

Using Flowable Composite as Gingival Retraction Cord in Prosthodontics Dentistry: Two Case Reports: A Dental Technique

Fahad Hussain Alqahtani

Saudi Boards in Restorative Dentistry, Center of Advanced Consultants in Healthcare Education and Training, Riyadh, Saudi Arabia
Email: mrfahad55@hotmail.com

How to cite this paper: Alqahtani, F.H. (2024) Using Flowable Composite as Gingival Retraction Cord in Prosthodontics Dentistry: Two Case Reports: A Dental Technique. *Open Journal of Stomatology*, 14, 118-131.
<https://doi.org/10.4236/ojst.2024.142011>

Received: December 19, 2023

Accepted: February 25, 2024

Published: February 28, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

One of the most challenging factors affecting impression quality and good marginal fit is the gingival retraction method, which aims to separate the gingiva from the tooth to expose the finishing line of the prepared tooth. Bleeding and contamination from the crevicular fluid may compete for space with the impression material within the sulcus, leading to indistinct preparations and a lack of detail at the margin. In addition, such procedures might damage the PDL and cause permanent recession. Flowable composite cable, as opposed to traditional retraction cords, offers the proper marginal seal and visibility during the impression record because of its lower viscosity, improved adaptability, and elastic properties. The aim of this report is to present a brand-new, innovative method for controlling gingival hemorrhage in addition to the gingival retraction in restorative and prosthodontic treatment by utilizing a flowable composite during the final impression record procedure. In these case reports, the flowable composite cord technique is used instead of traditional gingival cords to modify and refine the gingival tissue before taking the traditional final impression or digital scan. Two cases were done for patients undergoing fixed prosthodontics and veneer treatment within a 2-year follow-up period. In addition, the flowable composite cord was used as temporary restoration before the final prosthetic cementation or under the provisional crowns. As a result, clean and healthy gingival tissues render cementation of the final prosthesis quicker and easier to perform. The patients in both cases claimed that their prosthodontic treatments, which involved the application of a flowable composite cord to temporarily retraction the gingiva, had produced good outcomes at the yearlong follow-up. In conclusion, the flowable composite cord technique is found to be a useful tool to improve the quality of impressions in fixed prosthodontics by providing excellent

access for impression material to record fine details of the finish line of the prepared tooth structure, and to alter the inflamed tissue into a healthy tissue.

Keywords

Flowable Composite, Gingival Retraction Methods, Impression Material, Marginal Integrity Final Cementation

1. Introduction

Fluid/moisture control is imperative in taking a dental impression. A good impression requires lateral displacement of the gingiva so the impression material can be deposited on the finish line and accurately record some of the prepared and unprepared tooth structures located apical to the finish line.

A proper impression is a golden key for a highly fitted final restoration and fixed dental prostheses such as crowns, veneers, and onlay restorations which improve patient health, function, and smile by correcting the shape of the teeth and discolored teeth [1] [2]. Accurate impression and excellent marginal fitness raise the success and survival rates of the restoration [3] [4].

The main reason for gingival inflammation over a fixed dental prosthesis is the lack of marginal integrity which may lead to overhanging or open margin restorations [1] and may further cause secondary caries or have a negative impact on the periodontal index. Many clinicians prefer the supra-gingival finish line to ensure proper marginal fitness and reduce the chances of gingival inflammation following the final cementation of the dental prosthesis [5] [6].

One of the most challenging factors affecting impression quality and good marginal fit is the gingival retraction method which aims to expose the finish line of the prepared tooth. Bleeding and contamination from the crevicular fluid may compete for space with the impression material within the sulcus leading to indistinct preparations and a lack of finish line details [7] [8].

Furthermore, traumatized tissues following the use of gingival retraction cords are likely to recede. Taking an impression in an unhealthy environment is one of the main compromises a dentist can make while taking impressions [9].

The classical method of gingival retraction is by using retraction cords of different sizes, plain or soaked with astringent-hemostatic agents such as ferric sulfate, aluminum potassium sulfate, aluminum chloride, racemic epinephrine, aluminum or potassium sulfate. These cords are inserted into the gingival sulcus to retract the gingiva and expose the finish line of the prepared tooth. The main disadvantages of conventional retraction cords are that their application is time-consuming, they may cause gingival damage and discomfort, might cause bleeding after removal of the retraction cords, and in many cases, may cause gingival recession in the future [10]. It is a sensitive procedure that cannot be standardized because the force applied to the gingival cord differs from dentist

to dentist, and differs from case to case depending on the sulcus width and anatomy. In addition, chemically impregnated retraction cords have many side effects and need careful precautions.

There is another technique in which a newly introduced material is named Expasyl (clay-like material). The main disadvantage of Expasyl is that it may interact with the polyether impression materials and polyvinyl siloxane, altering its setting time. Also, it has poor results with deep sub-gingival finish lines, the material itself is expensive, and the procedure is time-consuming [7] [8].

Magic foam cord or vinyl polysiloxane material was introduced in the market to retract the gingiva by expansion. Many disadvantages have been reported with magic foam such as bleeding tendency due to the lack of a hemostatic agent in the material, as well as its low reliability in deep sub-gingival finish lines [11].

Merocel strips are synthetic strips made of polymer hydroxylate polyvinyl acetate inserted in the gingival sulcus to create a space allowing the impression material to record the details of the prepared tooth [12]. The strips showed promising results without any damage to the gingival tissues in addition to having the ability to absorb oral fluids making the area clean [11] [13] [14].

Here, we intend to report a novel clinical technique that injects flowable composite circumferentially around the finish line and covering part of the gingival tissue adjacent to the finish line without acid etch or bonding steps and cure the flowable composite to act as a retraction cord. Flowable composite is a biocompatible material that has been recommended for use as low-stress filling material and in situations where good penetration is required [15]. More stress-buffering capacity, a low modulus of elasticity, and low viscosity are characteristics of flowable composite that improve marginal seal and reduce micro-leakage at the gingival margin [16]. Lower viscosity allows for appropriate adaptation and a more defined marginal space over a shorter distance. As a result, it is possible to properly observe the prepared tooth edges during the impression record [17]. Injecting flowable composite in the finish line immediately after blowing air into the gingival sulcus and finish line of the prepared tooth, then curing it quickly without using a bonding agent will provide a clean and dry area for impression recording by directing the gingival fluid and hemorrhage away from the finish line. Any hemorrhage or fluid leaking during this procedure will recede normally without using any hemostatic solution. After 2 - 5 minutes, the cured flowable composite cord can be removed easily with an explorer or small spoon excavator leaving a clean finish line and a healthy gingival tissue. This technique can provide excellent results even in sub-gingival finish lines. Materials used in these case reports were performed in accordance with the Declaration of Helsinki. Ethical clearance was obtained from the Human Ethics Committee of the Center of Advanced Consultants in Healthcare Education & Training (CACHET) (C19/11/18).

Case presentation 1: (1 year follow up) (case started 14th October 2021 and finished 26th October 2021/Follow up 26th August 2022).

A healthy 35-year-old woman presented to our clinic asking to replace her old anterior crowns and improve her smile (**Figure 1**). A health questionnaire, clinical examination, and photographic documentation were carried out.

After discussing the treatment options and the optimal treatment plan, the patient agreed to sign the consent form and the treatment plan was as follows:

- 1) To change and restore teeth # 15, 14 (implant crown).
- 2) To replace old crowns on teeth 13, 12, 11, 21, 22, 23 with new zirconia crowns.

First visit: Removal of old crowns and performing the one-step final impression with Polyvinyl siloxane impression materials (light body and regular impression) after using the flowable composite as gingival cord, a technique is to spray air into the gingival sulcus to dry and blow the blood and saliva away from the finish line followed by injecting flowable composite and curing immediately. Bite registration was also recorded.

(Note: final impression can be taken in five minutes after this procedure or can be delayed 2 - 3 days depending on the presence of gingival inflammation and depending on the time available for the dentist after such procedure. In simple cases, 1 or 2 teeth impressions can be taken in the same visit after applying the flowable composite cord).

Second visit: After seven days temporary crowns were removed and final cementation was done with resin cement. Occlusion was adjusted after cementation of the crowns as shown in **Figure 2**.



Figure 1. Pre-operative photograph.



Figure 2. After crowns cementation.

Follow-up visits were held after a year. The patient was satisfied with the appearance. During this visit, scaling was performed and oral hygiene instructions were given. Periapical radiographs and photographs were taken (**Figure 3**).

Case # 2 (Treatment started 23th December 2019 and finished 2nd January 2020 -Follow up 20th January 2022).

A 55-years old male patient presented to our clinic complaining of generalized teeth discoloration and was looking to improve his smile. On examination, we found that some teeth were restored with old composite restorations, and all maxillary and mandibular teeth had fluoride stains (**Figure 4**).



Figure 3. Follow up radiograph and photograph on 26th August/2022.



Figure 4. Pre-operative photograph.

After clinical and radiographic examination, treatment planning was formulated that consisted of ceramic veneers for all anterior teeth and premolars of both arches. After evaluating the new smile of the patient from models, and obtaining approval of the patient to precede the procedure, minimal preparation veneers were planned. The following procedures were performed:

- 1) First visit: Supra-gingival scaling and polishing was done. Oral hygiene instructions (OHI) were given that included modification of brushing technique.
- 2) Second visit: Veneer preparation for all anterior teeth and premolars of both arches. 15, 14, 13, 12, 11, 21, 22, 23, 24, 25, 35, 34, 33, 32, 31, 41, 42, 43, 44, 45.
- 3) Use a flowable composite cord for 2 - 5 minutes before taking the final impression.
- 4) Temporization of the maxillary teeth with Success CD, Promedica's composite-base, self-curing paste system Temporary Crown and bridge material shade A1 on the top of the cured flowable composite cord around all prepared finish line without temporary cementation (**Figure 5**).
- 5) The mandibular teeth were temporized with flowable composite to protect the gingival tissue and finish line since the preparation was minimal.
- 6) Temporary veneers and Flowable composite cords were removed leaving clean and healthy gingiva. Final cementation of the veneers was done with resin cement by using RelyX™ Unicem Self-Adhesive Universal Resin Cement 3M ESPE (**Figure 6**).
- 7) Follow up with the patient after two years: Evaluating the gingival health and the veneer's fit (**Figure 7**).



Figure 5. Flowable composite applied before final impression.



Figure 6. Post-operative treatment after veneer cementation in January/2020.



Figure 7. Follow up after two years on January/2022.

2. Discussion

There is a strong association of fixed prosthesis with periodontal diseases. Ill-fitting restorations can lead to periodontal diseases and later result in teeth loss. To date, there is no clear recommendation about which gingival retraction method is the gold standard. To our knowledge, this is the first documented case report to describe using flowable composite as a gingival retraction method. The most significant factor is to provide appropriate access for the impression material and digital scanning to record the tooth and soft tissue details without gingival damage [12] [18]. However, gingival retraction cords still the standard technique for gingival retraction in taking final impressions. It might cause impairment and bleeding to the gingiva and possibly initiate inflammatory reactions in the periodontium.

A study comparing the newly introduced methods and the cord technique to retract the gingiva showed that the newly introduced paste Expasyl and vinyl polysiloxane material can achieve hemostasis and possibly wash out easily [19] [20]. These new techniques are faster, easier to manipulate, and do not need anesthesia [21] [22]. A clinical study reported that the new pastes technique for gingival retraction is less damaging and lowers the inflammatory process compared to other retraction cords [23] [24]. However, the disadvantages are more of a concern, as it inhibits the polymerization of polyether and polyvinyl siloxane impression materials. It is also less effective in sub-gingival deep margins [25].

A recent study showed that fluoride-releasing flowable composite resins can initiate an inflammatory process when done as class v filling near the periodontium, as it increases gingivo clavicular fluid (GCF) and interleukin (IL) levels [26]. The characteristics of flowable composite as a cavity liner (marginal seal and reduced micro leakage at the gingival margin) are still under debate [27]. However, our technique using flowable composite is applied for a few minutes to cease the gingival bleeding and achieve retraction of the gingiva needed for clear final impression or for 2 - 7 days as a temporary covering and protecting the finish line and the gingiva from the irritating polycarbonate temporary crowns

and temporary cement. In our recent case presentation, we dried the area of interest with air and applied the flowable composite for 2 - 5 minutes, then removed leaving the dry, clean workspace and ready to receive the impression material for recording fine details without any risk or damage to the periodontal tissues and without using any hemostatic chemical material. A vitro study by Nicola Scotti et al in 2014 claimed that bulk flowable composite provides a better marginal seal near the gingival sulcus [28]. Other vitro studies reported that low viscosity, self-adhesion, and flow ability of composite provide better adaptation with dentin or cementum at the gingival sulcus. Therefore, provides appropriate marginal integrity, decreases gingival margin leakage, and provides visibility for teeth impression [29] [30].

In addition, the flowable composite was used as intermediate temporary restoration or under the intermediate temporary crowns to protect the gingiva from irritating polycarbonate temporary crowns and temporary cement.

We claim that using the flowable composite as a retraction cord favors to the gingiva before taking the final impression. This technique may start a new era for taking final impressions, with less traumatization and excellent prosthetic results before, during, and after the prosthetic treatments.

The flowable composite used in the current report served as a precise mediator during the visits and aided in final cementations by reducing the hemorrhage and inflammation of the gingiva.

Moreover, we skipped using the gingival cord retraction for all the cases that restrict the attached gingival destruction and the use of harmful medications (e.g. hemodentis or astrigents). Apparently, this might interfere with patient health.

In addition, it saves working time and cut the cost by eliminating the step of gingival cord procedure.

The current study's limitation is that, to the best of our knowledge, the clinical procedure used in it is novel. Additional clinical trials and related research investigations are needed to adopt this unique method across a wide range.

3. Conclusions

The flowable composite cord technique controls gingival hemorrhage, circular fluid, and moisture in the sulcus by providing sufficient gingival retraction

We found it an effective tool to improve the quality of impressions in all fixed restorative and prosthodontic cases, even cases with sub-gingival margins. Flowable composite cords facilitate impression taking with both regular technique and scanning impression technique and will ease the cementation process by providing a clean and healthy field.

TECHNIQUE

1) After teeth preparation for fixed prosthodontics or restorative procedures (**Figure 8**), the air blown in the gingival sulcus and immediately the flowable composite is placed in the dry finish line with 2 - 4 mm thickness without acid etching or bonding (**Figure 9**).



Figure 8. Teeth prepared for fixed ceramic crown with subgingival finishline.



Figure 9. After drying the field flowable composite were injected over the finish line filling the space between the gingival tissue and the prepared tooth structure.

2) The dental assistant's role is crucial in this technique to maintain a clean field & polymerize the flowable composite immediately (**Figure 10**).

3) The polymerized flowable composite can be removed after 2 - 5 minutes with the tip of the dental explorer or small spoon excavator if the definitive impression planned to be made at this stage (**Figure 11**).



Figure 10. Polymerized flowable composite over the finish line.

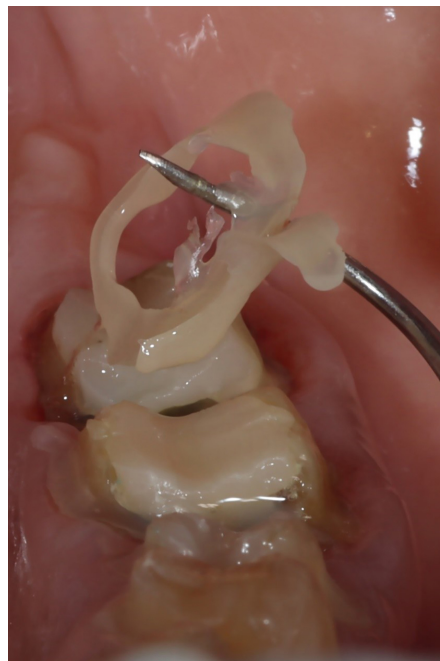


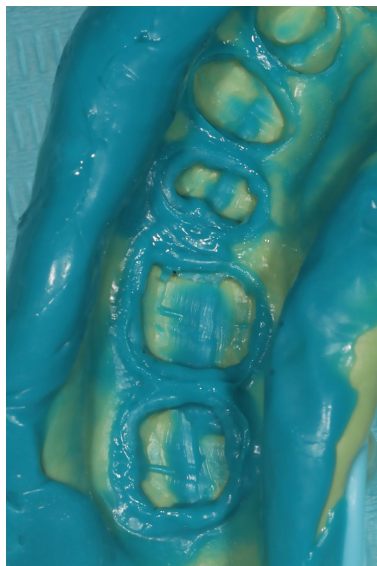
Figure 11. Removing the polymerized flowable composite after 2 - 4 minutes from teeth making the field ready to be scanned or to receive the definitive impression material with good gingival condition.

4) In a situation of severe bleeding, temporary restorations can be placed over the polymerized flowable composite if needed (Figure 12).

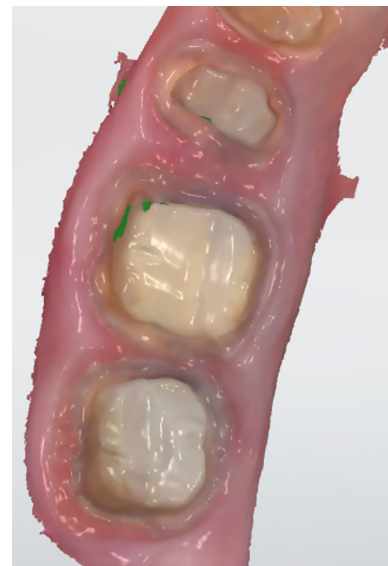
5) Any definitive impression technique could be performed immediately after removing the temporary restorations and the polymerized flowable composite underneath (Figure 13(a) and Figure 13(b)).



Figure 12. Healthy and displaced gingiva after removal of the temporary restoration and flowable composite.



(a)



(b)

Figure 13. Good definitive impression recording after 3 - 4 days of temporary polymerized flowable composite was removed. (a) By using elastomeric impression materials. (b) Scanned impression after removal of the flowable composite cord.



Figure 14. Definitive cementation with resin cement.

6) It is noted that the flowable composite acted as a cushioning material protecting the gingiva and the finish line from the temporary restoration and temporary cements making the definitive cementation stage easy (**Figure 14**).

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Rosenstiel, S.F., Land, M.F. and Walter, R. (2015) Contemporary Fixed Prosthodontics. Fifth Edition, Elsevier, Amsterdam.
<https://evolve.elsevier.com/cs/product/9780323185769?role=student>
- [2] Wöstmann, B., Rehmann, P., Trost, D. and Balkenhol, M. (2008) Effect of Different Retraction and Impression Techniques on the Marginal Fit of Crowns. *Journal of Dentistry*, **36**, 508-512. <https://doi.org/10.1016/j.jdent.2008.03.013>
- [3] Naveen, Y.G. and Patil, R. (2013) Effect of the Impression Margin Thickness on the Linear Accuracy of Impression and Stone Dies: An *in Vitro* Study. *The Journal of Indian Prosthodontic Society*, **13**, 13-18. <https://doi.org/10.1007/s13191-012-0160-7>
- [4] Baharav, H., Kupersmidt, I., Laufer, B.Z. and Cardash, H.S. (2004) The Effect of Sulcular Width on the Linear Accuracy of Impression Materials in the Presence of an Undercut. *The International Journal of Prosthodontics*, **17**, 585-589.
- [5] Tabassum, S., Adnan, S. and Khan, F.R. (2017) Gingival Retraction Methods: A Systematic Review. *Journal of Prosthodontics*, **26**, 637-643.
<https://doi.org/10.1111/jopr.12522>
- [6] Anupam, P., Namratha, N., Vibha, S., Anandakrishna, G.N., Shally, K. and Singh, A. (2013) Efficacy of Two Gingival Retraction Systems on Lateral Gingival Displacement: A Prospective Clinical Study. *Journal of Oral Biology and Craniofacial Research*, **3**, 68-72. <https://doi.org/10.1016/j.jobcr.2013.05.006>
- [7] Vaishnav, K., Rana, D., Joshi, R., Agnihotri, R., Shah, D. and Patel, R. (2022) A

- Study on Clinical Comparison between Expasyl Retraction System and Medicated Retraction Cord on Gingival Retraction. *Journal of Coastal Life Medicine*, **10**, 263-273.
- [8] Masek, R. (2005) Margin Isolation for Optical Impressions and Adhesion. *International Journal of Computerized Dentistry*, **8**, 69-76.
- [9] Yang, J.C., Tsai, C.M., Chen, M.S., Wei, J.Y., Lee, S.Y. and Lin, C.T. (2005) Clinical Study of a Newly Developed Injection-Type Gingival Retraction Material. *Journal of Dental Sciences*, **24**, 147-151.
- [10] Khajuria, R.R., Sharma, V., Vadavadgi, S. and Singh, R. (2014) Advancements in Tissue Displacement—A Review. *Annals of Dental Specialty*, **2**, 100-103.
- [11] Rajambigai, M.A., Raja, S.R., Soundar, S.I.J. and Kandasamy, M. (2016) Quick, Painless, and Atraumatic Gingival Retraction: An Overview of Advanced Materials. *Journal of Pharmacy and Bioallied Sciences*, **8**, S5-S7.
<https://doi.org/10.4103/0975-7406.191968>
- [12] Baba, N.Z., Goodacre, C.J., Jekki, R. and Won, J. (2014) Gingival Displacement for Impression Making in Fixed Prosthodontics: Contemporary Principles, Materials, and Techniques. *Dental Clinics of North America*, **58**, 45-68.
<https://doi.org/10.1016/j.cden.2013.09.002>
- [13] Shivasakthy, M. and Ali, S.A. (2013) Comparative Study on the Efficacy of Gingival Retraction Using Polyvinyl Acetate Strips and Conventional Retraction Cord—An *in Vivo* Study. *Journal of Clinical and Diagnostic Research*, **7**, 2368-2371.
<https://doi.org/10.7860/JCDR/2013/6980.3526>
- [14] Donovan, T.E. and Chee, W.W.L. (2004) Current Concepts in Gingival Displacement. *Dental Clinics of North America*, **48**, 433-444.
<https://doi.org/10.1016/j.cden.2003.12.012>
- [15] Tuloglu, N., Tunc, E.S., Ozer, S. and Bayrak, S. (2014) Shear Bond Strength of Self-Adhering Flowable Composite on Dentin with and without Application of an Adhesive System. *Journal of Applied Biomaterials & Functional Materials*, **12**, 97-101. <https://doi.org/10.5301/jabfm.5000166>
- [16] Lokhande, N.A., Padmai, A.S., Rathore, V.P.S., Shingane, S., Jayashankar, D.N. and Sharma, U. (2014) Effectiveness of Flowable Resin Composite in Reducing Microleakage—An *in Vitro* Study. *Journal of International Oral Health*, **6**, 111-114.
<https://pubmed.ncbi.nlm.nih.gov/25083045/>
- [17] Sooraparaju, S.G., Kanumuru, P.K., Nujella, S.K., Konda, K.R., Reddy, K.B.K. and Penigalapati, S. (2014) A Comparative Evaluation of Microleakage in Class V Composite Restorations. *International Journal of Dentistry*, **2014**, Article ID: 685643.
<https://doi.org/10.1155/2014/685643>
- [18] Sarmiento, H.R., Leite, F.R.M., Dantas, R.V.F., Ogliari, F.A., Demarco, F.F. and Faot, F. (2014) A Double-Blind Randomised Clinical Trial of Two Techniques for Gingival Displacement. *Journal of Oral Rehabilitation*, **41**, 306-313.
<https://doi.org/10.1111/joor.12142>
- [19] Huang, C., Somar, M., Li, K. and Mohadeb, J.V.N. (2017) Efficiency of Cordless versus Cord Techniques of Gingival Retraction: A Systematic Review. *Journal of Prosthodontics*, **26**, 177-185. <https://doi.org/10.1111/jopr.12352>
- [20] Laufer, B.Z., Baharav, H. and Cardash, H.S. (1994) The Linear Accuracy of Impressions and Stone Dies as Affected by the Thickness of the Impression Margin. *The International Journal of Prosthodontics*, **7**, 247-252.
- [21] Hirata, R. (2019) The Use of Retraction Paste to Simplify Impression and Cementation of Ceramic Veneers and Crowns: 3-Year Follow-Up Report. *Quintessence In-*

- ternational*, **50**, 604-610.
- [22] Raigrodski, A.J. (2015) *Soft Tissue Management: The Restorative Perspective: Putting Concepts into Practice*. Quintessence Publishing, Tokyo.
- [23] Poss, S. (2002) An Innovative Tissue-Retraction Material. *Compendium of Continuing Education in Dentistry*, **23**, 13-17.
- [24] Shannon, A. (2002) Expanded Clinical Uses of a Novel Tissue-Retraction Material. *Compendium of Continuing Education in Dentistry*, **23**, 3-6.
- [25] Safari, S., Vossoghi Sheshkalani, M., Vossoghi Sheshkalani, M., Hoseini Ghavam, F. and Hamed, M. (2016) Gingival Retraction Methods for Fabrication of Fixed Partial Denture: Literature Review. *Journal of Dental Biomaterials*, **3**, 205-213. <https://pubmed.ncbi.nlm.nih.gov/28959744/>
- [26] Peskersoy, C., Oguzhan, A. and Gurlek, O. (2022) The Effect of Flowable Composite Resins on Periodontal Health, Cytokine Levels, and Immunoglobulins. *BioMed Research International*, **2022**, Article ID: 6476597. <https://doi.org/10.1155/2022/6476597>
- [27] Boruziniat, A., Gharaee, S., Sarraf Shirazi, A., Majidinia, S. and Vatanpour, M. (2016) Evaluation of the Efficacy of Flowable Composite as Lining Material on Microleakage of Composite Resin Restorations: A Systematic Review and Meta-Analysis. *Quintessence International*, **47**, 93-101.
- [28] Scotti, N., Comba, A., Gambino, A., Paolino, D.S., Alovise, M., Pasqualini, D., *et al* (2014) Microleakage at Enamel and Dentin Margins with a Bulk Fills Flowable Resin. *European Journal of Dentistry*, **8**, 1-8.
- [29] Hala, A.N., Etman, W.M. and Geniad, T.M. (2023) Internal and Marginal Adaptation of Self-Adhesive and Flowable Composite Resins. *Tanta Dental Journal*, **20**, 299-306. https://doi.org/10.4103/tdj.tdj_47_23
- [30] Lotfi, N., Esmaili, B., Ahmadizenouz, G., Bijani, A. and Khadem, H. (2015) Gingival Microleakage in Class II Composite Restorations Using Different Flowable Composites as Liner: An *in Vitro* Evaluation. *Caspian Journal of Dental Research*, **4**, 10-16.