disease, its presence increases the risk of developing dentin sensitivity,[4] and it is also an aesthetic concern when located on the anterior teeth, negatively impacting the quality of life; recession can happen due to several factors, such as periodontal disease, aggressive tooth brushing, improper orthodontic treatment, a minimal amount of keratinized tissue, etc.[5]

The treatment of GR can be accomplished with a variety of surgical procedures. However, the combination of the coronally advanced flap (CAF) with connective tissue graft (CTG) or enamel matrix derivative has been shown to demonstrate the highest success rate.[6] After the surgical procedure, tissues are approximated by sutures; in these technique-sensitive surgeries where there is high aesthetic importance, generally microsurgical absorbable sutures are being widely used. Absorbable sutures are made of materials such as the fibres that line animal intestines or artificially created polymers that easily dissolve in the body, may develop suture hypersensitivity, and have increased postoperative discomfort and a higher infection rate.[7] To overcome these disadvantages, tissue adhesives have been researched for years. Fibrin glue is



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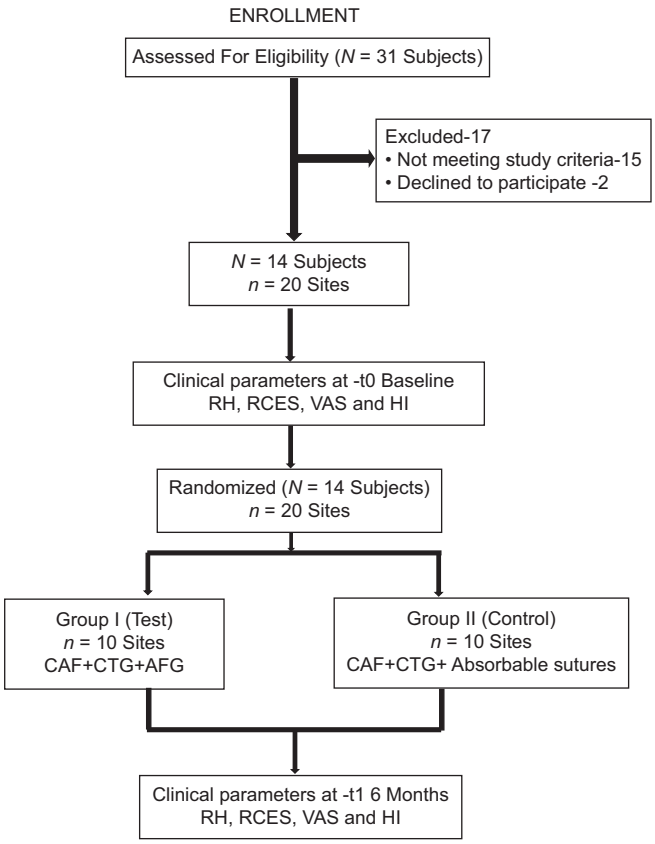


**Figure 1: Study design**

one such biological tissue adhesive mimicking the final stages of coagulation with several advantages. Fibrin sealant is a synthetic substance used to create fibrin clots. It is composed of fibrinogen and thrombin, where thrombin acts as an enzyme and converts the fibrinogen to fibrin, which can act as a tissue adhesive. Fibrin which is used as a tissue adhesive, is highly malleable and flexible, allowing for its use within small spaces; in addition to this, fibrin may be applied to improve haemostasis.[8]

Commercially available fibrin sealants have disadvantages such as being significantly more expensive than sutures at face value[9] and having a theoretical risk of transmission of viruses or prion diseases.[10] In autologous fibrin glue (AFG), the fibrinogen is prepared from the patient's blood in contrast to the fibrin adhesive available commercially, where the fibrinogen is prepared from pooled donor plasma. The glue had a fibrinogen concentration of approximately 12 times the value in platelet-rich plasma and the concentration of growth factors was approximately eight times the value in platelet-rich plasma.[11] As there is no scientific literature available proving the efficiency of AFG and conventional absorbable sutures in treating marginal tissue recession, the present study is the first of its kind, designed to evaluate and compare the efficiency between AFG and conventional sutures in the treatment of marginal tissue recessions utilizing CTG.

## Methods

Twenty Miller's class I and II recession sites in maxillary/mandibular areas in systemically healthy subjects were recruited for this study [Figure 1]. The subjects from the outpatient department of periodontology were enrolled and desired treatment for GR. The nature and purpose of the study were explained to the patients in their native language and informed consent was obtained. The Institutional Ethical Committee (IEC) approved the study (IEC No: IEC/2020/411). The study was registered in Clinical Trials Registry-India (CTRI) (Reg No. CTRI/2021/07/034610).

Inclusion criteria include the presence of Miller's class I or II maxillary or mandibular marginal tissue recession, an age group of 18–55 years, and systemically healthy patients.

Exclusion criteria include systemically compromised patients, pregnant women and lactating mothers, smokers, and those with malposed teeth. Twenty sites were randomly allocated into two groups (10 in each group) by a computer-generated system of randomization. Sites in group I (test) were treated by CAF + CTG + AFG, whereas in group II (control), sites were treated by CAF + CTG with conventional absorbable sutures. Changes in clinical parameters like gingival recession height (RH), root coverage esthetic score (RCES), visual analogue scale (VAS), and healing index (HI) were recorded at baseline and six months. All the patients underwent scaling and root planning four weeks prior to the surgical procedure. RH was measured as the distance from the CEJ to the most apical point of the gingival margin (GM). The root coverage esthetic score (RCES) system evaluated five variables 6 months following surgery: GM, marginal tissue contour (MTC), soft tissue texture (STT), mucogingival junction (MGJ) alignment, and gingival colour (GC). Zero, 3, or 6 points were used for the evaluation of the position of the gingival margin, whereas a score of 0 or 1 point was used for other variables. VAS: patients were asked to evaluate the post-operative period after treatment for pain, discomfort, and swelling with VAS ranging from 0 to 10 and recorded. HI: it evaluates periodontal soft tissue wound healing with scores from 1 to 3. On this scale, wounds are scored 1 in the absence of gingival oedema, erythema, suppuration, patient discomfort, and flap dehiscence; a score of 2 refers to uneventful healing with slight gingival oedema, erythema, patient discomfort, and flap dehiscence, but no suppuration; and a score of 3 corresponds to poor wound healing with significant gingival oedema, erythema, suppuration, patient discomfort, and flap dehiscence, or any suppuration.

### Surgical procedure

Ten millilitres of patient's venous blood were collected from the anti-cubital by venipuncture in vacutainers containing 0.9% sodium citrate for AFG preparation and was centrifuged (REMI 8C) at 3000 rpm for 10 min. This

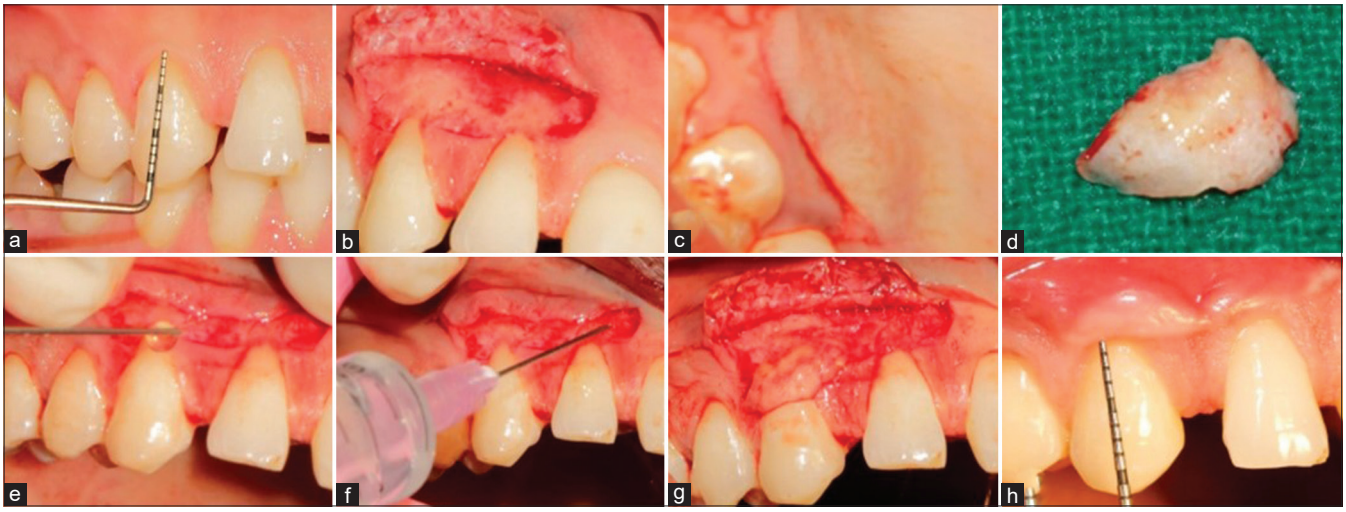


**Figure 2: Surgical procedure in the test group. a: Pre-operative image measuring recession height (RH); b: Recipient site – incision and reflection; c: Donor site – incision line; d: Connective tissue graft (CTG); e: Application of autologous fibrin glue (AFG) f: An equal amount of $CaCl_2$; g: Stabilised CTG; h: Postoperative six-month follow-up**

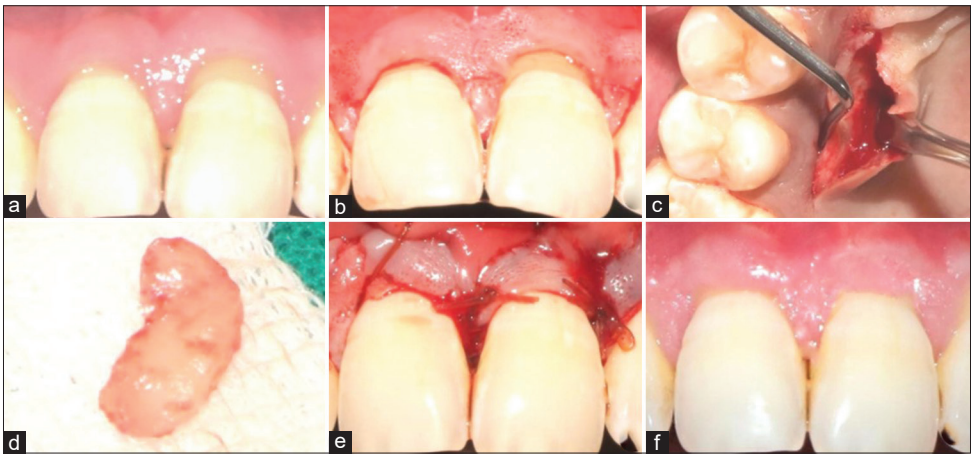


**Figure 3: Surgical procedure in the control group. a: Pre-operative image measuring RH; b: Recipient site- incision and reflection; c: Donor site – incision line; d: Connective Tissue Graft (CTG); e: Stabilised CTG; f: Postoperative six-month follow-up**

vacutainer now had a top layer of platelet-poor plasma, a middle layer of platelet-rich plasma, and a bottom fraction of red blood cells. The platelet-poor and platelet-rich plasma were aspirated using a sterile syringe and then transferred into the non-coated glass tube and the RBC fraction was discarded.

Protamine sulphate (10 mg/ml) was added to a non-coated glass tube containing platelet-rich and platelet-poor plasma for precipitation of the maximum quantity of fibrinogen.[12] This test tube was centrifuged (REMI 8C) at 1000 rpm for 5 min. The centrifuged tube contained a top layer of serum with thrombin (autologous) and the bottom part of the fibrinogen precipitate, of which the top serum was discarded, retaining 0.5 ml of it in the test tube to dilute the fibrinogen precipitate. It was then aspirated into a separate syringe. Another syringe of calcium chloride (0.025 mmol/l) was loaded, and both solutions in equal quantities were used for application at selected test sites.[13]

After achieving profound anaesthesia at donor sites with lignocaine with 1:80,000 adrenaline (Lignox 2% A; Indoco Remedies Ltd., L-32, Goa), a CTG was harvested by a single incision technique.[14] A single horizontal incision was made with the #15 blade directing towards bone approximately 2–3 mm apically to the gingival margin of the maxillary teeth. Based on the obtained requirements of the graft dimensions, the length of the incision was given for the elevation and removal of the donor tissue. To minimise the chance of sloughing of the overlying tissue, a partial-thickness dissection was made within the single incision. This provides the intact palatal flap with adequate thickness. The dissection of the flap was also carried out as far apical as necessary to obtain the desired dimensions of the graft; the connective tissue was carefully elevated from periosteum and the graft was then harvested. The periosteum was left intact on the surface of the bone. The CTG was retrieved, and 3-0 black braided non-absorbable silk sutures (Trusilk) were placed.

After anesthetizing the area, oblique submarginal incisions in some areas were given. The envelope flap was raised with a split-full-split approach in the coronal apical direction, keeping a split thickness manner at the level of the surgical papilla. The gingival tissue apical to the exposure was raised in a full-thickness manner to provide that portion of the flap critical for root coverage with more thickness. The most apical portion of the flap was elevated in a split-thickness manner to facilitate the coronal displacement of the flap. The root surfaces were mechanically treated with Gracey curettes (Hu-Friedy, USA). The harvested graft was placed below the split-thickness flap and AFG was added to stabilise the graft. Digital pressure was applied for 2–3 minutes, flap was coronally advanced for the final flap position and closure was done [Figure 2] by using 3-0 black braided non-absorbable silk sutures (Trusilk) in the test group, whereas in the control group the harvested graft was placed onto the recipient site and immobilised by holding sutures using 4-0 absorbable Vicryl sutures [Figure 3] (Ethicon) and periodontal dressing was given (GC Coe-Pak). Patients were recalled after 10 days for suture removal and measurements were recorded at six months (t1).

All patients received systemic antibiotic therapy (capsule amoxicillin 500 mg thrice daily and tablet Metrogyl 400 mg thrice daily) for five days and analgesics (tablet Voveran 50 mg twice daily) for three days to prevent postoperative pain and oedema. Postoperative instructions were given to the patient. Then, a 0.2% chlorhexidine mouth rinse was advised twice daily.

### Statistical analysis

The values were described as means and standard deviations. The null hypothesis was tested by the Mann-Whitney U test. The comparison between RH, RES, VAS, and HI at baseline (t0) and 6 months (t1) after surgery was performed by the Wilcoxon matched-paired *t*-test. The relationship between periodontal parameters was analysed by the Pearson correlation coefficient. All tests adopted a significance level of 5% ($P < 0.05$).

## Results

On intragroup comparison of clinical parameters from baseline to 6 months in RH, HI, VAS, and RCES were 1.7 ± 0.8, 1 ± 0, 3.9 ± 1.8, −1.5 ± 1.8, respectively, in the test group were statistically significant, and RH, HI, VAS, and RCES values in the control group were 2 ± 0.8, 0.8 ± 0.6, 5 ± 1.33, −2.2 ± 0.6, respectively [Table 1]. Improvement in clinical parameters, when compared between test and control groups at baseline to six months [Table 2], were RH 1.7 ± 0.8, 2 ± 0.8, HI was 1 ± 0 and 0.8 ± 0.63, VAS was 3.9 ± 1.8 and 5 ± 1.3 and RCES −1.5 ± 1.8 and −2.2 ± 0.63, respectively.

## Discussion

The present randomised controlled clinical trial was conducted to evaluate the post-surgical soft tissue healing efficiency of AFG and to compare and evaluate the soft tissue healing efficiency between AFG and conventional sutures. In the present study, the CAF + CTG group showed a reduction of RH from mean the baseline 2.6 ± 1.0 to 0.6 ± 0.6 at the end of six months. In a study done by Neves *et al*.,[15] Miller's class I or II GR defects were treated by CAF + CTG, TUN + CTG the graft was stabilised by absorbable sutures in both groups. The baseline mean RH in the CAF + CTG group was 3.2 ± 0.7, which reduced to 0.4 ± 0.7 at the end of 12 months, which was statistically significant. The results obtained are similar to those of the CAF + CTG group in our present study. In the present study, CAF + CTG with absorbable sutures group mean baseline value of HI reduced from 2 ± 0 to 1.2 ± 0.6 at the end of 6 months, which was statistically significant.

In a split-mouth randomised controlled trial (RCT) by Jenabian *et al*.[16] Miller's class I GRs were treated on one side with CAF + CTG + Plasma Rich in Growth Factors (PRGF) and the other side was treated with CAF + CTG where absorbable sutures were used to stabilise the graft. HI exhibited significant differences at 1-, 3-, 7- and 30-day post-operative intervals. The results obtained in the above study agree with the results obtained in the CAF + CTG with absorbable sutures group of the present study. In another randomised controlled clinical trial, Pulikkoti *et al*.,[17] compared wound healing clinically after periodontal flap surgery. On the test site, fibrin sealant was applied for flap closure and on the control site, sutures were used. Clinically, wound healing was observed at 7, 14, and 21 days of periodontal flap closure. The difference between the test and control groups was statistically significant with a $P$ value < 0.005. These results are similar to the results obtained in the CAF + CTG + AFG group of the present study, where the HI score at six months shows statistical significance with a $P$ value of 0.0019.

In a case report by Dave and Sathyanarayana,[13] a new simplified and modified version of Alston *et al*.,[12] was followed to prepare AFG. They reported better healing in the areas closed with fibrin glue. The result obtained in the case report is similar to the CAF + CTG + AFG group of the present study, where there is a statistically significant healing score from baseline to 6 months. In a study done by Bhatia and Yadav,[18] a total of 20 adjacent recession defects in mandibular incisors were treated with CTG, where graft-holding sutures were absorbable sutures. In the present study, VAS scores were recorded at baseline and six months. The mean VAS score was 5.00 ± 0.89 at baseline and reduced to 1.16 ± 0.98 at six months; the difference was statistically significant. This result is similar to the result obtained in the CAF + CTG + absorbable

**Table 1: Intragroup comparison of mean difference, percentage of change at different time points, and their significance in both test and control groups for RH, healing index, VAS, and root coverage aesthetic scores**

| Groups | Time points | Mean diff. | | | | % of change | | | | *P* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [+]RH | [++]HI | [§]VAS | [ǁ]RCES | [+]RH | [++]HI | [§]VAS | [ǁ]RCES | [+]RH | [++]HI | [§]VAS | [ǁ]RCES |
| Control | t0–t1 | 1.7±0.8 | 1±0 | 3.9±1.8 | −1.5±1.8 | 62.9 | 50 | 92.8 | -22.3 | 0.00055* | 0.00055* | 0.00069* | 0.01497 |
| group | t0–t1 | 2±0.8 | 0.8±0.6 | 5±1.33 | −2.2±0.6 | 76.9 | 40 | 100 | 37 | 0.00055* | 0.00823* | 0.00055* | 0.00055* |

[+]RH: recession height, [++]HI: healing index, [§]VAS: visual analogue scale, [ǁ]RCES: root coverage aesthetic score, *P*≤0.0001*: statistical significance

**Table 2: Inter-group comparison of means at different time points, and their significance in both test and control groups for RH, HI, VAS, and root coverage aesthetic scores**

| Outcomes assessed | Test group Mean | | | Control group Mean | | | *P* | | |
|---|---|---|---|---|---|---|---|---|---|
| | [+]t0 | [++]t1 | t0–t1 | [+]t0 | [++]t1 | t0-t1 | [+]t0 | [++]t1 | t0–t1 |
| RH | 2.7±0.9 | 1±1.33 | 1.7±0.8 | 2.6±1.0 | 0.6±0.6 | 2±0.8 | 0.93 | 0.67 | 0.42 |
| HI | 2±0 | 1±0 | 1±0 | 2±0 | 1.2±0.6 | 0.8±0.63 | 1 | 0.7 | 0.7 |
| VAS | 4.2±1.3 | 0.3±0.9 | 3.9±1.8 | 5±1.3 | 0 | 5±1.3 | 0.2 | 0.7 | 0.19 |
| Root coverage aesthetic score | 6.7±0.9 | 8.2±1.8 | −1.5±1.8 | 5.9±1.28 | 8.1±1.19 | −2.2±0.63 | 0.16 | 0.70 | 0.79 |

[+]t0: baseline, [++]t1: 6 months, *P*≤0001*: Statistical significance. RH: Recession height, HI: Healing index, VAS: Visual analogue scale

sutures group, where the mean VAS score at baseline was 5 ± 1.333 which was reduced to 0 which was statistically significant.

In another study by Stephany Gil *et al*.,[19] where 48 patients were randomly assigned for treatment either with CAF or with CAF + CTG, in the latter group, absorbable sutures were used to stabilise the graft. A professional aesthetic evaluation was performed using the RCES. The final RCES in the CAF + CTG group at the end of 4 years was 7.25 ± 1.29, which was statistically significant. The CAF + CTG group results are similar to the CAF + CTG + absorbable sutures group results of the present study, where RCES at the end of six months were 8.1 ± 1.197 which were found to be statistically significant. In a study by Narsingyani *et al*.,[20] the time taken to close the incision, to achieve haemostasis, wound healing, postoperative pain and oedema were found to be less in the cyanoacrylate group when compared to the silk suture.

In the present clinical study, both test and control groups showed clinically and statistically significant improvement in RH, HI, VAS, and RCES within the groups from baseline to six months. However, there was no statistically significant difference between the groups. Therefore, AFG is equally efficient as conventional absorbable sutures. Even though scientific data proves that AFG contains growth factors, there was no superiority in statistical and clinical outcomes with respect to post-surgical soft tissue healing; this could be attributed to various factors like variations in the preparation of AFG, patient-related factors, study design, and technical difficulties.

The limitations of the present study are, less sample size in both groups, less time period of follow-up, VAS comparison is limited mainly by the similar donor site morbidity as the graft is being harvested for recession coverage in both the test and control groups, and stability of the CTG after placement was not evaluated. AFG preparation requires expertise in phlebotomy, technical difficulties, and additional preparation time away from the chairside. Future research should focus on eliminating these limitations by further simplifying the process using minimal materials, which would make its use more common.

## Conclusion

The present study demonstrated that AFG + CTG and conventional absorbable sutures with CTG are effective and predictable in providing clinically and statistically significant outcomes with respect to root coverage in Miller's class I and class II recessions without significant morbidity or potential clinical difficulties associated with donor site surgeries.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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