Comparative Evaluation of Effectiveness of Intra-pocket Anesthetic Gel and Injected Local Anesthesia during Scaling and Root Planing – A Split-mouth Clinical Trial

Abstract

Background and Aim: Pain control is an important outcome measure for successful periodontal therapy. Injected local anesthesia has been used to secure anesthesia for scaling and root planing (SRP) and continues to be the anesthetic of choice for pain control. Alternatively, intra-pocket anesthetic gel has been used as an anesthetic during SRP. Hence, this clinical trial was done to compare the effectiveness of intra-pocket anesthetic gel and injected local anesthesia during SRP and also to assess the influence of intra-pocket anesthetic gel on treatment outcomes in chronic periodontitis patients. Materials and Methods: Fifteen systemically healthy chronic periodontitis patients were recruited. The dental quadrants on right side received either intra-pocket 20% benzocaine gel (Gel group) or infiltration/block by 2% lidocaine with 1:80,000 adrenaline (injection group). Quadrants on the left side received the alternative. Pain perception and patients preference for the type of anesthesia was recorded. Clinical parameters: plaque index, modified gingival index, modified sulcular bleeding index, probing pocket depth, and clinical attachment level were recorded at baseline and 1 month after treatment. Results: No difference was observed in visual analog scale (P > 0.05) and verbal rating scale (P > 0.05) pain perception between gel group and injection group. A slightly increased preference to gel as an anesthesia (53% vs. 47%) was observed. The treatment outcome after SRP did not show a significant difference between gel and injection group (P > 0.05). Conclusion: Intra-pocket administration of 20% benzocaine gel may be effective for pain control during SRP and may offer an alternative to conventional injection anesthesia.

Keywords: Injectable lidocaine, intra-pocket benzocaine gel, local anesthetic, pain control, scaling and root planing, treatment outcomes

Introduction

Scaling and root planing (SRP) are effective components in the treatment of periodontal disease. To eliminate and control periodontal disease and prevent further tissue destruction, periodontal pockets need repeated subgingival mechanical debridement and cleansing. When utilized as a part of the comprehensive treatment plan, SRP results in decreased gingival inflammation, bleeding on probing, clinical attachment loss, and probing depth. To instrument, the pocket and root surface anesthesia may be required.

Pain control is considered to be an important outcome measure for successful periodontal therapy. Adequate pain control may be extremely important in gaining patient compliance for further maintenance therapy.

Injected local anesthesia has been used to secure anesthesia for SRP and continue to be anesthetic of choice for pain control. The injected anesthesia technique used in conjunction with SRP is mostly either a nerve block or infiltration. Injected anesthesia can be carried out alone or in conjunction with topical anesthesia. However, the use of injected anesthesia may be associated with adverse effects and is also itself, a cause for discomfort and fear.

While no single technique has been identified to completely replace injected local anesthesia, several alternatives such as reassurance, biofeedback, distraction, transcutaneous electronic nerve stimulation, hypnosis, nitrous oxide, and a transmucosal patch containing 10% or 20% lidocaine have been used to alleviate pain associated with dental procedures.

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Topical anesthetics have been used in dental procedures to reduce or eliminate discomfort associated with the needle.\[^{10}\] It is preferred by patients due to lower incidence of postprocedure problems and the absence of discomfort caused by the injection.\[^{10,11}\] Intra-pocket anesthesia gel has a lower algogenic efficacy than injected anesthesia.\[^{10}\] As a topical anesthetic, the gel is only able to reduce the soft tissue pain perception and will have no effect on pulpal pain or dentin hypersensitivity. Less efficacy, uncontrolled spreading, and undesirable taste limit the use of topical agents.\[^{10}\] In a study by Friskopp and Huledal (2001) it was shown that anesthetic gel provided anesthesia for SRP within 30 s, with a mean duration of action (as assessed by probing of pocket depths) of 17–20 min.\[^{12}\]

Hence, the present study was designed to evaluate and compare the effectiveness of intra-pocket anesthetic gel (20% benzocaine) and injected local anesthesia (2% lidocaine) during SRP and also the influence of intra-pocket anesthetic gel on treatment outcomes after SRP in chronic periodontitis patients.

Materials and Methods

The present study was a randomized, single-blind, split-mouth, clinical trial done to compare the effectiveness of intra-pocket anesthetic gel (20% benzocaine) and injected local anesthesia (2% lidocaine) during SRP and also the influence of intra-pocket anesthetic gel on treatment outcomes after SRP in chronic periodontitis patients.

At screening visit, systematically healthy controls in the age group of 30–50 years with minimum of 4 sites with probing depth ≥4 mm per quadrant requiring SRP and who had not undergone any periodontal therapy or any antimicrobial therapy in the past 6 months were included in the study. Patients with a history of allergy to local anesthesia or any of its components, smokers, pregnant, or lactating females were excluded from the study.

A total of 15 systemically healthy chronic periodontitis patients satisfying the inclusion and exclusion criteria were recruited from the outpatient section of Department of Periodontics and Oral Implantology, GITAM Dental College and Hospital, Visakhapatnam to participate in this randomized, split-mouth clinical trial. A written informed consent was obtained before the start of the study. The study protocol was approved by the institution review board of Gandhi Institute of Technology and Management Dental College and Hospital, Visakhapatnam (No: 2308881).

Before the start of treatment, clinical parameters such as plaque index (PI),\[^{13}\] modified gingival index (MGI),\[^{14}\] modified sulcular bleeding index (mSBI),\[^{15}\] probing pocket depth (PPD), and clinical attachment level (CAL) were recorded. All the measurements were performed by a single examiner (KC) using a UNC-15 periodontal probe (Hu-Friedy, Chicago, IL, USA). In the first appointment, the dental quadrants on the right side received either intra-pocket 20% benzocaine gel [Gel group] or infiltration/block by 2% lidocaine with 1:80000 adrenaline [Injection group] as assigned by randomization. The randomization was done by coin toss method.

The type of anesthesia was switched for the left quadrant. No topical anesthesia was applied before injection. Topical 20% benzocaine gel was delivered subgingivally with the help of a blunt tip applicator. SRP was performed after waiting for 1–2 min until a smooth and accretion free root surface was obtained.

After each SRP treatment, pain perception was recorded by a questionnaire using a Visual Analog Scale (VAS)\[^{16}\] and a 5 step Verbal Rating Scale (VRS).\[^{17}\] Anesthetic acceptance by the patient was evaluated after completing the treatment, and the patient was allowed to choose his/her preferred type of anesthesia. At the 1 month posttreatment visit, all the clinical parameters were recorded. Possible adverse events were monitored throughout the treatment period.

Statistical analysis

Descriptive statistics were assessed. Paired t-test was used to assess intragroup PI, MGI, mSBI, PPD, and CAL at baseline and 1 month for injection and gel group. Unpaired t-test was used for intergroup comparison of PI, MGI, mSBI, PPD, and CAL for injection and gel group at baseline and 1 month. Mann–Whitney U-test was used to compare VAS and VRS scores between injection and gel group. p < 0.05 was considered statistically significant. Data were analyzed using SPSS (Statistical Package for the Social Sciences, IBM, USA) VER. 21 statistical software package.

Results

Fifty patients (10 males and 5 females) were randomized to gel and injection groups; all the subjects completed the study. No evidence of adverse effect was detected in both anesthetic groups.

Plaque index

Intragroup comparison showed a significant decrease in the mean plaque scores in both injection group (p = 0.002) and gel group (p = 0.001) at 1 month [Table 1]. On intergroup comparison, the mean plaque scores did not show a significant difference between the groups at baseline (p = 0.218) and at 1 month (p = 0.203) [Table 2] indicating that the plaque scores were similar in both groups at all the time intervals.

Modified gingival index

MGI reduced significantly after 1 month in both injection group (P = 0.001) and gel group (P = 0.001) [Table 1]. MGI did not differ significantly at baseline (P = 0.575) and 1 month (P = 0.816) when mean values of MGI scores of gel and injection group were compared [Table 2].
Both groups demonstrated a significant ($P = 0.001$) reduction in mean sulcus bleeding scores at 1 month [Table 1]. On comparison between both groups, mSBI did not show significant difference at baseline ($P = 0.494$) and at 1 month ($P = 0.814$) [Table 2].

Probing pocket depth

Both the injection group and gel group showed a significant decrease in mean PPD at the end of 1 month ($p = 0.001$) [Table 1]. Intergroup analysis showed no significant difference in mean PPD between groups at baseline ($p = 0.382$) and at 1 month ($P = 0.409$) [Table 2].

Clinical attachment level

Mean gain in CAL was significant in both groups ($p = 0.001$) after 1 month [Table 1]. However, mean CAL did not show significant difference between groups at baseline ($p = 0.395$) and at 1 month ($p = 0.379$) [Table 2].

### Visual analog scale

Injected anesthesia was associated with slightly higher intraoperative VAS pain rating scales than the gel group, but the difference was not statistically significant ($p = 0.150$) [Table 3].

### Verbal rating scale

The five step VRS was divided as follows (1) none, (2) mild, (3) moderate, (4) severe, and (5) very severe. Pain perception through VRS did not reveal any significant differences between gel and injection group ($p = 1.00$) [Table 3].

### Patient’s preference of local anesthesia

A slightly higher percentage of patients (53%) favored gel as compared to injection (47%). Patients who had opted for the anesthetic gel showed no significant difference in VAS and VRS pain perception as compared to injection.

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**Table 1: Intra group comparison of clinical parameters**

| Periodontal parameter          | Type of anaesthesia | Mean baseline score±SD | Mean 1 month score±SD | $t$    | Significant (two-tailed) ($p$) |
|--------------------------------|---------------------|------------------------|-----------------------|-------|-----------------------------|
| Plaque index                   | Injection           | 1.79±0.39              | 1.63±0.31             | 3.849 | 0.002                       |
|                               | Gel                 | 1.64±0.26              | 1.50±0.27             | 11.244| 0.001                       |
| Modified gingival index        | Injection           | 1.81±0.40              | 1.65±0.35             | 4.042 | 0.001                       |
|                               | Gel                 | 1.73±0.38              | 1.62±0.40             | 5.581 | 0.001                       |
| Modified sulcus bleeding Index | Injection           | 1.57±0.17              | 1.49±0.16             | 5.137 | 0.001                       |
|                               | Gel                 | 1.61±0.14              | 1.50±0.13             | 4.257 | 0.001                       |
| Probing pocket depth           | Injection           | 3.74±0.35              | 2.65±0.33             | 4.976 | 0.001                       |
|                               | Gel                 | 3.87±0.45              | 2.77±0.45             | 6.992 | 0.001                       |
| Clinical attachment level      | Injection           | 3.76±0.35              | 2.66±0.33             | 5.269 | 0.001                       |
|                               | Gel                 | 3.88±0.45              | 2.79±0.45             | 7.889 | 0.001                       |

**Table 2: Inter group comparison of clinical parameters**

| Periodontal parameter          | Injection group | Gel group | $t$    | Significant (two-tailed) ($p$) |
|--------------------------------|-----------------|-----------|-------|-----------------------------|
| Plaque index                   | MBLS±SD         | 1.79±0.39 | 0.64±0.26 | 1.261 | 0.218                       |
|                               | MOMS±SD         | 1.63±0.31 | 0.49±0.27 | 1.304 | 0.203                       |
| Modified gingival index        | MBLS±SD         | 1.81±0.40 | 0.73±0.38 | 0.567 | 0.575                       |
|                               | MOMS±SD         | 1.65±0.35 | 0.62±0.40 | 0.235 | 0.816                       |
| Modified sulcus bleeding index | MBLS±SD         | 1.57±0.17 | 0.61±0.14 | −0.693 | 0.494                       |
|                               | MOMS±SD         | 1.49±0.16 | 0.50±0.13 | −0.238 | 0.814                       |
| Probing pocket depth           | MBLS±SD         | 3.74±0.35 | 3.87±0.45 | −0.888 | 0.382                       |
|                               | MOMS±SD         | 2.65±0.33 | 2.77±0.45 | −0.838 | 0.409                       |
| Clinical attachment level      | MBLS±SD         | 3.76±0.35 | 3.88±0.45 | −0.864 | 0.395                       |
|                               | MOMS±SD         | 2.66±0.33 | 2.79±0.45 | −0.894 | 0.379                       |

MBLS=Mean baseline score, MOMS=Mean 1 month score, SD=Standard deviation
Discussion

Injected local anesthetics have been used to secure anesthesia during SRP. The use of injected anesthetics is known to be associated with pain and discomfort for the patient. In a study by Milgrom et al., it was reported that 25% of adults surveyed expressed at least one clinically significant fear of injection. Almost one in 20 respondents indicated avoiding, canceling, or not appearing for dental appointments because of fear of dental injections.

As an alternative to injection, topical anesthetics have been developed to avoid patient discomfort caused by the injection. Furthermore, there is a need for fast-acting anesthetic preparation that is easy and painless to apply for SRP. The most commonly used topical anesthetic agent worldwide is 20% benzocaine gel.

The present study was designed to compare the effectiveness of intra-pocket anesthetic gel (20% benzocaine) and injected anesthesia (2% lidocaine) in pain control during SRP and also to assess the influence of intra-pocket anesthetic gel on treatment outcomes.

To measure pain more than one scale have been used in studies to confirm that the values are correlated and reliable. This care is based on the fact that pain is a very individual experience, which may be influenced by psychological and physical effects. VAS and VRS have been used for pain evaluation in several studies.

Data from the present study showed that pain perception as assessed by VAS showed a slightly higher scale for injection group as compared to gel group although it was not statistically significant (p = 0.150). Results of VRS did not show any significant difference among the gel and injection group (p = 1.00), the scale of measurement showed equal numerical for both injection and gel group. The split-mouth design ensured that host characteristics did not affect the pain values and enabled a paired analysis.

Previous studies have found out that intra-pocket topical gels are more effective than placebos at controlling pain during SRP. Case reports suggest that topical anesthetics alone may be adequate for some patients to control pain during restorative care, oral surgical procedures such as tooth extractions, and soft tissue biopsies.

Furthermore, it is interesting to note that a slightly higher percentage of patients preferred intra-pocket gel anesthesia (53%) as compared to injected 2% lidocaine. Similar data were reported in two multicenter evaluations comparing intra-pocket lidocaine/prilocaine (2.5%) gel versus injected lidocaine, with 70%–72.4% of patients preferring the gel. Stoltenberg et al. compared 20% benzocaine gel versus injected 2% lidocaine for SRP procedures, with the result being that 52% favored gel. Jacob and Nath in their study showed a significant reduction (p < 0.01) in pain in benzocaine applied side when compared with placebo. In a systematic review and meta-analysis conducted by Wambler et al., concluded that anesthetic gel decreases the risk and intensity of pain during probing/SRP. The reasons for patients preference of anesthetic gel may be because of lack of postoperative numbness, avoidance of anesthetic needle, patients tolerance to mild-moderate pain if an injection could be avoided. Moreover, when compared with injected anesthetics, relatively high concentrations of the active ingredients can be used in topical preparations without producing toxic concentrations.

The secondary endpoint was to evaluate the influence of intra-pocket 20% benzocaine gel on “treatment outcomes.” There was a significant reduction in PI, MGI, mSBI, PPD, CAL from baseline at the end of 1 month in both groups (p = 0.001) [Table 1]. On intergroup comparison PI, MGI, mSBI did not show a significant difference between both groups at baseline and 1 month (p > 0.05). The use of local anesthetic gel (20% benzocaine) for SRP had no influence on the reduction of PPD and the change in CAL (p > 0.05) compared to injected local anesthesia [Table 2]. These results suggest that placement of gel in pocket did not lead to any adverse outcomes or interfere with the results of SRP.

Conclusions

Within the limits of the present study, it can be concluded that 20% benzocaine gel is a well-tolerated anesthetic gel with efficacy similar to that of injected 2% lidocaine and no adverse treatment outcomes. 20% benzocaine gel can be seen as a valuable alternative for injected anesthesia during SRP which can reduce the fear and discomfort associated with the same. To evaluate the larger benefits of gel anesthesia, there is a need for larger studies in patients with dental fear or anxiety.

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Conflicts of interest

There are no conflicts of interest.

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