Vapes, Nicotine Pouches Linked to Achilles Tendon Complications

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Achilles tendon ruptures present a persistent challenge in musculoskeletal surgery, often requiring surgical repair to restore function and prevent chronic disability. But even with optimal surgical technique and rehabilitation, a subset of patients experiences complications, including delayed healing, infection, and re-rupture.
Clinicians have long understood the detrimental effects of traditional cigarette smoking on wound healing and tissue repair. However, the impact of newer nicotine delivery systems, such as electronic cigarettes and nicotine pouches, on surgical outcomes has remained less clear, despite their growing popularity.

KEY TAKEAWAYS

- The Pivot: Newer nicotine products, previously considered less harmful, now show clear links to surgical complications after Achilles repair.
- The Data: Patients using vapes or nicotine pouches face a significantly elevated risk of re-rupture and other complications.
- The Action: Surgeons and primary care physicians must counsel patients on the risks of all nicotine products, not just traditional cigarettes, before and after Achilles tendon repair.

Achilles tendon ruptures are common, particularly among active individuals, and their incidence continues to rise. Surgical repair aims to restore the tendon's integrity, allowing patients to return to their pre-injury activity levels. But the biological processes involved in tendon healing are complex, relying on robust cellular proliferation, collagen synthesis, and neovascularization. Any factor that disrupts these delicate processes can compromise the outcome, leading to prolonged recovery or outright failure of the repair.
Traditional cigarette smoking has a well-established deleterious effect on wound healing across various surgical specialties. Nicotine, carbon monoxide, and other toxins in cigarette smoke induce vasoconstriction, impair oxygen delivery to tissues, and directly inhibit fibroblast function and collagen production. This leads to higher rates of infection, dehiscence, and non-union. The widespread adoption of electronic nicotine delivery systems (ENDS), commonly known as vapes or e-cigarettes, and oral nicotine pouches has introduced a new variable into this equation. These products deliver nicotine without the combustion byproducts of traditional cigarettes, leading some users and even clinicians to perceive them as a safer alternative. However, nicotine itself is a potent vasoconstrictor and has direct effects on cellular metabolism and inflammation, which could theoretically impede tendon healing.

The numbers on nicotine's impact

Recent observational data, synthesized from multiple cohorts, now clarifies the risks associated with these alternative nicotine products in the context of Achilles tendon repair. Patients who reported using electronic cigarettes or nicotine pouches in the perioperative period demonstrated a significantly higher incidence of postoperative complications compared to non-users. Specifically, the risk of re-rupture of the Achilles tendon was elevated by more than twofold in nicotine product users (odds ratio [OR] 2.3; 95% CI, 1.6-3.4; P=.001). This finding underscores a direct and substantial impact of nicotine on the structural integrity of the repaired tendon.

Beyond re-rupture, other complications also saw increases. Surgical site infections occurred in 12% of nicotine users compared to 4% of non-users (P=.003), suggesting impaired local immunity and vascularity. Delayed wound healing, characterized by prolonged time to epithelialization or persistent drainage, affected 18% of nicotine users versus 6% of controls (PThe patient populations in these analyses typically included adults undergoing primary open or minimally invasive repair of acute Achilles tendon ruptures. Investigators collected data on nicotine product use via detailed patient questionnaires and, in some instances, urine cotinine levels to confirm exposure. Confounding factors such as age, body mass index, diabetes status, and concomitant medication use were adjusted for in multivariate models. Still, residual confounding from unmeasured lifestyle factors or varying adherence to rehabilitation protocols remains a possibility. The observational nature of these studies means they establish association, not causation, but the biological plausibility of nicotine's detrimental effects on tissue healing is strong.

The mechanism behind these complications likely involves nicotine's direct effects on vascularity and cellular function. Nicotine stimulates sympathetic nervous system activity, leading to peripheral vasoconstriction and reduced blood flow to the healing tendon. This hypoxia impairs the metabolic activity of fibroblasts, which are crucial for synthesizing collagen and extracellular matrix components. Nicotine also promotes inflammation and oxidative stress, further disrupting the delicate balance required for effective tissue repair. These cellular-level disruptions manifest clinically as weaker scar tissue, delayed integration of the repair, and increased susceptibility to infection.

The lack of a prospective, randomized controlled trial specifically comparing different nicotine products to placebo in Achilles repair patients is an obvious caveat. Such a trial would be ethically challenging given the known harms of nicotine. But the consistency of findings across multiple retrospective cohorts, coupled with a clear biological rationale, provides compelling evidence for clinical practice changes. The data also does not differentiate between the various forms of electronic cigarettes or nicotine pouches, nor does it quantify the dose-response relationship, which could be relevant for patient counseling. Whether cessation at a specific time point before or after surgery mitigates these risks remains an area for further investigation.

CLINICAL IMPLICATIONS

The notion that vapes and nicotine pouches are 'safer' for surgical patients is now demonstrably false, at least for Achilles tendon repair. Clinicians must abandon the passive acceptance of these products as a harm reduction strategy in the perioperative setting. The data clearly shows nicotine, regardless of delivery method, compromises healing and increases re-rupture risk.

Surgeons and primary care providers now have a clear mandate: counsel patients on the absolute necessity of abstaining from all nicotine products, including e-cigarettes and pouches, both pre- and postoperatively. This requires direct, unambiguous communication, not merely a generic 'stop smoking' instruction. The nuance of

> 'nicotine is the problem' needs to be explicit.
> The industry, which has aggressively marketed these products as alternatives to traditional cigarettes, bears a responsibility here. The perception of reduced harm has permeated patient populations, creating a significant barrier to effective preoperative counseling. This evidence should prompt a re-evaluation of public health messaging regarding nicotine products in the context of surgical outcomes.
> For patients facing Achilles repair, the message is stark: continued use of any nicotine product jeopardizes their recovery and increases their chance of needing another surgery. This is not a minor inconvenience; it is a direct threat to their functional outcome and quality of life.

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