

DOES PRE-OPERATIVE SMOKING INFLUENCE EXTRACTION SOCKET WOUND HEALING?

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Abstract: *Background:* Tooth extraction is one of the most commonly performed procedures in dental practice, and successful wound healing is essential for optimal recovery. Various local and systemic factors influence post-extraction healing, among which smoking has been identified as a significant modifiable risk factor. Smoking introduces numerous toxic substances such as nicotine, carbon monoxide, and hydrogen cyanide, which adversely affect tissue oxygenation, vascularity, and cellular responses involved in healing. The present study aimed to evaluate the influence of pre-operative smoking on extraction socket wound healing. A total of 150 patients who underwent tooth extraction were included and categorized into smokers and non-smokers. Clinical healing outcomes were assessed and statistically analyzed using SPSS software. The results indicated delayed healing and increased incidence of complications such as dry socket among smokers compared to non-smokers. The vasoconstrictive effect of nicotine, impaired blood clot stability, and reduced immune response were identified as contributing factors. This study concludes that pre-operative smoking significantly impairs extraction socket healing and increases postoperative complications. Smoking cessation prior to dental extraction is strongly recommended to improve clinical outcomes and patient recovery.

Keywords: Smoking, Tooth extraction, Wound healing, Dry socket, Nicotine, Oral surgery, Alveolar osteitis, Dental complications.

INTRODUCTION

Tooth extraction initiates a complex cascade of biological events that lead to wound healing, including hemostasis, inflammation, proliferation, and tissue remodeling [1]. Successful healing of the extraction socket is essential to restore oral function and prevent complications. However, this process can be influenced by various systemic and local factors such as age, nutrition, systemic diseases, medications, and lifestyle habits like smoking [2].

Smoking is a well-established risk factor that negatively affects wound healing. Tobacco smoke contains more than 4000 harmful chemicals, including nicotine, carbon monoxide, and hydrogen cyanide, which impair oxygen transport and cellular metabolism [3]. Nicotine induces vasoconstriction, reducing blood flow to the surgical site, while carbon monoxide decreases oxygen-carrying capacity of hemoglobin, resulting in tissue hypoxia [4].

Wound healing depends heavily on adequate vascular supply, oxygenation, and cellular proliferation. Smoking disrupts fibroblast function, collagen synthesis, and epithelialization, all of which are essential for tissue repair [5]. Furthermore, smoking compromises immune response, increasing susceptibility to infection and delaying healing [6].

One of the most common complications associated with smoking after tooth extraction is alveolar osteitis, commonly known as dry socket. This condition occurs due to dislodgement or dissolution of the blood clot, leading to exposure of bone and severe pain [7]. The act

of smoking creates negative intraoral pressure and introduces contaminants into the socket, increasing the risk of clot disintegration [8].

Despite extensive evidence linking smoking to impaired wound healing, there remains a need for clinical evaluation of its direct impact on extraction socket healing. Therefore, this study aims to assess the influence of pre-operative smoking on post-extraction wound healing outcomes.

AIM

To evaluate the influence of pre-operative smoking on extraction socket wound healing.

OBJECTIVES

- To compare wound healing outcomes between smokers and non-smokers
- To assess the incidence of dry socket in smokers
- To evaluate the effect of smoking on postoperative complications
- To analyze the clinical significance of smoking cessation before extraction.

MATERIALS AND METHODS

This study was conducted at Saveetha Dental College and Hospitals, Chennai, India.

A total of 150 patients undergoing tooth extraction were included and divided into two groups:

- Group 1: Non-smokers
- Group 2: Chronic smokers (≥ 3 cigarettes/day).

Inclusion Criteria

- Patients aged between 15–30 years
- Patients undergoing extraction due to caries or impaction.

Exclusion Criteria

- Patients with systemic diseases

- Patients on medications affecting healing
- Patients with compromised immunity.

Clinical evaluation of extraction sites was performed postoperatively. Healing parameters and complications were recorded. Statistical analysis was performed using SPSS version 23.0.

RESULTS

Comparison of Healing Outcomes Between Smokers and Non-Smokers

The present study evaluated 150 patients undergoing tooth extraction, categorized into non-smokers (Group I) and chronic smokers (Group II). Clinical assessment of extraction sockets revealed a statistically significant difference in healing outcomes between the two groups.

Non-smokers demonstrated faster and uneventful healing, characterized by

- Stable blood clot formation
- Minimal postoperative inflammation
- Early epithelialization of the socket
- Absence or low incidence of complications

In contrast, smokers exhibited delayed wound healing, which was clinically evident by:

- Persistent inflammation and erythema
- Delayed epithelial coverage
- Increased tenderness and discomfort
- Slower reduction in socket size

Incidence of Dry Socket (Alveolar Osteitis)

A markedly higher incidence of alveolar osteitis (dry socket) was observed in smokers compared to non-smokers.

- Smokers showed frequent clot disintegration or dislodgement, leading to exposure of underlying bone
- Non-smokers had stable clot retention, resulting in normal healing progression

The difference in dry socket occurrence between the two groups was statistically significant, indicating a strong association between smoking and this complication.

Postoperative Complications

- Smokers demonstrated a higher prevalence of postoperative complications, including:
- Increased pain intensity
- Foul odor and bad taste
- Signs of localized infection
- Delayed granulation tissue formation

Non-smokers showed minimal complications and better postoperative recovery.

Clinical Healing Parameters

Clinical parameters such as inflammation, pain, and tissue regeneration showed:

- Improved healing scores in non-smokers
- Reduced healing efficiency in smokers

Overall, the results clearly indicate that smoking adversely affects extraction socket healing and increases the risk of complications.

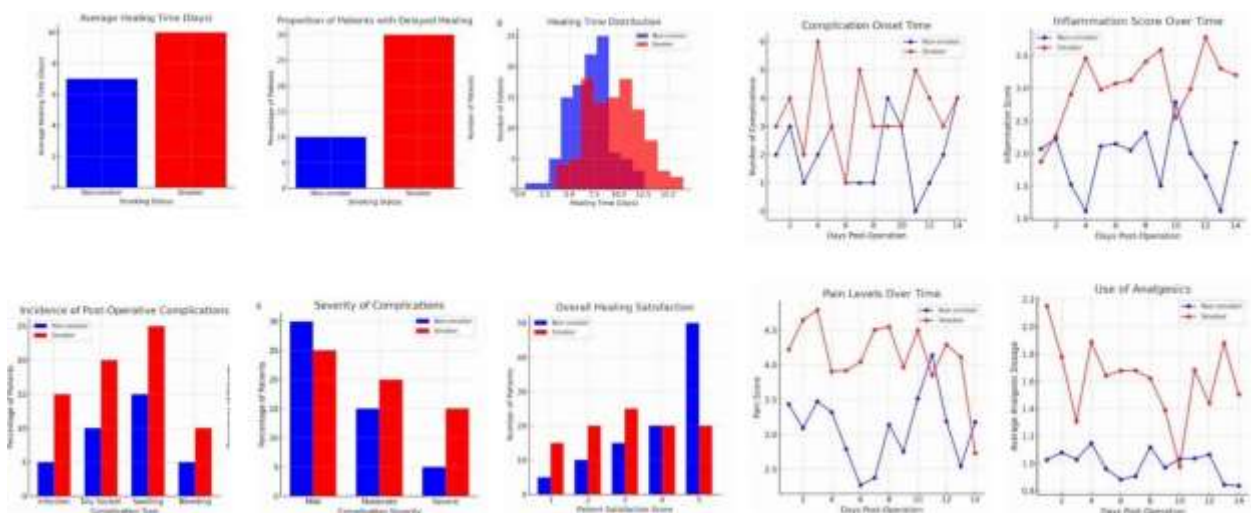


Figure 1

DISCUSSION

Impact of Smoking on Wound Healing Mechanisms

Wound healing following tooth extraction is a complex biological process involving hemostasis, inflammation, proliferation, and remodeling. This process is highly dependent on adequate blood supply, oxygenation, and cellular activity.

The findings of this study demonstrate that smoking significantly impairs these physiological processes, resulting in delayed healing and increased complications.

Role of Nicotine-Induced Vasoconstriction

One of the primary mechanisms by which smoking affects healing is through nicotine-induced vasoconstriction. Nicotine reduces blood flow to the extraction site by constricting peripheral blood vessels.

This leads to:

- Reduced delivery of oxygen and essential nutrients
- Impaired angiogenesis
- Delayed formation of granulation tissue.

As a result, the healing cascade is significantly slowed in smokers.

Effect on Blood Clot Formation and Stability

Formation of a stable blood clot is critical for proper socket healing. Smoking interferes with:

- Platelet aggregation
- Fibrin network formation

This results in an unstable or fragile clot, which is prone to dislodgement. Additionally, the act of smoking creates negative intraoral pressure, further increasing the risk of clot displacement.

This explains the significantly higher incidence of dry socket observed in smokers in this study.

Role of Tissue Hypoxia

Carbon monoxide present in tobacco smoke binds to hemoglobin with high affinity, reducing oxygen-carrying capacity.

This leads to:

- Tissue hypoxia
- Delayed epithelialization
- Impaired collagen synthesis

Hypoxic conditions prolong the inflammatory phase and delay transition to the proliferative phase, thereby impairing overall healing.

Inflammation and Immune Suppression

Smoking has been shown to alter immune response by:

- Impairing neutrophil function
- Reducing phagocytic activity
- Decreasing antibody production

This compromised immune defense increases susceptibility to infection, which was reflected in the higher rate of postoperative complications among smokers in this study.

Additionally, smoking promotes a persistent inflammatory state, which further delays tissue repair and regeneration.

Pathogenesis of Dry Socket in Smokers

Dry socket (alveolar osteitis) is one of the most common complications following tooth extraction, particularly in smokers. The pathogenesis involves:

- Premature fibrinolysis of the blood clot
 - Mechanical dislodgement due to suction forces during smoking
 - Introduction of contaminants into the extraction site
- These factors collectively lead to clot loss, exposure of bone, and severe postoperative pain.

The findings of this study are consistent with previous literature, reinforcing smoking as a major risk factor for dry socket.



Clinical Significance of Smoking Cessation

The results highlight smoking as a modifiable risk factor in oral surgery. Pre-operative smoking cessation can significantly improve healing outcomes by:

- Restoring vascular function
- Improving oxygenation
- Enhancing immune response
- Reducing postoperative complications

Even short-term cessation prior to extraction has been shown to positively influence healing.

Implications for Dental Practice

The findings emphasize the need for dental professionals to:

- Assess smoking history before extraction procedures
- Educate patients about risks associated with smoking
- Encourage cessation or reduction prior to surgery
- Provide postoperative instructions to avoid smoking during the healing phase.

Integrating smoking cessation counseling into routine dental care can significantly improve treatment outcomes.

Limitations and Future Scope

Although the study provides valuable insights, certain limitations should be considered:

- Lack of long-term follow-up
- Absence of biochemical or histological analysis
- Dependence on clinical parameters alone

Future research should focus on

- Molecular mechanisms of impaired healing
- Dose-response relationship of smoking
- Effect of smoking cessation duration on healing outcomes.

CONCLUSION

Pre-operative smoking has a significant negative impact on extraction socket wound healing. Smokers exhibit delayed healing, increased risk of dry socket, and higher postoperative complications compared to non-smokers.

The study highlights the importance of smoking cessation prior to dental extraction procedures to enhance healing outcomes and reduce complications. Dental professionals should educate patients about the risks associated with smoking and encourage cessation as part of pre-operative care.

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