Tobacco Use in the Surgical Patient

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Outline

- Tobacco Use in the United states
- Implications in the Surgical Patient
- Effects on Bone Healing
- Effects on Wound Healing
- Implications for Anesthesia
- Smoking Cessation
Tobacco Use in the United States

- 5.1% of all adults (36.5 million people) smoke cigarettes\textsuperscript{1}

- Use of smokeless tobacco increasing in many areas as is combination use of cigarettes and smokeless tobacco\textsuperscript{2}

Image Sources: Huffington Post, Centers for Disease Control and Prevention
Cigarette Smoke

- 4000+ chemicals in cigarette smoke\(^2\)

- Two phases of cigarette smoke\(^3\)
  - Volatile Phase
  - Particulate Phase

- Systems most affected\(^4\)
  - Pulmonary
  - Cardiovascular
  - Immune System
  - Wound Healing

*Image Source: Centers for Disease Control and Prevention*
Several studies reveal an increased prevalence of overall post-operative complications in smokers vs. non-smokers.

Peri-operative complications include:

- Non-union or delayed union of surgical and non-surgical/traumatic fractures
- Delayed wound healing
- Pulmonary complications
- Increased rate of infection
- Increased risk of thrombus

Image Source: American Podiatric Medical Association
Effects on Bone Healing

- Prolonged healing time
- Increased rates of non-union
- Decreased quality of bone repair
- Impaired collagen production
- Decreased bone density
- Impaired cellular function and formation
Stages of Bone Healing

Image Source: Nature Reviews Rheumatology
Effects on Wound Healing

- Decreased peripheral blood flow
  - Decreased tissue oxygenation and aerobic metabolism\(^6\)
- Direct inhibition of cellular function
- Increased risk of infection
Stages of Wound Healing

**a** Injury

Skin surface  
Red blood cell

<table>
<thead>
<tr>
<th>Wound</th>
<th>Platelet</th>
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<table>
<thead>
<tr>
<th>Epidermis and dermis of skin</th>
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<td>PMN</td>
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<tr>
<th>Macrophage</th>
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**b** Coagulation

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<th>PMN</th>
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**c** Early inflammation (24 h)

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<th>TGF-β</th>
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<td>PDGF</td>
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**d** Late inflammation (48 h)

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<tr>
<th>Collagen</th>
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<td>Fibroblast</td>
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**e** Proliferation (72 h)

**f** Remodeling (weeks to months)

The phases of cutaneous wound healing

*Expert Reviews in Molecular Medicine ©2003 Cambridge University Press*
Implications for Anesthesia

- Increased risk of pulmonary complications in OR or PACU
- Impaired cellular function
- Reduced pulmonary capacity
- Increased carbon monoxide levels
- Selection of anesthetic agents
Lung Tissue: Non-Smoker vs Smoker
Other Considerations

- Greater frequency of chronic pain
- Increased requirements of postoperative analgesia
- Increased risk of DVT/PE
Smoking Cessation

- Reduces pulmonary and wound-related complications \(^2\)
  - Overall relative risk reduction of 41% across multiple surgical subspecialties \(^{11}\)

- Effects on bone at least partially reversible \(^3\)

- Each additional week of cessation decreased effect of smoking by 19% \(^2\)

- Short-term success
  - Only 22% of patients remained tobacco-free at 1 year-post-op \(^2\)
Conclusions

- 1 in 5 Americans use tobacco

- Effects of tobacco can be seen particularly in bone healing, wound healing, cardiovascular complications

- Pre-operative smoking cessation is beneficial as effects of smoking/risk of post-op complications can be partially reversed
References

References


