

Complications of nonphysician-supervised laser hair removal

Case report and literature review

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The presence of unwanted hair continues to plague many individuals for whom traditional methods of hair removal remain unsatisfactory. Old methods of removing unwanted hair include shaving, waxing, chemical depilation, and electrolysis, all of which have temporary results. The invention of photothermolysis and the development of various laser systems with many ranges of wavelengths have made effective hair removal possible.

There has been an explosive increase in the use of lasers for hair removal since the first lasers were approved in 1996. Since then, numerous advances in laser hair removal, which use melanin as a chromophore, have been made. Laser hair removal is accomplished through follicular unit destruction. The ability to remove hair without damaging the surrounding skin is based on selective photothermolysis—the theory that at a particular wavelength, pulse duration, and fluence, thermal injury is confined to a target that contains a light-absorbing molecule called a chromophore.¹

Laser-assisted hair removal is the most efficient method of long-term hair removal currently available. Several hair removal systems have been shown to be effective in this setting: the ruby laser (694 nm), the alexandrite laser (755 nm), the diode laser (800 nm), an intense pulsed light source (590 to 1200 nm), and the neodymium:yttrium-aluminum-garnet (Nd:YAG) laser (1064 nm), with or without the application of carbon suspension. Both the long-pulsed alexandrite and the long-pulsed diode laser systems are effective in the treatment of unwanted hair, and they are more effective than the Nd:YAG laser.² The parameters used with each laser system vary considerably.²

The young female population often asks for laser procedures for hair removal. Family physicians should know the skin-related side effects of these procedures in order to correctly diagnose and treat them.

Here we report a case in which the characteristic lesions of hair removal appear on the neck, a typical site, especially in those women with hirsutism associated with polycystic ovary syndrome. Similar lesions can be

seen more frequently in other hair removal areas, such as on the forearms or the groin.

Case description

A 28-year-old healthy woman was referred to our department with a 2-day history of painful lesions on her neck, which appeared 8 to 10 hours after her first laser hair removal session with a ruby laser in a new aesthetic centre in her neighbourhood. Upon questioning, she admitted that no physicians supervised the hair removal procedure. Dermatologic examination revealed 3 linear hyperpigmented macules and a linear erythematous erosion, without exudation or edema, limited to the laser contact area (**Figure 1**). Owing to the characteristic parallel disposition of lesions (due to the superposition of laser fields), a diagnosis of post-laser hair removal first-degree burns was made. A twice daily application of a topical corticosteroid was prescribed, resulting in partial improvement of the lesions. Textural skin pigmentation and slight scarring of

Figure 1. First-degree burn and hyperpigmentation on the neck due to hair removal treatment with a ruby laser



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Cet article a fait l'objet d'une révision par des pairs.

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the area had not completely resolved at 6 months follow-up.

Discussion

The increasing incidence in our hospital of side effects of laser hair removal carried out by nonphysicians led us to conduct a literature search of PubMed MEDLINE and PubMed Central from 1966 to 2008, using 4 MeSH terms and key words: *laser hair removal*, both alone and with the words *nonprofessional*, *nonphysician*, or *complications*. The following points might be of clinical interest to family physicians:

Generalities. Laser hair removal continues to increase in popularity. Laser and flashlamp technology now offer the potential for fast, safe, and effective treatment of unwanted hair. A number of published studies have confirmed the long-term efficacy of laser and flashlamp treatment. However, commercial claims often suggest that laser hair removal is free from side effects.²⁻⁴

Removal of hair by light can be accomplished, in theory, by 3 mechanisms: photothermal destruction through local heating, photomechanical destruction through the generation of shock waves, or photochemical destruction through the creation of toxic mediators such as singlet oxygen or free radicals.⁵ Light sources that destroy hair photothermally include the long-pulsed ruby (694 nm), long-pulsed alexandrite (755 nm), long-pulsed diode (810 nm), long-pulsed Nd:YAG (1064 nm), and intense-pulsed light. Radiofrequency also injures hair photothermally. A Q-switched Nd:YAG laser (1064 nm), with or without the addition of a topical carbon suspension, destroys hair mechanically.

Using the theory of selective photothermolysis, laser hair removal will be more effective in those patients with light skin and dark hair. Those with darker skin are more difficult to treat, although it is possible. For treatment of light hair, combination radiofrequency and optical devices as well as photodynamic therapy, is under investigation.

Indications for laser therapy in dermatology

1. Vascular lesions
2. Infectious disorders
3. Hair removal
4. Tattoos
5. Benign pigmented lesions
6. Scars and keloids
7. Benign tumours
8. Epidermal nevi
9. Premalignant and malignant tumours
10. Inflammatory dermatoses
11. Resurfacing

Side effects. Complications can occur after laser hair removal, but can be reduced through an understanding of the fundamentals of laser treatment. The goal of laser hair removal is to damage the stem cells in the bulge of the hair follicle by targeting melanin, the endogenous chromophore used by laser and light devices to remove hair. The competing chromophores in the skin and hair—oxyhemoglobin and water—have a decreased absorption of between 690 nm and 1000 nm, thus making this an ideal range for laser and light sources.⁶ Typical complications include scarring and pigmentary changes; less obvious ones include reticulate erythema and ocular complications (**Table 1**). Periorbital epilation should be performed with caution until further studies have been undertaken regarding the potential damage to the intraocular structures with this procedure. Until then, patients need to be informed of the rare but potentially serious side effects of this particular laser cosmetic procedure.

Table 1. Complications and treatment of laser hair removal

COMPLICATION	TREATMENT
Burning	Topical steroid plus antibiotic, preventive (epidermal-cooling devices)
Scarring	Preventive only (adjust laser's parameters, epidermal-cooling devices)
Pigmentary changes	Topical steroid, preventive (adjust laser's parameters, avoid sun exposure)
Posttreatment erythema and edema	Topical steroid
Reticulate erythema	Topical steroid
Ocular complications	Specific to each complication
Pain	Epidermal-cooling devices, topical anesthetic
Purpura	Preventive only (adjust laser's parameters)

Laser hair removal is now widely accepted as a successful technique to remove unwanted hair in both men and women.⁷ Although overall incidence of adverse effects after laser hair removal appears to be low and transient, these side effects can be more common when laser hair removal is carried out by untrained personnel.^{8,9}

Prevention and postoperative care. Light absorption of the pigmented hair shaft and surrounding follicle is an important factor in hair removal; therefore, the patient should avoid plucking, waxing, or electrolysis before laser therapy. Shaving and bleaching the hair, which preserve the hair shaft, are allowed. Depilatory creams, which are less likely to disturb the follicle than plucking, waxing, or electrolysis, can also be used, as the hair shaft is not absolutely necessary for laser hair removal.

EDITOR'S KEY POINTS

- Laser-assisted hair removal is the most efficient method of long-term hair removal and is therefore becoming extremely popular; family physicians should recognize the skin-related complications of such procedures in order to correctly diagnose and treat them.
- Laser hair removal is achieved through follicular unit destruction, in which the ability to remove hair without damaging the surrounding skin is based on selective photothermolysis: the goal is to damage the stem cells in the bulge of the hair follicle by targeting melanin, the endogenous chromophore used by laser and light devices to remove hair.
- Characteristic lesions typically appear on the neck, face, forearm, and groin as hyperpigmented macules; other side effects include skin pigmentation, scarring, reticulate erythema, and ocular complications. These side effects are more common when procedures are carried out by untrained personnel.

POINTS DE REPÈRE DU RÉDACTEUR

- L'épilation au laser est la méthode la plus efficace pour l'enlèvement à long terme des poils et devient donc extrêmement populaire; les médecins de famille devraient reconnaître les complications dermatologiques de telles interventions pour les diagnostiquer et les traiter correctement.
- L'épilation au laser se fait par la destruction de l'unité folliculaire, dans laquelle la capacité d'enlever le poil sans endommager la peau tout autour dépend d'une photothermolysé sélective; le but est d'endommager les cellules souches dans le bulbe du follicule du poil en ciblant la mélanine, le chromophore endogène utilisé par le laser et des dispositifs lumineux pour enlever le poil.
- Des lésions caractéristiques apparaissent typiquement sur le cou, le visage, l'avant-bras et l'aîne, sous forme de macules hyperpigmentées; parmi les autres effets secondaires figurent la pigmentation de la peau, les cicatrices, l'érythème réticulé et des complications oculaires. Ces effets secondaires se produisent le plus souvent lorsque l'intervention a été faite par un personnel sans formation.

The abundance of melanin in the epidermis of patients with dark skin colour has been regarded as hazardous because of the increased incidence of side effects in this patient population. Similarly, sun avoidance should be emphasized, as a patient with tanned skin is at a higher risk of epidermal damage.

After therapy, patients should be given ice to decrease pain and reduce swelling. Topical corticosteroid creams help to minimize posttreatment erythema and edema; they also decrease the duration of hyperpigmentation.¹⁰ Antibiotic ointment is recommended if epidermal injury is noted. Patients should be advised to continue avoiding sun exposure. If epidermal injury has not occurred, makeup can be applied the day after treatment.

Conclusion

Family physicians are increasingly involved in supervising laser hair removal. The knowledge about the cutaneous side effects of this technique and its clinical presentation is important for prevention and patient counseling, as well as correct diagnosis and treatment of complications.

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Competing interests

None declared

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