Smoking and calcaneus fracture - what should we do

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When smoking was good
Status 2014
General health effects

• Smoking is estimated to increase the risk—
  • For coronary heart disease by 2 to 4 times\textsuperscript{1,2}
  • For stroke by 2 to 4 times\textsuperscript{1}
  • Of men developing lung cancer by 25 times\textsuperscript{1}
  • Of women developing lung cancer by 25.7 times\textsuperscript{1}


How tissues are affected

• Nicotine: vasoconstriction -> tissue ischemia
• Toxic gass:
  • CO inhibits oxygen trasport by blocking hemoglobin
  • Hydrogen cyanide inhibits oxydative metabolism (cytochrome oxidase) and intracellular O2 transport
• +++
Postoperative complications general surgery

• The surgical procedures of the studies were abdominal ($N = 28$), head/neck ($N = 11$), breast surgery ($N = 16$), oral/dental ($N = 6$), orthopedic ($N = 11$), plastic ($N = 4$), thorax ($N = 17$), transplantation ($N = 7$), and general surgery ($N = 7$).

• Preoperative smoking was associated with an increased risk of various postoperative complications including general morbidity (RR = 1.52, 95% CI: 1.33–1.74), wound complications (RR = 2.15, 95% CI: 1.87–2.49), general infections (RR = 1.54, 95% CI: 1.32–1.79), pulmonary complications (RR = 1.73, 95% CI: 1.35–2.23), neurological complications (RR = 1.38, 95% CI: 1.01–1.88), and admission to intensive care unit (RR = 1.60, 95% CI: 1.14–2.25).

Bone metabolism
Arthrodesis 1 - Spine fusion

• the nonunion rate was 14.2% for nonsmokers and 26.5% for patients who continued to smoke after surgery (P < 0.05)

• 357 pts retrospective

Arthrodesis 2 – ST fusion

• The union rate was 92 percent (ninety-three of 101 feet) for nonsmokers and 73 percent (sixty-one of eighty-three feet) for smokers (p < 0.05)
• 3.8 x risk for non-union in smokers
• 150 pts retrospective

• .
Increased complication rate in forefoot surgery

- Active smokers were found to have a notably higher complication rate (36.4%) after forefoot surgery than patients who previously (16.5%) or never (8.5%) smoked.
- Active cigarette smokers were 4.3 times more likely to have a complication than nonsmokers.
- 602 pts retrospective review.

Bettin CC\(^1\), Gower K\(^2\), McCormick K\(^3\), Wan JY\(^4\), Ishikawa SN\(^2\), Richardson DR\(^2\), Murphy GA\(^2\). Foot Ankle Int. Cigarette smoking increases complication rate in forefoot surgery. 2015 May;36(5):488-93.
Snefrid får ikke operasjon fordi hun røyker

Da hun kom til sykehuset ble hun sendt hjem igjen.
Non-union rate increases in fractures

The adjusted odds of non-union was 2.3 times higher in smoking patients than in non-smokers, and mean healing time for all fracture types was 30.2 weeks in smokers, compared to 24.1 weeks in non-smokers. However, this metanalysis did not show a significantly higher rate of infection among smokers.

Medline/Cochrane research – 237 articles, meta-analysis

• John A. Scolaro, MD, MA; Mara L. Schenker, MD; Sarah Yannascoli, MD; Keith Baldwin, MD, MPH, MSPT; Samir Mehta, MD; Jaimo Ahn, MD, PhD Cigarette Smoking Increases Complications Following Fracture, A Systematic Review J Bone Joint Surg Am, 2014 Apr 16; 96 (8): 674 -681
Ankle fxs: smoking increases postop complications

• Postoperative complications of any kind (30.1% versus 20.3%, P = 0.005) as well as deep wound infections (4.9% versus 0.8%, P < 0.001) were more common among smokers than nonsmokers. Multivariable analyses showed that smokers had six times higher odds of developing a deep infection compared with nonsmokers.

• 906 pts multicenter retrospective

Calcaneus fracture

- Operative treatment still disputed
- High rate of wound complications in extensile approach
No adverse effect of smoking?

• Other factors such as smoking, fracture severity and wound closure did not affect the rate of deep infection (5.6%)
• (surgeons experience did correlate with deep infection)
• 178 pts retrospective

Smoking increases wound complications in calc fracture

• Wound complications were observed in 21% (87/405) of fractures, of which 33% (29/87) required operative intervention. Male sex (P = .032), smoking (P = .028), and the extensile lateral approach (P < .001) were associated with higher complication rates.

• 405 closed calc fxs multicenter USA, 24 surgeons (!)

• Kwon JY¹, Guss D², Lin DE³, Abousayed M³, Jeng C⁴, Kang S⁵, Ellington JK⁶. Effect of Delay to Definitive Surgical Fixation on Wound Complications in the Treatment of Closed, Intra-articular Calcaneus Fractures. Foot Ankle Int. 2015 May;36(5)
Increased infection rate in smokers w calc fractures

• Superficial and deep infection rate were 11.6% and 2.9%, respectively. Smokers had an increased rate of 12.5% and 6.25%, respectively.

• Retrospective 81 cases, single surgeon, extensile lateral approach

• Sani A¹, Volans S², Malhotra K², Mann C² Association Between Smoking and Wound Infection Rates following Calcaneal Fracture Fixation. Foot Ankle Spec. 2014 Jul 15;7(4):266-270.
Smoking and DM increases wound complication

- Forty-eight patients (25 percent) developed some form of wound complication. Forty (21 percent) of these required surgical treatment. Statistical analysis identified diabetes ($p = 0.02$; relative risk 3.4), smoking ($p = 0.03$; relative risk 1.2), and open fractures ($p < 0.0001$; relative risk 2.8) as risk factors for wound complication,

- 179 pts – 190 fxs retrospec (senior author), extensile apporach

Severly increased infx ratio in calc fx ORIF in smokers

• 40 pts 13 smokers (70% infection) 27 non smokers (15% infection)
• Retrospective, UK
• Infection DEF= wound seepage and positive cultures (superficial + deep)
• Authors: care should be taken when considering internal fixation of Os calcis fracture in patients who smoke.

Smoking among severs risk factors in calcaneal fracture

- With the regression model, smoking history (odds ratio, 5.79; 95% CI: 1.55 to 21.70; \( P = .009 \)), diabetes mellitus (odds ratio, 6.23; 95% CI: 1.37 to 28.31; \( P = .018 \)), Sanders type (odds ratio, 5.44; 95% CI: 2.02 to 14.64; \( P = .001 \)), number of residents and/or fellows present during the case (odds ratio, 1.63; 95% CI: 1.06 to 2.52; \( P = .028 \)), duration of surgery (odds ratio, 4.54; 95% CI: 1.46 to 14.12; \( P < .001 \)), estimated blood loss (odds ratio, 1.02; 95% CI: 1.01 to 1.04%; \( P < .001 \)), and 10 or more people present in the operating room during the entire case (odds ratio, 2.30; 95% CI: 1.79 to 2.94; \( P < .001 \)) were risk factors for wound complication.

- 479 cases

- Ding L\(^1\), He Z, Xiao H, Chai L, Xue F Risk factors for postoperative wound complications of calcaneal fractures following plate fixation. Foot Ankle Int. 2013 Sep;34(9):1238-44.
Nicotine substitution 4 weeks preop is effective

• An intention-to-treat analysis showed that the overall
  complication rate in the control group was 41%, and in the intervention
  group, it was 21% (P 0.03). Relative risk reduction for the
  primary outcome of any postoperative complication was 49% and
  number needed to treat was 5 (95% CI, 3–40).

• RCT 117 cases, general and ortho surgery

How to counsel the patient

“Lose some weight, quit smoking, move around more, and eat the carrot.”
Summary

- Smoking increases risk for
- wound complication
- Posteroperative pain
- Need for revision surgery
- non-union in artrodesis
Strategy and advice – Authors opinion

• In calcaneus fracture considered for surgery
• Demand immediate smoking cessation
• Consider medication to suppress withdrawal symptoms
• Unwilling/non-compliant patients should not have surgery
Thank you