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Review Articles

Is It Worth Discriminating Against Patients Who Smoke? A Systematic Literature Review on the Effects of Tobacco Use in Foot and Ankle Surgery

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ABSTRACT

Although numerous studies have linked smoking with lower extremity wound and bone healing complications, a comprehensive study on the effects of smoking in foot and ankle surgery has not yet been reported. The purpose of the present study was to report the results of our systemic literature review, identifying the effects of tobacco use on common foot and ankle procedures. The systematic literature review was performed according to guidelines set by the PRIMSA statement (Preferred Reporting Items for Systematic Review and Meta-Analyses). Smoking, as a single risk factor, was analyzed and used to compare adverse outcomes in the postoperative setting of foot and ankle surgery. We reviewed 528 abstracts that met our initial identification criteria. After an extensive review process, 46 of the articles (8.71%) met the eligibility requirements to be included in the present study. Distal bunionectomy with osteotomy, first metatarsophalangeal joint arthrodesis, Lapidus bunionectomy, toe amputation, transmetatarsal amputation, Syme's amputation, open reduction internal fixation (ORIF) of calcaneal fractures, ankle fracture ORIF, pilon fracture ORIF, subtalar arthrodesis, rearfoot arthrodesis, tibiocalcaneal arthrodesis, ankle arthrodesis, total ankle arthroplasty, and plastic surgery procedures and their respective negative association with smoking was identified and described in our review. Our systematic literature review revealed that procedures involving arthrodesis, fracture ORIF, and plastic surgery were associated with negative outcomes in smokers. Procedures that did not involve osseous unions such as total ankle arthroplasty and amputations did not appear to have negative outcomes associated with smoking.

Smoking has become the leading cause of preventable deaths in the United States (1). Clear evidence has linked smoking with multiple types of cancer, cardiovascular disease, respiratory disease, complications in reproduction, and a host of other health effects (1). Despite the known harmful effects of smoking, the prevalence of tobacco use is alarming because 17.8% of adults in the United States currently smoke cigarettes (2).

It has been estimated that 30% of all elective surgeries are performed on smokers; this translates into approximately 10 million surgeries performed on smokers annually (3). In a survey of foot and ankle surgeons, 99% reported they were aware of the damaging effects of smoking in foot and ankle surgery (4). Given this widespread belief that smoking is tied to negative outcomes in surgery, we wondered whether the evidence supports this theory and whether specific procedures are more likely to have poorer outcomes in active tobacco users.

Although numerous studies have linked smoking with lower extremity wound and bone healing complications (5–8), the data on the effects of smoking on the entire array of foot and ankle surgeries performed are quite limited. The purpose of the present study was to report the results of our systemic literature review linking specific foot and ankle procedures with various outcomes in smokers. Specifically, we aimed to observe the incidence of reports of the adverse influence of smoking on outcomes after foot and/or ankle surgery.

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Materials and Methods

A systematic literature review was performed according to guidelines set by the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement (9,10).

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Search Strategy

An electronic search of PubMed, OVID, ScienceDirect, EBSCO, and other sources (Kaiser Permanente Clinical Library) was performed. The following keywords were searched: "smoking," "tobacco," "foot," "ankle," and "surgery." All titles were screened, and we reviewed the appropriate abstracts. No restrictions were placed on the date of publication. The final search date was July 25, 2015.

Inclusion Criteria

To meet our inclusion criteria, the studies must have reported on both variables (smoking and foot and/or ankle surgery) and have been written in the English language.

Exclusion Criteria

The studies were excluded if they did not pertain to smoking or foot and/or ankle surgery. Case reports, statements and opinion articles, and nonhuman studies were also excluded.

Extraction Process

The search was performed by a single reviewer (J.H.K.). A second author (S.P.) examined and verified the contents of the search in reference to the inclusion or exclusion of the studies. The included studies were organized into a comprehensive database. Additional studies were identified and acquired by examining the relevant studies cited in the reference lists of published research.

Outcomes of Interest

Smoking, as a single risk factor, was analyzed and used to compare the adverse outcomes in the postoperative setting of foot and ankle surgery. For the purpose of the present review, we defined the adverse influence of smoking on outcomes of foot and/or ankle surgery as follows:

1. A delay in bone healing or nonunion.
2. Failure to heal or delayed healing of soft tissues.
3. Infection, wound dehiscence, or wound slough or necrosis.

Results

Results of the Literature Review

We reviewed 528 abstracts that met our initial identification criteria. During the title and abstract screening process, we excluded 431 abstracts (81.63%) on the basis of the title and research involving nonhuman subjects. The remaining 97 articles (18.37%) were reviewed in their entirety. After an extensive review process, 46 (47.42% of the 97 and 8.71% of the 528 articles) met the eligibility requirements to be included in the present study. A flow diagram describing this process is shown in the Fig. The relationship between smoking and postoperative complications in specific foot and ankle surgeries is summarized in Table 1. Table 2 is a consolidation of Table 1 because the contraction was helpful in showing the incidence of adverse events in smokers when considering a category of foot and/or ankle surgery. The following procedures and their associated risk of complications were identified: Austin bunionectomy, first metatarsophalangeal joint arthrodesis (MTPJ), Lapidus bunionectomy, toe amputation, transmetatarsal amputation, Syme's amputation, open reduction internal fixation (ORIF) of calcaneal fractures, ankle fracture ORIF, pilon fracture ORIF, subtalar arthrodesis, rearfoot arthrodesis, tibiocalcaneal arthrodesis, ankle arthrodesis, total ankle arthroplasty, and plastic surgery procedures.

Austin Bunionectomy

A level 2 evidence report (11) used 1-way analysis of variance to show that smoking was associated with increased bone healing time in patients undergoing Austin bunionectomy. The study found a 1.73 times longer radiographic bone consolidation time for smokers compared with nonsmokers.

First MTPJ Arthrodesis

In 1 retrospective study (12), no link was established between patients who smoked and increased complications after first MTPJ arthrodesis procedures. The purpose of the study was to evaluate the complication rates in diabetic patients and compare them with the existing complication rates with first MTPJ arthrodesis. The investigators also evaluated other variables, including tobacco use. With an overall mild or moderate complication rate of 35.5%, the patients who smoked had a comparable complication rate of 40%. Overall, the study was only able to conclude that diabetic patients with peripheral neuropathy had an increased risk of complications.

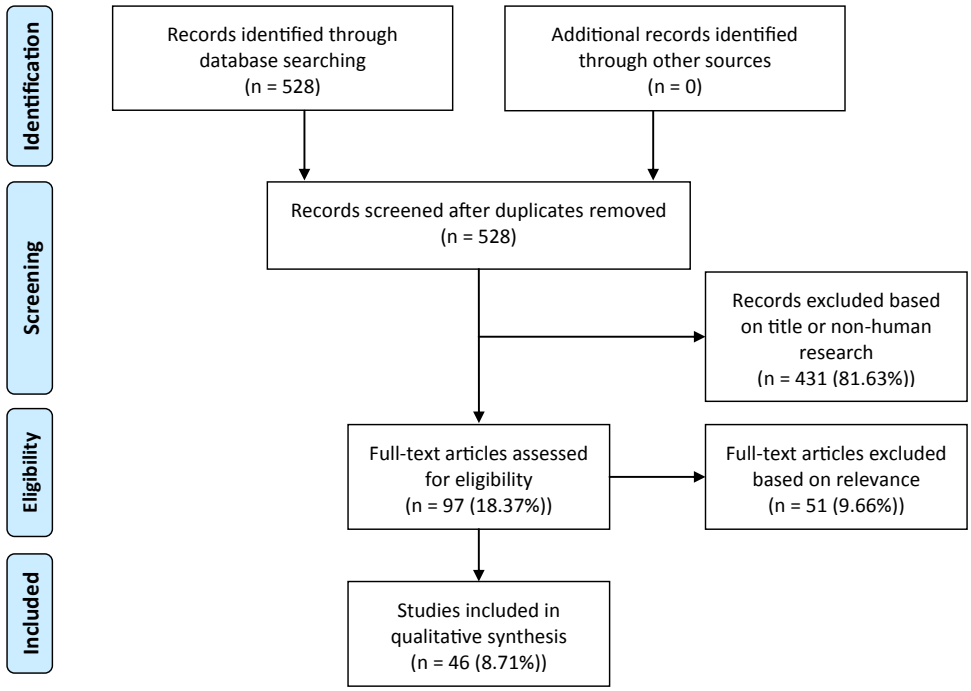

Fig. Flowchart showing the review process.