

A woman with dark hair is shown in profile, facing left. She has a large, intricate black tattoo on her upper back and shoulder. She is wearing a black lace top. Her hand is resting on her neck. The background is a plain, light-colored wall.

Invisible Ink

During the NBA Playoffs in May and June 2009, millions of basketball fans thrilled to the athleticism of top players like Carmelo Anthony, Kobe Bryant and LeBron James. They also marveled at the gallery of tattoos adorning the players' arms, necks and backs. Young people are increasingly emulating their sports and entertainment idols by getting their own tattoos. In January 2007 the PEW Research Center reported that 36% of U.S. citizens between the ages of 18 and 35 have at least one tattoo—that's more than 2.5 million tattooed citizens in that age category alone. Earlier research published in the *Journal of the American Academy of Dermatology* in 2005 suggested that 17% of those with tattoos will consider having one or more of them removed.

"People tire of their tattoos—they become boring or outdated, or the person's life changes," remarks Suzanne Linsmeier Kilmer, MD, of the Laser and Skin Surgery Center of Northern California. The current gold standard for tattoo removal is Q-switched lasers, which deliver high energy in short (nanosecond) pulses at large spot sizes. Our panel of experts explores some of the latest laser introductions and refinements in practice parameters that allow them to offer more effective tattoo treatments, plus a surprising new technology developed to remove tattoos.

By Linda W. Lewis

ASSESSING TATTOOS FOR REMOVAL

Accurately estimating the number of laser treatments required and the approximate cost of a patient's tattoo removal procedure may have been made easier with the publication of a proposed grading system known as the Kirby-Desai Scale. Published in the March 2009 issue of the *Journal of Clinical and Aesthetic Dermatology*, "The Kirby-Desai Scale: A Proposed Scale to Assess Tattoo-Removal Treatments" offers a practical numerical scale to assess the number of laser tattoo-removal treatments necessary to achieve clearance. Based on a retrospective chart review of 100 tattoo patients who achieved total clearance, it suggests an algorithm to assign numerical scores to six parameters: skin type, location, color, amount of ink, scarring and layering. The Kirby-Desai score derived by totaling the values of these six parameters correlates with the number of treatment sessions required. "Providing patients with accurate information is one of the most important things physicians can do in terms of setting realistic expectations," says William Kirby, DO, FAOCD, lead author on the original research and principal at Dr. Tattoff, Beverly Hills, California. "As we continue to improve the way we relay information to patients, we will become more efficient with this emerging technology, and this increase in efficiency will make treatment more cost effective."

"Our ability to remove tattoos improved dramatically with the introduction of the Q-switched laser about 10 years ago," says Eric Bernstein, MD, director of the Mainline Center for Laser Surgery in Bryn Mawr, Pennsylvania, and clinical associate professor of dermatology at the University of Pennsylvania. "Q-switched just means the laser energy is delivered in really short pulses (nanoseconds not microseconds). To remove tattoos effectively, you need a large spot size (3mm to 5mm or more), which necessitates high laser energies to penetrate deeply into the skin, with sufficient fluences to fracture tattoo particles. Problems occur when you try to use a Q-switched laser that is underpowered, forcing one to use a smaller spot size, which deposits the energy superficially, hurting the epidermis but delivering very little energy to where the tattoo pigment lies."

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Because laser wavelengths are absorbed by different colors, you will need more than one laser to remove a wide range of tattoos. "I use an alexandrite (755nm) or ruby (694nm) laser for black, blue or green inks and an Nd:YAG (1064nm or 532nm) for black or red/orange ink," Dr. Bernstein explains.

Many companies offer Q-switched Nd:YAG lasers, which can effectively remove most black, dark blue and red tattoo inks; for other colors, you will need a Q-switched alexandrite or ruby laser. Fortunately, manufacturers are now creating platform systems that give you all of the necessary wavelengths in a single box.

"The HOYA Conbio Revlite delivers a lot of power at 1064nm, enabling the use of large spot sizes for treating black and red inks, especially in darkly pigmented patients," says Dr. Bernstein.

The RevLite and MedLite C Series Q-

switched Nd:YAG lasers (HOYA ConBio, www.conbio.com) have been widely used for tattoo removal for several years. They produce powerful 1064nm and 532nm wavelengths and include MultiLite Dye Laser Handpieces that deliver 585nm and 650nm wavelengths for virtually full-color spectrum tattoo removal.

Candela (www.candelalaser.com) introduced its Alex TriVantage in 2007, featuring a lightweight, flexible fiber optic delivery system. Using its popular AlexLAZR, a Q-switched alexandrite laser as a base, the company built in laser resonators to create Q-switched 532nm and 1064nm wavelengths.

"The Alex TriVantage offers the first-ever *laser-pumped laser handpieces*," says Dr. Bernstein. "This new technology lets the Alex TriVantage reliably deliver powerful 532nm and 1064nm wavelengths

as well as the 755nm alexandrite wavelength. It treats a wide variety of tattoo ink colors because it can deliver three different wavelengths of light. It's also great at treating pigmented lesions, especially in darker skin types, because of its longer duration Q-switched pulse and microsecond domain alexandrite laser pulses.

"I am also impressed with the new Sinon Q-switched ruby laser (Quantel)," says Dr. Bernstein. "Ruby lasers used to be very difficult to build reliably and efficiently. The Sinon offers a 20ns pulse length and a 2hz repetition rate with high fluences and reliability, a breakthrough in ruby laser technology in my opinion." The ruby wavelength offers good to excellent clearance for black, blue, green, magenta, gray and brown tattoo colors. The Sinon laser beam is divergent and spreads with distance, an important safety consideration. In May 2009 Palomar Medical (www.palomarmedical.com) signed

a distribution agreement with Quantel SA (formerly WaveLight and the Quantel Group) to distribute the Sinon in the United States and Canada.

Practical Considerations

“When investigating devices for tattoo removal I ask questions like: How many photons can your device deliver at the largest spot size? You don’t want to have to decrease the spot size to get the energy you need as larger spot sizes penetrate deeper into the dermis where the ink is located. What is the pulse duration? The pulse must be really short—nanoseconds—to best target the ink particle size and for safety,” says Dr. Kilmer.

Purchasing lasers that will allow you to offer effective tattoo removal to a wide range of patients can cost \$100,000 or more. “If you are unsure whether your practice can support this equipment purchase, consider renting a laser to get started or buy one laser that can be used for additional procedures like treating pigmented lesions and rent any additional lasers you may need,” Dr. Kilmer suggests.

Some inks will not clear completely even if you have a complete arsenal of lasers. “Aquas, yellows and fluorescents are particularly difficult to remove,” says Dr. Kilmer. “The number of treatments required will also depend on the type of application and what’s in the ink. Tattoos applied by professionals with ink guns can take up to 15 treatments and some may never clear if the inks contain certain compounds.”

Dr. Bernstein adds, “We never know what kind of ink we’re working with. Removing black ink from light skin is not a problem, but the iron oxide in white tattoo pigment can turn black as a result of a laser treatment and that discolored pigment can be impossible to remove. Be sure to include this possibility in your consent form because some tattoos may even have a base layer of white pigment underlying the entire tattoo.”

Removing tattoos from dark skin can be especially difficult. Melanin absorbs

laser light so special caution is the rule. Dr. Bernstein insists on a test spot before offering the treatment to some patients. “When treating black tattoos in dark skin, I always start with the 1064nm wavelength, which will ‘see’ the tattoo pigment

but have less melanin absorption than other Q-switched wavelengths,” he says. “For some patients I recommend Triluma, a retinoid, pulse hydroquinone, and a steroid bleaching cream or other bleaching agents to lighten the skin above the

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tattoo before laser treatments and I advise patients to stay out of the sun. I don't treat tanned skin. After the treatment I cover the skin with Aquaphor tape for 6 to 10 days to protect it and help it heal."

Contraindications to laser tattoo removal include immunosuppression, pregnancy, collagen vascular disease, plaque psoriasis, malignancy, use of Accutane within six months and any history of keloid scarring. "I won't treat tattoos if there is any sign of an allergic reaction to the tattoo ink because the treatment can lead to a more systematized allergic reaction," adds Dr. Bernstein.

"Pain management depends on the type, size and location of the tattoo; we use topical lidocaine for some, and local injections or even nerve blocks for others. We offer patients these options for pain control and charge just enough to cover costs. In some cases, we sell patients topical anesthetic creams so they can come in for treatment with the cream already in effect," notes Dr. Kilmer.

Patients at Dr. Kilmer's Laser and Skin Surgery Center of Northern California sign a consent form that clearly states the possibility that clearance can take 20 treatments or more, that some tattoos will never clear completely and that some may even darken in color.

"Bottom line, these devices are expensive to use," says Dr. Kilmer. "You

"When treating black tattoos in dark skin, I always start with the 1064nm wavelength, which will 'see' the tattoo pigment but have less melanin absorption than other wavelengths."

have to charge accordingly. Our nurses have become quite adept at estimating the number of treatments based on the size, ink density and ink colors, which determine how many different lasers are needed. The alexandrite laser is more expensive to maintain so if the tattoo includes green and blue inks, we add a bit more. Our cost for a first treatment is



□ Bruce Saal, MD, obtained these results following multiple sessions with the Medlite C6 at 1064nm.

\$200 and increases with tattoo size. The fee drops at each subsequent treatment, but we tell patients the minimum cost will be \$100/treatment." Prices listed on a variety of websites ranged from \$50 to \$500 per session, depending on the type of tattoo. Most fell into the \$150 to \$300 per session range. A few doctors offer flat, up-front rates of \$1,000 to \$1,200 for tattoos that can generally be cleared in 10 to 12 treatments, noting that the set price allows patients to better manage their budgets and feel more secure that they can afford the procedure.

Something New

Until a few months ago, the only alternatives to laser tattoo removal were dermabrasion and chemical peels that faded but could not reliably remove any but the most superficial tattoos. Now there's an interesting third option: Elim-

inInk. Introduced by Cynergy Products (www.cynergyproducts.com) in November 2008, EliminInk is placed into tissue using a technique similar to that used by the original tattoo or permanent makeup artist. It contains magnesium oxides and other ingredients that bind to the iron oxides in the tattoo inks or the color pigments in permanent makeup and safely lift

them to the surface through oxidation. A scab forms over the treated area that must be kept dry until it falls off naturally.

Because EliminInk is classified as a cosmetic rather than a medical procedure, it does not need FDA approval. Unfortunately, that also means there are no long-term safety and efficacy studies of the product. The company did provide us with the name of a physician who is offering the procedure in his practice, James J. Murata, MD, FACS, Ear, Nose and Throat Associates of South Florida in Boca Raton, Florida. We spoke with Caroline Murata, RN, who performs the EliminInk procedures in Dr. Murata's practice, and heads the Harmonix Institute in Boca Raton, Florida, which provides training on the procedure.

"Dr. Murata initially investigated the product because he had seen many patients treated with lasers who had scarring and minimal improvement even after multiple sessions," reports Murata. "In our experience, EliminInk offers better removal of permanent makeup and tattoo ink with less discomfort during the procedure and with a better outcome.

"We use a German-made digital machine designed for permanent makeup application that precisely places EliminInk at the correct level of the tattoo ink or makeup pigment," Murata explains. "After the procedure, a scab forms and must remain in place for several weeks until it comes off naturally. The scab actually changes color as the different inks in the tattoo are absorbed by the EliminInk and pulled to the surface. For permanent makeup, two to three treatments will usu-

ally do the job. For more complex tattoos, we may need to repeat the application of ElimInk several times. When the scab comes off, the patient applies Cynergy DermRenu, a scar inhibitor, two to three times per day for up to eight weeks.

“It works for everything from jailhouse tattoos to top of the line tattoo pigments of all colors. We have even used it successfully on multicolor tattoos that failed to respond to multiple laser treatments. That’s why this is so exciting,” says Murata.

“We have had no complications of any kind from doing the procedure,” says Dr. Murata, “but patient compliance is a big issue in determining the outcome. Patients must follow postprocedure care instructions. It is vital that they do nothing to soften the scab prematurely.”

“We charge \$280 to \$500 per treatment, depending on the size and density of the tattoo,” says Murata. “Each session takes approximately one hour, and we generally achieve complete clearance of a tattoo within three to six sessions.”

On the Horizon

“I think current lasers are fast and effective tools for removing tattoos,” states Dr. Bernstein. “Of course, doctors always want more power and a larger spot size at a more reasonable price. What would really improve our ability to remove tattoos is if everyone used an ink like the Freedom2 ink recently developed by R. Rox Anderson and Kim Koger,” suggests Dr. Bernstein. “Freedom2 Ink contains known ingredients and should be easier to remove by laser than other inks.” Candela has exclusive rights to develop a laser device that works specifically with Freedom2 Ink, but it will undoubtedly be many years before a substantial number of tattoos use the ink.

Meantime, doctors continue to work with existing equipment in an effort to fine tune laser tattoo removal. Sciton is working with several doctors, including Todd Bessinger, MD, PhD, Aesthetic & Dermatology Center, Honolulu, Hawaii, to investigate the use of the ProFractional (Sciton, www.sciton.com) laser for

tattoo removal. “We have found that the ProFractional lightens tattoos independent of the color of the tattoo, although it takes multiple treatments just like Q-switched lasers. Ultimately, I think that tattoo removal will involve both Q-

switched Nd:YAG and alexandrite lasers combined with fractional resurfacing,” says Dr. Bessinger. 

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