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### Application of reflectance confocal microscopy to investigate the non-ablative, micro-ablative, and ablative effects of CO<sub>2</sub> fractional laser irradiation on skin.

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#### ABSTRACT

CO<sub>2</sub> fractional laser, as an ablative fractional laser, is commonly used in cosmetic treatment. We applied CO<sub>2</sub> fractional laser irradiation to skin in vitro and used reflectance confocal microscopy (RCM) to image and detect the presence of any non-ablative, micro-ablative and ablative effects, in order to better understand the features of a CO<sub>2</sub> fractional laser. In vitro irradiation of foreskin was performed using a CO<sub>2</sub> fractional laser. Foreskin specimens were divided into 4 groups that received different amounts of irradiation energy, based on the number of irradiation passes they received: 5, 10, 15, and 20 passes, respectively. This corresponds to fluence energy of 16.3, 32.6, 48.9, 65.3 J/cm<sup>2</sup>. Immediately after irradiation, digital microscopy (DM), RCM, and histopathology were performed to observe whether the non-ablative, micro-ablative, and ablative phenomenon occurred, and the injury features of MTZs. Immediately after CO<sub>2</sub> fractional laser irradiation, RCM and DM showed that when the numbers of passes were 5 and 10, a micro-ablative column (MAC) could not be observed or was very small. We mainly observed a thicker thermal coagulation zone (TCZ), representing non-ablative or micro-ablative effects. When the number of passes were increased to 15 and 20, the MAC was significantly enlarged and surrounded by a TCZ of medium thickness, representing ablative effects. For the first time, this study used RCM and DM to demonstrate that a CO<sub>2</sub> fractional laser could achieve non-ablative, micro-ablative, and ablative effects on irradiated skin via different energy levels. KEYWORDS: CO<sub>2</sub> fractional laser; Digital microscopy (DM); Micro-ablative; Microscopic treatment zone (MTZ); Non-ablative; Reflectance confocal microscopy (RCM) PMID: 31845041 DOI: 10.1007/s10103-019-02910-5