A Better Tattoo Removal Technique

Optimal Tattoo Removal in a Single Laser Session Based on the Method of Repeated Exposures

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Study Summary

Q-switched lasers are the treatment of choice for amateur and professional tattoos, because these devices achieve optimal selective photothermolysis of dermal tattoo pigment, thereby minimizing collateral tissue damage.[1] Unfortunately, laser tattoo removal is costly and tedious, requiring multiple treatments for professional tattoos (up to 20 sessions). Variables that make tattoos harder to clear include multiple or challenging colors (eg, green); greater ink density; and hard-to-treat anatomical locations, such as bony prominences and distal sites (eg, the ankle or calf). In contrast, most amateur tattoos done in black ink clear rapidly, and complications are rare.

Laser tattoo removal sessions are traditionally spaced 4-6 weeks apart to allow for pigment fading and complete epidermal healing. Although early dosimetry studies showed little benefit of treating tattoos with multiple passes per session, only short second-to-minute delays between passes had been used.[2,3] In contrast, Kossida and colleagues hypothesize that the "immediate whitening reaction" seen after Q-switched laser irradiation optically scatters subsequent laser passes, acting as a temporary block. Because this whitening reaction resolves within approximately 20 minutes, could better results be achieved by waiting at least 20 minutes between laser passes?

Amazingly, the answer seems to be a resounding "yes." In a small, internally controlled pilot study, Kossida and colleagues treated 18 tattoos in 12 white adults, dividing each tattoo in half. One half received traditional single-pass QS-alexandrite treatment (755 nm, 5.5 J/cm^2, 100 nsec, 3-mm spot), whereas the other half underwent 4 consecutive treatments spaced at 20-minute intervals (the "R20" method). Tattoos were either amateur, in black ink (n = 10), or professional, involving mixed pigments that included black, green, and blue (n = 8). The investigators used tattoo fading at 3 months as their primary outcome measure, as assessed by treatment-blind observers (5-point scale, digital photograph comparison).

This study may have been small, but the results were impressive:

1. Tattoo clearance was markedly better in the areas treated with the R20 method vs single-pass methods. Specifically, 61% of the R20 method sites cleared completely after a single treatment, compared with none of the sites treated with a single pass.
2. For all 18 tattoos, lightening was superior in the R20-treated halves.
3. On average, professional tattoos showed 70% better lightening response when treated with the R20 method; amateur tattoos showed 59% better lightening.
4. Histologic evaluation revealed less tattoo pigment, especially in the deeper dermis, with "more pronounced and deeper skin injury" in the R20-treated sites.
5. Despite more pronounced epidermal injury with the R20 method, scarring and pigment alteration remained low and rates were similar to those seen with traditional single-pass treatment.

Viewpoint

Before the introduction of Q-switched lasers, such as ruby, neodymium:YAG, and alexandrite, people with tattoos had a simple choice: tattoo or scar. Unfortunately, Q-switched lasers -- although they are superior to older options, such as dermabrasion, laser resurfacing, and excision -- aren't magic tattoo erasers. Even the best technologies require multiple treatments to deliver meaningful tattoo fading, and notoriously stubborn colors, such as green, often persist despite dozens of laser sessions.

Can tattoo clearance be optimized using current technologies? Intriguingly, Kossida and colleagues may have found a relatively simple way to accomplish this. By performing multiple laser passes at 20-minute intervals, they achieved markedly better ink clearance in a small group of patients with both amateur and professional tattoos.

Are these results real? Apparently, because the main strength of this study is that each tattoo served as its own internal control. The investigators also analyzed the histology of the treated tattoos, revealing markedly deeper pigment alteration and loss in sites treated with the R20 method. Finally, they showed that despite a higher incidence of post-treatment epidermal blistering with the R20 method, this did not translate into more complications, such as scarring or hypopigmentation.

These tantalizing results raise more questions. Would multiple passes using different lasers (eg, alexandrite followed by 1064-nm neodymium:YAG) yield even better results? Could laser variables be further optimized by using larger spot sizes, higher fluences, or deeper-penetrating wavelengths? And finally, is there a way to reduce the waiting time between sequential passes without losing efficacy (for instance, would skin hydration speed up resolution of the intradermal gas bubbles that cause epidermal whitening)? This last question should be addressed, because most clinicians will be put off by the 70- to 90-minute treatment time required for the current R20 protocol.