Comparative evaluation of pain in vestibular depth extension procedure using scalpel, electrocautery and diode laser

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Abstract

The oral rehabilitation of patients after loss of teeth has made much progress in recent times. Whenever there is an inadequate vestibular depth present to maintain oral hygiene and to increase the retention and stability of the denture, deepening of the vestibule is considered. The vestibular depth depends on various factors such as age, physical status, amount and consistency of mucous membrane, amount of alveolar and basal bone, positon and tension of adjacent muscles, presence of bony projections and ridges and neurovascular foramina. One of the main objectives of periodontal therapy is to achieve an area which permits an optimal level of oral hygiene. A shallow labial vestibule hampers the proper placement of a tooth brush. As a result, a decreased depth of the vestibule is often associated with plaque accumulation and consequently marginal gingival inflammation. Vestibuloplasty is the surgical procedure whereby the oral vestibule is deepened by changing the soft tissue attachments. The most common procedures in vestibuloplasty are submucosal vestibuloplasty, secondary epithelial vestibuloplasty, soft tissue graft vestibuloplasty and Edlanplasty. Although vestibular depth extension procedure remains relatively painless under local anesthesia on the first day of surgery, there is a subtle increase in pain on the second day relative to the first. The present study was conducted to measure and compare pain by 3 different scales i.e., visual analogue scale, numerical rating scale, faces rating scale in vestibular extension procedure done by scalpel, laser and electrocautery. The pain was measured at baseline, 1 day post-operative, 1 week post-operative. Data thus collected was put to statistical analysis.

Keywords: Vestibule, Laser, Pain, Scale, Depth, Electrocautery, Scalpel.

Introduction

The oral rehabilitation of patients after loss of teeth has made much progress in recent times. Whenever there is an inadequate vestibular depth present to maintain oral hygiene and to increase the retention and stability of the denture, deepening of the vestibule is considered.(1) The vestibular depth depends on various factors such as age, physical status, amount and consistency of mucous membrane, amount of alveolar and basal bone, positon and tension of adjacent muscles, presence of bony projections and ridges and neurovascular foramina.(2) One of the main objectives of periodontal therapy is to achieve an area which permits an optimal level of oral hygiene. A shallow labial vestibule hampers the proper placement of a tooth brush. As a result, a decreased depth of the vestibule is often associated with plaque accumulation and consequently marginal gingival inflammation. Vestibuloplasty is the surgical procedure whereby the oral vestibule is deepened by changing the soft tissue attachments.(1)

Friedman introduced mucogingival surgeries to describe the surgical procedure to correct the relationship between the gingiva and oral mucous membrane with reference to three areas: attached gingiva, shallow vestibule and frenum interfering with marginal gingiva.(1) The Schluger "pouch" and the Fox "push back" procedures, were formally introduced into the literature and renamed the "local extension of the vestibular trough" and the "gingival extension operation" respectively. Both procedures introduced bone exposure as an aspect of Periodontics and became basic to subsequent developments in mucogingival surgery.(2)

Many of the procedures described since 1956 have been refinements of previous techniques, designed to avoid the postoperative pain which results when extensive areas of exposed bone are covered only with a periodontal dressing. These refinements endeavored to retain or create a protective cover of mucosa or periosteum for bone which had been exposed for recontouring. One such modification by Ariaudo and Tyrrell combined Naber's repositioned flap with a minimal post-operative exposure of bone. The conventional procedure of deepening the vestibule and placing coe pack for prevention of epithelial re-attachment is a successful procedure and literature shows that it is an excellent procedure for gaining the width of attached gingiva.(1)

Although vestibular depth extension procedure remains relatively painless under local anesthesia on the first day of surgery, there is a subtle increase in pain on

the second day relative to the first. Pain is referred to as the fifth vital sign and is an important reason for which patients seek health care. Scales to assess pain have been extensively studied.[2] Pain can be measured by self-report, biological markers, and behaviour because pain is subjective; self-report is the best if available. It will be useful to know which pain assessment scale is more appropriate to evaluate how the health care professionals perceive the pain in patients undergoing surgical procedure.[2]

Aim & Objectives

The aim of this study was to measure and compare pain by 3 different scales i.e., visual analogue scale, numerical rating scale, faces rating scale in vestibular extension procedure done by scalpel, laser and electrocautery.

Materials & Method

Patient Selection: 15 subjects (both males and females), in good general health and attending for routine care only, were selected from the outpatient Department of Periodontology and Oral Implantology, National Dental College and Hospital, Derabassi (Punjab).

Inclusion Criteria

- Subjects with shallow vestibular depth.
- Absence of systemic or acute periodontal alterations.
- Subjects should not have undergone any periodontal treatment within 6 months prior to study.
- No antibiotic therapy in the previous 3 months.
- Co-operative subjects showing acceptable oral hygiene.

Exclusion Criteria

- Subjects having any history of chronic systemic disease including diabetes mellitus.
- Subjects on any antimicrobial drug in the previous 3 months.
- Subjects having aggressive periodontitis, periodontal abscess or necrotizing ulcerative gingivitis.

Subject Groups: The subjects so selected were categorized into two groups:

- Group A- 5 patients underwent vestibular depth extension procedure by scalpel.
- Group B- 5 patients underwent vestibular depth extension procedure by laser.
- Group C- 5 patients underwent vestibular depth extension procedure by electrocautery.

Clinical Parameters: The following clinical parameters were evaluated:

Pain measurements by:

- Visual Analogue Scale (VAS).
- Numerical Rating Scale (NRS).
- Faces Rating Scale (FRS).

Study Method: Fifteen patients were selected from Department of Periodontology in National Dental College, Hospital who reported for oral prophylaxis or missing teeth. On examination it was found that the vestibular depth in the anterior region was inadequate. Hence, vestibular deepening was planned. Local anesthesia was first administered bilaterally by using a mandibular nerve block. Incision was made with scalpel, laser and electrocautery.

Scalpel: A horizontal incision was made using a no 15 scalpel blade in 5 patients at the mucogingival junction retaining all the attached gingiva. A split thickness flap was reflected sharply, dissecting muscle fibres and tissue from periosteum. This was then sutured in the depth of vestibule using 3-0 silk sutures. A dressing (Coe-Pack) was then placed over the wound.

Laser: A diode laser of 940 nm (Biolase) at 3.0W power output was used in a pulsed mode.[2] A surgical tip of 400 μm was used. The tip was first initiated as per manufacturer's instructions. The cutting of tissue was carried out in a contact mode using paint - brush - like - strokes. The incision was made at the mucogingival junction and the muscle and alveolar mucosal fibres were severed from the periosteum. The wound was then irrigated with saline. No sutures were given. A dressing was placed over the wound.

Electrocautery: An electrocautery in a light brushing stroke was used and the tip was kept moving all the time. Prolonged application of electrode to the tissues was avoided to prevent heat accumulation which could induce undesirable tissue damage. The wound was then irrigated with saline. No sutures were given. A dressing was placed over the wound.

Patients filled out a questionnaire about pain and discomfort, and were asked to score the pain based on visual analogue scale, numeric pain score scale and faces rating scale immediately after and at 1 day & 1 week after surgery.

Statistical Analysis: Mann Whitney U Test and Wilcoxon signed rank test was applied using SPSS 16 software.

Results

A total of 15 subjects were enrolled in the study. Comparison of the mean VAS, FRS and NRS scores of the levels of pain in all the 3 groups were observed at the baseline, 1st day and 1st week of the study as summarized in Table 1.

Table I: Intergroup comparison of VAS, NRS and FRS pain score

Group Parameters	Scalpel	Laser	Electrocautery	p-value
VAS (BASELINE)	7.40 ±1.1	5.40±2.6	5.40±2.1	>0.05
VAS (1 DAY)	5.00 ±1.2	5.00±1.5	4.00±2.0	>0.05
VAS (1 WEEK)	1.40 ±0.8	1.40±1.5	0.80±0.4	>0.05
NRS (BASELINE)	7.20±1.3	5.00±2.4	4.80±1.3	>0.05
NRS (1 DAY)	4.60±1.1	4.80±1.9	3.60±1.6	>0.05
NRS (1 WEEK)	0.80±0.8	0.80±0.8	1.00±0.7	>0.05
FRS (BASELINE)	7.20±1.0	5.00±2.4	4.40±1.8	>0.05
FRS (1 DAY)	4.40±1.8	4.40±1.6	3.60±2.3	>0.05
FRS (1 WEEK)	0.40±0.5	1.20±0.8	0.60±0.5	>0.05

Analysis between the groups showed a significant difference in VAS, NRS and FRS score when compared with baseline and 1 week in all the groups. There was also asignificant difference in electrocautery and scalpel seen at baseline in NRS and FRS. Significant difference in VAS, NRS and FRS was observed when compared with baseline and one day in scalpel group.

Discussion

Lack of an adequate residual alveolar ridge and basal seat severely compromises the success of prosthodontic treatment. It has been suggested that expansion of the denture-bearing area by means of vestibuloplasty would reduce denture load per square unit of supporting bone and thus reduce the bone resorption caused by transfer of occlusal forces.[3] Patients who undergo vestibular depth extension procedures using a scalpel often experience postsurgical pain and discomfort, which is further aggravated when sutures come in contact with food.[3] One feasible alternative that is considered iselectrocautery and laser, as it offers various advantages, that is, relatively bloodless surgery, sterilization of wound, no suturing required in most cases, less surgical time, no periodontal dressing required, less postsurgical pain and discomfort and increased patient acceptance.[4]

Diode lasers are solid state semiconductor lasers. The diode laser exhibits thermal effects using the "hot-tip" effect, caused by heat accumulation at the end of the fiber, which results in coagulation at the treated surface. Lasers such as Nd: YAG, Co_2, and erbium: YAG have been used for surgical procedures. Diode laser is considered as an excellent soft tissue laser as it doesn't interact with dental hard tissues.[5] Haytac and Ozcelik[6] compared 20 frenectomy procedures performed with Co_2 laser to an equal number performed with conventional scalpel surgery and reported that patients treated with laser experienced less pain after 1st day and 7th day. In this study, it was observed that patients treated with the diode laser experienced less pain and discomfort when compared with those treated with scalpel. It has also been observed that the reduction in pain and discomfort levels from the 1st to the 3rd and further to the 7th day is much more significant for the laser group. The increased pain perception associated with the scalpel frenectomy might be attributed to the fact that it is a more intrusive surgical procedure involving blood loss, wide surgical wound and suturing. The sutures also contribute to the discomfort postoperatively since they interfere with regular functions such as speech and intake of food.

On the contrary, the decreased pain and discomfort in the laser group might be ascribed to the protein coagulum formed over the wound, which acts like a biological dressing, aids in sealing of the ends of sensory nerves. Absence of any sutures post the laser procedure might have contributed to lesser discomfort levels. In this study, it was observed that patients treated with electrocautery experienced less pain and discomfort when compared with those treated with other techniques. It has also been observed that the reduction in pain and discomfort levels from the baseline to day 1 and further to 1week was significant for all the three groups.

Conclusion

The results presented in this paper support the use of electrocautery in soft tissue procedures like vestibular depth extension; as it provides better patient perception in terms of pain and discomfort than that obtained by the scalpel and laser techniques.

References

1. Singh GP, Srivastava R, Kaur M, Singh R. An innovation in vestibular/gingival extension procedure-A case report. Asian J Oral Health Allied Sci 2011;1(1):47-50.
2. Hawker GA, Mian S, French M. Measures of adult pain. Arthritis Care Res 2011;63(11):240-52.
3. Sikkerimath BC, Dandagi S, Gudi S. Comparison of vestibular sulcus depth in vestibuloplasty using standard

Clark's technique with and without amnion as graft material. Ann Maxillofac Surg 2012;2(1):30-5.
4. Doshi Y, Thukral N. Management of inadequate vestibular depth-A comparison between periosteal fenestration and laser assisted vestibular deepening. JOLA 2010;10:125-9.
5. Younger J, RebeccaMc C, Sean M. Pain outcomes: A brief review of instruments and techniques. Curr Pain Head Rep 2009;13(1):39-43.
6. Haytac MC, Ozcelik O. Evaluation of patient perceptions after frenectomy operations: A comparison of carbon dioxide laser and scalpel techniques. J Periodontol. 2006;77:1815-9.