



## RESEARCH ARTICLE

### SYSTEMATIC ANALYSIS ON GINGIVAL HEALTH AFTER GINGIVAL RETRACTION USING VARIOUS TECHNIQUES IN PROSTHODONTICS

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#### ABSTRACT

**Objectives:** In spite of extensive research and progress over the past few decades in prosthetic dentistry, a common objective for impressions of interim crowns or fixed dental prostheses is to register the prepared abutments and finish lines accurately. For all impression procedures, the gingival tissue must be displaced to allow the subgingival finish lines to be registered. Retraction is the temporary displacement of the gingival tissue away from the prepared teeth. Different techniques are mentioned in literature for this purpose.

**Materials and Methods:** in this article four techniques are discussed namely retraction cord, Diode LASER, Electrosurgery and Expasyl retraction system to evaluate and compare with time 1) Patient's comfort after gingival retraction/displacement. (2) Gingival health.

**Results and Conclusion:** The results indicated that gingival retraction by Expasyl retraction system is better than the other two in term of patient comfort, gingival recession (0.04 mm 14 days after retraction), and gingival health. Trauma to gingival tissue was minimal and gingival tissue returned to normal condition within 24 hours.

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## INTRODUCTION

The relationship between gingival health and restoration of teeth in the form of crown or FPDs are intimate and inseparable. For such a restoration to survive long term, the gingiva and periodontium must remain healthy. For the gingiva and periodontium to remain healthy these type of restorations must be critically managed in several areas so that they are in harmony with the surrounding gingival and periodontal tissues. A healthy co-existence between such dental restorations and their surrounding gingival and periodontal structure is the goal of a dentist and the expectation of an informed patient. Gingival displacement is defined as the deflection of marginal gingiva away from the tooth. This is performed to create sufficient lateral and vertical space between the margins of the tooth preparation and the gingival tissue in order to allow the injection of adequate bulk of impression material into the expanded crevice. Impression along the margin is critical for the marginal fit and emergence profile of the prosthesis. Success of fixed prosthodontic restorations are largely dependent upon the long term health and stability of the surrounding periodontal structures. Full coverage preparations

often require sub gingival margins because of caries, existing restorations, esthetic demands, or the need for additional retention. In such situations, the clinician must make impressions that accurately capture the prepared cervical finish lines and permit the fabrication of accurate dies on which the restorations are fabricated. For creation of a physiologically acceptable prosthesis in addition to establishing occlusal contacts, contours and esthetics, the dentist must decide for proper placement of the gingival margins of the restoration. It can be placed above, at, or below the gingival crest. A systematic analysis was undertaken to research the long term health of gingival tissues after having been retracted using one of the above mentioned techniques.

## MATERIALS AND METHODS

The following analysis was performed according to the guidelines and the principles of the PRISMA (Preferred Reporting Items for Systemic Reviews and Meta-Analyses) statement for a systematic review.

### Focused question (PICO)

We focused on the following question: "what is the effect of gingival retraction using various techniques on long term health of associated soft tissue?"

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Characteristics of the 26 studies included: (Table 1)

Reference	Study design	Number of patients	Techniques used for gingival retraction	Index for measuring gingival health	Amount of retraction	Gingival recession	Follow up gingival recession	Gingival health
Tripty rahangdale et al	Clinical study	10	Laser Electrosurgery Expasyl	Gingival index			0.04mm	Expasyl better than other 2 methods
Enrico F.Gherlone et al	Randomized clinical trial	103	Laser Double cord electrosurgery	Bleeding index.				
Sushma phatale.P	Case series	30	Retraction paste Retraction cord		2-3 mm			Retraction paste(expasyl) has better gingival health
Manule .S.Thomas	Review article	-	-	-	-	-	-	-
Vamsi Krishna	Review article	-	Laser.	-	-	-	-	-
Jignesh chaudhari	RCT	30	Aluminium chloride Tetrahydrozoline Expasyl		Aluminium chloride has maximum gingival retraction compared to others			
Ivan kostic	Review article	-	Astringents Vasoconstrictors	-	-	-	-	-
Jen chang yang	Clinical study	8	Ultrapack Expasyl Korlex-GR		0.28mm 0.29mm 0.25mm			
Lylajam .S, Prasanth .V Vincent bennani	Review article RCT	-	Expasyl Knitrox cord	-	-	-	-	-
Gordon J christensen Zainab M dawood	Review article RCT	32	Ultrapack Magic foam cord Racegel Astringent retraction paste					
Ulrike .S.Beier et al Bernd Wostmann et al	Clinical study RCT	269 abutments 340 abutments	Ultrapack Surgident Expasyl	Plaque &bleeding index	-	-	-	-
Teruhito kunimatsu et al Ovul kumbuloglu et al	Casec series RCT	35 patients 50	Plain retraction cords Cords impregnated with medicaments Untreated cord					
Tulin polat et al	RCT	30	Aluminium chloride impregnated cords Epinephrin impregnated cords					
Richa gupta	Case report	1	Did not mention					
Maria csillag	Case series	17	Chemico mechanical					
Danuta nowakowska	Experimental study	-	Conventional method					
Nawaf labban	Case report	Did not mention	Chemico mechanical					
Al hamad KQ et al	RCT	60	Magic foam cord Expasyl Ultrapack	Gingival index		Did not mention		All the techniques produce gingival inflammation after gingival retraction but in cordless method there is no bleeding
Ozlem acar et al	RCT	252	NIC, nonimpregnated cord; IC, impregnated cord; PC, paste and cap; ICPC, impregnated cord, paste, and cap	Did not mention				Aluminium chloride with cord &retraction paste and cap are more efficient on gingival health
Fabio renato manzolini leite	RCT	12	Conventional & cordless technique	Bleeding index				
Rebecca Carville	Review article	-	Braided cord Knitted cord Impregnated cord					
Burke FJ, Crisp RJ	Caseseries	12	Novel compule based retraction system					
David H shaw	experimental study	3	-	-	-	-	-	-

Studies without abstract, but with a title suggesting relevance to the subject of the review, were selected for full text screening. The selected full-text articles were independently read in detail to verify whether they passed the inclusion/exclusion criteria. The references of the full text articles were screened for any relevant data for the review. The extracted data included: year of publication, design of the study, number of patients per study, gingival retraction techniques, gingival health, post operative follow up. The quality of the various studies were not considered in the final analysis, therefore, no quality assessment has been done.

## DISCUSSION

In the literature, evidence is available about the gingival retraction techniques. A wide range of different methods was used for gingival retraction. This review tried to systematically evaluate the current evidence about gingival health after gingival retraction. In total, 26 articles could be included, from which the data were obtained. In order to assess the health of the gingiva after gingival retraction, all the 26 articles were compared for the following characteristics: 1. health of the gingival tissues, 2. methods of gingival retraction. Various study on gingival healing showed that healing is variable after trauma caused by various retraction system.

### Retraction cord technique

Most of studies advocated that most meticulous placement of retraction cords resulted in transient tissue injury which may be reversible with healing period varying from 24hrs to 14 days according to different authors. Although, from gingival and periodontal point of view, it is preferable to place the margins of restorations supra gingivally, for esthetic or other reasons, the dentist may be forced to place them sub-gingivally. Other studies using clinical and histopathological evaluation of gingival retraction in humans show that gingival retraction with the cord caused destruction of the junctional epithelium, which took about 8 days to heal. The average postoperative gingival recession seen with cord retraction was  $0.2 \pm 0.1$  mm. The most widely used and popular method is the use of retraction cords. A study by Van der Velden and De Vries has shown that the epithelial attachment sustains injuries at a force of 1 N/mm<sup>2</sup>, while it ruptures at 2.5 N/mm<sup>2</sup>. The cord technique requires almost 2.5 N/mm<sup>2</sup>. The retraction cord achieves the desired retraction, but placing a retraction cord is not an easy method. It needs physical manipulation of the tissue, leading to gingival bleeding. Thus, use of a retraction cord has the risk of epithelial attachment injury, pain during cord placement, sometimes requiring local anesthesia. In some studies, the histological specimen of the retraction cord revealed that the disrupted sulcular epithelium and junctional epithelium were sometimes missing. Also, the junctional epithelium displayed intracellular hydropic degeneration, stripping, and desquamation of epithelium. These findings are similar to Jon Ruel *et al.* and Azzi *et al.*

### Expasyl technique

Phatale, *et al.* evaluated the effect of retraction materials on gingival sulcus of two retraction materials: Expasyl and Magic Foam Cord with the conventional retraction cord. The Fundamental principle of the Expasyl was to insert a stiff, hemostatic, plastic, non-setting material into the gingival sulcus under mild pressure and allow the material to stay in

place for 1 – 2 min. The histological specimens of the retraction paste showed only 6 cases of disrupted junctional epithelium and sulcular epithelium as compared to the retraction cord. The remaining specimens showed an intact junctional epithelium. According to Patrick Lesage and Mona Kakar, the material under pressure caused sufficient displacement of the gingival tissue and this displacement stayed in place long enough for either recording of the impression or to carry out the restorative or bonding procedures. The mean value of gingival recession, 14 days after gingival retraction by expasyl is 0.04mm. With Expasyl retraction the gingival tissues return to normal condition within 24 hours. Expasyl retraction system produce least transient trauma to the gingival tissue. It was noninvasive, simple to use, painless, reliable, a hemostatic agent, effective, safe, increased patient comfort, and saved time. Magic Foam Cord is a product for an easy, nontraumatic, and less time consuming retraction of the sulcus. It is biologically very compatible, with no adverse side effects or interactions. Polyvinylsiloxane has a high tear resistance. The technique is faster and easier than the use of retraction cords or scalpel / rotary instruments. Gingival retraction by Expasyl results minimal intra-operative and post operative discomfort.

### Electrosurgery

It was seen that almost all subjects experienced no pain during the retraction procedure giving score zero on the pain rating scale with only 50% of electrosurgical retraction group subjects giving score 2. The lack of pain during the procedure may be attributed to the mild topical anesthesia that was given to all the subjects. As half the subjects of Electrosurgery group still experienced some discomfort, it shows that Electrosurgery causes more discomfort as compared to other techniques. The mean value of gingival recession, 14days after gingival retraction by Electrosurgery is 0.5mm. So Gingival retraction by Electrosurgery causes maximum discomfort to the patients for the longest duration of time.

### Laser retraction

LASER is generally acceptable technique as far as patient comfort is concerned with only few patients experiencing mild discomfort for 2 – 4 days. This is in accordance with the studies by POGREL *et al* who stated that the carbon dioxide laser has ability to vaporize soft tissue with little bleeding, pain, swelling or wound contraction. POSS STEPHEN studied that the gingival retraction by Diode LASER and Expasyl results in minimum or no intraoperative or postoperative discomfort. GABBER *et al* and SCOTT A gave similar results regarding retraction by LASER. They concluded that LASER was simple, painless and convenient procedure and resulted in less hemorrhage, less inflammation and faster healing. LASER causes some amount of discomfort in some patients for short duration. With LASER retraction gingival recession is 0.21mm The healing by LASER retraction occurs within 4days after retraction.

### Conclusion

1. Gingival retraction by Electrosurgery causes maximum discomfort to the patients for the longest duration of time. Expasyl causes least amount of discomfort to the patient and LASER some amount of discomfort in some patients for short duration. Gingival retraction by

Expasyl results minimal intra-operative discomfort and better post operative gingival health as compared to other techniques.

2. The mean value of gingival recession, 14days after gingival retraction by Electrosurgery is 0.5mm, with LASER retraction is 0.21mm and with Expasyl is 0.04 mm. Gingival recession is minimal 0.04mm after 14 days of retraction with Expasyl retraction system.
3. With Expasyl retraction the gingival tissues return to normal condition within 24 hours. The healing by LASER retraction occurs within 4days after retraction. Expasyl retraction system produce least transient trauma to the gingival tissue.

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### Conflict of interest

No potential conflict of interest.

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