# Combining Fractional Resurfacing and Q-Switched Ruby Laser for Tattoo Removal

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*The authors have indicated no significant interest with commercial supporters.*

The prevalence of decorative tattoos has grown significantly in recent years, and the demand for tattoo removal has also increased dramatically. The advent of the Q-switched laser (QSL) enabled the safe removal of tattoo pigment with minimal damage to surrounding skin structures. This method relies upon targeted destruction of pigment particles through selective photothermolysis.[1] Matching of the appropriate wavelength of QSL to a given tattoo color results in maximal pigment clearance and minimal collateral damage to normal tissue; nonetheless, multiple treatments are always necessary, and blistering and treatment-induced hypopigmentation may occur.

Since the introduction of QSL treatment in the early 1990s, the technique of tattoo removal has changed little. Ablative fractional resurfacing (AFR) and nonablative fractional resurfacing (NAFR) systems are now commonly used for a variety of dermatologic indications, and these systems have displayed an excellent safety profile.

To the knowledge of the authors of this article, no other studies or case series reporting on the application of fractionated laser devices and QSL treatment for tattoo removal have been published. Our unique clinical experience combining NAFR and AFR with QSL therapy of unwanted tattoos has revealed several potential benefits of this combined technique.

It was hypothesized that the addition of AFR to QSL treatment of tattoos would enhance the rate of pigment clearance and prevent treatment-induced blister formation. It was also hypothesized that the addition of NAFR to QSL therapy would decrease the degree of treatment-induced hypopigmentation. A controlled clinical trial investigating this combination technique is currently being performed, and a brief report supporting the efficacy of this combined technique is presented here.

## Technique

Informed consent was obtained from each individual before initiating treatment. All subjects received fractionated carbon dioxide laser treatment (Fraxel Re:pair, Solta Medical, Inc., Hayward CA) or fractionated 1,550-nm laser treatment (Fraxel Re:store, Solta Medical, Inc.) to half of the tattoo in addition to Q-switched ruby laser (QSRL) treatment (Sinon, Wavelight Laser, Technologie AG, Erlanger, Germany) to the entire tattoo. Both halves received QSL treatment using the same treatment parameters. Standard photographs were taken at baseline and before each treatment.

## Case 1

Patient 1 presented with an untreated, 9-year-old blue and black tattoo on the lower back. Between February 23, 2009, and January, 15, 2010, the patient received six treatments with the QSRL to the entire tattoo (spot size 6.5 mm, fluence 3.5 J) immediately followed by AFR to the right half of the tattoo (fluences 20–50 mJ, coverage 20–30%). Figure 1A displays a baseline photo, and Figure 1B

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**Figure 1.** (Top) Baseline photograph displaying a 9-year-old blue and black tattoo on the lower back. (Bottom) Photograph of treated tattoo 12 weeks after the sixth treatment. The left side received Q-switched ruby laser (QSRL) only and the right side received ablative fractional resurfacing (AFR) plus QSRL. Note decreased blue and black ink on the AFR- and QSRL-treated side.

displays a 12-week follow-up image after the sixth laser treatment. The degree of black and blue tattoo ink clearance is visibly greater on the QSRL- and AFR-treated side.

## Case 2

Patient 2 presented with an untreated, 10-year-old professional black tattoo on the lower back. On January 15, 2010, the patient received QSRL treatment to the entire tattoo (3.5 J, 6.5 mm spot) immediately followed by AFR (fluence 20 mJ, 20% coverage) to half of the tattoo. Figure 2A and 2C represent baseline photographs, and Figure 2B and 2D represent corresponding 3-day follow-up images of treated tattoos. Note the absence of blistering on the AFR- and QSRL-treated tattoo (Figure 2B). Diffuse blistering and bullae are present on the tattoo treated with QSRL only (Figure 2D).

## Case 3

Patient 3 presented with an untreated, 8-year-old professional black tattoo on the lower back. Between March 17, 2009, and February 26, 2010, the patient received nine treatments with QSRL to the entire tattoo (spot size 5–6.5 mm, fluence 3–5 J) immediately followed by nine treatments with 1,550-nm NAFR to the right half of the tattoo (fluence 5–70 mJ, 5–30% coverage). Figure 3A displays a baseline photo, and Figure 3B displays a 7-week follow-up image after the ninth laser treatment.

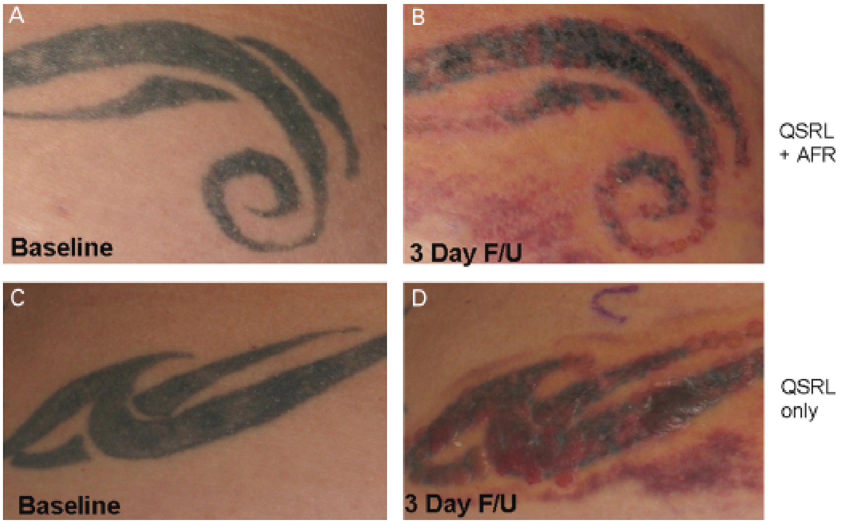


**Figure 2.** (A) Baseline photograph of tattoo. (B) Three-day follow-up photograph of Q-switched ruby laser (QSRL)- and ablative fractional resurfacing (AFR)-treated tattoo. Note the absence of blistering. (C) Baseline photograph of tattoo. (D) Three-day follow-up photograph of tattoo treated with QSRL only. Note diffuse blistering and bullae.

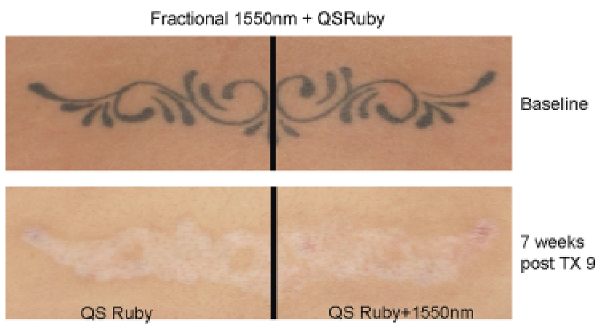


**Figure 3.** (Top) Baseline photograph displaying an 8-year-old professional black tattoo on the lower back. (Bottom) Photograph of treated tattoo 7 weeks after the ninth treatment. Treatment-induced hypopigmentation is present on both halves of the tattoo, but the degree and extent of hypopigmentation is noticeably less on the side treated with com-

Treatment-induced hypopigmentation is present on both halves of the tattoo, but the degree and extent of hypopigmentation is noticeably less on the combined NAFR- and QSRL-treated side.

## Discussion

This report supports the hypotheses that the addition of AFR or NAFR to QSRL enhances tattoo removal outcomes. No incidents of scarring were observed during follow-up examinations. Although this report presents only single cases with limited follow-up, these encouraging results are in agreement with additional unpublished clinical experience and ongoing clinical trials of this novel combined treatment technique.

AFR may enhance tattoo clearance through several possible mechanisms. Most simply, ablation of dermal tissue columns may remove any tattoo pigment superficial enough to be contained in the ablated tissue zones. Additionally, AFR is known to induce a brisk wound healing response that involves a robust inflammatory and phagocytic phase, which could also serve to enhance the removal of QSL-treated tattoo pigment.

The zones of ablation created by AFR in the epidermis allow the increased dermal intercellular fluid to be released rather than to build up and form a subepidermal blister. Without this release of fluid, the edema and subsequent subepidermal blistering and sloughing can prolong healing and further damage otherwise viable epidermis. This ability of AFR to prevent blister formation after QSL therapy of tattoos has been consistently observed throughout extensive clinical experience with this technique.

It may be that the addition of NAFR decreases the incidence of treatment-induced hypopigmentation by stimulating melanocyte activity or migration. NAFR has been reported to improve the appearance of hypopigmented scars,[2] and its ability to possibly decrease treatment-induced hypopigmentation presumably occurs through similar mechanisms.

## Conclusion

Laser treatment of tattoos is a commonly performed procedure that is increasing in popularity along with the increasing prevalence of tattoos. This report is the first published series describing the technique of AFR plus QSL and NAFR plus QSL treatment of unwanted tattoos. This combined technique for laser tattoo removal appears to increase tattoo clearance, eliminate blistering, shorten recovery, and diminish treatment-induced hypopigmentation. A controlled trial investigating this combined approach is underway.

## References

1. Anderson RR, Margolis RJ, Watenabe S, et al. Selective photothermolysis of cutaneous pigmentation by Q-switched Nd:YAG laser pulses at 1,064, 532, and 355 nm. J Invest Dermatol 1989;93:28–32.
2. Glaich AS, Rahman Z, Goldberg LH, Friendman PM. Fractional resurfacing for the treatment of hypopigmented scars: a pilot study. Dermatol Surg 2007;33:289–94.

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