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## BACKGROUND & AIM

Autologous platelet concentrates have been extensively studied due to their biocompatibility beneficial for possible regeneration. Due to the fibrin matrix, platelets, leukocytes, and high concentration of multiple growth factors in concentrated growth factor (CGF), bone marrow cell proliferation and osteoblast differentiation for new bone formation, and wound healing can be stimulated. Thus, the aim of this review is to evaluate on CGF's prospective usage in periodontal osseous surgery and periodontal plastic surgery.

## METHODS

### Focused question:

"Does adjunctive use of CGF in periodontal osseous surgery and periodontal plastic surgery provide clinical benefits to periodontal outcomes?"

<b>P</b>	Patients with periodontal osseous defects and mucogingival defect.
<b>I</b>	Periodontal surgery with CGF; with or without other regenerative biomaterials.
<b>C</b>	Periodontal surgery with or without regenerative biomaterials.
<b>O</b>	Periodontal osseous defect: CAL gain, PD reduction and radiographic bone gain. Periodontal plastic surgery: CRC, MRC
<b>S</b>	RCT, Non-RCT & cohort studies.



## RESULTS

The search results are presented in Figure 1. Total of seven studies were included in this systematic review and the summary of findings for periodontal intrabony defects and mucogingival defects are presented in Table 1 and 2. All RCT studies presented with high risk of bias based on Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) except for one study presented with some concern (Qiao et al., 2016). A study by Lei et al. (2020) presented with moderate risk of bias based on the Risk Of Bias In Non-randomized Studies- of Interventions (ROBINS-I) assessment tool for cohort-type studies.

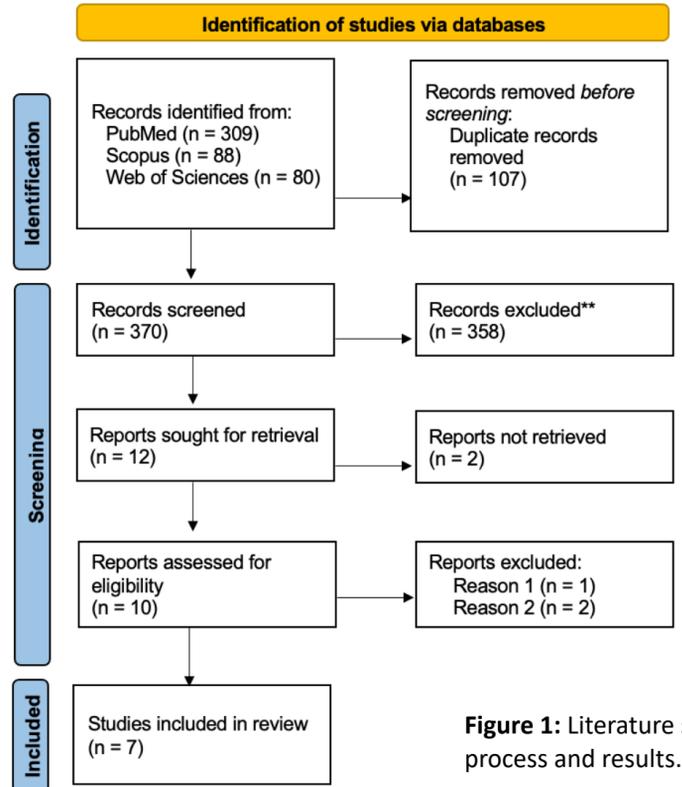


Figure 1: Literature search process and results.

## DISCUSSION

### Periodontal intrabony defect:

- The adjunctive use of CGF enhanced clinical outcome which might be attributed to its biological properties and scaffold structure (Masuki et al., 2016; Kang et al., 2011).
- The contradictory results of CGF in combination with BPBM in two trials might be attributed to the different types of intrabony defects investigated, which may have influenced the outcome of regenerative surgery.
- Despite the limitation of retrospective study, CGF and A-PRF may have the potential to be beneficial GTR biomaterials by promoting bone formation and early soft tissue healing.

### Periodontal plastic surgery:

- The significant improvement in CRC and MRC favouring CTG over CGF may be due to the CGF resorption, which cause inadequate time for cells to repopulate the area (Isler et al., 2018).
- The considerably higher KTW and GT in the CAF+CGF group compared to the CAF group might be explained by CGF biological characteristics of large, dense, and rich in growth factors fibrin matrix. (Rodella et al., 2011). Thus, providing long-term stability of root coverage.
- Significant increased of KTW in the CTG group could be explained by the ability of CTG to induce keratinization of the epithelium (Karing et al., 1975a).

Table 1: Summary of findings for periodontal intrabony defects.

Author/ year	Study design/ Follow up/	Control Group	Test group	CAL changes control (mm)	CAL changes test (mm)	PD reduction control (mm)	PD reduction test (mm)	DDR control (mm)	DDR test (mm)
Qiao et al. (2016)	RCT 12 months	OFD+BPBM	OFD + CGF + BPBM	2.40±1.10*	3.70±1.38*	3.00±1.60*	4.20±1.30*	2.80±1.40	3.80 ±1.50
Xu et al. (2019)	RCT 12 months	OFD	OFD + CGF	2.36±0.92*	3.09±1.14*	1.55±0.93*	2.45±0.76*		
			OFD + BPBM		4.18±1.08		3.72±0.90		
			OFD + CGF + BPBM		4.45±1.13		4.36±1.03		
Lei et al. (2020)	Retrospective cohort 6 months	GTR + BPBM	GTR+ BPBM + A-PRF	3.93±2.02	4.20±1.70	3.87±1.88	4.33±1.35	2.91±1.33	5.11±1.27
			GTR + BPBM + CGF		4.4±1.4		4.6±1.24		

Abbreviations: CAL, clinical attachment level; PD, probing depth; DDR, defect depth reduction; RCT, randomised clinical trial; CGF, concentrated growth factor; BPBM, bovine porous bone mineral; A-PRF, advanced-platelet rich fibrin; GTR, guided tissue regeneration  
\*Intergroup comparison shows statistically significant differences.

Table 2: Summary of findings for mucogingival defects.

Author/ year	Study design/ follow up/ defect type	Control Group	Test group	CRC control (n/%)	CRC test (n/%)	MRC control (%)	MRC test (%)	PF control (mm <sup>2</sup> )	PF test (mm <sup>2</sup> )
Bozkurt Doğan, et al. (2015)	Split-mouth RCT 6 months Multiple Miller class I and II	CAF	CAF + CGF	27/59 (45.8%)	34/60 (56.7%)	82.06 ± 17.49	86.67 ± 15.59	X	X
Akcan & Ünsal (2020)	Split-mouth RCT 6 months Isolated & multiple Miller class I	CAF + CTG	CAF + CGF	X	X	72.45 ± 22.92*	52.54 ± 33.97*	X	X
Korkmaz & Balli (2021)	Parallel RCT 6 months Multiple Miller class I and II	TT + CTG	TT + CGF	34/51 (66.7%) *	27/57 (47.4%) *	89.52 ± 16.36*	76.60 ± 24.10*	X	X
Çankaya et al. (2020)	Parallel RCT 12 months MAPL	Without surgical intervention	Minimally invasive surgery with CGF	X	X	X	X	0.25 ± 0.20	0.06 ± 0.10

Abbreviations: GR, gingival recession; CRC, complete root coverage; MRC, mean root coverage; PF, papillary filling; RCT, randomised controlled trial; CAF, coronally advanced flap; CGF, concentrated growth factor; CTG, connective tissue graft; TT, tunnel technique; MAPL, multiple adjacent papillary losses  
\*Intergroup comparison shows statistically significant differences.

## CONCLUSION

CGF may have beneficial effect on clinical improvement of intrabony defects. Whereas CTG provide superior outcome compared to CGF in root coverage. Further studies with appropriate study design and standardized defect characteristic are needed.

### REFERENCES:

- Bozkurt Doğan, Ş., Öngöz Dede, F., Ballı, U., Atalay, E. N., & Durmuşlar, M. C. (2015). Concentrated growth factor in the treatment of adjacent multiple gingival recessions: a split-mouth randomized clinical trial. *Journal of clinical periodontology*, 42(9), 868–875.
- Lei, L., Yu, Y., Han, J., Shi, D., Sun, W., Zhang, D., & Chen, L. (2020). Quantification of growth factors in advanced platelet-rich fibrin and concentrated growth factors and their clinical efficacy as adjunctive to the GTR procedure in periodontal intrabony defects. *Journal of periodontology*, 91(4), 462–472.
- Masuki, H., Okudera, T., Watanebe, T., Suzuki, M., Nishiyama, K., Okudera, H., Nakata, K., Uematsu, K., Su, C. Y., & Kawase, T. (2016). Growth factor and pro-inflammatory cytokine contents in platelet-rich plasma (PRP), plasma rich in growth factors (PRGF), advanced platelet-rich fibrin (A-PRF), and concentrated growth factors (CGF). *International journal of implant dentistry*, 2(1), 19.