

Pico Laser Buyer's Guide

RESEARCH REVIEW — EXECUTIVE SUMMARY

755-nm Picosecond vs. Nanosecond Alexandrite Lasers for Tattoo Removal

A Randomized, Split-Tattoo Clinical Trial

Source: Ma G, Han Y, Huang L, et al. Plastic and Reconstructive Surgery. DOI: 10.1097/PRS.00000000000012958.

1. Study at a Glance

Design	Population	Picosecond Arm	Nanosecond Arm
Prospective, randomized, split-tattoo; blinded evaluators	30 completers; Chinese patients; Fitzpatrick III–IV; 90% black tattoos	PicoSure, 755 nm, 750 ps, 2.68–5.25 J/cm ² , 2–3 mm spot	Accolade, 755 nm, 70 ns, 5.0–8.0 J/cm ² , 3 mm spot

2. Executive Summary

This prospective, randomized, split-tattoo study compared a 755-nm picosecond alexandrite laser (PicoSure) operating at 750 picoseconds with a 755-nm nanosecond alexandrite laser (Accolade) operating at 70 nanoseconds. Both systems were manufactured by Cynosure. The study was designed to address a practical clinical question: when wavelength is held constant at 755 nm, does the tested picosecond protocol produce better tattoo-removal outcomes than the tested nanosecond protocol?

Thirty Chinese patients completed the study. Each tattoo was divided into two equal halves; one side was randomized to the picosecond laser and the other to the nanosecond laser. Three board-certified dermatologists who scored the standardized photographs were blinded to treatment allocation. Patients received five sessions at three-month intervals, with final evaluation six months after the last treatment.

3. Key Efficacy Findings

The picosecond-treated sides achieved substantially greater tattoo clearance. Median clearance on the 10-point visual analogue scale was 8/10 with the picosecond laser versus 5/10 with the nanosecond laser ($p < 0.0001$).

Outcome	Picosecond	Nanosecond	Statistical result
Median clearance VAS	8 (IQR 6–9)	5 (IQR 2.75–6.25)	$p < 0.0001$
Satisfactory clearance (VAS ≥ 7)	73.3% (22/30)	23.3% (7/30)	$p = 0.0003$
Complete clearance	10% (3/30)	0% (0/30)	Descriptive
Median pain score	5 (IQR 3–6)	5 (IQR 3–7)	$p = 0.023$

The strongest buyer-facing result is the proportion achieving satisfactory clearance, defined by the investigators as a VAS score of at least 7 (approximately 70% or greater clearance). This threshold was reached by 73.3% of picosecond-treated tattoo halves compared with 23.3% of nanosecond-treated halves—an absolute difference of 50 percentage points.

Complete clearance remained uncommon. Only 3 of 30 picosecond-treated sites (10%) achieved complete clearance after five sessions, compared with none of the nanosecond-treated sites. The study therefore demonstrates a substantial improvement in clearance, but not reliable complete removal within five treatments.

Professional tattoos

Professional tattoos showed one of the largest differences: median clearance was 8 with the picosecond laser versus 4 with the nanosecond laser ($p < 0.0001$). The authors propose that deeper pigment placement, greater pigment density, and more complex particle composition may contribute to this difference; that mechanistic explanation was not directly tested in the trial.

4. Safety and Tolerability

The safety profile favored the picosecond treatment for several acute reactions, but not for every pigmentary outcome. Bleeding, blistering, and crusting were significantly less frequent with the picosecond protocol. However, transient hyperpigmentation was significantly more frequent on the picosecond-treated sides.

Adverse event	Picosecond	Nanosecond	p value
Bleeding	2.0%	8.0%	0.031
Blistering	7.33%	15.33%	0.044
Crusting	7.33%	15.33%	0.044
Hyperpigmentation	21.33%	12.0%	0.043
Hypopigmentation	9.33%	4.67%	0.173
Scarring	0%	0%	>0.99

Pain was statistically lower with the picosecond treatment, although the practical difference was modest because the median score was 5 in both groups. No permanent scarring occurred in either treatment arm during follow-up.

5. What the Study Suggests About Pulse Duration

Because both systems operated at 755 nm, the trial reduces one major source of confounding and provides a particularly useful comparison of picosecond and nanosecond treatment approaches. The authors interpret the superior picosecond results as consistent with stronger photomechanical fragmentation of tattoo pigment at shorter pulse durations and cite prior mechanistic research suggesting that smaller pigment fragments may be more readily cleared by macrophages and the lymphatic system. That particle-fragmentation mechanism was not directly measured in this trial.

A critical limitation is that the two protocols were not identical except for pulse duration. The PicoSure arm used 2.68–5.25 J/cm² with 2–3 mm spot sizes, whereas the Accolade arm used 5.0–8.0 J/cm² with a 3 mm spot. The study therefore strongly supports the performance of the tested picosecond protocol over the tested nanosecond protocol, but it does not isolate pulse duration as the sole causal variable.

The 750-ps technical point

The authors note theoretical modeling suggesting that pulse durations in approximately the 10–100 ps range may maximize photoacoustic effects while limiting collateral thermal damage. They also point out that the PicoSure used in this trial operates at 750 ps—considerably longer than that theoretical range. This observation is technically interesting, but the study does not test whether a shorter picosecond pulse, such as 350 ps, would produce better clearance or fewer complications than 750 ps.

6. Study Strengths

Prospective, randomized, split-tattoo design.

Computer-generated allocation with concealment.

Three blinded board-certified dermatologist evaluators.

Both comparison systems used the same 755-nm wavelength.

Standardized photography and good-to-excellent inter-rater agreement.

Government/public research funding was disclosed; the authors reported no financial interest related to the article.

7. Study Limitations

Small sample size: 30 subjects completed the study.

Single-center design.

Single ethnic population; all analyzed subjects were Fitzpatrick skin types III–IV.

Only black and dark-blue tattoos were studied.

Treatment was limited to five sessions.

No histopathologic or electron-microscopic evaluation was performed within this trial.

Fluence and spot-size parameters differed between the two treatment protocols, so pulse duration was not the only treatment variable.

Reporting discrepancy

The manuscript contains a discrepancy between the abstract and Table 1. The abstract reports 53.3% professional and 33.3% amateur tattoos, while the Results/Table 1 report 83.3% professional (25/30), 3.3% amateur (1/30), and 13.4% cosmetic (4/30). Because the Table 1 percentages align with the reported counts and total sample, this summary uses the Table 1 values.

8. Pico Laser Buyer's Guide Conclusion

Bottom line: This study provides strong evidence that the tested 755-nm, 750-ps PicoSure protocol outperformed the tested 755-nm, 70-ns Accolade protocol for black and dark-blue tattoo removal in Fitzpatrick III–IV Chinese patients. The picosecond protocol produced substantially better clearance and fewer acute reactions such as bleeding, blistering, and crusting, but transient hyperpigmentation was more frequent and complete clearance remained uncommon after five sessions.

The study does not establish that every picosecond laser is superior to every nanosecond laser, nor does it prove that a pulse duration shorter than 750 ps would necessarily deliver better clinical outcomes.

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