"COMPARATIVE EVALUATION OF CORONALLY ADVANCED FLAP WITH SUBEPITHELIAL CONNECTIVE TISSUE GRAFT ALONE AND IN CONJUNCTION WITH INJECTABLE PLATELET RICH FIBRIN FOR THE TREATMENT OF MILLER'S CLASS-II GINGIVAL RECESSION: A RANDOMIZED CLINICAL TRIAL."

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Abstract:

Introduction: The major aesthetic concern in relation to the periodontal tissues is mostly due to gingival recession. In such conditions, achieving root coverage with the assistance of soft and hard tissue periodontal regenerative surgeries might minimize such problems. The aim of the study was to compare the clinical outcomes of coronally advanced flap procedure in root coverage with subepithelial connective tissue graft alone and in conjunction with injectable platelet rich fibrin for the treatment of Miller's class II gingival recession.

Materials and Methods: The study design consisted of 30 patients with a total of 15 sites in both test group and control group with Miller's Class-II recession on anterior teeth. They were randomly assigned into CAF+SCTG+ I-PRF group (test) or CAF+SCTG group (control). The patients were followed up period of 3 months.

Statistical Analysis: The obtained values were analysed using Unpaired 't' test. SPSS version 21 was used to analyse the collected data.

Results: Both the surgical approaches showed healing without complications and recession coverage of 86-92% was achieved at the end of 3 months.

Conclusion: CAF+SCTG procedure with either I-PRF or alone are both effective for treating Miller's Class-II gingival recessions. CAF with SCTG provided better root coverage than CAF +SCTG with I-PRF. Use of I-PRF as a root surface bio-modifier offered no additional benefit in our study. Further studies with bigger sample size should be done to support the insights of our study.

Keywords: coronally advanced flap, subepithelial connective tissue, injectable platelet rich fibrin, gingival recession.

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INTRODUCTION

GINGIVAL RECESSION is defined as the exposure of root surface by an apical shift in the position of the gingiva.[1] More than two-thirds of the population worldwide was found to be affected by gingival recession.[2] The predominant cause for localized gingival recessions are tooth brushing trauma, tooth malposition, loss of attachment in periodontally untreated populations, high frenal, thin marginal soft tissue, and abnormal muscle attachments that encroaches over the marginal gingiva, chronic trauma and orthodontic tooth movement of thin buccal bony plate.[3,4]

Over the years, several different surgical techniques have been introduced for the correction of gingival recession defects. Coronally advanced flap (CAF) in conjunction with Subepithelial connective tissue graft (SCTG) has emerged as a superior technique and is considered to be gold standard procedure for root coverage in gingival recessions.[5,6] *Choukroun et al* in 2001 was the first to introduce and develop Platelet Rich Fibrin (PRF) .[7,8] PRF is a second-generation platelet concentrate widely used to accelerate soft and hard tissuehealing. Injectable PRF (I-PRF) is the liquid form of PRF and is a bio-active agent and hasthe capacity to stimulate tissue regeneration. At high concentrations, PRF may stimulate the secretion of several growth factors and trigger fibroblast migration.[9] I-PRF is generally used in regenerative treatments, with good outcomes.[10]

The current study aimed to compare the clinical outcomes of coronally advanced flap procedure in root coverage with subepithelial connective tissue graft alone and in conjunction with injectable platelet rich fibrin for the treatment of Miller's class II gingival recession.

MATERIALS AND METHODS:

This clinical study was carried out in the Department of Periodontology, School of Dental Sciences, Krishna Institute of Medical Sciences, Karad. The study sample included 30 subjects having Miller's class II gingival recession. Patients were randomly allocated to receive either Group A (n= 15) –Coronally advanced flap (CAF)+ Subepithelial connective tissue graft (SCTG). Group B (n= 15) –CAF+SCTG along with I-PRF and followed up for a period of 3 months. Approval from the ethical committee of Krishna Institute of Medical Sciences Deemed University was obtained (Ref. No. KIMSDU/IEC/ 06/2022). The nature andpurpose of the study and the surgical protocol was explained to the subjects and a written consent was obtained before commencing the study.

CRITERIA FOR SELECTION OF PATIENTS

Inclusion criteria:

Patients ranging between 20 to 40 years of age with Miller's Class-II gingival recessionhaving at least 2.5 mm thickness sufficient palatal donor tissue, vital tooth involving recession which are free of faulty restorations in a good systemic health.

Exclusion criteria:

Patient with ongoing orthodontic treatment, tobacco usage habits, teeth in traumatic occlusion, malaligned teeth, pregnancy, previous history of periodontal therapy in last 3 months, and long-term use of systemic medications such as corticosteroids or calcium channel blockers or taking non-steroidal anti-inflammatory drugs were excluded from thestudy.

The surgical procedure was elected by flip of a coin prior to the surgery. Surgical procedures were solitarily performed by a trained periodontist for both the groups. The clinical parameters were recorded using a Williams graduated periodontal probe (Hu-Friedy Mfg.

Co., Rotterdam, Netherlands) at baseline, 1 month, 2 months and 3 months interval follow-up. The periodontal clinical parameters were recorded in a specially designed proforma which constituted: 1. Clinical attachment loss/gain, 2. Keratinized tissue width (KTW), 3. Width of gingival recession (WGR), 4. Vertical recession depth (VRD), 5.

Percentage root coverage (RC), 6. Gingival biotype. PPD was measured from the margin of gingiva to the base of gingival sulcus and CAL was measured from cemento-enamel junction(CEJ) to the base of gingival sulcus. KTW was measured from the margin of gingiva to the mucogingival junction (MGJ). VRD was measured from the CEJ to the deepest point on the gingival margin. WGR was measured at 1mm apically to the CEJ in the mesiodistal directionover the designated tooth.

Presurgical Protocol

All the patients underwent the preliminary phase of oral prophylaxis including thorough scaling and root planing. The patients were demonstrated proper tooth brushing technique and motivated with emphasis on adequate oral hygiene maintenance. Before commencing, required blood investigations were performed. All the necessary measurements were recorded. Preoperative photographs were taken.

Surgical procedure

Extra-oral skin preparation was done with 5% povidone-iodine solution. The patient were asked to do a pre-procedural rinse with 10ml of 0.2%

Chlorhexidine di gluconate solution forone minute. Following asepsis, local anaesthesia (2% lidocaine with adrenaline 1:80,000) was administered at the surgical site. Incisions and flap reflection were carried out as proposed by *Pini Prato et al.* after local anesthesia.[11] An intrasulcular incision, a horizontal incision and two divergent vertical incisions were placed, sparing at least 0.5 mm from the margins of gingiva of adjacent teeth extending to the alveolar mucosa. All the incisions were connected to form a trapezoidal full-thickness flap which was elevated 3-4 mm apical to the marginal bone. A partial-thickness dissection was performed apically to permit the coronal positioningof the elevated flap. (Figure.2c) The exposed surface of root was gently planed with a sharp Gracey 1-2 curette to reduce root convexity. The papillae adjacent to the involved tooth were de-epithelialized. The flap was then coronally advanced to cover the gingival recession towards CEJ.

For Group B-Five millilitres of blood was withdrawn from antecubital fossa with a 24-gauge needle from antecubital fossa into a plain plastic vacutainer. The blood was then immediately centrifuged at 3300 rpm for two minutes in a centrifuge machine (REMI CENTRIFUGE R- 8M PLUS, Remi Laboratories, Jogeshwari, Mumbai, India). Use of plastic tubes has a hydrophobic surface which does not activate the coagulation process effectively. The separated plasma and platelets together situated at the upper layer in light yellow color areused in injectable form.I-PRF was applied over the exposed root surface for 5 minutes.(Figure.2d)

After preparation of the recipient bed, the donor area was anesthetized. Connective tissue without any epithelial collar was harvested from the premolar/molar region of the palate using a trap-door approach suggested by *Edel et al*.[12] Following anaesthesia, a split thickness flap using trap-door technique was elevated to access the donor graft tissue. The connective tissue graft was removed and care was taken to obtain a thickness ranging from 1.5 to 2mm. After an adequate layer of connective tissue was reflected and removed by incising the mesialedge of the graft. The initial trap door flap was replaced over the donor site along with pressure application by a wet gauze soaked with saline. Finger pressure was applied to the donor site for 5 minutes. At the donor site wound edges were closed with 4-0 resorbable sutures.

The CTG was trimmed according to the area of expected coverage and snugly fitted at the recipient site so that it completely covers the exposed root surface.(Figures.1c and 2e) Firmpres sure was then applied on the graft with a sterile moist-gauze pack for 3-5 minutes to aidthe graft to adapt and adhere to the recipient bed. The connective tissue graft was secured inposition with the 4-0 absorbable vicryl sutures. Suturing of oblique incisions was performed with 4-0 ethicon non-resorbable sutures.(Figures 1d and 2f) Periodontal dressing was placed on the recipient site. Post-operative antibiotics and analgesics were prescribed.

Immediately following surgery, intermittent use of ice packs was recommended for 3 hours continuously. All the patients were instructed to refrain from tooth brushing to avoid trauma around the surgical site. Chlorhexidine di-gluconate mouthwash rinse (0.2%) was prescribed twice daily (for 60 seconds) for the initial ten days. The sutures were removed after ten days. The patients were recalled for collection of data at regular intervals of one month and three months.

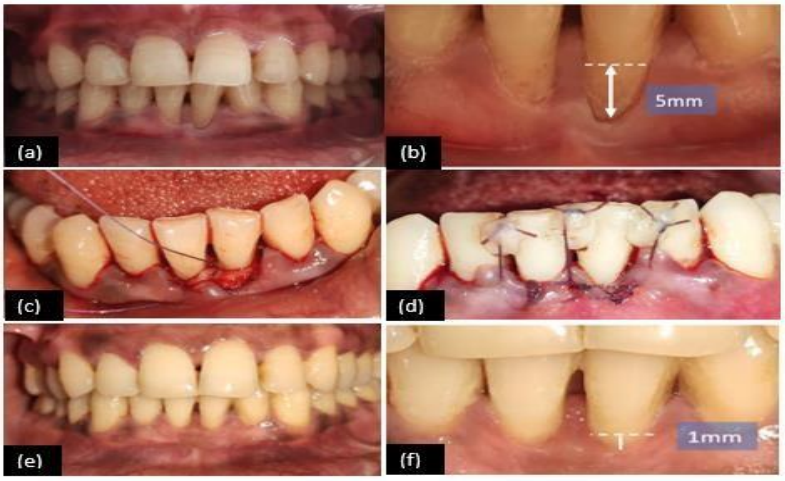


Figure 1: Group A. (a) and (b) Baseline view. (c) placement of SCTG at recipient bed. (d) SCTG with CAF after suture placement. (e) and (f) 3 MONTHS postoperative view.

Figure 2: Group B. (a) and (b) Baseline view, (c) Flap reflection (d) I-PRF application over the root surface (e) placement of SCTG And (f) suture placement. (g) and (h) 3 months postoperative view.

Statistical analysis

Statistical Product and Service Solution (SPSS) version 21 for Windows software was used to analyse the data Statistical analysis was done by using tools of descriptive statistics.

Probability $p<0.05$, considered as significant as alpha error set at 5% with confidence interval of 95% set in the study. Power of the study was set at 80% with beta error at 20%.

Student t test/Unpaired 'I' test used to compare between means of two groups independent of each other i.e, effectiveness of coronally advanced flap with subepithelial connective tissue graft alone (Group A) and in conjunction with injectable platelet rich fibrin (Group B).

Results

The randomized clinical trial assessed the efficacy of root coverage procedure with SCTG+CAF+I-PRF and SCTG+CAF alone in 30 patients with Miller's Class-II gingival recession. At baseline, the mean CAL was found to be 3.13±0.85 and 3.13±0.62 amongst Group A and Group B respectively. (Table 1) On follow up visits at 1, 2 and 3 months no significantly relevant difference in CAL was observed. However, there was a clinically better CAL in Group B (1.86±0.81) as compared to Group A (1.72±0.78). Similarly, no significant statistical difference was observed in KTW at 1, 2 and 3 month follow ups. Group B revealed more gain in overall mean KTW (2.33±0.8) as compared to Group A (2.13±0.81) with no statistical significance. (Table 2) On comparison at baseline, Group A had mean VRD of 3.13±0.89 and for Group B it was 3.13±0.62. (Table 3) However, the VRD was significantly declined in group A (2.8±0.55) on intragroup comparison with Group B (2.7±0.87). The overall decline in WGR was more clinically significant in Group A (4.4±0.62) as compared to Group B (4.36±0.55) whereas no statistically significant difference was noted.

(Table 4) On inter comparison, there was no statistically significant difference in Group A and Group B. (p value =0.177) However, on intragroup comparison Group A showed more clinically evident increase in mean % of root coverage of 92.33±13.37 and in Group B it was found to be 86.11±21.02. (Graph 1) On 3 month follow up, the mean increase in GBT was more in Group A (2.48±0.54) than Group B (2.45±0.54). (Table 5) There was clinically better increase in GBT in Group B (0.66±0.4) as compared to Group A (0.61±0.53).

CAL	Group A (CAF + SCTG) Mean (S.D)	Group B (CAF+SCTG+ I-PRF) Mean (S.D)	Unpaired 't' test	p value, Significance
Baseline	3.13 (0.89)	3.13 (0.62)	t = 0.000	p = 1.000
1 months	2.2 (0.55)	2.06 (0.69)	t = 0.826	p = 0.412
2 months	1.8 (0.66)	1.93 (0.58)	t = - 0.826	p = 0.412
3 months	1.4 (0.49)	1.26 (0.44)	t = 1.088	tp= 0.281
OVERALL CHANGE (Reduction)	1.73 (0.78)	1.86 (0.81)	t = -0.644	p =0.522

p>0.05- no significant difference *p<0.05- significant **p<0.001- highly significant

TABLE 1: Comparison of Clinical Attachment Level (CAL) among group A and group B.

KTW	Group A (CAF + SCTG) Mean (S.D)	Group B (CAF+SCTG+ I-PRF) Mean (S.D)	Unpaired 't' test	p value, Significance
Baseline	2.0 (0.74)	2.0 (0.74)	t = 0.000	p = 1.000
1 months	3.66 (0.8)	3.83 (0.83)	t = -0.789	p = 0.412
2 months	3.73 (0.58)	3.86 (0.57)	t = - 0.894	p = 0.412
3 months	4.13 (0.62)	4.33 (0.6)	t = -1.254	p = 0.281
OVERALL CHANGE (Increase)	2.13 (0.81)	2.33 (0.8)	t = -0.955	p =0.522

p>0.05- no significant difference *p<0.05- significant **p<0.001- highly significant

TABLE 2: Comparison of Keratinized Tissue Width (KTW) among group A and group B.

VRD	Group A (CAF + SCTG) Mean (S.D)	Group B (CAF+SCTG+ I-PRF) Mean (S.D)	Unpaired 't' test	p value, Significance
Baseline	3.13 (0.89)	3.13 (0.62)	t = 0.00	p = 1.000
1 months	0.33 (0.47)	0.33 (0.47)	t = 0.00	p = 1.000
2 months	0.33 (0.47)	0.33 (0.47)	t = 0.00	p = 1.000
3 months	0.33 (0.47)	0.33 (0.47)	t = -0.602	p = 0.550
OVERALL CHANGE (Decline)	2.8 (0.55)	2.7 (0.87)	t = 0.529	p =0.599

p>0.05- no significant difference *p<0.05- significant **p<0.001- highly significant

TABLE 3: Comparison of Vertical Recession Depth (VRD) among group A and group B.

WGR	Group A (CAF + SCTG) Mean (S.D)	Group B (CAF+SCTG+ I-PRF) Mean (S.D)	Unpaired 't' test	p value, Significance
Baseline	4.66 (0.71)	4.63 (0.71)	t = 0.181	p = 0.857
1 months	0.26 (0.44)	0.2 (0.4)	t = 0.602	p = 0.549
2 months	0.26 (0.44)	0.26 (0.44)	t = 0.00	p = 1.000
3 months	0.26 (0.58)	0.26 (0.63)	t = 0.00	p = 1.000
OVERALL CHANGE	4.4 (0.62)	4.36 (0.55)	t = 0.219	p =0.827

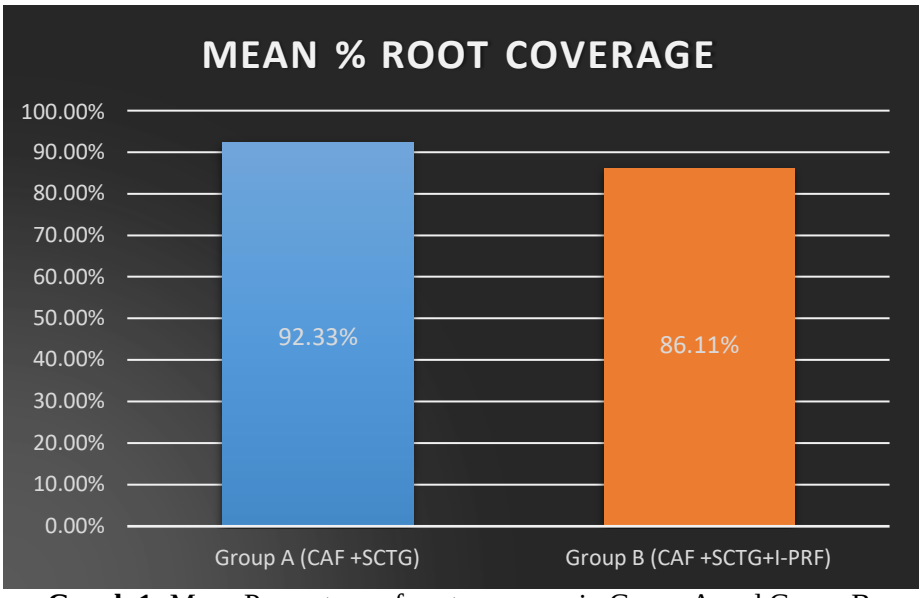
p>0.05- no significant difference *p<0.05- significant **p<0.001- highly significant

TABLE 4: Comparison of Width of Gingival Recession (WGR) among group A and group B.

GBT	Group A (CAF + SCTG) Mean (S.D)	Group B (CAF+SCTG+ I-PRF) Mean (S.D)	Unpaired 't' test	p value, Significance
Baseline	1.86 (0.52)	1.78 (0.44)	t = 0.661	p = 0.511
1 months	2.3 (0.53)	2.23 (0.5)	t = 0.497	p = 0.621
2 months	2.35 (0.54)	2.35 (0.55)	t = 0.000	p = 1.000
3 months	2.48 (0.54)	2.45 (0.53)	t = 0.239	p = 0.812
OVERALL CHANGE (Increase)	0.61 (0.53)	0.66 (0.4)	t = -0.409	p =0.684

p>0.05- no significant difference *p<0.05- significant **p<0.001- highly significant

TABLE 5: Comparison of Gingival Biotype (GBT) among group A and group B.



Graph 1: Mean Percentage of root coverage in Group A and Group B.

Discussion

The development of I-PRF fulfils multiple requirements for clinical application of cell-based tissue-engineering procedures. Use of I-PRF results in the initiation of wound healing and improvises angiogenesis process.[13] I-PRF contains fibronectin,[14] which acts as an adhesive glycoprotein.[15] Hence, we contemplated that it might have a positive clinically favourable adhesive effect on immobilization of autogenous graft. The current study assessed the clinical efficacy of autologous injectable PRF membrane with CAF + SCTG in the treatment of gingival recession compared to CAF+SCTG alone. In the current study, there was a clinically significant CAL gain predominantly seen in Group A (SCTG+CAF) at 3 months follow-up ascompared to Group B (SCTG + CAF + I-PRF) and at 6 months. *Jankovic et al.* [16] observed a non-significant CAL gain with both PRF mesh and CTG controlled sites, whereas authors *Aroca et al* [17] and *Da Silva et al* [18] found statistical significance in sites treated with SCTG than the sites treated with PRF alone, respectively. The gain in CAL was due to the coronal shift of attachment apparatus after performing root coverage procedures. This increase in CAL gain might be attributed to the healing and interpositional property of PRF, as proposed by *Del Corso et al. (2009).* [19]

PRF as a healing material stimulates the gingival connective tissue on its whole surface, withgrowth factors and impregnates the root surface with key matrix proteins, for cell migration. Moreover, the fibrin matrix itself shows mechanical adhesive properties and biologic functions like fibrin glue, which maintained the flap in a high and stable position, enhanced neo-angiogenesis and reduced necrosis, result in maximum root coverage. As an inter- positional matrix PRF layers prevents the early invagination of the gingival epithelium.[20] In the current study, the KTW gain was statistically significant in both groups while group B showed comparatively higher values from baseline to three months follow-up period. On comparison, both the groups showed non-significant increase in KTW values at the end of 3 months. The control group showed an increase in mean KTW by 0.20 mm at 3rd month. Thisis in accordance with the studies done by *Cortes et al. (2004)*[21] and *Huang et al. (2005)*[22] where a gain of KTW was 0.4 mm and 0.6 mm respectively at 6th month. Similarly, the results of the study done by *Jankovic et al. (2010)*[23] showed 0.4 mm increase of mean KTW in CAF group at 6th month which is greater than 0.17 mm for isolated recession defects in CAF+PRF group. Also, *Jankovic et al. (2007)*[24] in another study observed a higher KTW gain, as a result of the influence of growth factors from PRP. The present study did not demonstrate statistically significant ($p>0.05$) difference between the groups for KTW at 3rd month. These results were in accordance with several previous studies like *Roccuzzo M et al* and *Wang HL et al* [25-26] while *Eren and Atilla* [27] reported contradictory results. The KTW gain was statistically significant in both PRF as well as the SCTG groups with high KTW gain in SCTG group from baseline to three months follow-up period. On Intergroup comparison, both the groups showed nonsignificant increase in KTW values at the end of 6 months. The gain in KTW of CTG group is similar to the ability of the palatal graft connective tissue to induce epithelium

keratinisation.[28] The KTW gain in PRF membrane group may be attributed to the fibroblasts gingival or periodontal origin. The results of the current study indicated that both the techniques have significant VRD reduction and improved root coverage percentage. Complete root coverage ensures predictable reduction in dentinal hypersensitivity and enhance aesthetics. *Eren and Atilla* [29] observed that CAF + PRF provided higher percentage of root coverage as compared to CAF+ SCTG alone. The results of their study are contradictory to the present study findings where a lower percentage of root coverage was observed in PRF-treated sites. At month 3 mean % of Root coverage of Group-A (SCTG + CAF) was higher than mean % of Root coverage of Group-B (SCTG+CAF+I- PRF). This finding is contradictory to the study conducted by *Joshi A et al (2020)*[30] in a 6 month follow up a subsequent root coverage was obtained in SCTG+PRF test group than SCTG alone. In the study investigated by *Bozan S. et al (2019)* [31] the patients in the control group were treated only with free gingival graft (FGG). The patients in the experiment group were treated with free gingival graft and injected with I-PRF as a root surface bio modification agent (FGG+I-PRF). The mean root surface coverage values of the 2 groups were 3.5±1.05 and 3.9±0.78 mm in the control and experiment groups, respectively. These findings are against the results of our current study wherein the use of I-PRF as a RSB agent obtained less root coverage than CAF+SCTG treated recessions. In the current study, on 3 month follow up the mean increase in GBT (gingival biotype) was more in Group A than in Group B. A systematic review by *Verma UP et al* demonstrated that PRF enhances the GB (gingival biotype), showed greater stability during remodelling and enhances blood supply to the underlying structures thereby affirming PRF as a therapeutic regenerative biomaterial.[32] *Ozsagir ZB et al.* in a very recent study showed a statistically significant 44% increase in Gingival thickness postI-PRF usage.[33]
Our literature search did not find any studies available which applied I-PRF for root surface bio modification for treatment of recession along with SCTG+CAF. So, we decided to utilise I-PRF application as a RSB agent as it contains fibronectin which is known to improvise the healing process, and it possess an adhesive effect. When some disadvantages with CAF+SCTG are overlooked, evidence from the current study and previously conducted clinical studies support the finding that both the techniques provide predictable root cove rage for recession.

Conclusion

In this randomized clinical study, CAF+SCTG with and without the addition of I-PRF yielded effective favorable clinical outcome in treating Miller's class II gingival recession. The subjects with treated with CAF+SCTG showed better root coverage than CAF+SCTG+I-PRF. In our study, I-PRF as a root surface bio-modifier offered no additional benefit.

Limitations

Smaller sample size and shorter post-surgical follow up period are the limitations of the present study. Shorter post operative follow-ups may lead to failure in recording additional root coverage which may be due to creeping attachment over a long period of time.

Future perspective

Further evaluation of the regenerative capacity of I-PRF can be performed through histologic examinations. A larger sample size with longer follow-up period is essential to substantiate the results of current study.

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Conflicts of interest There are no conflicts of interest.

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