



Contents lists available at ScienceDirect

Journal of Orthopaedics, Trauma and Rehabilitation

Journal homepages: www.e-jotr.com & www.ejotr.org



Review Article

Adverse Effects of Smoking on Outcomes of Orthopaedic Surgery 吸煙對骨科手術結果的不良影響



Ho Sheung-tung*

Department of Orthopaedics and Traumatology, Caritas Medical Centre, 111 Wing Hong Street, Sham Shui Po, Kowloon, Hong Kong SAR, China

ARTICLE INFO

Article history:

Received 22 March 2017

Accepted 7 April 2017

Keywords:

adverse effects
arthroplasty
fracture
smoking
spine surgery

ABSTRACT

Smoking has many adverse effects on the musculoskeletal system, particularly on the outcomes after orthopaedic surgery. Smoking is associated with surgical site infection and postoperative wound complications after spine surgery, total joint arthroplasty, and fracture fixation; nonunion after spinal fusion, ankle fusion, osteotomy, and internal fixation and bone grafting for scaphoid nonunion; worse outcomes after lumbar disc prolapse, spinal stenosis, and cervical myelopathy surgery; periprosthetic joint infection and lower survival after total hip, knee, and shoulder arthroplasty; worse outcome after shoulder rotator cuff repair and anterior cruciate ligament reconstruction; and wound complications after microsurgery. Orthopaedic surgeons should inform smokers and motivate them to quit smoking before orthopaedic operations.

中文摘要

吸煙對肌肉骨骼系統有很多不良影響，特別是骨科手術後的結果。吸煙和手術部位感染；脊柱手術、全關節置換和骨折內固定後傷口併發症；脊柱融合、踝關節融合、截骨術、內固定和舟骨不癒植骨手術後的不癒合；腰椎間盤脫出、椎管狹窄症和頸髓症較差的術後結果；假體周圍關節感染；全髖關節置換、全膝關節置換、肩關節置換後較低的存活率；肩袖修後和前十字韌帶重建較差的結果；顯微手術後傷口併發症等都有關聯。骨科醫生應告知吸煙者並鼓勵他們在骨科手術前戒煙。

Introduction

Smoking is the leading cause of preventable disease and premature death (smokers die 13 years earlier than non-smokers) in the United States. About 7000 persons die from smoking-related diseases and 1300 persons die from passive smoking each year in Hong Kong. Smoking causes lung, liver, colorectal, bladder, kidney, and other cancers. Smoking is a major cause of chronic obstructive pulmonary disease, cardiovascular diseases (hypertension, heart attack, stroke, and peripheral arterial disease), diabetes, and eye disease (cataract and macular degeneration). Other than these commonly known facts, smoking actually causes disease in nearly every organ and has many adverse effects on the musculoskeletal system, particularly on the outcomes after orthopaedic surgery. Orthopaedic surgeons should be aware of such adverse effects of smoking on orthopaedic surgery, educate and advise patients on

these negative effects, and encourage and help patients to quit smoking before orthopaedic surgery.

This study aimed to review the literature to identify the adverse effects of smoking on orthopaedic surgery. When applicable, the level of evidence of studies quoted referred to that used by *Journal of Bone Surgery American Volume* (revised January 2015) as adapted from the *Oxford Centre for Evidence-Based Medicine for Prognostic Studies* (Table 1). When available, information on confounder-adjusted or unadjusted relative risks (RRs), odds ratios (ORs), hazard ratios (HRs) with 95% confidence intervals (CI), number of studied patients, and the level of evidence of the study was included.

Surgical site infection and postoperative wound complications

There are many clinical studies showing that smokers have a higher rate of complications after surgery when compared to patients who never smoke. In a systematic review and meta-analysis¹ of 107 studies of general and orthopaedic operations, preoperative

* Corresponding author. E-mail: host1@ha.org.hk.

Table 1

Levels of evidence for primary research questions investigating the effect of a patient characteristic on the outcome of disease (prognostic studies)

Level of evidence	Prognostic studies
Level I	Inception cohort study (all patients enrolled at an early, uniform point in the course of their disease)
Level II	Prospective cohort study (patients enrolled at different points in their disease) Control arm of randomized trial
Level III	Retrospective cohort study Case–control study
Level IV	Case series
Level V	Mechanism-based reasoning

smoking (current or ever smoker) was associated with a significantly increased risk of 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 the intensive care unit (RR, 1.60; 95% CI, 1.14–2.25). For orthopaedic operations, preoperative smoking was associated with a significantly increased risk of wound complications (RR, 2.21; 95% CI, 1.22–3.83), general infections (RR, 2.16; 95% CI, 1.22–3.83), and bleeding (RR, 3.10; 95% CI, 1.37–7.03).

Smokers have an increased risk of surgical site infections. Smoking was one of the six strong evidence-based independent risk factors (others were obesity, long operating times, diabetes, history of previous surgical site infection, and type of surgical procedures) for surgical site infections after spinal surgery in an analysis of 36 observational studies involving 2439 patients.² Current smokers had a significantly higher rate of superficial surgical site infection ($p < 0.05$), overall wound complications ($p < 0.05$), and total 30-day morbidity ($p = 0.04$) than non-smokers, whereas former smokers also had an increased risk but it did not reach statistical significance in a retrospective review of prospectively collected data of 35,477 patients who underwent lumbar spine surgery (level of evidence, III).³ Smoking as a significant risk factor (OR, 1.17; 95% CI, 1.03–1.32; $n = 41,652$) of infection after spine surgery was confirmed in an analysis of 25 case–controlled studies (level of evidence, III).⁴ Smoking was also a significant risk factor (OR, 1.83; 95% CI, 1.24–2.70; $n = 20,689$) for periprosthetic joint infection after total joint arthroplasty in meta-analysis of eight studies.⁵ A systematic review showed that, after fractures, there were nonsignificant trends towards increased superficial infection (7% vs. 4%; OR, 13.8; 95% CI, 0.91–2.07; $p = 0.13$; $n = 4796$; 3 studies) and deep infection (7% vs. 2%; OR, 1.48; 95% CI, 0.67–3.26; $p = 0.33$; $n = 5217$; 6 studies) in smokers than non-smokers (level of evidence, III).⁶ In the Lower Extremity Assessment Project (LEAP) of 268 limb-threatening open tibia fractures, smokers were twice as likely to develop acute postoperative infection ($p = 0.05$) and 3.7 times as likely to develop chronic osteomyelitis ($p = 0.01$) than non-smokers were (level of evidence, III).⁷ The largest single series of 906 consecutive surgically treated ankle fractures revealed smokers had a higher rate of postoperative complications (30.1% vs. 20.3%; $p = 0.005$) and greater risk of deep wound infection (4.9% vs. 0.8%; $p < 0.001$; OR, 6) than non-smokers had (level of evidence, IV).⁸ Even in knee arthroscopy with a low infection rate, smoking (OR, 1.90; $p < 0.001$; $n = 595,083$) was also a risk factor for infection in a cross-sectional study (level of evidence, IV).⁹

Delayed union and non-union

Smoking delays fracture healing and increases nonunion rate following fractures. A systematic review (level of evidence, III)⁶

showed that smoking significantly increased the risk of nonunion for all fractures (OR, 2.32; 95% CI, 1.76–30.6; $p < 0.001$; $n = 1221$; 10 studies), for tibial fractures (OR, 2.16; 95% CI, 1.55–3.01; $p < 0.001$; $n = 925$; 7 studies), and for open fractures (OR, 1.95; 95% CI, 22.7–37.7; $n = 658$; 4 studies). There was a nonsignificant trend towards increased time to union in all fractures (30.2 weeks vs. 24.1 weeks; $p = 0.18$), tibial fractures (32 weeks vs. 25.1 weeks; $p = 0.18$), and open fractures (37.2 weeks vs. 29.1 weeks; $p = 0.19$). Smoking also adversely affects incorporation of allograft/demineralized bone matrix in bone grafting. In a retrospective cohort study of 107 patients (112 bone graft sites) using a composite graft of lyophilized cancellous allogenic chips and demineralized bone matrix to treat acute fractures with bone loss and atrophic nonunion, healing occurred in 38/56 smokers compared with 49/56 non-smokers, and smoking was characteristic in 7/9 nonunion and 11/16 fractures in failed cases (level of evidence, III).¹⁰

A recent systematic review (level of evidence, IV)¹¹ showed that smokers had a significantly higher rate of nonunion after spinal fusion. There was a significantly higher nonunion after lumbar fusion in smokers in three retrospective case series of 883 patients and after 2 level fusion in another retrospective case series of 281 patients. The systematic review did not find a significant difference in fusion rate between smokers and non-smokers in posterior cervical fusion with lateral mass screw fixation (1 study of 158 patients), anterior corpectomy and strut graft (2 studies of 356 patients), and single level discectomy and fusion with allograft and internal fixation (1 study of 573 patients). Although not reaching statistical significance, a trend towards higher rate of nonunion was noted in smokers after anterior cervical discectomy and interbody fusion in two prospective comparative studies of 209 patients, and after anterior corpectomy and strut graft at 1 year in a retrospective study of 166 patients. In the subgroup analysis of 131 multilevel anterior cervical interbody fusion, a significant higher nonunion rate was reported in smokers (50% vs. 24%; $p < 0.02$). The systematic review suggests a significant risk of nonunion after lumbar fusion in smokers and the risk increases with the number of levels fused and the number of cigarettes consumed daily; particularly > 10 . The detrimental effect of smoking on cervical fusion is less profound. Even with recombinant human bone morphogenetic protein 2 supplement, smoking remained the strongest predictor of failure and reoperation for nonunion, instrumentation failure, and/or adjacent segment disease in instrumented lumbar fusion (OR, 4.75; 95% CI, 1.48–15.24; $p = 0.009$) in 110 patients (level of evidence, IV).¹²

Besides spinal fusion, other surgical bony fusions are adversely affected by smoking. Observational studies show smokers have higher failure in ankle fusion, open wedge tibial osteotomy, hemicallosis, and ulnar shortening osteotomy. The risk of nonunion was 3.75 times greater for active smokers than non-smokers in a retrospective case–control study of 44 patients who underwent ankle fusion (level of evidence, III).¹³ A delay in the osteotomy gap-filling rate in smokers compared to non-smokers was observed in a prospective series of 70 open wedge high tibial osteotomies, but the difference was not significant (level of evidence, III).¹⁴ Complications, delayed healing, and nonunion were more common (RR, 2.5) in smokers than non-smokers in a study of consecutive 200 patients with hemicallosis in proximal tibia for knee deformities (level of evidence, IV).¹⁵ Of 40 ulnar shortening osteotomies in 39 patients, the mean union time was 7.1 months in smokers and 4.1 months in non-smokers, and 30% of smoker versus no non-smokers had delayed union or non-union (level of evidence, IV).¹⁶ Smoking was significantly associated with failure of internal fixation and bone grafting for scaphoid nonunion in two retrospective studies. Among 64 patients, 13 of 17 patients with nonunion were smokers (RR, 3.7; 95% CI, 1.3–10.1; $p = 0.005$; level of evidence,

Download English Version:

<https://daneshyari.com/en/article/5710042>

Download Persian Version:

<https://daneshyari.com/article/5710042>

[Daneshyari.com](https://daneshyari.com)