



EXAMINING THE EFFECTS OF SMOKING AND ALCOHOL USE ON BONE HEALING OUTCOMES

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ABSTRACT

BACKGROUND:

Background: Smoking and alcohol consumption are common lifestyle factors that negatively impact bone health. This study aims to investigate the effects of smoking and alcohol consumption on bone healing in patients undergoing orthopaedic procedures.

Objective: To evaluate the impact of smoking and alcohol consumption on bone healing outcomes, including delayed healing, non-union, and post-operative complications.

Material and Methods: A cross-sectional study was conducted in the Department of Orthopaedics at a tertiary care hospital, including 40 patients undergoing fracture fixation or bone grafting. Data were collected on smoking and alcohol history, and bone healing was assessed radiographically at 6, 12, and 24 weeks post-operatively.

Results: Among smokers, 60% experienced delayed healing, 20% developed non-union, and 30% had post-operative infections. Among alcohol consumers, 50% had delayed healing, 15% developed non-union, and 25% had infections. Both smoking and alcohol consumption were significantly associated with impaired bone healing.

Conclusion: Smoking and alcohol consumption negatively impact bone healing outcomes in orthopedic patients. These findings underscore the need for smoking cessation and alcohol reduction programs as part of pre-operative and post-operative care to enhance bone healing and reduce complications.

Keywords: Bone healing, Smoking, Alcohol consumption, Orthopaedic surgery, Delayed union, Non-union

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INTRODUCTION

Bone healing is a complex biological process involving multiple stages, including inflammation, repair, and remodelling. Successful bone healing depends on various factors such as age, nutrition, and the overall health of the patient. However, lifestyle factors, particularly smoking and alcohol consumption, have been shown to adversely affect bone healing and fracture recovery (1). Both smoking and alcohol intake are common habits that contribute significantly to public health

challenges, and their impact on bone healing warrants further investigation.

Smoking has been identified as a major risk factor for delayed bone healing and non-union of fractures (2). The toxic components in cigarette smoke, such as nicotine and carbon monoxide, impair osteoblast function, reduce blood flow to the fracture site, and disrupt the normal bone healing cascade (3). Smokers are also more prone to infections after surgery, which can further compromise bone healing (4). Moreover, the dose-dependent relationship

between smoking and delayed fracture healing underscores the need to address smoking cessation in patients undergoing bone repair (5).

Alcohol consumption is another modifiable risk factor that negatively impacts bone health. Chronic alcohol use leads to impaired bone formation and increased bone resorption, resulting in a higher risk of osteoporosis and fractures (6). Alcohol interferes with calcium absorption and disrupts the balance of hormones essential for bone metabolism, such as estrogen and testosterone (7). In the context of bone healing, alcohol impairs the inflammatory response necessary for early fracture repair and compromises the production of bone matrix by osteoblasts (8). Heavy alcohol use has been associated with delayed fracture healing and an increased risk of complications, similar to the effects seen in smokers (9).

Given the detrimental effects of smoking and alcohol consumption on bone health, this study aims to investigate their impact on bone healing in patients undergoing orthopaedic procedures. The findings will help inform clinical recommendations for improving bone healing outcomes in patients who smoke or consume alcohol.

Aims and objectives:

Aim: To investigate the impact of smoking and alcohol consumption on bone healing in patients undergoing orthopaedic procedures.

Objectives:

- To evaluate the association between smoking and delayed bone healing.
- To assess the effect of alcohol consumption on fracture healing outcomes.

Material and Methods

This study was conducted in the Department of Orthopaedics at a tertiary care hospital. A total of 40 patients undergoing orthopaedic procedures, including fracture fixation and bone grafting, were included in the study.

Study Population:

Inclusion Criteria:

Patients aged 18-65 years undergoing fracture fixation or bone grafting.

Patients with a history of smoking and/or alcohol consumption.

Exclusion Criteria:

Patients with metabolic bone disorders (e.g., osteoporosis).

Patients on medications affecting bone healing (e.g., corticosteroids).

Data Collection: Patients were recruited from the inpatient and outpatient units over a 6-month period. A structured questionnaire was used to collect demographic data, smoking history (number of cigarettes per day, duration of smoking), alcohol consumption (quantity and frequency), and details of the orthopedic procedure. Bone healing was assessed radiographically at 6 weeks, 12 weeks, and 24 weeks post-operatively.

Outcome Measures: The primary outcome was the time to radiographic evidence of bone healing. Secondary outcomes included the incidence of delayed union, non-union, and post-operative complications such as infection. Data were analyzed using descriptive and inferential statistics, with significance set at $p < 0.05$.

Results:

Table 1: Bone Healing Outcomes in Smokers and Alcohol Consumers (n = 40)

Group	Number of Patients (n)	Delayed Healing (%)	Non-union (%)	Infection Rate (%)
Smokers (n = 20)	20	12 (60%)	4 (20%)	6 (30%)
Alcohol Consumers (n = 20)	20	10 (50%)	3 (15%)	5 (25%)

Table 1 summarizes the bone healing outcomes in patients who smoke and those who consume alcohol. Among the 20 smokers, 60% experienced delayed healing, and 20% developed non-union. The infection rate was also high in smokers, at 30%. Among alcohol

consumers, 50% had delayed healing, with a 15% non-union rate and a 25% infection rate. These findings suggest that both smoking and alcohol consumption significantly impair bone healing, with smokers exhibiting slightly worse outcomes overall.

Table 2: Comparison of Bone Healing Outcomes by Smoking and Alcohol Consumption

Factor	Smoking (n = 20)	Alcohol Consumption (n = 20)	Control (n = 20)
Average Time to Healing (weeks)	16.5 ± 2.1	15.2 ± 1.8	12.8 ± 1.5
Delayed Healing (%)	60%	50%	25%
Non-union (%)	20%	15%	5%
Infection Rate (%)	30%	25%	10%
Reoperation Rate (%)	15%	10%	5%

Table 2 compares bone healing outcomes among smokers, alcohol consumers, and a control group of non-smokers and non-drinkers. The average time to healing was longest in smokers (16.5 weeks) and shortest in the control group (12.8 weeks), indicating that smoking delays bone healing. Alcohol consumers had an intermediate healing time (15.2 weeks), also suggesting an adverse effect, though less severe than smoking. The incidence of delayed healing was highest among smokers (60%) and lowest in the control group (25%). Non-union rates followed a similar trend, with smokers experiencing the highest rate (20%) and controls the lowest (5%). Infection rates were notably higher in smokers (30%) compared to alcohol consumers (25%) and controls (10%), further complicating healing. The reoperation rate was also higher among smokers (15%) compared to alcohol consumers (10%) and the control group (5%), emphasizing the increased complications associated with smoking.

Discussion:

This study demonstrates a clear association between smoking, alcohol consumption, and impaired bone healing. Smoking was associated with a higher rate of delayed healing and non-union, which is consistent with previous research highlighting the detrimental effects of nicotine and other toxic substances in cigarette smoke on bone metabolism (10). The vasoconstrictive effects of nicotine reduce blood supply to the fracture site, impairing the delivery of essential nutrients and cells required for bone repair (11). Additionally, the increased infection rate observed in smokers may be related

to the immunosuppressive effects of smoking, which further complicates the healing process (12).

Alcohol consumption also had a negative impact on bone healing, with 50% of alcohol consumers experiencing delayed healing. Chronic alcohol use disrupts the hormonal regulation of bone turnover and impairs the osteogenic response, leading to delayed fracture repair (13). Alcohol's negative effect on calcium absorption and vitamin D metabolism further contributes to poor bone health (14). These findings align with previous studies that have shown heavy alcohol consumption to be a significant risk factor for delayed fracture healing and complications (15).

The results of this study underscore the importance of addressing modifiable lifestyle factors, such as smoking and alcohol consumption, in patients undergoing orthopedic procedures. Smoking cessation and alcohol reduction should be prioritized as part of pre-operative and post-operative care to improve bone healing outcomes.

Conclusion:

This study confirms that smoking and alcohol consumption have a detrimental impact on bone healing in patients undergoing orthopedic procedures. Smokers had a higher incidence of delayed healing, non-union, and infections compared to alcohol consumers, although both groups exhibited impaired healing outcomes. These findings highlight the need for targeted interventions, such as smoking cessation programs and alcohol use reduction strategies, to optimize bone healing and reduce complications in orthopedic patients.

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