INSELSPITAL
Universitätsklinik für Dermatologie

Laser Complications Management

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Causes of Complications

- Operators errors 29-45%
  - Patient selection (wrong diagnosis, wrong indication, risk factors/ skin type)
  - Treatment technique (stacked pulses, fluence, pulse duration)
  - Wrong choice of device and technology
  - Neglect of treatment protocol (flammability, eye protection, pre-procedure care, cooling)
  - Post-procedural care (sun protection, antibiotic/antiviral prophylaxis, contact dermatitis)
- Unknown 30%
- Patient related 23%
- Device malfunction 19%

Kalashnikova NG, et al. Management and prevention of laser complications in aesthetic medicine: An analysis of the etiological factors. Dermatol Ther. 2021

Burn

- Device/wavelength (IPL) not adapted to skintype
- Treatment technique
- No immediate treatment of burn

- How do you treat it?

Treatment of burn

- Topical corticosteroids (class III or IV) over 3-4 weeks
- Inform the patient that discoloration persists over months and maybe persists permanently
- Take pictures for legal aspects

Burn

- Prevention
  - Adapt skin type/ wavelength
  - Avoid stacked pulses
  - Cover tattoo
  - Remove make-up / marking pens

- Treatment:
  - Cooling
  - Corticosteroids class IV
  - After 2-3 months: treatment of dyspigmentation
  - Scar-treatment: triamcinolone, vascular laser NAFL, AFL, hydrochinone

Kluger N, Hakimi S, Del Giudice P. Keloid occurring in a tattoo after laser hair removal. Acta Derm Venereol. 2009
Lee SJ, Yeo IK, Park KY, Seo SJ. Second-degree burns on skin marked for photoepilation: the need for white pencil use in cutaneous marking. J Am Acad Dermatol. 2014 Jul

Hyperpigmentation

- Device/wavelength (IPL) not adapted to skintype
- Treatment technique

- How do you treat it?

Hyperpigmentation

- Self-limiting (month-years) up to permanent

- Risk factors
  - more frequent in dark and mixed skin types/ tanned patients
  - higher risk with laser with shorter wavelength and IPL
  - lack of cooling
  - inflammed skin condition
  - intake of tetracycline, 5FU, hormones

- Treatment:
  - immediately! class IV steroids, min for 2 weeks and sunscreen
  - bleaching creams (eg hydrochinon, tretinoin)
  - glycolic acid peels

Alster TS, Li MK. Dermatologic Laser Side Effects and Complications: Prevention and Management. Am J Clin Dermatol. 2020
Goldman A, Wollina U. Komplikationen nach Laserbehandlung vaskulärer Veränderungen des Gesichts [Complications after laser treatment of facial vascular lesions]. Hautarzt. 2021 May

Hypopigmentation

- Delayed in appearance (months), rarely self-limmiting (months-years) up to permanent

- Risk factors
  - dark and mixed skin types/ tanned patients
  - higher risk with laser with shorter wavelength
  - lack of cooling
  - high fluences
  - stacked pulses

- Treatment:
  - class IV steroids, min for 2 weeks
  - pimecrolimus
  - sunscreen
  - (P) UVA
  - Excimer 308nm laser

Alster TS, Li MK. Dermatologic Laser Side Effects and Complications: Prevention and Management. Am J Clin Dermatol. 2020
Goldman A, Wollina U. Komplikationen nach Laserbehandlung vaskulärer Veränderungen des Gesichts [Complications after laser treatment of facial vascular lesions]. Hautarzt. 2021 May

Paradoxical Hypertrichosis

- Increase in hair density, color, or coarseness at treated sites; velus->terminal hair
- Incidence 0.6%-10%
- Mainly face and neck
- Mechanism of paradoxical hypertrichosis remains uncertain
  - subtherapeutic thermal injury to the follicular
    - vasculature may affect follicular cycling
    - inflammatory reaction in the follicular papilla
    - increases blood flow supply and growth factors for the follicle
    - heat shock may induce follicular stem cell differentiation and growth
    - synchronize the cycling of hairs growing

Figure 1. Photographs of a 22-year-old woman (skin type IV) (A) before and (B) after two treatments with a long-pulse 755-nm alexandrite laser of the chin and beard area with the GentleLASE (Candela Corp, Wayland, MA): 18-mm spot size, energy level of 20 J/cm^2, and 3-ms pulse.

Desai S, Mahmoud BH, Bhatia AC, Hamzavi IH. Paradoxical hypertrichosis after laser therapy: a review. Dermatol Surg. 2010
Willey A. & al.Hair stimulation following lasers & IPL photoepilation..

PH Management

- Risk factors
  - Thick hairs and velus hairs
  - Presence of underlying untreated hormonal conditions (polycystic ovary syndrome)
  - Use of hormone supplements or medications (corticosteroids)
  - Anatomic site (face and neck)
  - Darker skin types (III–VI)

- Prevention:
  - Keep surrounding area cool
  - Treatment intervals 4-6 weeks, not longer
  - High fluence, short pulse duration

- Treatment of new hairy areas: laser epilation with higher fluence, shorter pulse duration

Desai S, Mahmoud BH, Bhatia AC, Hamzavi IH. Paradoxical hypertrichosis after laser therapy: a review. Dermatol Surg. 2010 Mar;36(3):291-8. doi: 10.1111/j.1524-4725.2009.01433.x. Epub 2010 Jan
Willey A. & al.Hair stimulation following lasers & IPL photoepilation.

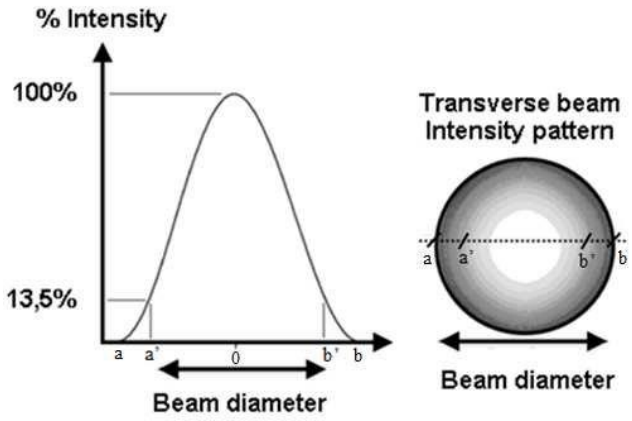
Device failure

- Do testspots
- Wait 1-2min after testspot
- Stop in case of unexplainable reaction and check device

- Treat burn

Honeycomb pattern

- reticular lesions caused by the Gaussian distribution of laser energy in PDL and KTP laser



Bordin, Fabiane. (2015). Terrestrial Laser Scanner in the characterization of forest targets

- can be avoid by overlap of the laserspot (30%)

Tattoo removal: scar

- Risk for scars:
  - Preexisting scar
  - High fluence (blisters)
  - High pigment density
  - Treatment over joints/ extremities
  - Poor technique

Weiss, E. T., & Geronemus, R. G. (2011). Combining fractional resurfacing and Q-switched ruby laser for tattoo removal. *Dermatol Surg*
Successful treatment of paradoxical darkening. Yoon Soon C.2016
Diagnosis and Therapy of Tattoo Complications. With Atlas of Illustrative Cases. Serup et al. Basel, Karger 2017

Ghost tattoo

Resistant pigment / Ghost tattoo:

- Tattooing technique/ scarring
- Blue, green and yellow
- Treatment: combination of fractional ablative

  Laser and QS/Pico laser

Weiss, E. T., & Geronemus, R. G. (2011). Combining fractional resurfacing and Q-switched ruby laser for tattoo removal. *Dermatol Surg*
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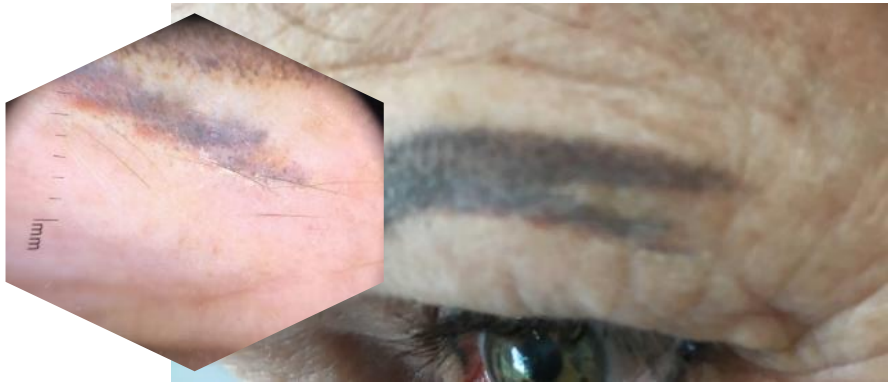
Postinflammatory Hyperpigmentation

Additional practical tips tattoo removal

- Be aware of **ink darkening** (do testspots!)
  - iron oxide, titanium dioxide in pink, peach, white, skin colored tattoo
  - Frequent in PMU
  - Check for hidden pigments
  - Do dermoscopy and testspot
  - Short-pulsed lasers with new wavelenghts, (fractional) ablative laser, excision



Weiss, E. T., & Geronemus, R. G. (2011). Combining fractional resurfacing and Q-switched ruby laser for tattoo removal. *Dermatol Surg*
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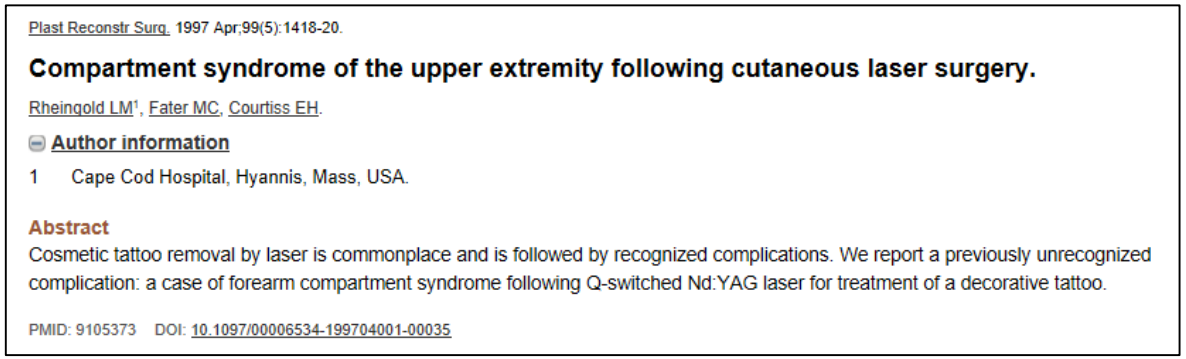
Additional practical tips tattoo removal

- Never treat traumatic tattoo with lasers after accidents with fireworks!

- Don’t treat circular tattoos on extremities in 1 session



Plast Reconstr Surg. 1997 Apr;99(5):1418-20.

Compartment syndrome of the upper extremity following cutaneous laser surgery.

Rheingold LM[1], Fater MC, Courtiss EH.

Author information

1 Cape Cod Hospital, Hyannis, Mass, USA.

Abstract

Cosmetic tattoo removal by laser is commonplace and is followed by recognized complications. We report a previously unrecognized complication: a case of forearm compartment syndrome following Q-switched Nd:YAG laser for treatment of a decorative tattoo.

PMID: 9105373 DOI: 10.1097/00006534-199704001-00035

Diagnosis and Therapy of Tattoo Complications. With Atlas of Illustrative Cases. Serup et al. Basel, Karger 2017
Successful treatment of paradoxical darkening. Yoon Soon C.2016

Take Home Messages

- Patient selection
- Check all factors (patient, lesion, device) before start of treatment
- In case of side-effect/complication: treat immediately