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Asclepion
Laser Technologies

VASCULAR LESIONS

(532 & 577 nm)

Treatment of superficial vascular lesions with the KTP 532-nm laser: experience with 647 patients

Becher GL, Cameron H, Moseley H. Lasers Med Sci. 2014 Jan;29(1):267-71. doi: 10.1007/s10103-013-1330-5. Epub 2013 Apr 30.

ABSTRACT

Superficial vascular lesions are a common dermatological diagnosis but are often difficult to treat. Numerous lasers (especially the dye laser) and intense pulsed light sources have been used, but there have been very few reports on the effectiveness of the potassium-titanyl phosphate (KTP) laser. We have extensive experience of this modality at our institution, and the purpose of this survey is to report on the safety and efficacy of the KTP laser. Using an in-house database, we retrospectively collected data from patients who had undergone treatment with the KTP laser for superficial vascular lesions. Patients of Fitzpatrick skin type I-IV were included. Exclusion criteria were Fitzpatrick skin type V, patients with obvious suntan and those on potentially phototoxic medications or minocycline therapy. Diagnoses included discrete or matted telangiectasia, strawberry naevus, spider angioma, rosaceal erythema, rosaceal telangiectasia, telangiectatic naevus, angioma, combined rosaceal erythema/telangiectasia, port-wine stain, venous lake haemangioma and hereditary haemorrhagic telangiectasia. Patients underwent an initial test treatment and further treatment at 6-week intervals as required. Clinical photographs were taken pre- and post-treatment, and outcome was graded by patient and physician. Adverse effects were recorded including scarring, hypo- or hyperpigmentation, marked swelling, blistering, scabbing and bruising. Six hundred forty-seven patients with 13 diagnoses on 9 different body sites were recorded. Four hundred eighty-six were female, and the median age was 39.5 years. Of the lesions treated, 33.7 % (n = 218) were discrete telangiectases and 31.8 % (n = 206) were spider angiomas. A 92.7 % of lesions were on the face. Four hundred thirteen (77.6 %) patients who had outcomes recorded at 6 weeks were graded as "clearance" or "marked improvement". Only 38 (5.8 %) patients experienced adverse effects, all of which were minor; the main adverse effect was swelling. Unlike the dye laser, there was only one case of bruising out of 647 patients. This is the largest survey of patients to have undergone KTP laser treatment reported in the literature. Our results show that the KTP laser is a safe and effective modality for the treatment of superficial vascular lesions.

Treatment of superficial cutaneous vascular lesions: experience with the KTP 532 nm laser

Clark C, Cameron H, Moseley H, Ferguson J, Ibbotson SH. Lasers Med Sci. 2004;19(1):1-5. Epub 2004 Apr 14.

ABSTRACT

Whilst most facial telangiectasias respond well to short-pulse-duration pulsed dye laser therapy, studies have shown that for the treatment of larger vessels these short-duration pulses are sub-optimal. Long-pulse frequency-doubled neodymium:YAG lasers have been introduced with pulse durations ranging from 1-50 ms and treatment beam diameters of up to 4 mm. We report the results of KTP/532 nm laser treatment for superficial vascular skin lesions. The aim was to determine the efficacy of the KTP/532 nm laser in the treatment of superficial cutaneous vascular lesions at a regional dermatology centre in a 2 year retrospective analysis. Patients were referred from general dermatology clinics to a purpose-built laser facility. A test dose was performed at the initial consultation and thereafter patients were reviewed and treated at 6 week intervals. Outcome was graded into five classifications by the patient and operator independently based on photographic records: clear, marked improvement, partial response, poor response, and no change or worsening. Over the 2 year period, 204 patients with 246 diagnoses were treated [156 female; median age 41 (range 1-74) years; Fitzpatrick skin types I-III]. Equal numbers of spider angioma (102) and facial telangiectasia (102) were treated. Of those patients who completed treatment and follow up, 57/58 (98%) of spider angiomas and 44/49 (90%) of facial telangiectasia markedly improved or cleared. Satisfactory treatment outcomes, with one clearance and two partial responses, occurred in three of five patients with port-wine stain. Few patients experienced adverse effects: two declined further treatment due to pain, and a small area of minimal superficial scarring developed in one case. Two patients developed mild persistent post-inflammatory hyperpigmentation, and one subject experienced an episode of acute facial erythema, swelling and blistering after one treatment. The KTP/532 nm frequency-doubled neodymium:YAG laser is a safe and effective treatment for common superficial cutaneous vascular lesions in patients with Fitzpatrick skin types I-III.

Comparison of the 532-nm KTP and 1064-nm Nd:YAG lasers for the treatment of cherry angiomas

Pancar GS, Aydin F, Senturk N, Bek Y, Canturk MT, Turanli AY. J Cosmet Laser Ther. 2011 Aug;13(4):138-41. doi: 10.3109/14764172.2011.594058. Epub 2011 Jun 20.

ABSTRACT

BACKGROUND:
Laser therapy is the treatment of choice for cherry angiomas since it is more effective and has better cosmetic results. There is no comparative study about the treatment efficacies with KTP and Nd:YAG lasers for cherry angiomas.

OBJECTIVE:
To compare the efficacy and side effects of 532-nm KTP and 1064-nm Nd:YAG lasers for the treatment of cherry angiomas.

METHODS:
Two comparable lesions of the same patient were chosen. One of them was treated with the KTP laser while the other was treated with the Nd:YAG laser. Sessions were repeated every 4 weeks until complete clearance was achieved. Side effects were evaluated using a severity scale (0 to 4).

RESULTS:
The number of sessions was significantly higher with the KTP than with the Nd:YAG laser ($p = 0.002$). Erythema, edema, pain and scar formation were higher in the Nd:YAG laser group (erythema: $p = 0.001$; edema: $p < 0.001$; pain: $p < 0.001$; scar: $p < 0.001$). The hyperpigmentation rate was statistically higher with the KTP laser ($p = 0.01$).

CONCLUSION:
Both KTP and Nd:YAG lasers were found to be effective methods. The Nd:YAG laser offered fewer treatment sessions, but a higher risk of scar formation. The KTP laser seems more advantageous, but in dark-skinned patients the Nd:YAG laser may be preferable.

Acne rosacea: effectiveness of 532 nm laser on the cosmetic appearance of the skin

Maxwell EL, Ellis DA, Manis H. J Otolaryngol Head Neck Surg. 2010 Jun;39(3):292-6.

ABSTRACT

OBJECTIVE:
The aim of the study was to perform a prospective blinded trial to compare the improvement of midface acne rosacea using 532 nm laser therapy with and without a retinaldehyde-based topical application.

SETTING:
A private clinic and surgicentre specializing in facial plastic surgery.

DESIGN:
A prospective randomized blinded clinical trial.

METHODS:
Fourteen patients with type 1 erythematotelangiectatic acne rosacea were enrolled in the study. The side of the face to be treated was chosen randomly. The opposite side of the face served as the control. Patients underwent six treatments with the 532 nm laser, with four sets of photodocumentation over a period of 3 months. Following each treatment, patients were asked to rate their degree of improvement based on a 5-point improvement scale. A final assessment was performed by five separate blinded evaluators.

MAIN OUTCOME MEASURES:
Final photographic evaluation to assess (1) reduction in overall redness, (2) reduction in visible telangiectasia, (3) difference between left and right sides of the face, and (4) degree of overall skin texture improvement.

RESULTS:
Three men and eight women completed the study. Six right hemifaces and five left hemifaces were treated. One hundred percent of patients noted a mild to moderate improvement in all signs of type 1 acne rosacea, including overall redness of the face, telangiectasia, and skin texture. The blinded evaluators were able to note a difference between the treated and untreated sides 47% of the time.

CONCLUSION:
The 532 nm laser combined with the topical retinaldehyde improved overall redness, telangiectasia, and skin texture in acne rosacea patients. The degree of improvement was greater when compared to using the laser alone as the sole treatment modality.

Treatment of spider leg veins with the KTP (532 nm) laser--a prospective study.

Spendel S, Prandl EC, Schintler MV, Siegl A, Wittgruber G, Hellbom B, Rappl T, Berghold A, Scharnagl E. Lasers Surg Med. 2002;31(3):194-201.

ABSTRACT

BACKGROUND AND OBJECTIVES:
Spider leg veins are telangiectasias located intracutaneously. This condition poses a cosmetic problem.

STUDY DESIGN/PATIENTS AND METHODS:
The purpose of this study was to determine what influence the KTP (532 nm) laser has on spider leg veins dependent on the vascular diameter and to what extent the skin has been affected. Seventy female patients were treated in three laser sessions. Analysis was done 30 weeks after the last laser treatment session.

RESULTS:
Fifty-six patients completed the study. In group 1 (vascular diameter < or = 0.6 mm), spider leg veins were no longer visible in 33%; in 40%, a decrease in vascular diameter could be observed; in 27%, no change in size occurred. In group 2 (vascular diameter 0.7-1.0 mm), laser-treated spider leg veins were visible in all patients. Hyperpigmentation occurred in 13 patients.

CONCLUSIONS:
The KTP (532 nm) laser is an effective for treating spider leg veins having a vascular diameter under 0.7 mm.

Diode laser for the treatment of telangiectasias following hemangioma involution.

Cerrati EW, O TM, Chung H, Waner M. Otolaryngol Head Neck Surg. 2015 Feb;152(2):239-43. doi: 10.1177/0194599814559192. Epub 2014 Dec 1.

ABSTRACT

OBJECTIVE:
Infantile hemangiomas are well known for their rapid growth during the first 6 to 9 months of life, followed by a spontaneous but slow involution. The standard of care is to treat these lesions at an early age with propranolol to expedite the involution process; however, surgery still remains an active component in the management. Medical treatment with propranolol or natural involution will often result in residual telangiectasias. We evaluated the efficacy of using a diode laser as a treatment for telangiectasias following cervicofacial infantile hemangioma involution.

STUDY DESIGN:
Case series with chart review.

SETTING:
Tertiary care hospital and practice specializing in the care of vascular anomalies.

SUBJECTS AND METHODS:
Twenty patients, aged 4 months to 11 years (average 2.69 years), underwent treatment with a 532-nm diode laser to treat the residual telangiectasias following hemangioma involution. All procedures were performed in the operating room. To assess the efficacy, we independently evaluated pre- and posttreatment digital photographs and ranked them on a 0- to 4-point scale (0 = no change and 4 = complete response). Adverse reactions were also recorded.

RESULTS:
The telangiectasias showed considerable improvement following treatment. In more than half of the patients treated, the affected area demonstrated a complete response. No adverse reactions were noted.

CONCLUSION:
A 532-nm diode laser effectively treats the remaining telangiectasias following hemangioma involution. Whether used independently or in conjunction with other treatment modalities, the diode laser should be part of the surgical armamentarium when treating infantile hemangiomas.

The utilization of a new yellow light laser (578 nm) for the treatment of class I red telangiectasia of the lower extremities.

Sadick NS1, Weiss R. Dermatol Surg. 2002 Jan;28(1):21-5.

ABSTRACT

BACKGROUND:
A dual-wavelength approach is necessary in order to achieve consistent results when utilizing lasers and intense pulsed light sources to treat red and blue lower extremity vessels. In this regard, short-wavelength technologies (500-800 nm) may be employed to treat red telangiectasia of less than 2 mm on the lower extremities.

OBJECTIVE:
To demonstrate a new yellow light laser utilizing a copper bromide medium and its potential efficacy in the treatment of red lower extremity telangiectasia of less than 2 mm.

METHODS:
Forty-six women (mean age 37 years) were treated in two private practice settings with a 578 nm yellow light laser with a circulating cooling window (1-4 degrees C). Class I red telangiectases of the thighs 1.5 mm or less in diameter were considered for treatment. Patients were treated with up to three treatments at 6-week intervals on a 5 cm2 surgical area of vessels utilizing a fluence of 50-55 J/cm2. Results were analyzed by macrophotographic imaging, double-blinded observer evaluation/optical chromatography, and a patient evaluation scale.

RESULTS:
An average of 1.7 patient treatment sessions produced significant clearing of 75-100% in 71.8% of patients. The mean erythema index showed significant lightening (51-65a+) in the study population. Finally, 76.1% of patients reported great satisfaction with the results of their treatment session.

CONCLUSION:
A new 578 nm copper bromide (CuBr) yellow light laser produces excellent results in eradicating red telangiectases of the lower extremities that are less than 2 mm in diameter.

Copper bromide laser treatment of facial telangiectasia: results of patients treated over five years.

McCoy SE. Lasers Surg Med. 1997;21(4):329-40.

ABSTRACT

BACKGROUND AND OBJECTIVE:
Various yellow light lasers have been used over the past decade in an attempt to eradicate facial telangiectasia. Based on their power output, spot size, and pulsing characteristics, these lasers belong to one of two categories that exist at either end of a spectrum--high power, short pulse, and large spot size, or low power, long exposure, and small spot size. The copper bromide laser clearly belongs in the latter group, but with higher available power than most other lasers in this group, it exists further along the spectrum toward the region in which the laser parameters might be considered closer to theoretical ideals for treating certain cutaneous vascular pathologies. The objective of this study was to ascertain the role and efficacy of the copper bromide laser on treatment of a variety of facial telangiectasia.

STUDY DESIGN/MATERIALS AND METHODS:
A total of 570 patients with facial telangiectasia of different diameters and on different regions of the face were treated with the copper bromide laser one or more times and followed up over 5 years.

RESULTS:
More than 75% clearance was achieved in 70% patients, 50-75% clearance in 17.4% patients, and < 50% clearance in 12.6% patients. Poor results were correlated with anatomical location on the nasal alae and nasal tip and also with vessel size. Very small (< 100 microns) and very large (> 300 microns) vessels did not respond as well as vessels in the 100-300-micron diameter group. Very large vessels responded better to a combination of sclerotherapy and laser treatment. There were no reported long-term adverse effects.

CONCLUSION:
The copper bromide laser is a safe and effective modality for the treatment of the majority of facial telangiectasia. It is less suited to treating very small vessel lesions such as diffuse erythema, and conversely very large vessels as well as those of the nasal alae. These latter two groups respond better and more permanently to combined sclerotherapy and laser treatment.

An evaluation of the copper-bromide laser for treating telangiectasia.

McCoy S, Hanna M, Anderson P, McLennan G, Repacholi M. Dermatol Surg. 1996 Jun;22(6):551-7.

ABSTRACT

BACKGROUND:
Copper bromide lasers, producing pulsed yellow and green light, have been developed for treating cutaneous lesions.

OBJECTIVE:
A clinical trial was conducted to evaluate the role of this laser, using its yellow wavelength, to treat benign vascular ectasia and establish some clinical guidelines for therapy.

METHODS:
Twenty-three informed consenting adults with facial telangiectasia, spider angiomas, or vascular nevi on the head, neck, or upper chest were treated with the laser. Assessment of results was performed by: blinded clinical evaluation, blinded comparison of "before" and "after" photographs, and patients' own reports of satisfaction levels.

RESULTS:
Good to excellent results were obtained in most patients, except for a few suffering minor skin atrophy where very large vessels were treated.

CONCLUSIONS:
The copper bromide laser was an effective tool in the treatment of certain cutaneous vascular lesions.

PIGMENTED LESIONS

(532 & 577 nm)

Clinicopathologic efficacy of copper bromide plus/yellow laser (578 nm with 511 nm) for treatment of melasma in Asian patients.

Lee HI, Lim YY, Kim BJ, Kim MN, Min HJ, Hwang JH, Song KY. Dermatol Surg. 2010 Jun;36(6):885-93. doi: 10.1111/j.1524-4725.2010.01564.x. Epub 2010 May 7.

ABSTRACT

BACKGROUND:
Melasma is a common pigmentary disorder in Asians. Although the pathogenesis of melasma is not yet fully understood, there are several hypotheses supporting angiogenetic factors related to some types of melasma.

OBJECTIVE:
To test the efficacy of copper bromide laser in the treatment of Korean women with melasma.

MATERIALS AND METHODS:
Clinical parameters included physician and patient assessment and Melasma Area and Severity Index score. The intensity of pigmentation and erythema was measured using a chromometer. To evaluate histopathologic changes, punch biopsies from melasma were obtained from four patients. Immunohistochemical staining for Melan-A, endothelin 1, CD34, and vascular endothelial growth factor (VEGF) antigen of the melasma lesions was observed.

RESULTS:
Mean MASI score decreased dramatically after treatment. Patients exhibited telangiectatic erythema within the melasma lesion. The values of L(*) reflecting intensity of pigmentation increased, and the values of a(*) as the measurement of redness decreased after the treatments. Expression of Melan-A, CD34, endothelin-1, and VEGF decreased after treatment.

CONCLUSION:
The potential application of an antiangiogenetic laser for the treatment of melasma specially accompanied by pronounced telangiectasia in Asian skin is a possible treatment option.

Split treatment of photodamaged skin with KTP 532 nm laser with 10 mm handpiece versus IPL: a cheek-to-cheek comparison.

Butler EG 2nd, McClellan SD, Ross EV. Lasers Surg Med. 2006 Feb;38(2):124-8.

ABSTRACT

BACKGROUND AND OBJECTIVES:
The treatment of photodamaged skin with potassium-titanyl-phosphate (KTP) laser and intense pulsed light (IPL) has been reported in several studies. Each device has strengths and weaknesses; however, patient and device variability have made it difficult to ascertain the optimal device for photorejuvenation. The objective of this study was to obtain a head-to-head comparison of IPL and KTP laser for photorejuvenation. Each patient received one KTP laser treatment on one side of the face and one IPL treatment on the other side.

STUDY DESIGN/MATERIALS AND METHODS:
Seventeen patients with skin types I-IV were accepted into the study based on existence of dyschromias (pigmented and vascular) and/or discrete telangiectases. After performance of test spots on each patient to determine optimal settings for both devices, patients were treated with both devices in a split face manner. Evaluations and photographs were performed 1 week and 1 month after treatment. Patient and observer evaluations of results were recorded, as well as time to perform each treatment, and patient feedback with regard to pain and edema. No anesthesia was used in these treatments. Photographs were reviewed by a panel of blinded observers to assess changes in red and brown dyschromias.

RESULTS:
One month average improvement (evaluator) for IPL side was (mean) 38.16%/35.08% for vascular/pigment lesions versus 41.99%/30.21% for KTP side. Patient self-evaluated global improvement at 1 month was (mean) 65.59% for IPL side versus 60.88% for KTP side. A majority of patients found the KTP to be slightly more painful with a mean pain rating of 5.27 of 10 versus 4.4 of 10 for IPL. A majority of patients experienced subjectively greater post-procedure swelling on the KTP side. Time to conduct treatment was an average of 10.0 minutes for IPL, 8.7 minutes for KTP.

CONCLUSIONS:
Both large spot KTP and IPL achieved marked improvement in vascular and pigmented lesions in one session. The KTP laser caused slightly more discomfort and edema than the IPL. On the other hand, the KTP laser was faster, and more ergonomically flexible.

OTHER LESIONS

(532 & 577 nm)

Two-year follow-up results of copper bromide laser treatment of striae.

Longo L, Postiglione MG, Marangoni O, Melato M. J Clin Laser Med Surg. 2003 Jun;21(3):157-60.

OBJECTIVE:
The aim of our study was to follow-up 15 patients with stretch marks treated positively with the CuBr laser (577-511 nm) in 1998-99 and followed-up for 2 years.

MATERIALS AND METHODS:
The patients were Italian women, young to middle age (average 30 years old), with skin coloration classified as Fitzpatrick II-III. Biopsies were taken on some patients before the treatment and 1 month after the first treatment. Double-blind histological, histochemical and photographic evaluation was performed. Results obtained as well as to the contradictory effects reported elsewhere in the literature were compared.

RESULTS:
On average, the results were positive and there were some pathogenic considerations that justified the use of laser.

Recalcitrant viral warts: results of treatment with the KTP laser.

Gooptu C1, James MP. Clin Exp Dermatol. 1999 Mar;24(2):60-3.

ABSTRACT
We report the use of a potassium-titanyl-phosphate (KTP) continuous wave laser in an open study to treat 25 patients with multiple nongenital warts that had failed to respond to conventional therapies. All patients were treated monthly using the 532 nm KTP continuous wave laser and robotic scanner. Twenty patients (80%) responded to treatment with warts: in 12 patients there was complete clearing. Moderate discomfort was reported during the procedure but subsequent morbidity was slight with no evidence of scarring. Follow-up by postal questionnaire revealed that warts recurred in those patients who had stopped treatment early but not in those whose warts had been treated to complete clearance.

Treatment of recalcitrant viral warts using a 577-nm wavelength high-power optically pumped semiconductor laser

Bianca Bigge1 / Stefan Bigge2 Photonics & Lasers in Medicine. Band 5, Heft 3, Seiten 219–223, ISSN (Online) 2193-0643, ISSN (Print) 2193-0635, DOI: 10.1515/plm-2016-0013, July 2016

ABSTRACT
We report the use of a 577-nm wavelength high-power optically pumped semiconductor laser (HOPSL) to treat 12 patients with multiple recalcitrant non-genital warts that had not responded to conservative and invasive treatment. The patients were treated weekly using a 577 nm HOPSL connected to a scanner device. Ten patients with warts showed complete clearance after treatment. One patient had partial clearance and one did not respond at all. Slight to medium pain (visual analog scale, VAS=2–6) was reported during treatment. After treatment there was no evidence of scarring. After the 6-month follow-up there was no recurrence of the completely cleared warts.

EVLT

(940 nm)

Endovenous laser treatment of saphenous veins: is there clinical difference using different endovenous laser wavelenghts?

Cavallini A. Int Angiol. 2015 Feb;34(1):1-8. Epub 2014 Jun 13.

ABSTRACT

Endovenous laser treatment (EVLT) is an efficient method to treat incompetent saphenous veins with high occlusion rates. Major side effects reported with 810 nm and 980 nm diode laser are postoperative pain and bruising. Recently laser systems with higher wavelengths (WSLWs), associated with new energy delivery devices, seem to reduce some side effects previously reported. Aim of this study is to verify if there are real clinical advantages in the use of WSLWs, reviewing the comparison studies present in the literature. After a search on MEDLINE database, a review of all papers concerning WSLWs, was made. Five studies of comparison between different wavelength, 810 vs.. 980 nm, 940 vs.. 1320 nm, 810 vs.. 1320 nm, 980 vs.. 1500 nm and 980 vs.. 1470 nm were found. These studies report similar results: the WSLWs produce fewer side effects. New optical fibers have also been developed; WSLWs with the use of these new fibers dramatically changed the postoperative period, with a reduction of pain and bruising. There is no scientific evidence that WSLWs have any effect on long-term outcome, although short-term differences have been found for some side effects. Other parameters are also important: in particular, LEED and cold tumescent anesthesia are critical points. Laser fiber design probably has a significant effect on treatment success in the performance of EVLT and also how the energy is delivered (pulsing or continuous mode) and the pull-back rate of the laser fiber are possible factors affecting complication ratios and pain scores, regardless of the type of wavelength used.

Endovenous laser treatment (EVLT) for the saphenous reflux and varicose veins: a follow-up study.

Firouznia K, Ghanaati H, Hedayati M, Shakiba M, Jalali AH, Mirsharifi R, Dargahi A. J Med Imaging Radiat Oncol. 2013 Feb;57(1):15-20. doi: 10.1111/j.1754-9485.2012.02457.x. Epub 2012 Oct 9.

ABSTRACT

PURPOSE:
The aim of this study is to report our experience about endovenous laser treatment (EVLT) for lower extremity varices in our centre which was followed by ultrasonography during the 6-month period.

METHODS:
During a 1-year period, 46 patients who were treated by EVLT with the 940-nm diode laser for venous insufficiency enrolled in the study. The diagnosis of greater saphenous vein (GSV) incompetence with reflux was made by clinical evaluation and duplex Doppler examinations. Clinical outcomes, complications and duplex ultrasound of the GSV were assessed within 1 week, 1 month, 3 months and 6 months, after the endovascular laser treatment.

RESULTS:
The mean age of our patients was 44 ± 11 years (24-70), and among them, 23 (50%) were male. Improvement in visible varicosity was seen in 39 (84.8%) patients after 6 months (P value = 0.011). The baseline mean diameter of GSV was 4.9 ± 1.6 mm and it dropped to 3.5 ± 1.3 after 6 months (P < 0.0001). After 6 months, 95.7% of our patients were satisfied and recommended this procedure to others.

CONCLUSIONS:
Endovascular laser ablation seems to be a safe and effective method for the treatment of lower limb varices.

NAIL TREATMENT

(980 nm)

Laser therapy of onychomycosis.

Nenoff P1, Grunewald S, Paasch U. J Dtsch Dermatol Ges. 2014 Jan;12(1):33-8. doi: 10.1111/ddg.12251. Epub 2013 Nov 18. Review.

ABSTRACT

Since 2010 the FDA has approved laser systems as capable of producing a "temporary increase in clear nails" in patients with onychomycosis. Fungal eradication is probably mediated by heat in infrared laser systems; their efficacy has been confirmed thermographically, histologically and in electron microscopy. Another approach to decontaminate the nail organ is to disrupt fungi and spores by q-switched pulse applications. Recently specific combinations of wavelengths have been tested for their ability to disrupt the mitochondrial transmembrane potential at physiological temperatures by generating ATP and ROS. While clinically extremely high clearance rates of approximately 87.5-95.8 % have been reported, in-vitro investigations have failed to confirm the clearance. The variety of systems and advised parameters hampers a systematic evaluation. Recommendations for safe and practical treatment protocols, informed consent items, and combination with conventional treatment options are all areas of active work. Currently there is a lack of data concerning the long-term efficacy of laser therapy of onychomycosis; certified treatment protocols are needed.

Antifungal efficacy of lasers against dermatophytes and yeasts in vitro.

Paasch U, Mock A, Grunewald S, Bodendorf MO, Kendler M, Seitz AT, Simon JC, Nenoff P. Int J Hyperthermia. 2013 Sep;29(6):544-50. doi: 10.3109/02656736.2013.823672.

PURPOSE:

Approximately 2-13% of the world population suffers from onychomycosis. Recently, lasers have been introduced for treatment. However, no effect was found with in vitro laser irradiation of pathogens on agar plates. This study aimed to investigate the efficacy of laser irradiation against fungi using an alternative in vitro approach.

MATERIALS AND METHODS:

Lasers of 808, 980 and 1064 nm were used to heat cell culture media and a nail clipping. Trichophyton rubrum. T. interdigitale. Microsporum gypseum. Candida albicans. C. parapsilosis, and C. guilliermondii species were subcultured and subjected to laser treatments (808/980 nm: 9-27 J/cm(2), 6 ms, 12 × 12 or 12 × 50 mm and 1064 nm: 50-240 J/cm(2), 90 ms, 5-10 mm). After irradiation, the fungal elements were transferred onto agar plates using conventional and Drigalski spatulas and were incubated for 6 days.

RESULTS:

The highest increase in temperature was found using a 980-nm laser with a pulse duration of 6 ms and a fluence of 27 J/cm(2). The histology work-up revealed a dissection of the nail plate from the nail bed tissue after laser irradiation. Growth inhibition was only found for C. guilliermondii and T. interdigitale. All other pathogens presented only reduced growth, and C. albicans growth was unaffected.

CONCLUSIONS:
This study demonstrates a clear thermal effect for linear scanning 980-nm and long-pulsed 1064-nm laser systems on either nail clippings or cell culture media. Complete pathogen growth impairment was achieved if temperatures were measured above 50 °C. The results for the 1064-nm system were almost comparable to 980 nm results.

Heat profiles of laser-irradiated nails.

Paasch U, Nenoff P, Seitz AT, Wagner JA, Kendler M, Simon JC, Grunewald S. J Biomed Opt. 2014 Jan;19(1):18001. doi: 10.1117/1.JBO.19.1.018001.

ABSTRACT
Onychomycosis is a worldwide problem with no tendency for self-healing, and existing systemic treatments achieve disease-free nails in only 35 to 76% of cases. Recently, treatment of nail fungus with a near-infrared laser has been introduced. It is assumed that fungal eradication is mediated by local heat. To investigate if laser treatment has the potential to eradicate fungal hyphae and arthrospores, laser heat application and propagation needs to be studied in detail. This study aimed to measure nail temperatures using real-time videothermography during laser irradiation. Treatment was performed using 808- and 980-nm linear scanning diode lasers developed for hair removal, enabling contact-free homogeneous irradiation of a human nail plate in one pass. Average and peak temperatures increased pass by pass, while the laser beam moved along the nail plates. The achieved mean peak temperatures (808 nm: 74.1 to 112.4°C, 980 nm: 45.8 to 53.5°C), as well as the elevation of average temperatures (808 nm: 29.5 to 38.2°C, 980 nm: 27.1 to 32.6°C) were associated with pain that was equivalent to that of hair removal procedures and was not significantly different for various wavelengths. The linear scanning laser devices provide the benefits of contact-free homogeneous heating of the human nail while ensuring adequate temperature rises.

VAPORIZATION OF SOFT TISSUE

(980 nm)

Evaluation of safety and efficacy of 980-nm diode laser-assisted lipolysis versus traditional liposuction for submental rejuvenation: A randomized clinical trial.

Valizadeh N, Jalaly NY, Zarghampour M, Barikbin B, Haghighatkhah HR. J Cosmet Laser Ther. 2015 Jul 3:1-6

ABSTRACT

BACKGROUND:
Submental fat accumulation and skin laxity is a frequent concern of cosmetic patients.

OBJECTIVE:
The aim of this randomized prospective controlled clinical trial was to compare the efficacy and safety of laser-assisted lipolysis and liposuction in the submental rejuvenation.

MATERIAL AND METHODS:
Thirty-six female adults were enrolled in this clinical trial and were categorized into two groups: group 1 underwent 980-nm diode laser with the power of 6-8 W and group 2 underwent traditional liposuction. Patients were evaluated with ultrasonography 2 weeks and 2 months after the procedures.

RESULTS:
Ultrasonographic evaluation reported the significant reduction of fat thickness in each group compared with the baseline (p value < 0.001). At the 2 weeks and 2 months follow-up visit, fat thickness reduction was significantly higher in the lipolysis group (p value < 0.05). Overall patients' satisfaction in lipolysis group was higher than liposuction with 11 (61%) of lipolysis patients being very satisfied in contrast to 10 (55.5%) of liposuction patients reporting "dissatisfied or neutral" results.

CONCLUSION:
Laser-assisted lipolysis using 980-nm diode is approved to be safe and effective for skin tightening and rejuvenation of the submental area and seems to be a better option than traditional techniques for treatment of this cosmetic problem.

Laser assisted lipolysis for neck and submental remodeling in Rohrich type I to III aging neck: a prospective study in 30 patients.

Leclère FM1, Moreno-Moraga J, Alcolea JM, Casoli V, Mordon SR, Vogt PM, Trelles MA. J Cosmet Laser Ther. 2014 Dec;16(6):284-9. doi: 10.3109/14764172.2014.946053. Epub 2014 Sep 19.

ABSTRACT

BACKGROUND:
Since the first studies by Apfelberg in 1994 and the mathematical model by Mordon in 2004, laser lipolysis (LAL) has been on the rise. Laser lipolysis has the advantages of reduced operator fatigue, excellent patient tolerance, quick recovery time, as well as the additional benefit of dermal tightening. This article reports our experience with laser-assisted lipolysis (LAL) in submental and neck remodelling.

METHODS:
Between June 2010 and January 2013, a prospective study was performed on 30 patients treated for Rohrich type I to III aging neck, with LAL. The laser used in this study was a 980 nm diode laser (Quanta system, spa model D-plus, Solbate Olona (VA), Italy). Laser energy was transmitted through a 600 µm optical fiber and delivered in a continuous mode 15 W power. Previous mathematical modelling suggested that 0.1 kJ was required in order to destroy 1 ml of fat. Patients were asked to fill out a satisfaction questionnaire. The cervicomental angle was measured 6 months post-operatively and compared with the preoperative values.

RESULTS:
Other than three patients who developed mild hyperpigmentation that disappeared after 4 months, there were no complications in the series. Pain during the anaesthesia and discomfort after the procedure were minimal. The time taken to return to normal activities was 3.2 ± 1 days. All patients would strongly recommend this treatment. Overall satisfaction was high with both patients and investigators and was validated by decrease in cervicomental angle demonstrating a systematic decrease in fat thickness and improved skin tightening.

CONCLUSION:
LAL is a safe and reproducible technique for remodeling in Rohrich type I to III aging neck. The procedure allows for a reduction in the amount of adipose deposits while providing concurrent skin contraction.

Results of Laser assisted Lipolysis using a 980 nm diode Laser

Yann Renoulet, MD. 2010. Plastic and Reconstructive Surgery Center, Center for Lasertherapy, Elisabeth Krankenhaus Recklinghausen, Recklinghausen, Germany

Background

Laser assisted lipolysis devices are used to heat the adipose and connective tissue as adjunction to liposuction by improving skin laxity and providing hemostasis. With this new technique patients benefit of enhanced body shaping and skin tightening with reduced patient downtime. The efficacy of the 980-nm diode laser for laser lipolysis were evaluated in different body areas

Materials and Methods

Patients were treated with a continuous-wave (CW) power 980-nm diode laser system (QuadroStar+ 980 made by Asclepion Laser Technologies in Jena, Germany). We treated the under lid, submental area, arms, elbow, abdomen, vulva and flanks. A 300 µm fiber was used to treat the face and on all other areas a 600 µm fiber was used to perform the laser lipolysis

Results

Patients observed good to excellent skin textural improvement associated with efficient removal of unwanted fat. And since laser lipolysis is an outpatient procedure, patients were able to resume normal daily activities after 24 h.

Conclusion

Our clinical findings clearly demonstrate that the use of the new QuadroStar+ 980 diode laser system provides safe and efficacious body shaping, fat reduction and enhanced skin tightening. Most of our patients experienced a very pleasing clinical outcome with significant reduction in fat tissue and a smoother and tighter skin appearance with minimal downtime. This in general resulted into a high patient satisfaction.

Introduction

Body reshaping and fat removal has become a very popular desire in our actual modern society. This is one reason why liposuction procedures increasingly continue to be one of the most popular treatment options performed in aesthetic surgery today.

Laser assisted lipolysis which is FDA approved as a method since 2006 is a relatively new, but very effective application which has been developed to improve the traditional method of vacuum assisted liposuction. By using thin fiber optics and a powerful light delivery system, specific Laser wavelengths are precisely transmitted. They interact within the subcutaneous tissue layer selectively heating the target structures (fat layer and fibrous septae only) by use of a well known physical effect called selective photothermolysis.

This technology was already introduced in North America in 1994 and the used pulsed 1064- nm Nd:YAG laser has proven to be safe and effective using a so called wet technique, were a canula of 1 mm in diameter is inserted into the fat tissue during the treatment. Previous histological analyses of human fat tissue treated with this Nd:YAG laser showed reversible and irreversible cell and tissue damage and a significant reduction in bleeding when compared to conventional liposuction.

This study aimed to prove the efficacy of laser assisted lipolysis with a new 980-nm diode Laser (QuadroStar+ 980) manufactured by Asclepion Laser Technologies, Jena, Germany

Materials and Methods

We performed all treatments using a 980-nm high power (25 Watt) diode laser (QuadroStar+ 980, Asclepion Laser Technologies, Jena, Germany, Fig. 1) The laser works in a so called continuous emission mode (CW mode) which provides a very safe and constant absorption on fat tissue.

A special 300- µm and a 600- µm optical fiber delivery system (Fig.2-3) has been used for the treatment of different body areas. Power settings in (Watt) are adjusted and optimized as a important parameter required to be most effective for the treated area: We have used 5 Watt for the face and chin, 10 Watts for arms and elbow and 25 Watts on all abdominal treatment areas. A bright aiming beam (red color) at the end of the optical fiber ensures a precise visualization of the current position through transcutaneous illumination of the treated area (Fig.4).

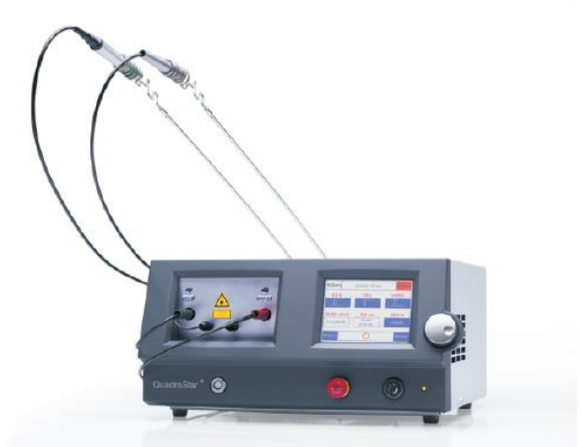


Fig. 1: QuadroStar+ 980, a modern high power table top diode Laser with 532-nm and 980-nm dual wavelength laser output made by Asclepion Laser Technologies, Jena

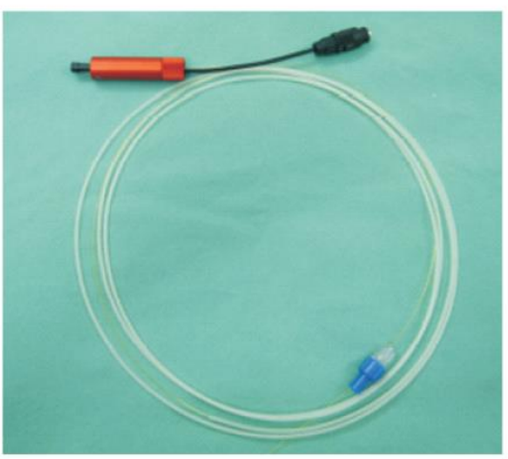


Fig. 2: High precision (300µm in diameter) optical fiber delivery system developed and manufactured by Asclepion Laser Technologies, Jena, Germany

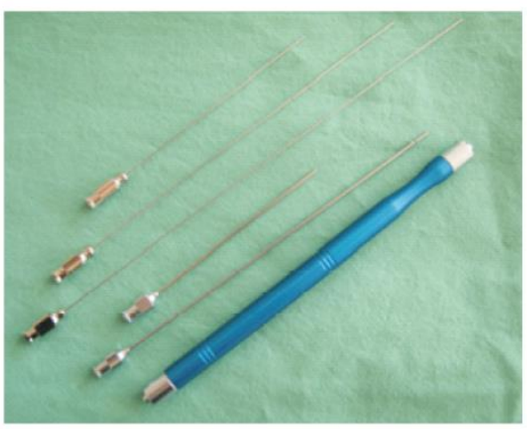


Fig. 3: High precision Laser lipolysis set manufactured by Asclepion Laser Technologies, Jena, Germany.
Handpiece for 600µm optical fiber with a canula length of 15 cm and 8 cm.
Handpiece for 300µm optical fiber with a canula length of 15 cm, 10 cm and 8 cm

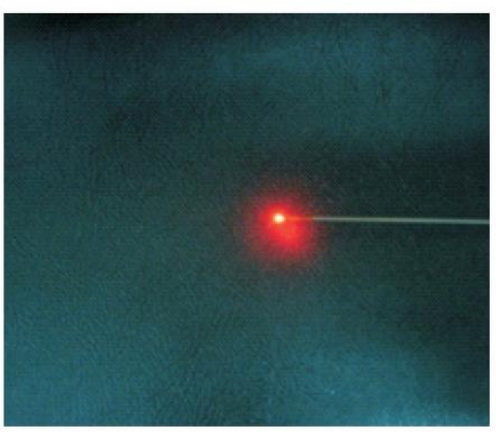


Fig. 4: Bright red aiming beam output for clear visualisation of the current position with a 300µm fiber set during the treatment.

Technique

All procedures were performed following a strictly outpatient clinic setting as recommended by the American Society for Dermatologic Surgery. The areas to be treated were marked with a surgical marker first. Afterwards the treatment areas have been further prepared, disinfected and draped in sterile fashion. We used the standard wet infiltration technique with Klein'sche solution in all our cases. After infiltration of the tumescent solution a 1mm stitch incision was made with a # 11 blade. The microcanula was then inserted through the incision point into the subcutaneous fat layer and moved according to the recommended fan technique in different layers of the skin parallel to the surface. We tried to maintain a constant speed of approximately 10cm per second. During the entire laser lipolysis procedure protective eyewear was used by the patient and the staff. After laser lipolysis, the liquefied fat was aspirated using a high vacuum liposuction device. After the procedure and the following end disinfection a compressive garment was applied to the treatment area. The patients have been instructed to wear the compressive garment day and night for almost 7 days and for a period of 2 more weeks just during the night.

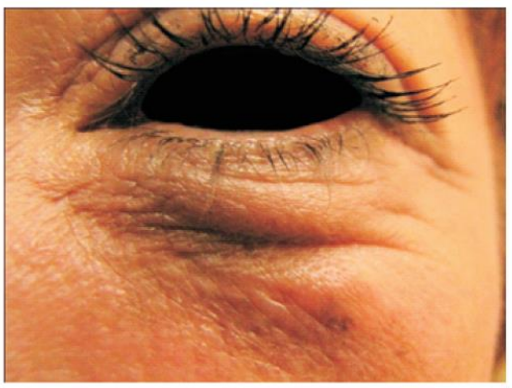
Results

Since July 2009, 53 cases of laser Lipolysis have been sucessfully performed using this new diode Laser

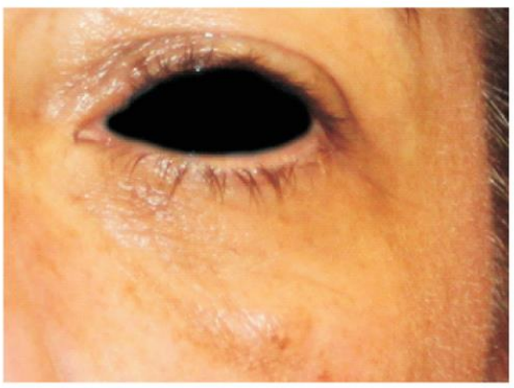
Treated body areas:		**Energy used per area:**					
Under lid:	3	Under lid:	468	to	535	J	per side
Chin:	7	Chin:	4796	to	5582	J	
Upper arms:	10	Upper arms:	6182	to	11282	J	per side
Elbows:	4	Elbows:	3454	to	4778	J	per side
Abdomen:	21	Abdomen:	23886	to	27992	J	
Flanks:	7	Flanks:	8732	to	12745	J	per side
Vulva:	1	Vulva:	2531			J	

Results

48 year old patient

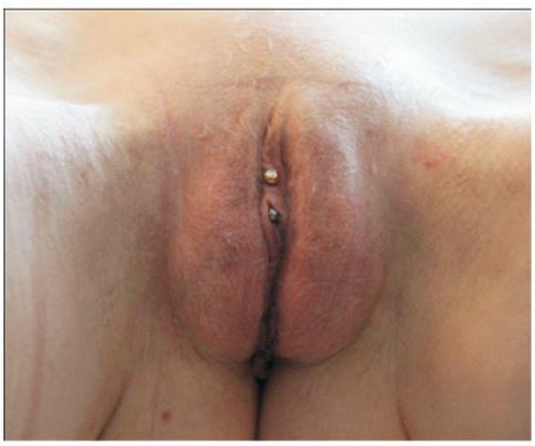


Before



After 4 months

52 year old patient after failed fat injection



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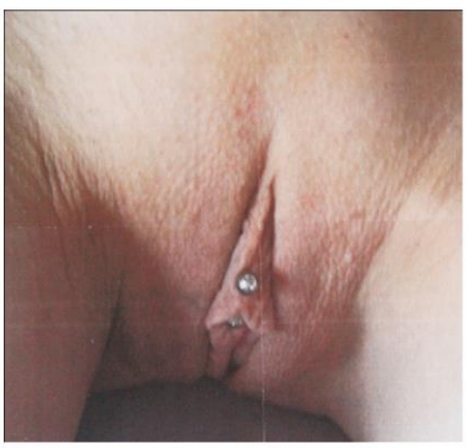
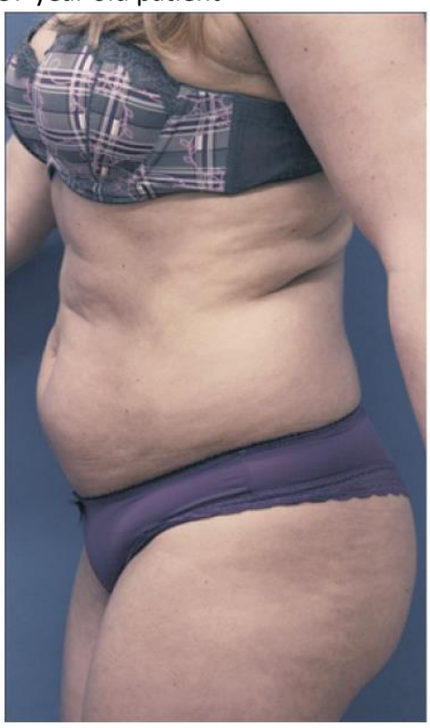


After 1 week

Results

37 year old patient



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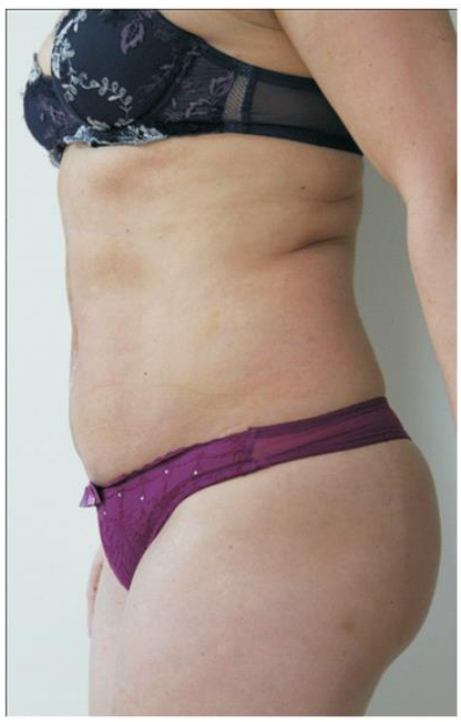
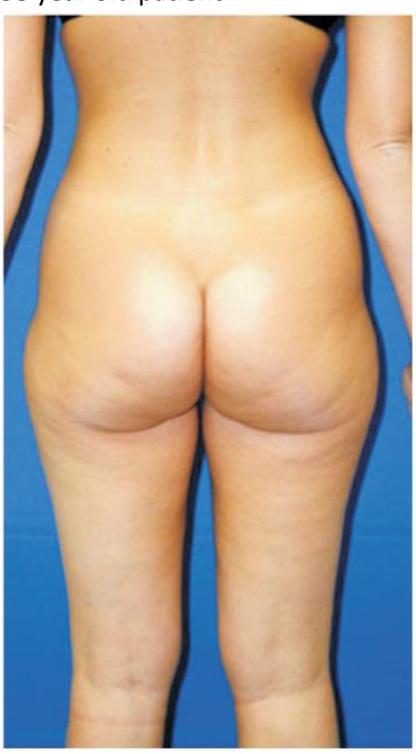
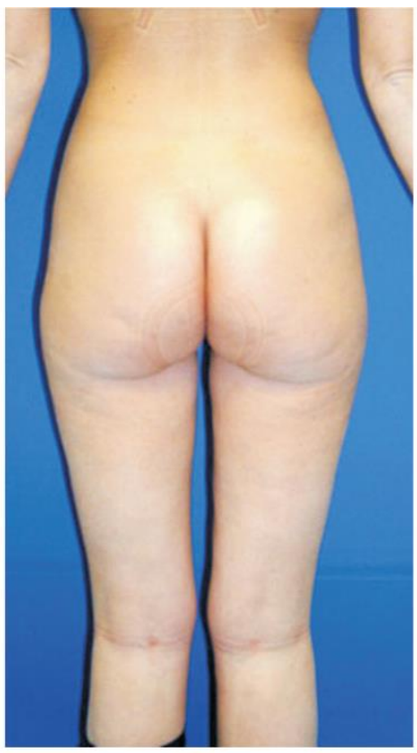


After 1 week

38 year old patient

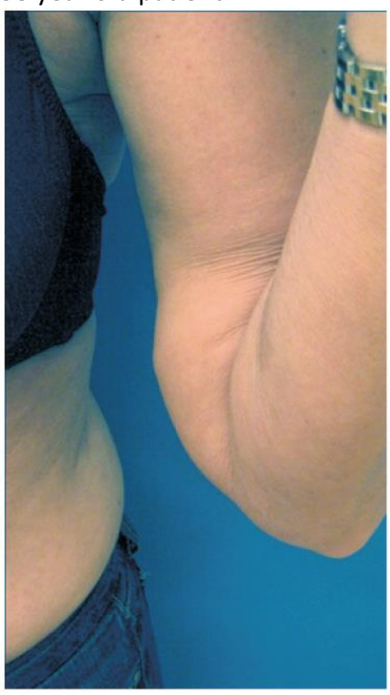


Before

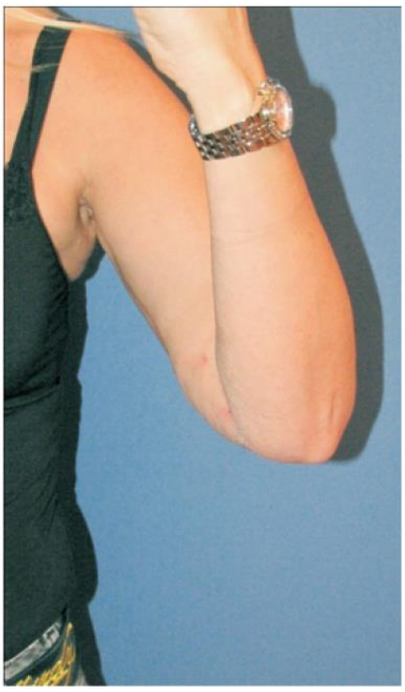


After 1 month

38 year old patient



Before



After 1 month

All of our patients returned to work on the very next day after procedure. The post operative pain could be treated with non steroidal anti-inflammatory drug such as ibuprofen at a dose of 800mg (1-1-1) for a period of 3 days if required.

Clinical results were excellent with remarkable improvements in 100% of our patients. All patients reported a high level of satisfaction and some asked for further treatment of other areas. All patients appreciated the minimal downtime and the tightening and smoothing of their skin structure as a final result of the treatment.

Discussion

Clinical experience and previous studies have shown that proper heating of the dermis provides additional skin retraction. The first studies were proposed with a Nd:YAG laser with a wavelength of 1064-nm but laser lipolysis is still a new technique under development. Our actual clinical experience with the new 980nm diode laser in CW mode confirmed that excellent clinical outcome and reproducable results can be performed. The very high patient satisfaction proved the efficacy and safety of this new diode Laser procedure. The ease of the treatment, especially in difficult-to-treat regions such as the submental region and the under lid area may be explained by the possibility to use very small 300 µm fibers with the QuadroStar+ 980.

Conclusion

The study demonstrates that the removal of fat with simultaneous tissue contraction due to collagen fragmentation and inflammatory response can be effectively performed in all body areas using the QuadroStar+ 980-nm diode laser (Asclepion Laser Technologies, Jena, Germany).

Safety of Laser assisted Lipolysis using a 980 nm diode Laser

Yann Renoulet, MD. 2010. Plastic and Reconstructive Surgery Center, Center for Lasertherapy, Elisabeth Krankenhaus Recklinghausen, Recklinghausen, Germany

Background
Laser assisted lipolysis devices are used to heat the adipose and connective tissue as adjunction to liposuction by improving skin laxity and providing hemostasis. With this new technique patients benefit of significant enhanced body shaping and skin tightening results with reduced patient downtime. The safety of a new 980-nm diode laser for laser lipolysis were evaluated using resected full skin followed by histological analyses.

Materials and Methods
After abdominal dermolipectomie a 300 µm and a 600 µm fiber was used to perform a Laser lipolysis. We used the new powerful QuadroStar+ 980 diode laser from Asclepion Laser Technologies, Jena. After using different parameters varying Energy, Power and Time the skin samples with the complete fat layer have been histologically analyzed.

Results
The histological analysis clearly confirmed the safeness of this new CW (continuous wave) diode technique which left the epidermal layer fully intact without any modifications but produced significant and selective thermal effects on the adipose and connective target tissue.

Conclusion
The study demonstrate and confirm the safeness in performing Laser assisted lipolysis procedures with the new Asclepion QuadroStar+ 980 diode laser. The safety profile of this new laser allows to perform effective treatment procedures resulting in significant improved clinical outcome while minimizing side effects and damage of the epidermal layer.

Introduction
Body reshaping and fat removal has become a very popular desire in our actual modern society. This is one reason why liposuction procedures increasingly continue to be one of the most popular treatment options performed in aesthetic surgery today.
Laser assisted lipolysis which is FDA approved as a method since 2006 is a relatively new but very effective application which has been developed to improve the traditional method of vacuum assisted liposuction. By using thin fiber optics and a powerful light delivery system, specific Laser wavelengths are precisely transmitted. They interact within the subcutaneous tissue layer selectively heating the target structures (fat layer and fibrous septae only) by use of a well known physical effect called selective photothermolysis.
This technology was already introduced in North America in 1994 and the used pulsed 1064- nm Nd:YAG laser has proven to be safe and effective using a so called wet technique, were a canula of 1 mm in diameter is inserted into the fat tissue during the treatment. Previous histological analyses of human fat tissue treated with this Nd:YAG laser showed reversible and irreversible cell and tissue damage and a significant reduction in bleeding when compared to conventional liposuction.
This study aimed to prove the safeness of laser assisted lipolysis with a new 980-nm diode Laser (QuadroStar+ 980) manufactured by Asclepion Laser Technologies, Jena, Germany

Materials and Methods

We performed all treatments using a 980-nm high power (25 Watt) diode laser (QuadroStar+ 980, Asclepion Laser Technologies, Jena, Germany, Fig. 1) The laser works in a so called continuous emission mode (CW mode) which provides a very safe and constant absorption on fat tissue.

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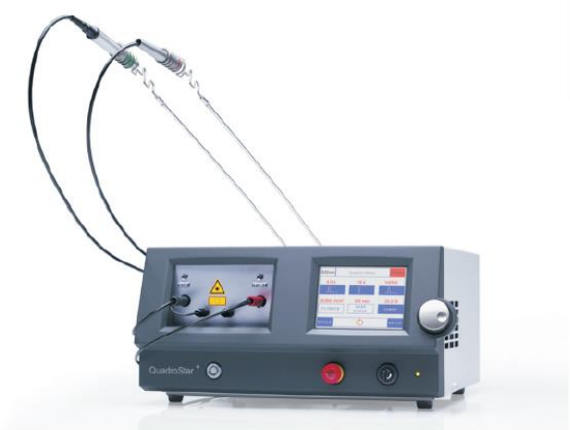

Fig. 1: QuadroStar+ 980, a modern high power table top diode Laser with 532-nm and 980-nm dual wavelength laser output made by Asclepion Laser Technologies, Jena

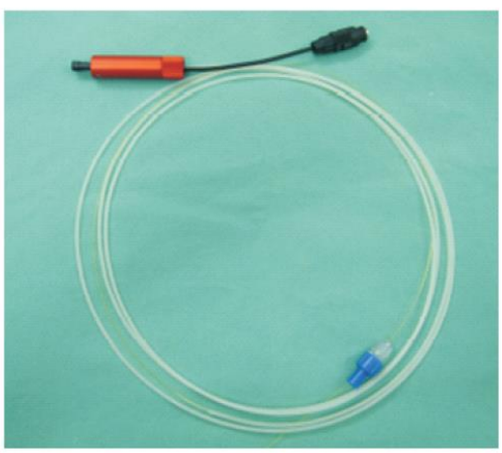

Fig. 2: High precision (300µm in diameter) optical fiber delivery system developed and manufactured by Asclepion Laser Technologies, Jena, Germany

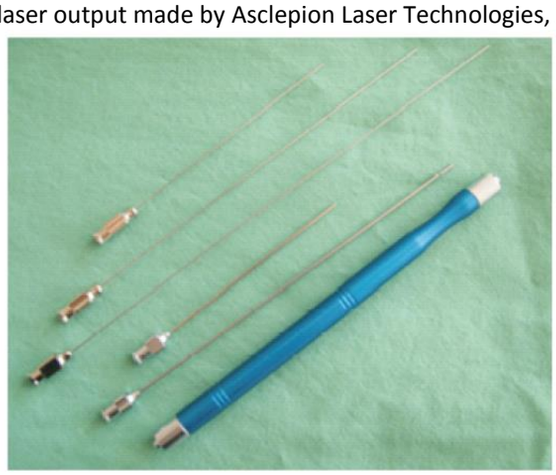

Fig. 3: High precision Laser lipolysis set manufactured by Asclepion Laser Technologies, Jena, Germany.
Handpiece for 600µm optical fiber with a canula length of 15 cm and 8 cm.
Handpiece for 300µm optical fiber with a canula length of 15 cm, 10 cm and 8 cm

Fig. 4: Bright red aiming beam output for clear visualisation of the current position with a 300µm fiber set during the treatment.

Technique

After abdominal dermolipectomie the resected full skin has been used to test different parameters of the laser as energy, power and time. Histological analyses were made from all test areas.

First we used the same power (5 Watt with the 300- µm fiber and 20 Watt with the 600- µm fiber in CW modus) in different layers of the skin moving parallel to the surface and maintaining a constant movement speed of 10cm per second. This protocol was used to demonstrate the effects of a standard performed laser lipolysis

In a second scenario we have modified the applied energy within a range from 0 Joule to 380 Joules but without any movement of the canula which has been placed in the upper layer of the subcutis. This protocol was used to prove the safety of the procedure even in case the surgeon does not perform the recommended proper technique.

Results

The histological analysis of the full skin layer cross section after application of energy with a canula (300- µm) and a speed of 10cm per second has shown a 500- µm tunnel formation (Fig.5) with no epidermal destruction (Fig.6).

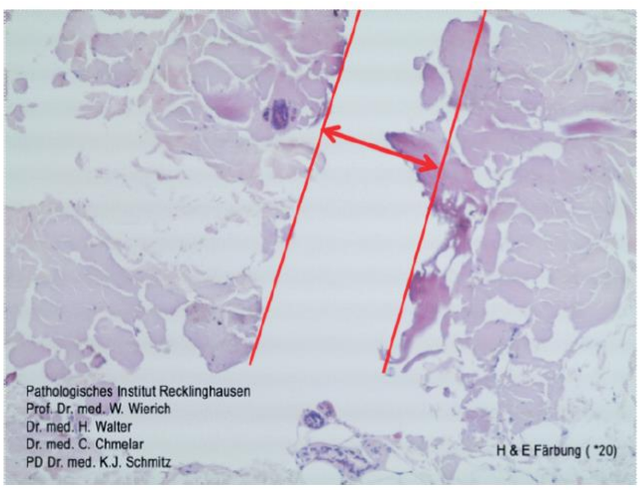

Fig. 5: 500-µm tunnel formation after the use of a thin 300 µm optical fiber

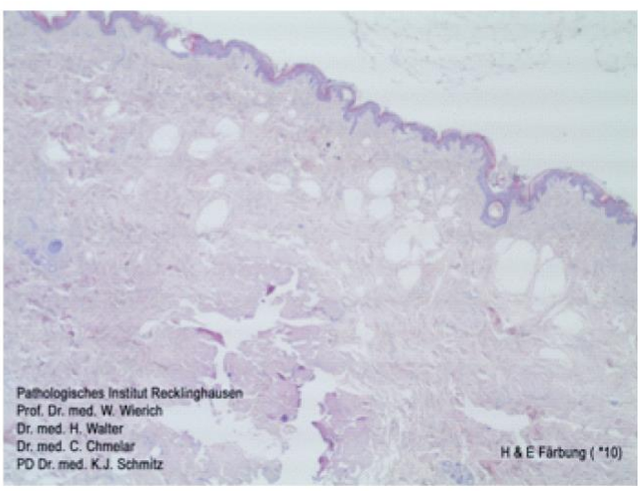

Fig. 6: No signs of epidermal destruction by using the 300-µm optical fiber inserted in the upper layer of the subcutis

Additional histology findings confirmed a perivascular inflammatory response (Fig. 7-9). In the subcutis histological analyze can show a fragmentation of the collagen (Fig.10)

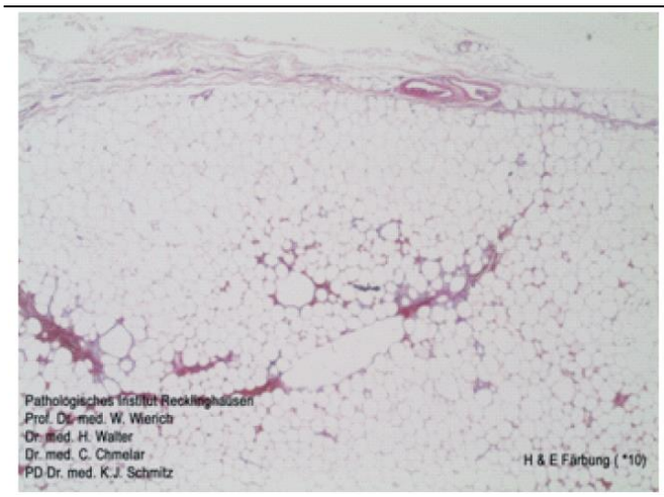

Fig. 7: 10x magnification. Perivascular inflammatory response

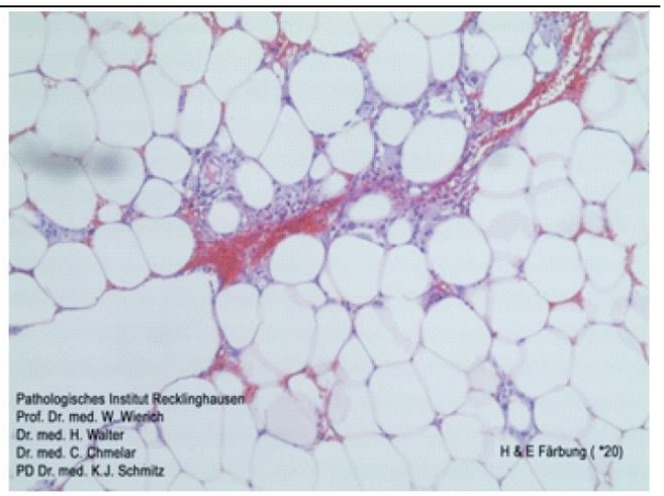

Fig. 8: 20x magnification. Perivascular inflammatory response

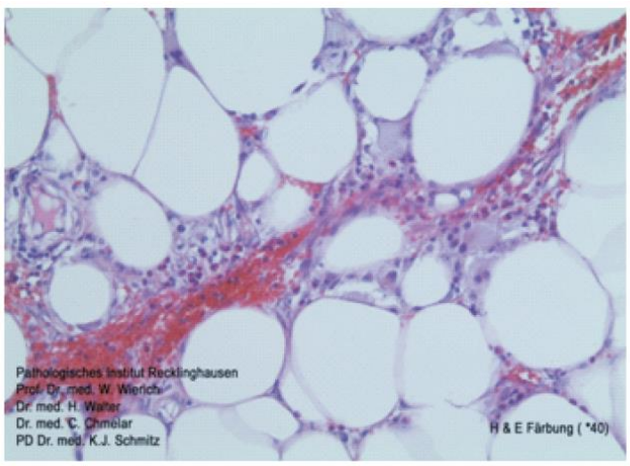

Fig. 9: 40x magnification. Perivascular inflammatory response

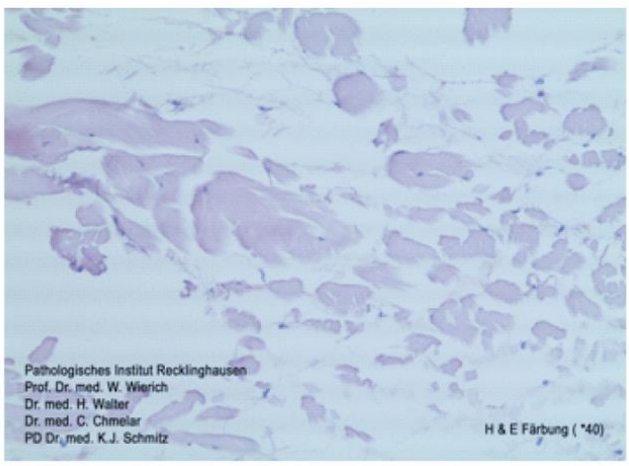

Fig. 10: 40x magnification. Collagen fragmentation. Histological analysis of the subcutis cross section shows a fragmentation of the collagen (Fig.10)

In the second part of the study we applied different amounts of energy in the upper layer of the subcutis but without moving the canula in a defined pattern (Fig.11).

60 J	100 J	140 J	180 J	220 J	0 J
260 J	300 J	0 J	340 J	380 J	No Canula

Fig. 11 Pattern of applied energy

In order to be sure not to interfere with the histological analyses we did not communicate the pattern to the pathologist. And in one area we have not given informations that no canula was inserted. (Fig.12)

No Canula	No Tunnel
0 J	Tunnel without Modification of adipocytes
60 J	Tunnel without Modification of adipocytes
100 J	Tunnel without Modification of adipocytes (Fig.13-14)
140 J	Tunnel, Homogenization in the Dermis, (Fig.15-16)
180 J	Tunnel, Homogenization in the Dermis, pale adipocytes
220 J	Tunnel, Homogenization in the Dermis, pale adipocytes (Fig.17-18)
260 J	Tunnel, Homogenization in the Dermis, pale adipocytes
300 J	Tunnel, Homogenization in the Dermis, pale adipocytes
340 J	Tunnel, Homogenization in the Dermis, pale adipocytes, Subepidermal vescia
380 J	Tunnel, Homogenization in the Dermis, pale adipocytes, Necrosis of Fat Tissue

Fig. 12 Results dependant on the applied energy

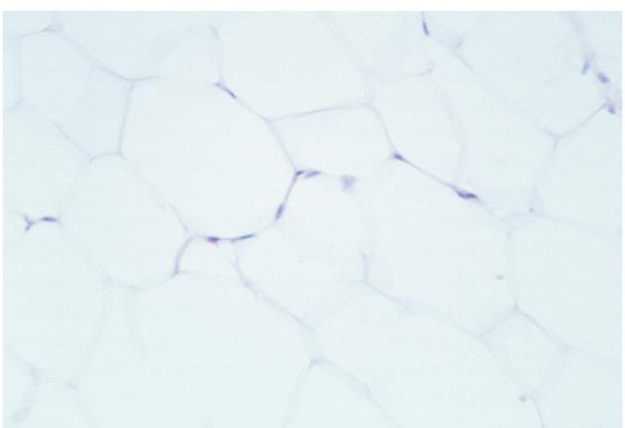

Fig. 13: 200x magnification. 100-J applied energy. Swollen lipocyte nucleous and partly lost of nucleous

Fig. 14: 200x magnification. 100-J applied energy. Swollen lipocyte nucleous and partly lost of nucleous

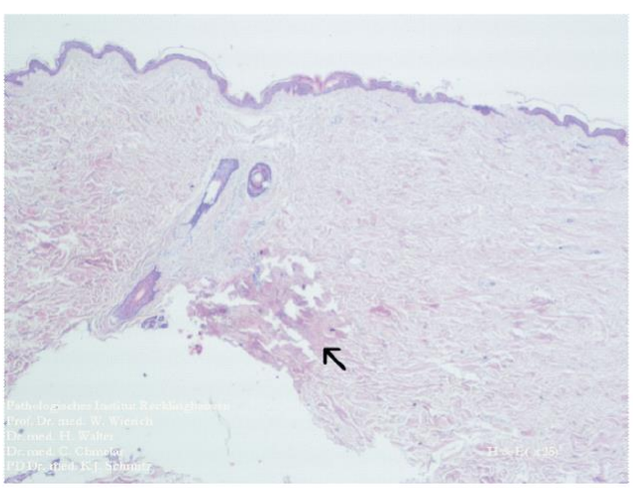

Fig. 15: 25x magnification. 140-Joule applied energy. Homogenization in the dermis

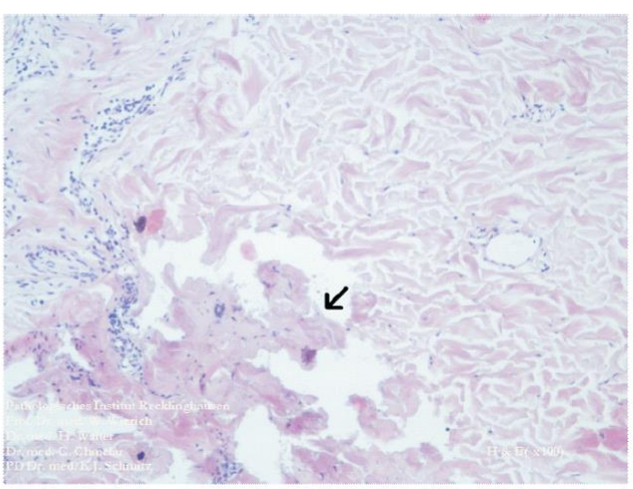

Fig. 16: 100x magnification. 140-Joule applied energy. Homogenization in the dermis

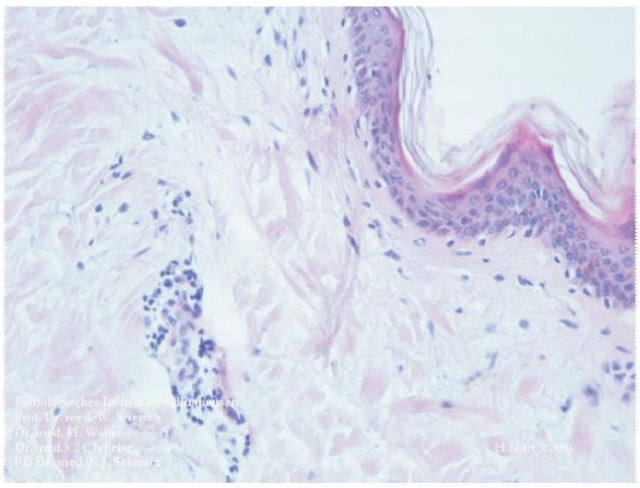

Fig. 17: 200x magnification. 220-Joule applied energy. Perivascular lymphocytic inflammation

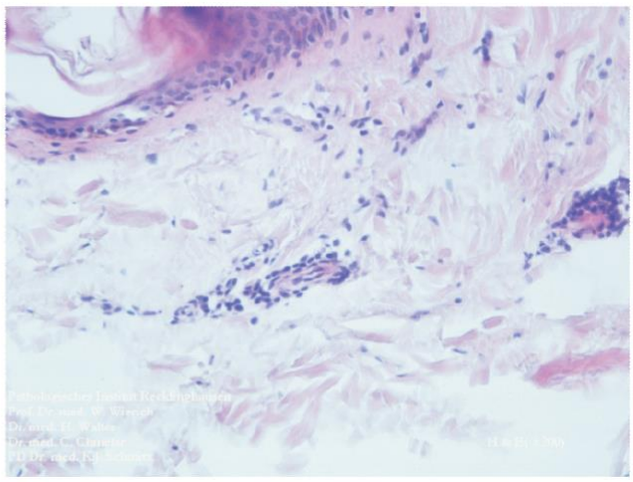

Fig. 18: 200x magnification. 220-Joule applied energy. Perivascular lymphocytic inflammation

Discussion

In the first part of the study, histological analyses could prove the efficient removal of fat with simultaneous tissue contraction due to collagen fragmentation and inflammatory response. The epidermal layer remains to be totally uneffected without any sign of destruction or damage.

The used 980-nm wavelength has an absorption coefficient in fat tissue of a=1,417-m-1 (R.L.P. van Veen and H.J.C.M. Sterenborg, A. Pifferi, A. Torricelli and R. Cubeddu, Annual BIOMED Topical Meeting, 2004). The absorption coefficient in water is a=43-m-1 (G. M. Hale and M. R. Querry, Appl. Opt., 12, 555--563, 1973) (Fig. 19)

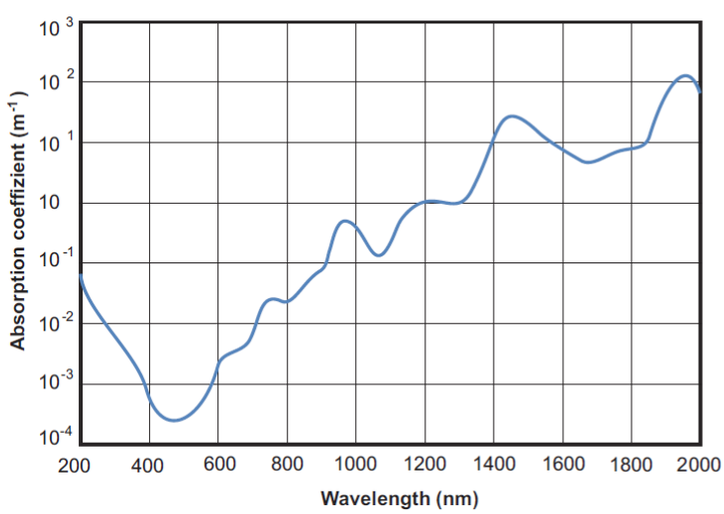

Fig. 19

Absorption coefficient in water

The use of the QuadroStar+ 980 with a 980 nm diode wavelength results in a more efficient heating of the adipose tissue and the dermis after tumescence (Fig. 20).

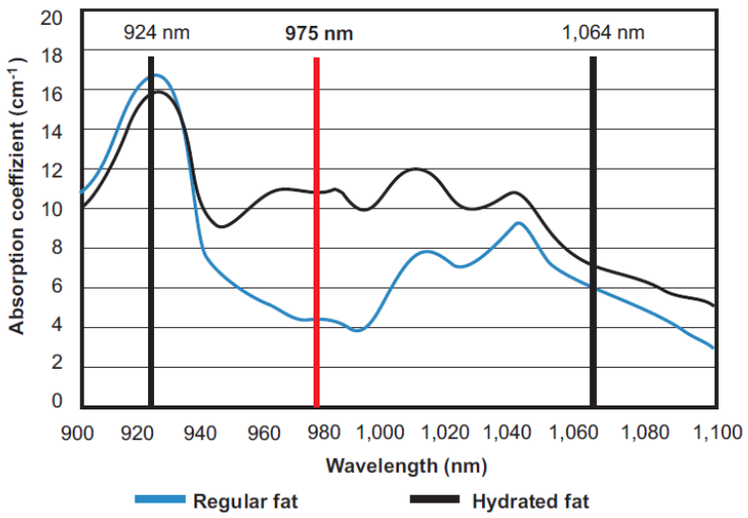

Fig. 20

Absorption coefficient of fat under physiological conditions and hydrated conditions (with tumescence)

Clinical experience and previous studies have shown that proper heating of the dermis provides additional skin retraction. In principle, as the adipose connective tissue also contains collagen heating of the septa together with reduced mechanical trauma to the tissue helps to preserve and tighten the adipose connective tissue leading to further skin retraction. Fairly immediate skin smoothing is observed while over time the skin retraction becomes even more pronounced as the septa and meshwork separating adipocytes are replaced with new connective tissue to remodel skin and body contours.

Conclusion

The study demonstrates that the removal of fat with simultaneous tissue contraction due to collagen fragmentation and inflammatory response can be safely performed in all body areas using the new QuadroStar+ 980 diode laser. (Asclepion Laser Technologies, Jena, Germany).

Studies Book

- QuadroStarPRO -

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