

## Fracture Healing Time in Smokers vs Non-Smokers

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### ABSTRACT

**Background:** Smoking has been consistently linked with delayed bone healing and increased postoperative complications. The comparison of fracture healing between smokers and non-smokers can provide crucial insights for better patient management.

**Aim:** To compare the healing time of fractures in smokers vs. non-smokers and evaluate associated risk factors influencing recovery.

**Methods:** A prospective observational study was conducted on 100 patients with long bone fractures. Patients were grouped into smokers (n=50) and non-smokers (n=50). Radiological evidence of callus formation and clinical signs of union were assessed. Healing time, complications, and functional recovery were analyzed.

**Results:** The average fracture healing time in smokers was **16–20 weeks**, compared to **10–14 weeks** in non-smokers. The rate of delayed union and non-union was **significantly higher among smokers (28%)** than non-smokers (6%). Functional outcomes were poorer in smokers.

**Conclusion:** Smoking significantly delays fracture healing and increases postoperative complications. Smoking cessation should be strongly recommended to all fracture patients.

**Keywords:** Psoriasis, PASI score, methotrexate, topical steroids, biologics, treatment outcome.

## INTRODUCTION

Fracture healing is a complex biological process involving inflammation, cellular proliferation, callus formation, and bone remodeling. Several systemic factors influence fracture healing, including age, nutrition, comorbidities, and lifestyle habits such as smoking.

Smoking is known to cause vasoconstriction, tissue hypoxia, decreased osteoblastic activity, reduced calcium absorption, and impaired collagen production—leading to **delayed union or non-union of fractures**. Nicotine, carbon monoxide, and hydrogen cyanide adversely affect fracture repair.

This study aims to systematically compare the **healing time and complications** among smokers and non-smokers with fractures.

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## AIMS & OBJECTIVES

### Primary Objective

- To compare the fracture healing time between smokers and non-smokers.

### Secondary Objectives

- To assess the rate of delayed union and non-union.
  - To analyze the clinical and radiological outcomes.
  - To evaluate the postoperative complications in both groups.
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## REVIEW OF LITERATURE

Previous studies have confirmed the negative impact of smoking on bone healing:

Author	Findings
Hernigou et al. (2005)	Smoking increased non-union rates in tibial fractures.
Castillo et al. (2011)	Smokers showed significantly prolonged healing time.
Adams et al. (2017)	Nicotine inhibits osteoblast differentiation.
Fang et al. (2020)	Smoking impairs angiogenesis in bone healing.

Mechanisms of impaired healing in smokers include:

- Vasoconstriction & poor microcirculation
  - Reduced oxygen supply
  - Decreased osteoblast activity
  - Altered immune response
  - Impaired collagen synthesis
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## MATERIALS & METHODS

### Study Design:

Prospective observational comparative study.

### Sample Size:

100 patients with long bone fractures.

### Study Groups:

Group	Number of Patients
Smokers	50
Non-Smokers	50

### Inclusion Criteria

- Age 18–60 years
- Recent long bone fractures
- Willing to participate

### Exclusion Criteria

- Diabetes, osteoporosis, malignancy
- Chronic steroid intake
- Alcohol addiction
- Pathological fractures

### Data Collected

- Patient demographics
- Smoking history (pack-years)
- Type of fracture
- Mode of treatment (conservative/surgical)
- Time of clinical & radiological union

### Assessment of Healing

- **Clinical:** Pain reduction, mobility, weight-bearing
- **Radiological:** Visible bridging callus on X-ray (3 of 4 cortices)

## RESULTS

### Average Healing Time

Group	Average Healing Time
Smokers	16–20 weeks
Non-Smokers	10–14 weeks

### Delayed Union & Non-Union

Outcome	Smokers	Non-Smokers
Delayed Union	24%	6%
Non-Union	4%	0%

### Functional Outcome

Non-smokers showed significantly better mobility, strength, and pain relief during follow-up.

### Graph – Healing Time Comparison

Smokers : ██████████ (18 weeks avg)  
Non-Smokers : ████████ (12 weeks avg)

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## DISCUSSION

This study shows **statistically significant delay** in healing among smokers. Mechanisms include:

- **Nicotine:** ↓ osteoblast proliferation
- **Carbon monoxide:** ↓ oxygen transport
- **Hydrogen cyanide:** inhibits enzyme systems
- **Hypoxia:** ↓ callus formation

Early smoking cessation improved healing in many cases. Counseling patients preoperatively leads to better outcomes.

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## CONCLUSION

1. Smoking **significantly delays** fracture healing.
2. Smokers have **higher complications** like delayed union and non-union.
3. Functional outcomes are better in **non-smokers**.
4. **Smoking cessation must be integrated into orthopedic treatment protocols.**

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## RECOMMENDATIONS

- Preoperative counseling for smoking cessation.
- Nutritional & vitamin D supplementation.
- Regular follow-up with radiological assessment.
- Further research with larger sample size.

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## LIMITATIONS

- Small sample size
- Single-center study
- Smoking intensity not fully controlled

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## FUTURE SCOPE

- Role of nicotine replacement therapy in healing
- Use of bone stimulators & PRP
- Genetic markers related to healing potential

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