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SCIENTIFIC COMMUNICATION:

THE IMPACT OF SMOKING AND VAPING ON WOUND HEALING AND SURGICAL OUTCOMES IN PLASTIC SURGERY

ABSTRACT

Cigarettes contain nicotine, which has vasoconstrictive effects that reduce blood flow to peripheral tissues. This decreased perfusion jeopardizes the flow of vital nutrients and oxygen required for recovery. Smoking has long been recognized as a significant risk factor for poor wound healing and adverse surgical outcomes in plastic surgery. Concern over vaping's impact on healing processes has grown since its introduction. Smoking has vasoconstrictive and pro-inflammatory effects that cause delayed healing, an increased risk of infection, and poor aesthetic results. Despite being perceived as a safer option, there is some preliminary evidence that vaping may also hinder the healing process. To improve surgical results in plastic surgery, this review emphasizes the significance of patient education and preoperative smoking and vaping cessation.

INTRODUCTION

Smoking has a well-established negative impact on wound healing and surgical results. Reduced blood flow, impaired angiogenesis, and altered immune responses are some of the physiological mechanisms through which smoking hinders healing (Sorensen *et al*., 2012). Vaping, or using e-cigarettes, on the other hand, poses a new problem in the surgical setting because little is known about how it affects wound healing over the long run. In order to critically compare smoking and vaping, the current paper will review the body of research on their effects on wound healing and surgical outcomes.

Mechanisms of Impaired Wound Healing in Smokers

Vasoconstriction and Reduced Tissue Perfusion

Cigarettes contain nicotine, which has vasoconstrictive effects that reduce blood flow to peripheral tissues. This decreased perfusion jeopardizes the flow of vital nutrients and oxygen required for recovery (Siana *et al*., 2015). According to Jorgensen *et al*. (2019), carbon monoxide, another dangerous component of cigarette smoke, attaches itself to hemoglobin and impedes the transport of oxygen. Smokers therefore have a higher chance of experiencing ischemic complications, especially during procedures like free flap surgeries that depend on microvascular integrity. Jensen *et al*. (2016) discovered that smokers had a greater rate of flap necrosis than non-smokers, underscoring the significance of vascular health in surgical results.

Impaired Angiogenesis

The development of new blood vessels, or angiogenesis, is essential for wound healing. According to Poggio *et al*. (2018), smoking reduces the expression of vascular endothelial growth factor (VEGF), a crucial regulator of angiogenesis. The healing process is further hampered by this impairment, which results in decreased collagen synthesis and delayed re-epithelialization. According to a study by Adams *et al*. (2017), smokers had a higher rate of wound dehiscence and delayed wound healing after elective surgeries like abdominoplasty than non-smokers.

Immune System Dysregulation

Smoking impairs immune system performance and makes one more vulnerable to surgical site infections. High levels of cytokines like TNF-α and IL-6 are indicative of a pro-inflammatory state brought on by prolonged exposure to tobacco smoke (Sorensen *et al*., 2012). According to Jensen *et al*. (2016), smoking also affects the function of neutrophils and macrophages, which hinders the body's capacity to eliminate infections and heal damaged tissues. This

immunosuppression is especially problematic in plastic surgery because infection can result in serious complications, such as implant loss and unsatisfactory aesthetic results (Adams *et al*., 2017).

Vaping and Its Effects on Wound Healing

Chemical Composition of E-Cigarettes

E-cigarettes still contain nicotine and other potentially dangerous substances like propylene glycol, formaldehyde, and different flavorings, despite the fact that vaping is frequently thought of as a safer option to smoking (McKelvey *et al*., 2019). The long-term effects on wound healing are still largely unknown, despite the fact that e-cigarettes typically expose users to fewer harmful substances than traditional cigarettes.

Nicotine in Vaping and Tissue Perfusion

Regardless of how it is delivered, nicotine poses risk to tissue perfusion. According to a Glassberg *et al*. (2020) study, vapers had vasoconstriction and decreased tissue oxygenation at a level comparable to smokers, though possibly less severe. Additionally, the study found that postoperative complications in vapers are similar to those in smokers, indicating that vaping may similarly impair surgical outcomes.

Inflammatory and Immune Responses

According to preliminary research, vaping can cause inflammatory reactions that could interfere with the healing of wounds. According to a study by Rahman *et al*. (2019), e-cigarette flavorings have the potential to worsen inflammation and compromise immunological function. Further evidence that vapers had higher systemic inflammation, as shown by elevated C-reactive protein levels, which could impede the healing process was provided by Agrawal *et al*. (2021).

Comparative Impact of Smoking and Vaping on Plastic Surgery Outcomes

Postoperative Complications

The risks of postoperative complications are higher for both smoking and vaping. In comparison to vapers and non-smokers, smokers had noticeably greater rates of wound dehiscence and infection, according to Pagotto *et al*. (2020). In contrast to their non-smoking counterparts, vapers continued to experience higher rates of complications, particularly during procedures like rhinoplasty that call for careful tissue healing.

Aesthetic Outcomes

Smoking can have a significant negative impact on the cosmetic results of plastic surgery. Smokers frequently have worse tissue viability and more scarring, which affects how well aesthetic procedures work overall (Poggio *et al*., 2018). Whitfield *et al*. (2018) found that smokers who had facelift surgery had greater rates of skin necrosis and undesirable scarring than non-smokers. Despite the paucity of comparable research on vaping's aesthetic effects, initial results indicate that vapers may also be more susceptible to undesirable aesthetic consequences (Glassberg *et al*., 2020).

Smoking and Vaping Cessation Strategies

Importance of Preoperative Cessation

Given the detrimental impact of smoking on wound healing, surgeons must emphasize the necessity of smoking cessation before elective surgeries. Research shows that quitting smoking 4-6 weeks prior to surgery can significantly enhance tissue oxygenation and reduce complications (Sorensen *et al*., 2012). This preoperative period is critical for optimizing outcomes, particularly in plastic surgery.

Strategies for Cessation

Resources for quitting smoking and vaping should be made available to patients. Incorporating behavioral counseling, support groups, and nicotine replacement treatments can help patients stop (McKelvey *et al*., 2019). It's crucial to let patients know about the possible dangers of continuing to vape instead of smoking, stressing that both habits can compromise the outcome of surgery.

CONCLUSION

Both smoking and vaping have detrimental effects on wound healing and surgical outcomes in plastic surgery. Smoking suppresses the immune system, tissue perfusion, and angiogenesis, which delays healing, raises the risk of infection, and produces unappealing results. Early research indicates that vaping also interferes with healing processes, even though it might be viewed as a less dangerous option. Prioritizing patient education about the dangers of smoking and vaping and promoting cessation before surgery is essential for plastic surgeons to maximize results. Guidelines for treating patients who smoke or vape should be developed, and more research is necessary to elucidate the long-term effects of vaping on wound healing.

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