
Rod J. Rohrich, M.D., Dana M. Coberly, M.D., Jeffery K. Krueger, M.D., and Spencer A. Brown, Ph.D.

Dallas, Texas

Patient smoking status affects many aspects of plastic surgery, including patient selection, counseling, management, and outcomes. No specific recommendations for performing elective procedures on patients who smoke are available. The goal of this study was to determine the current practice standards and attitudes toward this often controversial topic. In September of 2000, 1600 members of the American Society for Aesthetic Plastic Surgery were sent questionnaires, 955 of which were returned. Questions elicited categorical answers, either dichotomous or multiple choice. Data were evaluated using logistic regression and the chi-square and binomial tests. Our results show that 60 percent (p<0.01) of plastic surgeons routinely perform a less than optimal procedure on their patients who smoke. The survey measured willingness to perform various operative procedures on patients who smoke and types of smoking cessation aids offered. Of those physicians who require patients to quit smoking before surgery, only 16.7 percent (p<0.01) would perform a nicotine test if they suspected noncompliance. Interestingly, 28.6 percent (p<0.01) of the physicians responding admit to a smoking history, whereas only 1.5 percent (p<0.01) continue to smoke, compared with the national smoking rate of almost 25 percent. Physicians who are previous smokers are less likely to offer smoking cessation aids than those who have never smoked, and the proportion not offering aids increases as the amount of previous smoking increases (p=0.02). This study shows that a wide range of opinions exists on which elective surgical procedures should be performed on patients who smoke. Furthermore, the physician’s prior smoking history influences this decision. No clear consensus exists on how best to treat patients who smoke who request elective surgery. Although surgeons would prefer to operate on nonsmokers, they are faced with a significant population of patients who use tobacco. No clear consensus exists on how best to treat these individuals. Advancements in wound healing research and smoking cessation aids will provide more insight into this treatment dilemma. (Plast. Reconstr. Surg. 109: 350, 2002.)

Smoking is the greatest preventable cause of illness and preventable death in the United States, yet 22.7 percent of adult Americans continue to use tobacco.1 Cancer, cardiovascular and pulmonary disease, and perioperative complications are associated with tobacco use. Tobacco smoke contains over 3800 identified substances, of which nicotine and carbon monoxide are two of the most detrimental to wound healing.2 Nicotine is the principal vasoactive component, inducing endothelial wall injury, inhibiting capillary blood flow, and releasing catecholamines.3 It also decreases epithelialization and stimulates thromboxane A2, a potent vasoconstrictor. Carbon monoxide causes tissue hypoxia by decreasing the oxygen carrying capacity of the blood and oxygen dissociation.4 Both components increase platelet adhesiveness.5,6

Smoking has been shown in multiple studies to cause delayed perioperative wound healing and increased pulmonary complications. The dilemma for the plastic surgeon is that many patients who use tobacco also want elective cosmetic procedures. The impaired wound healing caused by smoking may dramatically decrease the final aesthetic outcome. The goal of this study was to ascertain the current practice standards and attitudes toward this controversial topic in cosmetic plastic surgery.

MATERIALS AND METHODS

In September of 2000, questionnaires were sent to 1600 members of the American Society for Aesthetic Plastic Surgery. In 8 weeks, 955
responses were received, for a return rate of 59.7 percent. Questions elicited categorical answers, either dichotomous or multiple choice. For example, members were given four choices—never, sometimes, usually, or always—with which to respond to the question “...do you typically perform a less invasive technique or procedure (on smokers) than you would on a non-smoking patient?” Data were evaluated using the binomial and chi-square tests and logistic regression. Significance was defined as $p \leq 0.05$.

RESULTS

Performing Elective Surgery on Patients Who Smoke

In practice, approximately nine out of 10 surgeons perform elective operations on smokers (Fig. 1). When questioned about performing elective operations on patients who smoke, 38.7 percent of the respondents would perform any cosmetic or reconstructive procedure, whereas 50.9 percent would perform only procedures not involving skin undermining, such as a face lift ($p < 0.01$). Approximately half of the respondents would operate electively on smokers with diabetes, whereas the remaining half would withhold surgical options from these patients.

Specific Surgical Procedures and Smoking

Respondents were asked which specific procedures they would consider performing on patients who smoke (Fig. 2). For rhinoplasty, liposuction, and breast augmentation, the majority of surgeons (>88 percent) offer surgery to patients who smoke. However, when considering rhytidectomy, abdominoplasty, and breast reduction, significantly fewer surgeons (39 to 54 percent; $p < 0.01$) would operate on smokers. Physicians who require their patients to abstain from smoking longer preoperatively are more likely to perform face lifts on smokers than those who do not require patients to quit for as long before surgery ($p < 0.01$, data not shown). This same subgroup is also less likely to operate electively on a smoker with diabetes ($p < 0.01$).

Preoperative Management of the Patient Who Smokes

A wide range of opinions was expressed regarding the level of acceptable smoking and compliance to preoperative guidelines (Fig. 3). A significant majority of surgeons (67.1 percent, $p < 0.01$) had established a maximum acceptable amount of smoking before surgery. Of this subgroup, less than a half pack per day was the maximum acceptable level for 62 percent, whereas 19 percent responded that a half pack per day was acceptable and 17 percent answered that one pack per day was acceptable. Greater than 70 percent of the respondents would cancel surgery if the patient did not comply with their respective maximum acceptable limit ($p < 0.01$). Only 16.7 percent of surgeons would perform a confirmatory nicotine test ($p < 0.01$).

For those surgeons who require patients to stop smoking before surgery, a time period of 2 weeks was most often reported (40.5 percent) (Fig. 4). The majority (72.2 percent) request their patients to quit from 2 to 4 weeks before surgery, whereas only 7.9 percent require only a week or less of preoperative cessation. Over
14 percent ask patients to quit smoking more than 4 weeks preoperatively \((p < 0.01)\).

Surgeons were divided in offering smoking cessation aides to their patients. Among surgeons who offer patients smoking cessation aids, 66 percent refer their patients to primary care physicians, 43 percent offer prescription oral medication such as bupropion, and 30 percent offer nicotine patches (Fig. 5).

Sixty percent of responders report “usually” or “always” performing a less invasive technique or procedure on smokers than on nonsmokers. Thirty-three percent “sometimes” change their technique, whereas only 6.5 percent never alter the operative plan to accommodate smokers (Fig. 6). The majority (78 percent) employ special postoperative measures for patients who smoke, with the most common being topical nitroglycerine \((p < 0.01)\).

**Smoking History of Surgeons**

Surgeons were asked about their own smoking history. Currently, 1.5 percent of surveyed surgeons still smoke, whereas 28.6 percent are former smokers. Of those who smoke, 82 percent listed a less than 20-pack-per-year smoking history, and the remainder had a total of 20 packs per year or more (Fig. 7). Current smokers were less likely to report a maximum acceptable amount of patient smoking before surgery \((p < 0.05)\). They were also more likely to perform a rhinoplasty on a smoker than physicians who have never smoked. In contrast, surgeons who have a history of smoking but have quit are less likely to perform a rhinoplasty on a smoker than surgeons with no smoking history \((p < 0.05)\). There was also a correlation between surgeon smoking history and liposuction \((p < 0.05)\). Surgeons who are previous smokers were less likely to perform a face lift on a smoker \((p < 0.05)\). A personal history of smoking made the surgeon less likely to electively operate on a patient with diabetes who smokes \((p < 0.05)\).

**DISCUSSION**

This study provides insight into the dilemma facing plastic surgeons who are requested to perform elective surgery on patients who smoke. In the absence of research-proven recommended guidelines concerning smoking and elective surgery, a wide variability of treatment algorithms have developed among individual surgeons. A physician’s prior smoking history has an effect on the management of smokers. From these data, conclusions can be drawn on how most plastic surgeons treat patients who smoke who request elective surgeries.

Almost 90 percent of surveyed surgeons would operate on smokers. However, the type of procedure planned greatly influenced this
decision. Most would be willing to perform breast augmentation (94 percent), rhinoplasty (90 percent), or liposuction (88 percent) but were much less likely to attempt procedures involving skin flaps and undermining such as rhytidectomy (39 percent), abdominoplasty (46 percent), and breast reduction (54 percent). Approximately half would electively operate on a smoker who was also a diabetic.

Two-thirds of respondents have a limit to the amount of preoperative smoking they find acceptable, with the majority listing less than one-half pack per day as permissible. Most surgeons would cancel a scheduled surgery if they suspected that the patient did not quit smoking, but less than 17 percent would run a nicotine test for suspected noncompliance. Despite the fact that pharmacologic assistance can achieve abstinence in 40 to 50 percent of subjects,7–9 less than 60 percent of plastic surgeons polled offer any type of smoking cessation aids. Physicians who are previous smokers are less likely to offer cessation aids than those who have never smoked, and the proportion not offering aids increases as the amount of previous smoking increases ($p < 0.02$).

Tobacco-induced perioperative complications include pulmonary and wound healing problems. Multiple studies have shown that smoking increases postoperative pulmonary complications, although the time frame of preoperative smoking abstinence required to prevent these complications is disputed.10 Bluman et al. reported that current smoking was associated with a nearly six-fold increase in risk for a postoperative pulmonary complication.11 Wound healing is adversely affected by smoking as demonstrated in basic research and clinical studies.12-14 The rabbit model by Mosely et al. showed direct damage to the erythrocyte precursors, vasoconstriction, and inhibition of epithelialization.12 In 1984, Lawrence et al. demonstrated the detrimental effects of postoperative smoke exposure on the survival of random skin flaps in the rat.15 Clinically, the adverse effect of smoking is most frequently apparent in the face lift as reported by Rees et al., who demonstrated a 12-fold increase in skin slough after face-lift surgery among smokers.16 Riefkohl et al. noted a significant relationship between skin slough and failure to abstain from smoking postoperatively after both a face lift and rhytidectomy.17 Goldminz and Bennett have reported that smokers are at increased risk of developing necrosis of full-thickness skin grafts and local flaps.18 Webster and others have suggested conservative, less than optimal procedures to help minimize the risk to patients who smoke.19 Watterson et al.20 and Paige et al.21 have reported increased complications in transverse rectus abdominis musculocutaneous flaps among smokers. Rohrich et al. recommended that smokers should undergo delayed breast contouring (i.e., mastopexy) after implant explantation.22 Cosmetically, smokers have been shown to form wider, lighter-colored scars than their nonsmoking counterparts,23 and smokers have a four-fold increased risk for developing premature facial wrinkling.24

The evidence is conclusive that wound healing is adversely affected by tobacco use; however, there are no particular guidelines in place as to how best to address this problem, especially in elective procedure cases. A review of the literature does not provide such clear guidelines, and as is clear from our study results, the polled surgeons do not agree on the management of smokers. On the basis of clinical experience, our institution currently recommends a 4-week period of no smoking both before and after elective cosmetic surgery.25
A recent review of plastic surgery claims notes a "continual flow of totally avoidable claims linked to smoking." A recommendation is that for smokers of one pack per day or more, surgery should be delayed or postponed. Proper documentation includes notification of possible complications and a signed statement that the patient has abstained from smoking for 1 month before surgery. If the surgeon suspects noncompliance, a urine nicotine test is recommended preoperatively. This test is simple, inexpensive, and takes only 5 minutes to perform. Several companies manufacture the enzyme immunosorbent assays (ELISA) that are much like urine pregnancy tests. For approximately five dollars, results document whether your patient has smoked within the last 2 to 4 days with 98 percent sensitivity and 94 percent specificity. Although nicotine is rapidly cleared from the body, a metabolite called cotinine can be detected in urine for up to 4 days because of its 17-hour half-life.

An interesting conclusion was observed in regards to how surgical plans were influenced by the current or past tobacco use by surgeons. For surgeons who were smokers, the maximum acceptable amount of tobacco use before surgery and the application of rhinoplasty, liposuction, and facelift procedures was significantly different from the amount accepted by nonsmoking plastic surgeons. This is an area for future research.

Our results indicate that 40.5 percent of surgeons request their patients who smoke to stop smoking 2 weeks before surgery. The literature supports cessation for 6 to 8 weeks preoperatively to decrease the risk of pulmonary complications. Some studies have indicated that the risk of pulmonary complications actually rises when patients stop or reduce smoking closer to surgery because of increased mucus production. The cessation time period necessary to prevent wound healing complications is not known.

Further studies are necessary to determine the time frame of abstinence important for wound healing. Complication information was not addressed in this study and has largely been addressed retrospectively for specific procedures within institutions. A prospective study designed to look specifically at wound healing complications among patients who smoke would be of great benefit in counseling patients and establishing practice guidelines.

Rod J. Rohrich, M.D.
Department of Plastic and Reconstructive Surgery
University of Texas Southwestern Medical Center
5323 Harry Hines Boulevard, Suite E7.210
Dallas, Texas 75390-9132
Rod.Rohrich@UTSouthwestern.edu

REFERENCES


