

## SHORT REPORT

# Hair structures are effectively altered during 810 nm diode laser hair epilation at low fluences

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### Abstract

**Background:** Diode lasers with high fluence and cooling technology are effective at removing unwanted hair but are also associated with discomfort and morbidity, especially when treating dark or tanned skins. **Methods:** Thirty patients with skin phototypes IV and V (range: 23–62 years of age; average: 39 years) underwent a single hair removal treatment using a new diode laser (810 nm) technology that incorporates low fluence but very high average power. The treatment technique employed multiple, in-motion, repetitive laser passes on a 100 cm<sup>2</sup> area of the skin. A 5 mm punch biopsy was carried out before and after a single treatment. Tissue samples were harvested and stained with haematoxylin-eosin. **Results:** The physical integrity of hair follicles was altered with inflammatory infiltrate, hair shaft detachment from its sheath, and perifollicular oedema, related to incipient necrosis. **Conclusion:** Low fluence but high average power diode laser technology yields significant changes in hair structure and architecture in patients with dark skin types. The procedure caused low levels of discomfort and was well tolerated.

**Key words:** Fluences, hair removal, histology, laser, melanin

### Introduction

Photo-epilation was the most practised medical intervention in 2008 (1). Unwanted hair causes psychological distress due to 'imposed' social rules. Several techniques that use different light devices can be used to remove hair, but there are limitations when treating dark or tanned skins.

When laser epilation is carried out on light skin and dark hair, the rate of success is high (2). The selective absorption of laser light by the hair follicle in the 810–1200 nm spectrum band is expected to cause thermal damage to the hair follicle growth centres—bulge, bulb and papilla. Reports based on histology observations present extensive immediate damage of hair follicles after laser treatment (0–8). Reports on low fluence epilation with IPL devices (9), filterless flashlamp systems (10), and the alexandrite laser (11) produce partial degeneration of hair follicles and changes such as coagulation in the standard pattern of the neighbouring tissue. Thus, there is a need for an

improved method for hair removal which heats the hair follicles to a sufficient temperature for hair removal while delivering a minimal amount of thermal energy to the epidermis (to achieve minimal discomfort).

A new 810 nm diode laser device for hair removal may have clinical advantages for epilation on dark and/or tanned skins due to its very high average power, high repetition rate, albeit at low a fluence, and may be a safer procedure that offers the possibility of achieving high clearance rates of hair removal with low morbidity. In order to evaluate the extent of treatment effects at the level of the hair follicle and to assess the extension of these effects in tissue, we have examined the histology of epilated areas in 30 patients immediately after a single treatment session.

### Materials and methods

Patients with phototypes IV and V (15 males and 15 females in each group), ranging from 23 to 62 years

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