A comparative study to evaluate the efficacy of *Azadirachta indica* (neem) and *Curcuma longa* (turmeric) in extraction socket

**ABSTRACT**

**Introduction:** Herbal medicines have less side effects in comparison with traditional medicines, but side effects occur and are safer to use than conventional medications. Herbal medicines have two special characteristics that distinguish them from chemical drugs; use of crude herbs and prolonged usage.

**Aim:** Evaluation of the efficacy of neem and turmeric in wound healing in orthodontic extraction sockets.

**Materials and Methods:** 45 extraction sites were divided in 3 group of 15 each where apart from group left as control, remaining groups received Neem and turmeric extracts respectively. the healing of extraction socket was assessed and compared with the control group.

**Results:** Delayed wound healing was found in the control group as compared to the group receiving Herbal extracts.

**Conclusion:** Herbal extract therapy should be administered in extraction sockets though a larger sample size may reveal more comprehensive picture.

**Keywords:** *Azadirachta indica*, *Curcuma longa*, herbal extracts, wound healing

**INTRODUCTION**

Extraction of teeth is a routine clinical procedure carried out prevalently both by an oral and maxillofacial surgeon and a general dental practitioner. Wound healing post extractions can be delayed by the presence of infection which, in turn, has been countered by antibiotics and their current trends. However, judicious prescription of the antimicrobial drugs has led to the evolution of more resistant strains making it challenging for the antibiotics to remain in the mainstay as a modality of management for postextraction infections. Antibiotics are usually administered systemically and exert side effect which may be harmful to the flora of remote locations in the body; hence, local delivery of the drug is preferred. Taking this into consideration, herbal remedies are being relied upon.

Neem and turmeric have been established as an effective modality for management by local delivery. Various authors have established their efficacy in relation to surgical wound healing and periodontal conditions.[1-6] Herbal extracts have been found to be effective when it comes to regenerative

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periodontal therapy. Limited information is present about its effect on osseous healing. Healing extraction socket seems an ideal place to determine the efficacy of the herbal extracts, and hence, this case study has been prepared.

MATERIALS AND METHODS

Study design
A total of 45 patients who require extraction of first premolars for orthodontic treatment reporting in the Department of Oral and Maxillofacial Surgery were considered for this study while patients with infected first premolars with associated periapical pathology or infections, immunocompromised and refused to provide consent were excluded. The extraction sockets were selected consecutively for placement of the gel foam impregnated with betadine, neem extracts, and turmeric extracts, respectively.

Formulation of delivery agents

**Betadine pack**
Medical grade betadine was incorporated in the gel foam which was then ready to be placed in the socket.

**Neem gel**
Neem gel containing 500 mg of neem extract (5% and 20% w/w) in the required amount of distilled water, 1 g of Carbopol 934P, Triethanolamine, 75 mg of methylparaben, and 25 mg propylparaben.

**Turmeric gel**
A total of 100 g of turmeric block was acquired and ground using mortar and pestle and a paste was prepared with distilled water which was then introduced into gel foam.

Surgical procedure
After taking general details as age and sex of patients who required of extraction of first premolars both mandibular and maxillary instead of orthodontic treatment, the procedure was carried out under local anesthesia with vasoconstrictor. All sites were operated by the same surgeon to minimize procedural error. Groups were allocated according to the pack placed in the sockets which means Group A, B, and C received gelfoam-containing betadine solution, neem, and turmeric, respectively [Figures 1-3], followed by prescription of nonsteroidal anti-inflammatory drugs which was same for all groups, that is they were to be taken as and when necessary only. Group A was taken as a control group while the rest of the groups were study groups. Patients were then recalled after 24 h of the procedure, 3rd day, and 7th day [Figure 4] consecutively to assess pain using visual analog scale, inflammation, wound dehiscence, and infection.

RESULTS
After extraction the socket was filled with betadine, neem and turmeric in 15 patients each and the pain severity of 45 sockets (15 in each group) on the postextraction days 1, 3, and 7 were noted.
The mean of pain severity for 3 days was averaged, and patients grouped as shown in Table 1. The average pain severity was found to be the highest in betadine followed by turmeric followed by neem. This order of pain relief was also proved statistically using one-way ANOVA test obtaining a value of $P < 0.0001$.

Inflammation was assessed in the patients on the postoperative day 3 and the results are shown in Table 2. It was observed that presence of inflammation was the highest in patients treated with betadine (66.7%), followed by those treated with neem (33.33%), and followed by those treated with turmeric (20%). Chi-square test was applied, and the results were found to be statistically significant.

Infection was also assessed in the patients on the postoperative day 3 and the results are shown in Table 3. It was observed that the presence of infection was the highest in patients treated with betadine (13.3%), followed by those treated with neem and turmeric (6.67%) each. Chi-square test was applied, and the results were found to be statistically insignificant.

Wound dehiscence was observed on the postoperative days 7, 14, and 21. No wound dehiscence was observed in patients treated with neem and turmeric.

Results showed that there were statistically significant difference in average pain severity on the 1st, 3rd, and 7th postoperative days which was highest in Group 1 followed by Group 3 and then Group 1 as shown in Table 1. Furthermore, there was statistically significant difference in the presence of inflammation on the 3rd postoperative day seen highest in Group 1 followed by Group 2 and least in Group 3 [Table 2]. The rate of infection was more in Group 1 (40%) as compared to that of Group 2 and 3 (6.67%) which was statistically significant. No wound dehiscence was seen in Group 2 and 3, whereas it was present in 2 patients in Group 1 [Table 4]. This shows that the use of herbal extracts in extraction socket significantly reduces the postoperative pain, inflammation, infection, and wound dehiscence. This indicates that herbal extracts have antimicrobial and anti-inflammatory activities which can help in reducing the incidence of postoperative infection and its complication.

![Figure 4: (a) socket after extraction of 24 (b) socket packed with gelfoam containing betadine (c) healing socket on the 1st postoperative day (d) healing socket on the 3rd postoperative day (e) healing socket on the 7th postoperative day](image)

| Pain (VAS) | Betadine, n (%) | Neem, n (%) | Turmeric, n (%) | Total, n (%) |
|-----------|----------------|-------------|----------------|-------------|
| ≤5.00     | 0 (0.0)        | 12 (80.0)   | 0 (0.0)        | 12 (26.7)   |
| 5.01-6.00 | 0 (0.0)        | 2 (13.3)    | 7 (46.7)       | 9 (20.0)    |
| 6.01-7.00 | 10 (66.7)      | 1 (6.7)     | 8 (53.3)       | 19 (42.2)   |
| >7        | 5 (33.3)       | 0 (0.0)     | 0 (0.0)        | 5 (11.1)    |
| Total     | 15 (100.0)     | 15 (100.0)  | 15 (100.0)     | 45 (100.0)  |

Mean±SD | 6.840±0.2995 | 4.727±0.551 | 6.093±0.433 | 5.887±0.984 |

Median | 6.8 | 4.6 | 6.2 | 6.2 |

VAS: Visual analog scale, SD: Standard deviation

| Inflammation | Neem | Turmeric | Betadine |
|--------------|------|----------|----------|
| -            | 10 (66.7) | 12 (80.0) | 5 (33.3) |
| +            | 5 (33.3)  | 3 (20.0)  | 10 (66.7) |
| Total        | 15 (100.0) | 15 (100.0) | 15 (100.0) |

- Absent, +: Present

| Infection | Neem | Turmeric | Betadine |
|-----------|------|----------|----------|
| -         | 14 (93.3) | 14 (93.3) | 13 (86.7) |
| +         | 1 (6.7)  | 1 (6.7)  | 2 (13.3)  |
| Total     | 15 (100.0) | 15 (100.0) | 15 (100.0) |

- Absent, +: Present
DISCUSSION

Herbal remedies are backed by ancient literature and were sidelined as pharmacologic measures took up the center stage for wound management. Growing antibiotic resistance and systemic side effects may have marred the credibility of commercial antimicrobial agents. Herbal medicines have less side-effect in comparison with traditional medicines, but side effects occur and are safer to use than conventional medications. The concept that the local delivery of antibiotic achieves greater concentrations of the drug than available with systemic delivery is very promising and appealing first because it exhibits negligible impact on the microflora residing in the other regions of the body and second, the concentration of the agent is controlled. When it comes to local delivery, it is also established that a higher concentration of herbal extracts is less toxic than standard concentration of the antimicrobial agent. The agents used in the study were incorporated in a biodegradable polymer for local delivery.

*Azadiracta indica* or Neem consists of genin, sodium nimbinate, salannin, nimbin, azadirachtin, nimbidiol, quercetin, and nimbidin. Neem leaves contain fiber, carbohydrates and at least 10 amino acid proteins, calcium, carotenoids, fluoride and can be either infused or externally applied. Neem has been shown to be effective in the treatment of inflammatory conditions as well as the organisms pathognomonic to it. *Curcuma longa* or turmeric is antimutagenic, anticarcinogenic, antioxidant, antibacterial and used in dental caries, oral lichen planus, gingivitis, halitosis, pit and fissure sealant, dental plaque detection. Turmeric is used widely – periodontal treatment, surgical wound healing, anti-cancer effect, and antioxidant effect. Habobilheha reported better efficacy in the healing of surgical wounds when *C. longa* – ghee was compared with hyaluronic acid. It has been shown to regulate the release of interleukin 6 to control the resorption of bone, which has already been concluded in various studies.

In the present study, all clinical parameters seem to favor the application of herbal extracts in the extraction socket as compared to the control site. Pain and inflammation were well controlled when compared to the control group because both neem and turmeric are potent anti-inflammatory in nature. Wound dehiscence was found in two patients overall in the control group indicating that herbal extracts provide a better outcome in healing. Furthermore, it was found that the healing "was better overall" in sockets that received with neem and turmeric extracts as compared to the control group which was also reported by Gruber et al.

Herbal medicine is an increasingly common form of alternative therapy throughout the world. Consequently, herbal medicines are finding their more and more usefulness in the arena of dentistry and their armamentarium. Herbal extracts are effective because they interact with specific chemical receptors within the body. Use of herbal extracts in the form of dentifrice, medicated gel, local drug delivery systems proved to be efficient.

In accordance with the result of this study, it can be stated that herbal extracts seem to be more effective in osseous healing though a larger sample size and a longer follow-up would yield a better picture which may further elucidate the present outcome.

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Conflicts of interest
There are no conflicts of interest.

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