

Impact of Smoking on Anal Abscess and Anal Fistula Diseases

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Abstract

Background: Several studies have investigated the association between smoking and anal abscess and anal fistula (AA/F) diseases. However, the relationship between cigarette smoking and AA/F remains unclear. This study sought to assess the role of smoking in anorectal male patients in a Chinese population.

Methods: In this retrospective study, a questionnaire, including smoking history, was completed over a 3-month period by male inpatients in the Proctology Department of China-Japan Friendship Hospital. “Cases” were patients who had AA/F, and “controls” were patients with other anorectal complaints. Mann-Whitney *U*-test and Chi-square test were carried out to examine differences in baseline characteristics between groups. Subsequently, multivariate logistic regression was used to explore any related factors.

Results: A total of 977 patients aged from 18 to 80 years were included, excluding those diagnosed with inflammatory bowel disease or diabetes mellitus. Out of this total, 805 patients (82.4%) completed the entire questionnaire. Among the 805 patients, 334 (41.5%) were cases and 471 (58.5%) were controls. Results showed significant differences between cases and controls ($\chi^2 = 205.2$, $P < 0.001$), with smoking found to be associated with the development of AA/F diseases (odds ratio: 12.331, 95% confidence interval: 8.364–18.179, $P < 0.001$).

Conclusions: This study suggested smoking to be a potential risk factor for the development of AA/F diseases in a Chinese population. Consequently, current smoking patients should be informed of this relationship, and further research should be conducted to explore and investigate this further.

Key words: Anal Abscess; Anal Fistula; Risk Factor; Smoking

INTRODUCTION

Anal abscess and anal fistula (AA/F) diseases are common disorders encountered by primary care physicians and colorectal surgeons. Pain, swelling, and fever are considered hallmark symptoms of AAs, with around 35% developing into an AF.^[1] Research exploring hospital inpatient and outpatient databases, in a variety of countries, found the prevalence of AFs varied, ranging from 1.04 to 2.32 per 10,000.^[2] Particularly, men aged 21–40 years old were found to be more likely to develop this disease.^[3] Although these diseases are regarded as nonthreatening conditions, they can be impactful on a patient’s well-being and quality of life, as well as a costly condition for the

society. Therefore, it is important for clinicians to find appropriate treatment interventions.^[4]

Considering smoking is a risk factor for inflammation,^[5,6] and based on surgeons’ clinical impressions, we hypothesized smoking to be a risk factor for AA/F. In 2011, one case-control

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Received: 07-02-2018 **Edited by:** Ning-Ning Wang

How to cite this article: Zheng LH, Zhang AZ, Shi YY, Li X, Jia LS, Zhi CC, Yu QX, Zhang W, Liu YJ, Wang L, Xiao D, Wang C. Impact of Smoking on Anal Abscess and Anal Fistula Diseases. *Chin Med J* 2018;131:1034-7.

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.4103/0366-6999.230738

study, based on an United States veteran population, found smoking to be a risk factor for AA/F.^[7] Furthermore, a retrospective case-control study for AF in China reported smoking to be a correlated factor of AF.^[8] However, contrary to this, another study reported no correlation between smoking and the transition from initial abscess to chronic fistula.^[9] Therefore, the relationship between smoking habit and AA/F diseases remains unclear.

The aim of this study was to test the hypothesis that smoking influences the risk of developing AA/F. We performed this retrospective case-control study to evaluate the associations between smoking and AA/F in a Chinese male population.

METHODS

Ethical approval

This retrospective case-control study was approved by the Ethics Committee of China-Japan Friendship Hospital, and all male patients who were included provided informed consent.

Data acquisition

We administered a one-page questionnaire to inpatients in the Proctology Department of China-Japan Friendship Hospital from July 1, 2017, to September 30, 2017.

All participants were asked whether they smoked or not, with current smokers asked to report how long they had smoked for and how much they smoked per day. Once the completed questionnaire was received, trained investigators recorded demographic and AA/F clinical data from each patient's medical records. Patients with a history of inflammatory bowel disease (IBD) or diabetes mellitus (DM) were excluded from analysis.

Statistical analysis

“Cases” were patients who had AA/F, and “controls” were patients with other anorectal complaints (internal hemorrhoids, external hemorrhoid, mixed hemorrhoid, anal fissures, perianal eczema, and anal papilloma). Cases and controls were further stratified into three subgroups: (a) current smokers, (b) former smokers, and (c) nonsmokers.

SAS statistical software was used (version 9.4, SAS Institute Inc., North Carolina, USA) for all analyses. Mann-Whitney *U*-test and Chi-square test were carried out to examine differences in baseline characteristics between groups. Differences with $P < 0.05$ (two sided) were considered to be statistically significant. Odds ratios (ORs) correlating prevalence of AA/F to smoking status were calculated using the conditional maximum likelihood estimate method, with associated confidence intervals (CIs). Multivariate logistic regression was used to explore any related factors.

RESULTS

Basic demographics characteristics

From July 1 to September 30, 2017, a total of 977 patients aged from 18 to 80 years were included, excluding patients with IBD and DM diagnoses. Of these, 805 (82.4%) completed the entire questionnaire, and 172 (17.6%) either declined were uncontactable or missed [Table 1].

Table 1 shows the basic characteristics of all patients. Of the 334 cases (41.5%), the mean age was 34 years with an age distribution as follows: 18–29 years (27.0%), 30–39 years (41.6%), 40–49 years (17.7%), 50–59 years (9.0%), and 60 years and over (4.8%). Whereas the 471 controls (58.5%) had a mean age of 35 years old with an age distribution as follows: 18–29 years (24.6%), 30–39 years (41.6%), 40–49 years (16.4%), 50–59 years (9.8%), and 60 years and over (4.0%). In regards to race, Han accounted for the majority of cases, i.e., 769 (95.5%). None of the differences in age and race between cases and controls were statistically significant. Moreover, no differences were found in the baseline characteristics of the subgroups.

Smoking status

Table 2 shows the results comparing smoking status in cases and controls. Overall, out of the 805 who completed the entire questionnaire, 261 (32.5%) were current smokers. Furthermore, of the 334 cases, 202 (60.5%) were current smokers, 7 (2.1%) were former smokers, and 125 (37.4%) were nonsmokers. Of the 471 controls, 59 (12.5%) were current smokers, 25 (5.3%) were former smokers, and

Table 1: Basic characteristics between patients who had anal abscess and anal fistula diseases and patients with other anorectal complaints

Variables	Controls (<i>n</i> = 471)	Cases (<i>n</i> = 334)	χ^2 or <i>Z</i>	<i>P</i>
Age (years), median (Q ₁ , Q ₃)	35.0 (30.0, 44.0)	34.0 (29.0, 43.0)	-0.863	0.388
Age group, <i>n</i> (%)				
18–29 years	116 (24.6)	90 (26.9)	3.200	0.525
30–39 years	196 (41.6)	139 (41.6)		
40–49 years	77 (16.4)	59 (17.7)		
50–59 years	46 (9.8)	30 (9.0)		
≥60 years	36 (7.6)	16 (4.8)		
Race, <i>n</i> (%)				
Han	448 (95.1)	321 (96.1)	0.449	0.503
Minority	23 (4.9)	13 (3.9)		

Mann-Whitney *U*-test and Chi-square test were used to examine differences in baseline characteristics between groups.

387 (82.2%) were nonsmokers. Results showed a significant difference between cases and controls ($\chi^2 = 205.2, P < 0.001$), indicating an association between smoking and the development of AA/F.

Moreover, multivariate logistic regression analysis was used to analyze the smoking effect in cases and controls further [Table 3]. Significant differences were observed for current smokers (*OR*: 12.331, 95% *CI*: 8.364–18.179, $P < 0.001$), suggesting smoking to be a potential risk factor. However, no significant differences were observed for age or race.

DISCUSSION

This study showed an initial relationship between smoking and the development of AA/F in a Chinese population.

Several strategies were implemented to minimize bias. First, all study investigators were trained to perform standardized and uniformed data collection procedures. Second, double blinding was conducted to prevent influence on results due to knowledge of group allocation. Investigators were oblivious to participant group allocation, and participants were given the questionnaire entitled “Is smoking a risk factor for surgical diseases?” to ensure they did not view themselves as either “cases” or “controls”. Regarding inclusion and exclusion criteria, patients with IBD and DM were excluded due to previously reported associations between these conditions and smoking.^[10] Interestingly, other common comorbidities associated with smoking, such as

chronic obstructive pulmonary disease and coronary artery disease,^[11] were not present in the current samples’ medical histories. This could indicate a negligible contribution to AA/F in the occurrence of anal infection, or simply due to the sample being young (mean age of “controls” was 35.0 years and “cases” was 34.0 years).

One reason for only recruiting male patients was due to the high popularity of smoking in men compared to women, in China. In 2015, an estimated 27.7% of people aged over 15 (316 million; 52.1% males and 2.7% females) were current smokers.^[12] Interestingly, it was found those developing AA/F were predominately male, with the ratio of male-to-female being 2:1.^[1,13] As the current data show, the smoking prevalence in this current male sample was 32.5%, which was lower than that of Beijing (55.5%) and nationwide (52.1%).^[14] An explanation for this might be the sociodemographic characteristics of this sample. China-Japan Friendship Hospital is a tertiary hospital, possibly attracting patients that have a higher status job, a higher income, and a higher education. In addition, a report in the Surgeon General in 2014 has shown smoking to be linked to many organ diseases in the body; however, there is no mention of smoking and AA/F.^[15] The same was found in the China Report on the Health Hazards of Smoking.^[16] As a result, further exploration of the relationship between smoking and AA/F needs conducting, as well as emphasizing the importance of physicians taking the necessary actions to intervene.

In this case-control study, we identified an increase in the development of AA/F in patients who smoke cigarettes. The cause of AA/F disease is poorly understood, but the consensus is due to infection of the anal glands and ducts.^[17] Cigarette smoke contains toxins and carcinogenic substances that contribute to infection, as well as the development of cancer and various diseases.^[14,18,19] One study suggested that the use of tobacco was associated with anal cytological abnormalities by CD4 levels.^[20] Another study indicated that components of tobacco smoke inflict genotoxic damage in the anal epithelium of smokers. In addition, the level of DNA adducts in the anal epithelium of smokers might be associated with cotinine, a major metabolite of nicotine and

Table 2: Smoking status between patients who had anal abscess and anal fistula diseases and patients with other anorectal complaints

Variables	Controls (n = 471)	Cases (n = 334)	χ^2	P
Smoking status, n (%)				
Non-smoker	387 (82.2)	125 (37.4)	205.171	<0.001
Former-smoker	25 (5.3)	7 (2.1)		
Current-smoker	59 (12.5)	202 (60.5)		

Mann-Whitney *U*-test and Chi-square test were used to examine differences between groups.

Table 3: Multivariate analysis of independent risk factors

Variables	β	Wald χ^2	P	OR	95% CI
Age					
18–29 years				1.000 (reference)	
30–39 years	–0.1680	0.4464	0.5040	0.845	0.516–1.384
40–49 years	–0.0069	0.0005	0.9825	0.993	0.533–1.849
50–59 years	–0.4201	1.1700	0.2794	0.657	0.307–1.406
≥60 years	–0.3139	0.4902	0.4839	0.731	0.303–1.759
Han	0.5398	1.6170	0.2035	1.716	0.747–3.942
Smoking status					
Non-smoker				1.000 (reference)	
Former-smoker	0.0136	0.0008	0.9768	1.014	0.406–2.533
Current-smoker	2.5121	160.9172	<0.001	12.331	8.364–18.179

Logistic regression was used to explore the related factors. *OR*: Odds ratio; *CI*: Confidence interval.

benzo[a]pyrene metabolites, which provides a plausible mechanism for a causal association between smoking and anal cancer.^[21] Further researches should be performed to explain why smoking could be increasing the number of incidences of AA/F, with application to epidemiological, clinical, and mechanism knowledge.^[22]

Compared with a previous case-control study for AF in China,^[8] our pilot study, to our knowledge, first showed an initial relationship between smoking and the development of AA/F. Although there was a limitation of 82% response rate, the sample size was adequate enough to analyze, producing data and results for a possible relationship. A further limitation could be recall bias, which may exist due to the questionnaire being administered through phone. Nevertheless, to minimize this bias, only patients who were discharged recently were contacted. As for the questionnaire, a long questionnaire was deemed unrealistic to be conducted by telephone, so it was adjusted to one page. Moreover, all smoking-related questions were referred to by the Global Adult Tobacco Survey (GATS), which is a validated and widely accepted measure.^[23,24]

In conclusion, we have shown a significant association between smoking and the development of AA/F in a Chinese population, highlighting a new area of research to be explored in the future. This study emphasizes the importance of making appropriate prevention and management interventions for AA/F patients, such as smoking cessation, to improve their quality of life and reduce the burden on the society.

Acknowledgment

We are very grateful to Miss. Kate Pittaccio from Queen Mary University of London to polish the language. And we thank Professor Yan-Mei Wang, Doctor Xue-Shun Fan, and Doctor Hui Li for their support. We also thank Yao-Wen Zhang for his help on data statistics.

Financial support and sponsorship

This study was supported by the grants from the National Key Research and Development Program of China (No. 2017YFC1309400) and Research Foundation of China-Japan Friendship Hospital (No. 2017-1-MS-4).

Conflicts of interest

There are no conflicts of interest.

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吸烟对肛周脓肿及肛瘘疾病的影响

摘要

背景: 目前, 吸烟与肛周脓肿、肛瘘疾病的关系尚不明确。本文的目的是在中国男性人群中探讨吸烟对肛周脓肿、肛瘘疾病的影响。

方法: 本文为回顾性研究, 对2017年7月–2017年9月期间在中日医院肛肠科进行手术的所有男性患者进行电话回访, 收集吸烟情况。病例组为患有肛周脓肿、肛瘘的患者, 对照组为患有肛肠科其它疾病的患者。应用曼-惠特尼U检验和卡方检验分析组间差异, 多因素回归分析潜在的影响因素。

结果: 在排除能引起感染的炎症性疾病、糖尿病后, 本研究共纳入977名18–80岁男性患者。其中805人(82.4%)完成问卷, 病例组为334(41.5%)人, 对照组为471(58.5%)人。结果显示, 病例组与对照组患者在吸烟方面有显著差异 ($OR: 12.331, 95\% CI: 8.364–18.179, P < 0.001$), 提示吸烟与肛周脓肿、肛瘘具有相关性。

结论: 本研究提出在中国人群中吸烟是肛周脓肿、肛瘘疾病的潜在危险因素。因此, 对患有肛周脓肿、肛瘘疾病的吸烟者应告知吸烟产生的此影响。同时, 亦需要开展进一步地研究以深入揭示两者关系。