WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

THE IMPACT OF LASER TECHNOLOGY ON SKIN HEALTH: A COMPREHENSIVE REVIEW

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ABSTRACT:

Over the past half-century, lasers have rapidly advanced into various medical disciplines, offering high precision and minimally invasive procedures. These are now widely used in fields such as dermatology, ophthalmology, dentistry, urology, cardiology, neurosurgery, and orthopedics. In many respects, lasers have modify the diagnosis and treatment of diseases. As a surgical tool, lasers are capable of performing various functions. Medical lasers are a prime example of how the evolution of an idea can profoundly transform the medical field. The purpose of this study was to evaluate the effectiveness of a new laser device that combines CO2 and 1540 nm wavelengths for wrinkle reduction, utilizing a recently developed scanning unit called the µScan DOT scanner.

INTRODUCTION :

Lasers, as the source of light or radiation energy, were described by Theodore Meimann in
1960.Lasers have revolutionized cosmetic procedures by providing minimally invasive solutions that significantly reduce recovery times. This innovation has made skin rejuvenation more accessible to a wider range of patients.*[1,2]*
Skin aging is a natural process that occurs as we grow older, but it can be accelerated by factors such as sunlight, stress, and exposure to chemicals. Numerous genetic and environmental factors influence skin aging, leading to the appearance of wrinkles, abnormal pigmentation, weakened skin, and telangiectasia (visible blood vessels).Researchers are increasingly exploring various methods for skin rejuvenation. Recently, the use of laser radiation for skin rejuvenation has become more common and has proven to be effective.*[3,4]*
This study explores the effects of laser therapy on skin rejuvenation from various perspectives and reviews published articles in this field to offer a fresh outlook on the application of lasers for skin rejuvenation.*[5]*

Risk of laser technique:

Burns
Scarring
Pain at site
Haperpigmentation
Skin damage
Rashes
Irritation
Bacterial infection

Benefit of laser technology:

Remove outer layer of skin
Reduces fine lines and wrinkles
Improves skin texture and tone

Minimizes scars (e.g., acne scars)
Reduces sun damage and age spots

Safety and precautions:-

Laser safety precautions vary depending on the specific laser system and its setting. It include:-
Comprehensive training for all personnel
Eye protection for both the patient and clinic staff
Placement of warning signs outside the procedure room
Use of non-reflective instruments to prevent accidental reflections
Avoidance of flammable materials in the procedure area

TYPES:

Ablative laser:-
Ablative lasers are commonly used for skin resurfacing and rejuvenation. They work by removing the epidermis and heating the dermis, effectively treating scars, pigmentation, and wrinkles (rhytides).*[6]*
Non -Abalative laser:-
Non-ablative laser resurfacing has emerged as one of the significant advancements in procedural dermatology over the past decade and has become the preferred treatment for a wide range of aesthetic concerns. However, safety issues regarding their use on darker skin types continue to be a concern. These lasers are less invasive than ablative lasers, working by tightening the skin through the stimulation of collagen production in the dermis, while the epidermis is safeguarded by skin cooling techniques.*[7]*
Fractional laser:-
Fractional lasers, including both non-ablative and ablative types, typically create microscopic treatment zones at varying depths in the skin. Non-ablative fractional lasers generally penetrate to a depth of around 1 mm, while ablative fractional lasers reach deeper, typically around 2.5 mm.*[8]*

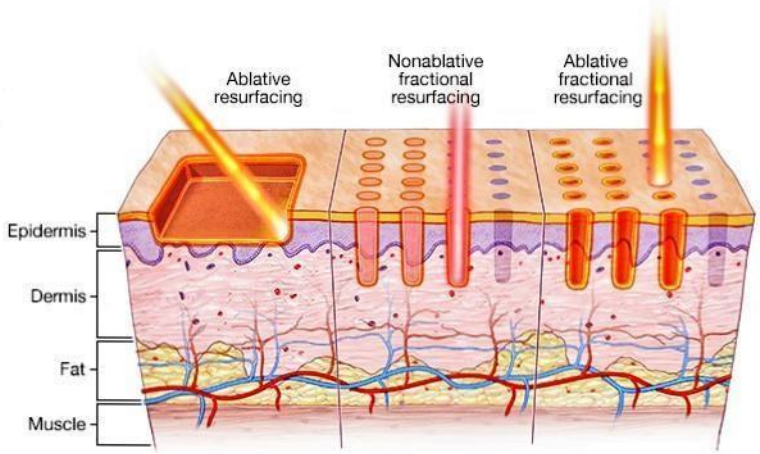

Fig:- 1.1 Types of laser technique

Table: 1.1 Characteristics of laser[9,10]

Types of laser	**Source of laser**	**Wavelength**
Ablative laser	CO2 Er:YAG	10600nm 2940nm
Non-abalative laser	ILP High dose PDL Low dose PDL PPTP Nd:YAG	500-1299nm 585-595nm 532nm 1450nm 1540nm
Fractional laser	Er:YAG CO2	2940nm 10600nm

USES:-

Fine wrinkles

Age spots
Uneven skin color or texture
Sun-damaged skin Mild to moderate acne scars

APPLICATION:

Laser resurfacing: Laser resurfacing is a cosmetic procedure that uses concentrated light energy to improve the skin's texture and appearance. It can help reduce wrinkles, scars, blemishes, and uneven skin tone.
Tattoo Removing: Laser tattoo removal is a procedure that uses concentrated light (laser) to break down the ink particles in a tattoo.
Hair Removal: Reduction of hair by targeting hair follicles.
Laser Therapy: For pain management, reducing inflammation, and promoting healing in soft tissues
Pigmentation reduction: Pigmentation reduction typically focuses on lightening dark spots or uneven skin tone caused by excess melanin production, which can result from sun exposure, hormonal changes, aging, or inflammation.
Scar Removal: Laser treatment for scar removal is a popular non-invasive method to improve the appearance of scars by using concentrated light beams to reduce scar tissue.
Skin Tightening: Skin tightening refers to treatments or procedures that aim to firm and tone loose or sagging skin, often caused by aging, weight loss, or other factors.

CURRENT TREND IN LASER TECHNOLOGY:-

Aerolase laser skin treatment

One of the latest innovations in cosmetic lasers is the Aerolase Laser Skin Treatment. Aerolase Laser Skin Treatment is a non-invasive, advanced technology that uses a patented 650-microsecond laser to deliver effective and painless cosmetic results. This innovative laser is capable of addressing common skin concerns and conditions such as acne, rosacea, pigmentation issues, and even fine lines and wrinkles.
During the treatment, the Aerolase laser emits a focused beam of light that penetrates the skin without harming the surrounding tissue. The laser's energy is absorbed by the target area, such as pigmented or vascular lesions, and heats the skin to stimulate collagen production, effectively addressing the skin concern.*[11]*

Fractional picosecond laser treatment

Picosecond lasers are capable of delivering pulse durations ranging from 300 to 900 picoseconds (10^{-12} seconds) . In 2012, the FDA approved the first picosecond laser for dermatological applications, known as Picosure, developed by
Cynosure in Westford, Massachusetts .*[12,13]*

A Quality switch laser treatment

QS laser tattoo removal has been refined over time due to continuous advancements in laser technology and the development of combination treatment protocols. However, research indicates that not all patients respond equally well to QS laser tattoo removal procedures. This highlights the importance of conducting a preliminary analysis of various clinical factors before treatment.*[14]*
Individual photogenic skin types, along with specific tattoo characteristics—such as the chemical composition of the ink, color intensity, distribution, age of the tattoo, and its anatomical location—significantly impact the parameters used in QS laser treatments and the subsequent aftercare required.*[15]*

CONCLUSION:-

The review revealed that advancements in laser technology have greatly improved skin resurfacing procedures, offering precise and effective treatments for a range of skin conditions. Researchers have found that using laserassisted drug delivery greatly improves therapeutic results. This method creates micro-channels in the skin, enhancing the absorption of topical treatments. Moreover, new developments in cooling systems have been implemented to alleviate pain and reduce side effects, thereby enhancing patient comfort and safety.

REFERENCE:-

1. Maiman TH. Stimulated optical radiation in ruby. Nature. 1960;187:493–4. Doi: 10.1038/187493a0.
2. Manstein D, Herron GS, Sink RK, Tanner H, Anderson RR. Fractional Photothermolysis: a new concept for cutaneous remodeling using microscopic patterns of thermal injury. Lasers Surg Med. 2004; 34(5): 426-438. Doi:10.1002/lsm.20048
3. Knight JM, Kautz G. Sequential facial skin rejuvenation with intense pulsed light and non-ablative fractionated laser resurfacing in fitzpatrick skin type II–IV patients: A prospective multicenter analysis.
4. Lasers Surg Med. 2019;51(2):141-149. doi: 10.1002/lsm.23007.
.Dover JS, Hruza G. Lasers in skin resurfacing. Aust J Dermatol. 2000;41(2):72-85. doi:10.1046/j.14400960.2000.00399.x

5. Kang S, Fisher GJ, Voorhees JJ. Photoaging: pathogenesis, prevention, and treatment. Clin Geriatr Med. 2001;17(4):643-59.
6. Stewart N, Lim AC, Lowe PM, Goodman G. Lasers and laser-like devices: Part one. Australas J Dermatol. 2013;54(3):173–83. Doi: 10.1111/ajd.12034.
7. Kaushik SB, Alexis AF. Nonablative fractional laser resurfacing in skin of color: evidence-based review. J Clin Aesthet Dermatol. 2017;10(6):51–67.
8. Houreld NN. The use of lasers and light sources in skin rejuvenation. Clin Dermatol. 2019;37(4):358–64. Doi: 10.1016/j.clindermatol.2019.04.008.
9. Halbina A, Trznadel-Grodzka E, Rotsztejn H. Fractional laser therapy–the next step in alleviating the symptoms of skin aging (own observations) Prz Menopauzalny. 2014;13(2):132–5.
10. Ichikawa H, Kanda T, Kosugi S, Kawachi Y, Sasaki H, Wakai T. et al. Laser microdissection and two dimensional difference gel electrophoresis reveal the role of a novel macrophage-capping protein in lymph node metastasis in gastric cancer. J Proteome Res. 2013;12(8):3780–91.
11. https://www.thefacelab.ca/aerolase-laser-skin-treatment-the-latest-innovation-in-cosmetic-lasers
12. Freedman JR, Kaufman J, Metelitsa AI, Green JB. Picosecond lasers the next generation of short-pulsed lasers. Sem Cutan Med Surg. 2014;33:164–168. Doi: 10.12788/j.sder.0117.
13. Wu DC, Goldman MP, Wat H, Chan HHL. A systematic review of picosecond laser in dermatology: evidence and recommendations. Lasers Surg Med. 2021;53:9–49. Doi: 10.1002/lsm.23244.
14. Khunger N, Molpariya A, Khunger A (2015) Complications of tattoos and tattoo removal: stop and think before you ink. J Cutan Aesthet Surg 8(1):30–36
15. Marini L et al (2022) Q-S laser micro-drilling and multipass full-beam Q-S laser for tattoo removal – a case series. Lasers Med Sci 37(3):1763–1771