PICOHI™ FOR PIGMENTATION AND REJUVENATION:

Efficacy of a laser with a pulse duration of 300 ps in skin rejuvenation and treatment of pigmentation disorders in Asians

Jiehoon Kim, M.D.
Dr. Kim's Skin & Laser Clinic
Suwon, Korea

Conflicts of Interests

- ✓ **This lecture was sponsored by Hironic Co. (Youngin, Korea), including lecture expenses.**
- ✓ **Lecturer is a clinical advisor of Hironic Co.**
- ✓ **No stock ownership.**
- ✓ **Lecturer has been using the PICOHI for over 3 year.**

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ **Introduction**
- ✓ **About Hironic Co.**
- ✓ **Advantages of PICOHI™**
- ✓ **PICOHI™ for pigmentary disorders**
- ✓ **PICOHI™ for skin rejuvenation**
- ✓ **Conclusion**

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ **Introduction**
- ✓ About Hironic Co.
- ✓ Advantages of PICOHI™
- ✓ PICOHI™ for pigmentary disorders
- ✓ PICOHI™ for skin rejuvenation
- ✓ Conclusion

Selective photothermolysis

In 1983, Anderson and Parrish
proposed the concept of **Selective photothermolysis**,
which established the **framework for the treatment of pigmented and vascular lesions** today.

Selective photothermolysis requires a **target chromophore** that may be penetrated deep enough to be **absorbed selectively by the target**.

The goal is
to **lyse the chromophore** quickly and efficiently with **minimal damage to surrounding tissue** in order to bring clearance to the lesion.

Anderson RR, Margolis RJ, Watenabe S, Flotte T et. al.
Selective photothermolysis of cutaneous pigmentation by Q-switched Nd:YAG laser pulses at 1064, 532, and 355 nm.
J Investig Dermatol, 1989, 93:28–32

the Age of Pico Second Laser

▶ What is the Picosecond?

Prefix	Symbol	Numerical Value	Power of 10 Equivalent
Milli	ms	0.001	10^{-3}
Micro	μS	0.000001	10^{-6}
Nano	ns	0.000000001	10^{-9}
Pico	**ps**	**0.000000000001**	**10^{-12}**
femto	fs	0.000000000000001	10^{-15}
atto	as	0.000000000000000001	10^{-18}

cf) NANOSECOND PULSE? → One BILLIONTH of a second

PICOSECOND PULSE? → One TRILLONTH of a second

Significance of Picosecond Laser

- **Picosecond laser**

  → Target destroy mainly by **Photomechanical effect**

Nanosecond Laser	Picosecond Laser
Photothermal	**Photomechanical**
Thermal Relaxation Time	Stress Relaxation Time

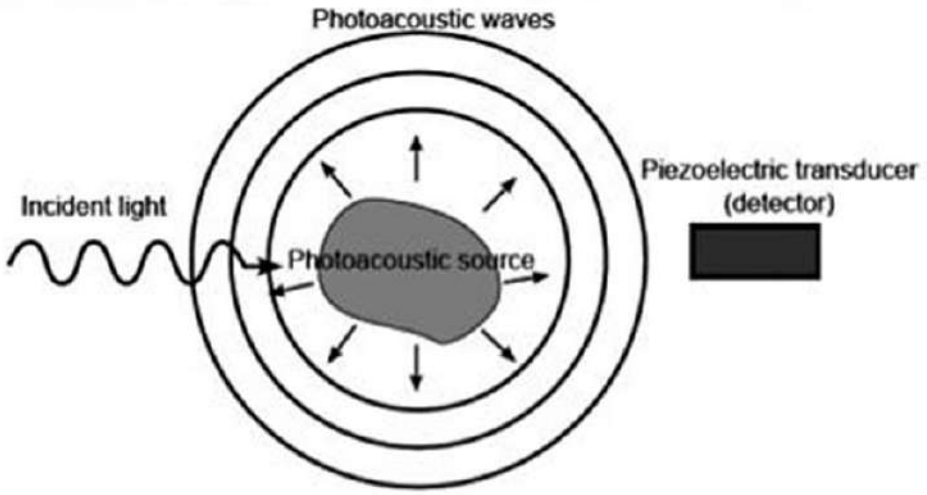


Fig. 1. Basic principle of the photoacoustic effect. Incident light is absorbed and converted in acoustic waves by thermal expansion. The acoustic waves are detected by a piezoelectric transducer.

Significance of Picosecond Laser

- **Picosecond laser**

  Target chromophore: **Photothermal effect < Photomechanical effect**

  → **minimize thermal effect** → **minimize side effect**

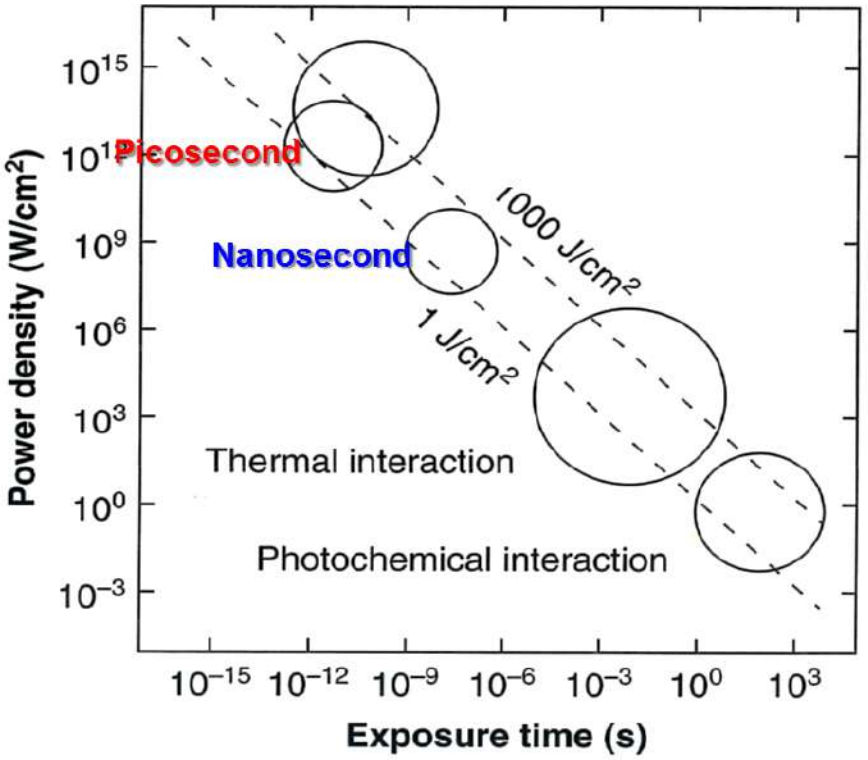
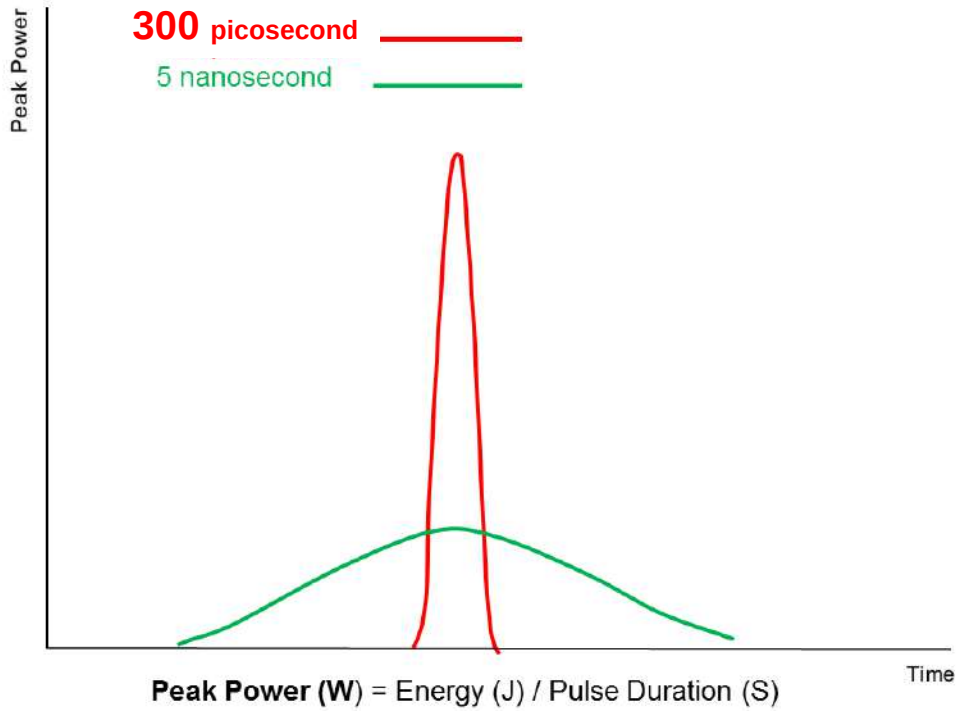


Figure 1.7 The relative mechanisms of action as a function of power density ranges. *Source*: Modified from Ref. 157.

Significance of Picosecond Laser

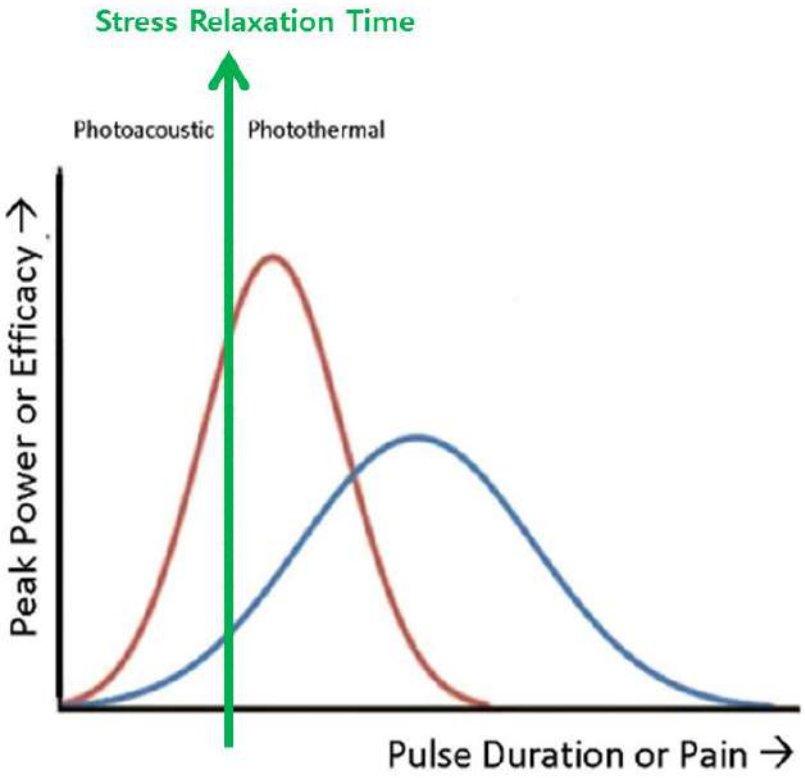
- **Picosecond laser**
  - → **Shortest picosecond pulses & Highest peak power**

PICOHI → 300 pico sec (peak power: 1.67 GW)



Significance of Picosecond Laser

- **Picosecond laser**
  - → **SRT (Stress Relaxation Time): 300 ps Vs 750 ps**
  - → **below SRT: photomechanical effect > photothermal effect**
  - → **advantages in treatment of pigmentary target**




The Age of Nano Second Laser
gone

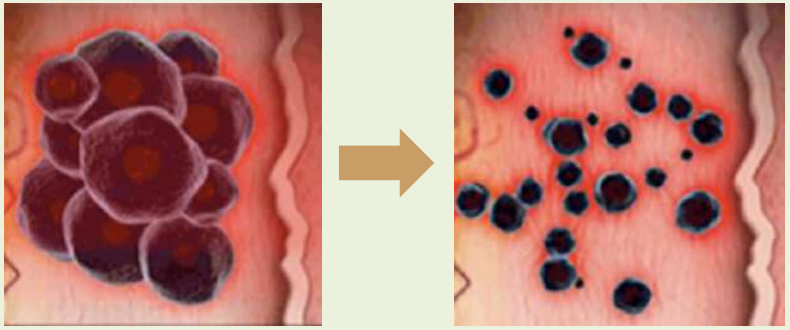

The Age of Pico Second Laser
arising

Clinical significance of Picosecond laser

Nano Laser

Photothermal effect

Not precise destruction of melanin pigment
Damages on near by tissues



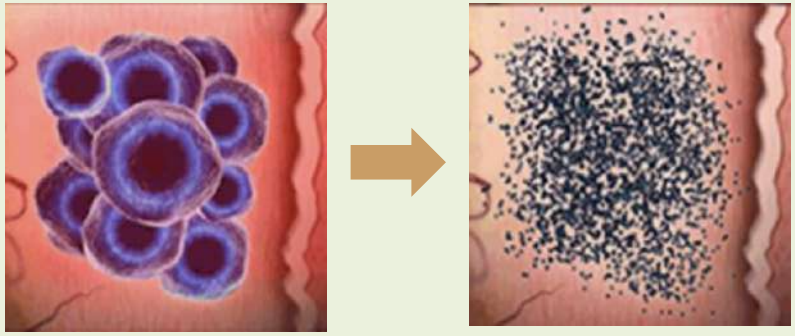
[Marks after Nanosecond laser]

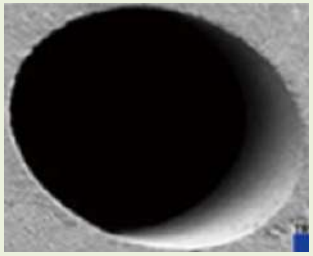
The heat damages melanin pigment and affects the surrounding tissue.

Pico Laser

Photomechanical effect

Precise destruction of melanin pigment
Targeting on the pigment is possible with great damage effects





[Marks after Picosecond laser]

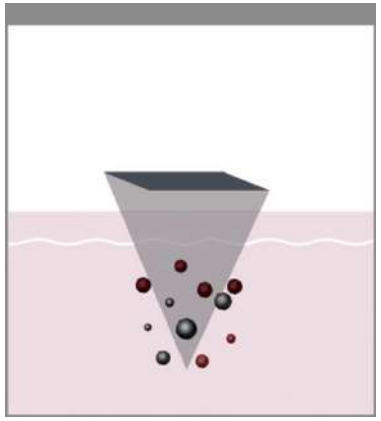
Physical destruction on melanin pigment while having no affects on the surrounding tissue.

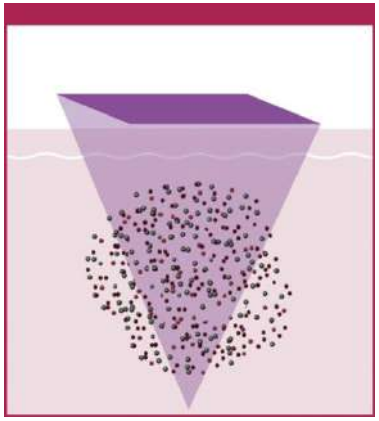
Clinical significance of Picosecond laser

Q-switched Nd:YAG Laser

Vs

Picosecond Nd:YAG Laser





Nanosecond lasers

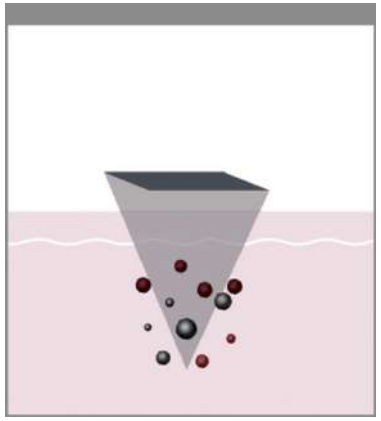
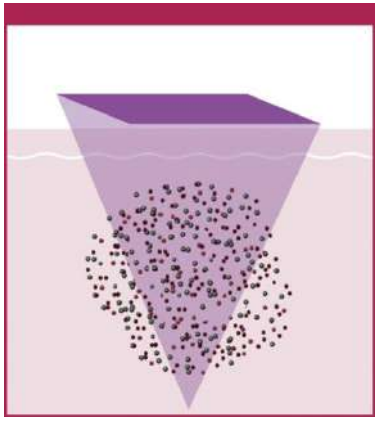
rely on photothermal action,

delivering heat to the pigment and surrounding tissue.

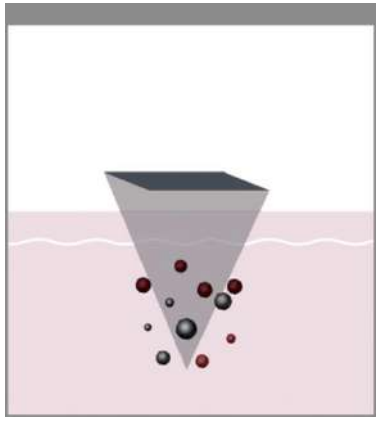
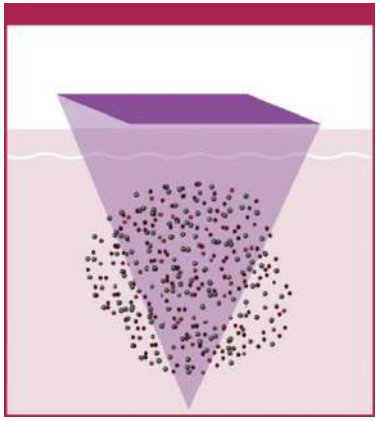
Only ultrashort pulse duration

triggers photomechanical effect.

Clinical significance of Picosecond laser

Q-switched Nd:YAG Laser	Vs	Picosecond Nd:YAG Laser
		
More Side Effect	→	Less Side Effect
More Discomfort	→	Less Discomfort
More Treatment	→	Fewer Treatment
Not Clearance Tattoo Removal	→	Clearance Tattoo Removal

Clinical significance of Picosecond laser

Q-switched Nd:YAG Laser	Vs	Picosecond Nd:YAG Laser
		
More Side Effect	→	Less Side Effect
More Discomfort	→	Less Discomfort
More Treatment	→	Fewer Treatment
Not Clearance Tattoo Removal	→	Clearance Tattoo Removal

▶ Picosecond laser

High speed of light energy targets pigmentations more effectively, minimizing discomfort, pain, side effect and downtime.

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ Introduction
- ✓ **About Hironic Co.**
- ✓ Advantages of PICOHI™
- ✓ PICOHI™ for pigmentary disorders
- ✓ PICOHI™ for skin rejuvenation
- ✓ Conclusion

Hironic: KOSDAQ listed company

cf) NASDAQ: USA
KOSDAQ: South Korea

2014. 12. 17.

RF+IR combination stimulrater (New MIDAS)

CO2 Fractional Laser (MIXEL)

Intense pulsed light (MIPL)

808nm Diode Laser for Hair Removal (MIDEPI)

Acne photo therapy (Miraclear)

PICOHI

1064/532 nm Picosecond Nd:YAG laser
HIRONIC, Korea

HIRONIC

Cryolipolysis (MICOOL & MICOOL-A)

FUE Hair Transplant (EASYMO)

2nd Generation HIFU (V-RO, doublo & doublo-S & doublo-m)

HIFU Vaginal-plasty (doublo-v)

HIFU (High Intensity Focused Ultrasound) : technical basis & clinical applications

저자 김지훈

HIRONIC

저 자 김지훈 (Jiehoon Kim, M.D.)
김지훈피부과의원 원장/ 피부과 전문의

Dr Kim's Skin & Laser Clinic

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ Introduction
- ✓ About Hironic Co.
- ✓ **Advantages of PICOHI™**
- ✓ PICOHI™ for pigmentary disorders
- ✓ PICOHI™ for skin rejuvenation
- ✓ Conclusion

Advantages of PICOHI™

PICOHI Specification

Wavelengths		Nd:YAG 1064nm, 532nm
Pulse Duration		300ps, 275ps
Peak Power		1.67GW, 0.91GW
Pulse Energy[mJ] Max		500mJ, 250mJ
Repetition		1, 2, 5, 10Hz
Handpiece	Zoom H/P	1064nm (Spot size : 2 to 10mm)
		532nm (Spot size : 1.5 to 7.5mm)
	Collimated H/P	1064nm (Spot size : 10mm)
	VMLA H/P	1064nm (Beam size : 13mm)
	ZMLA H/P	1064nm (Beam size: 4 to 12mm)
	DOE H/P	1064nm (Beam size: 10 x 10mm)
		532nm (Beam size: 10 x 10mm)
Convenience system		RMS System (WIFI)
		Wide LCD 12.1"
		Upper shelf display zone
		Handpiece storage
		Hidden front handle & Back handle
General	Electrical Power	200~240 VAC, 4.4 KVA, 50/60Hz
	Dimensions	455(W) x 1040(L) x 975(H) mm
	Weight	150kg

Advantages of PICOHI™

PICOHI™300

Experience,
the real photoacoustic effect

1 Next generation pico laser **Real 300ps pulse duration**

Stable technology providing pulse duration of 300ps.

2 Non-photothermal effect, **Photomechanical effect treatment**

Upgraded from photothermal effect treatment, photomechanical effect treatment allows selective treatment on targeted areas.

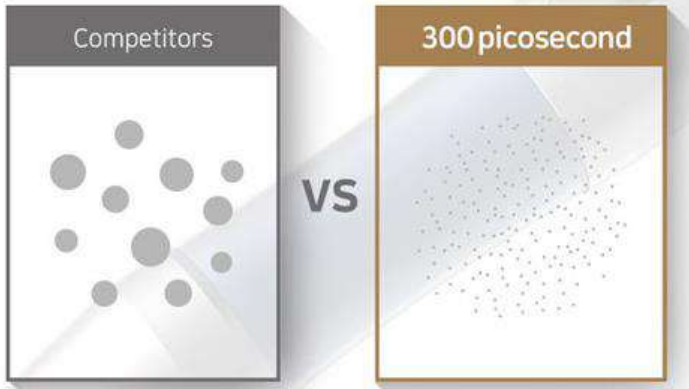
3 Various handpieces for **improving of skin rejuvenation**

DOE & MLA handpieces can provide various types of treatment in multiple sizes and depths depending on the treatment area.

Advantages of PICOHI™

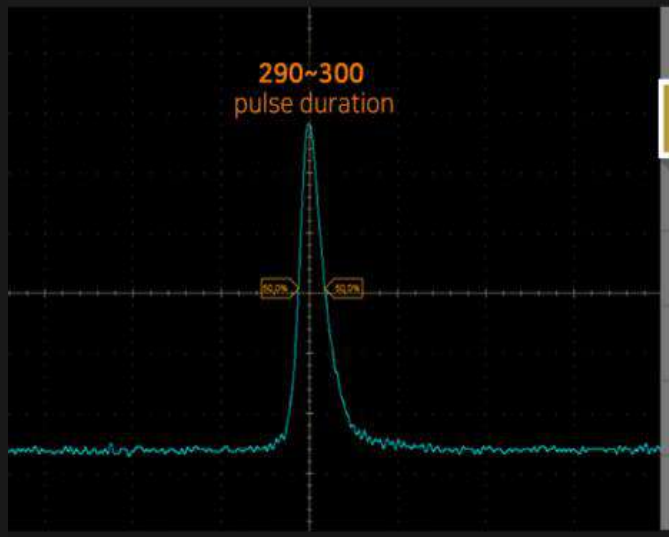
Why 300ps?

- Stress Relaxation Time(SRT) of 1㎛ melanosome is 300ps.
  The shock wave caused by the picosecond pulse acts only on the melanosome without being transmitted to the surrounding tissues.
- Thermal Relaxation Time(TRT) of 10-100nm tattoo ink particle is 100ps-10ns.
  300ps is equipped with appropriate pulse duration to destroy smaller particles than other picoseconds lasers.
- Micro bubble occurs in the skin more strongly by high peak power related to shorter pulse duration. High peak power with 300ps pulse duration increases LIOB formation and skin rejuvenation effect.

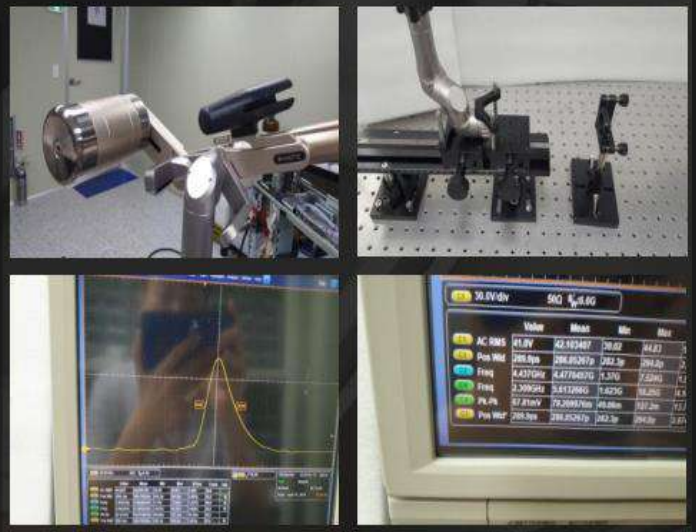


Advantages of PICOHI™

01. High Power



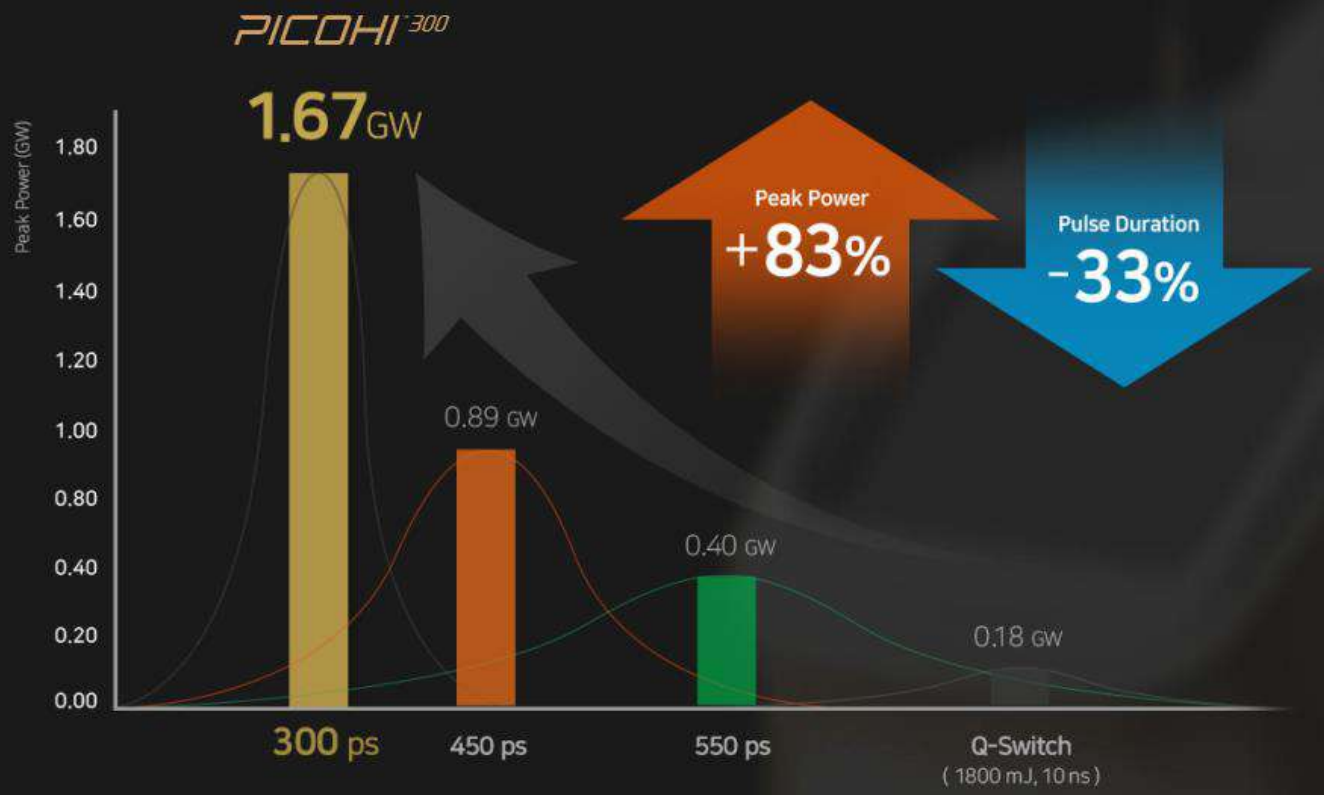
	Pos Wid
Value	297.1 ps
Mean	297.08333p
Min	297.1p
Max	297.1p
St Dev	0.0
Count	1.0



10Hz 반복에도 안정적으로 에너지 및 300ps pulse duration을 유지함을 입증하는 테스트 완료

Advantages of PICOHI™

01. HIGH Power



Q-switch 또는 다른 Pico Laser 대비 높은 peak power는 문신 제거, 색소 치료, 피부 재생 효과를 극대화 함

Advantages of PICOHI™

High Effect

LIOB effect with PICOHI VMLA handpiece (biopsy result)

Bubble within the skin helps to regenerate tissues which create new collagen for skin rejuvenation effect. MLA & DOE handpieces of PICOHI provides effective rejuvenation treatment.

Rejuvenation

VMLA H/P

Precise treatment at different layers from Deep dermis to Epidermis with 13mm beam size.

Depth depending on the target can be adjusted(0.5mm)

ZMLA H/P

Cover the various lesion sizes and providing effective results.

Adjustable Beam Size depending on the treatment (4~12mm)

DOE H/P

Synergy rejuvenation effect with MLA handpieces.

Very even energy uniformity with 10mm(7*7 dots) spot size

Pigmentation

Collimated H/P

Stable and effective toning treatment with same spot size regardless of laser separation distance.

1064nm collimation / 10mm spot size

Zoom H/P

Various pigmentation treatment possible.

532nm · 1064nm Zoom / 2~10mm spot size

Advantages of PICOHI™

Tattoo Removal

Clinical Data

Lentigine Treatment | after 1 treatment

532nm Zoom : 3mm · 0.3J/㎠ · 1pass

Tattoo Removal Treatment | after 1 treatment

1064nm Zoom : 3mm · 1.96J/㎠ · 1pass

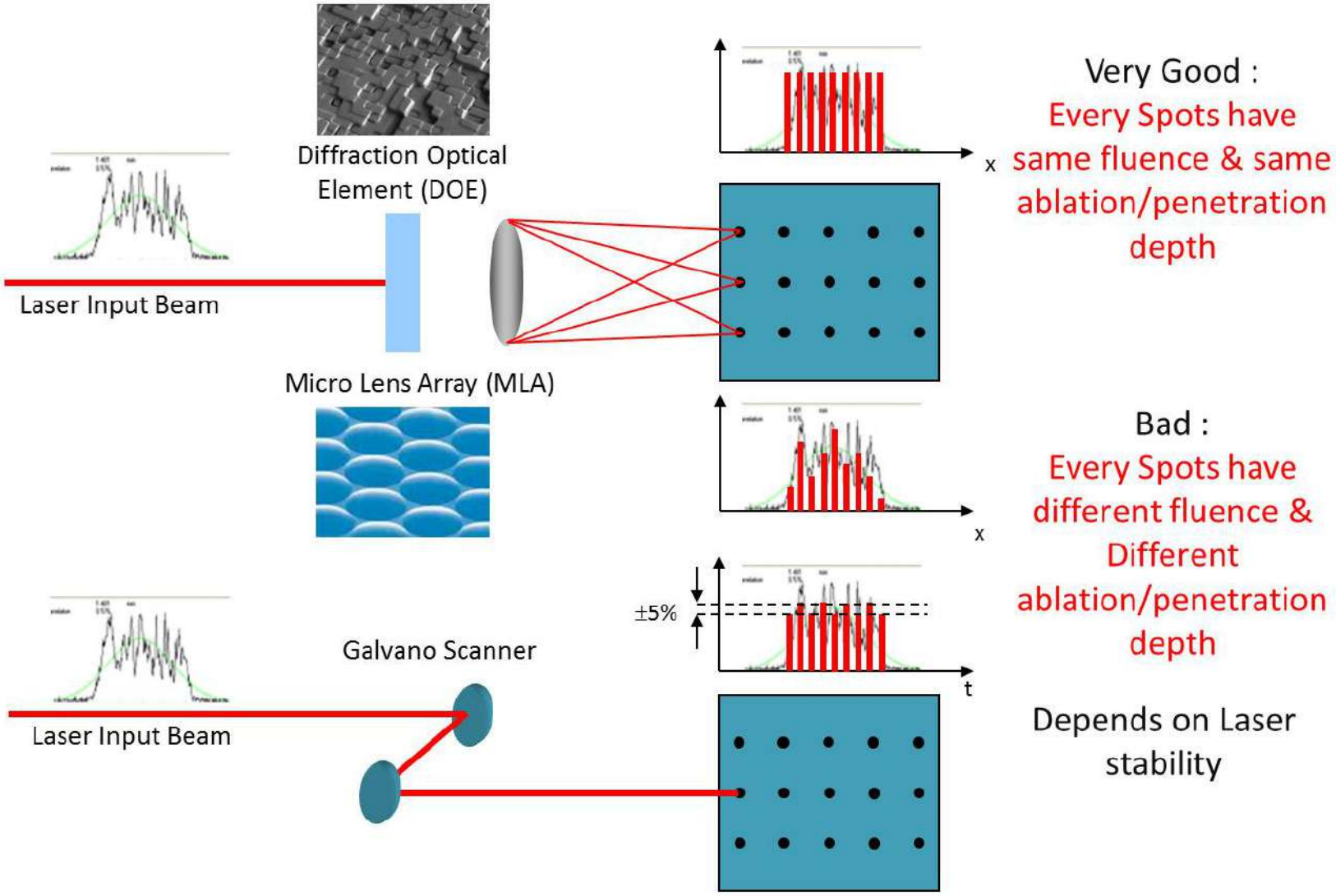
Scratched Scar Treatment | after 1 treatment

ZMLA : 5mm · 1.3J/㎠ · Stacking

Advantages of PICOHI™

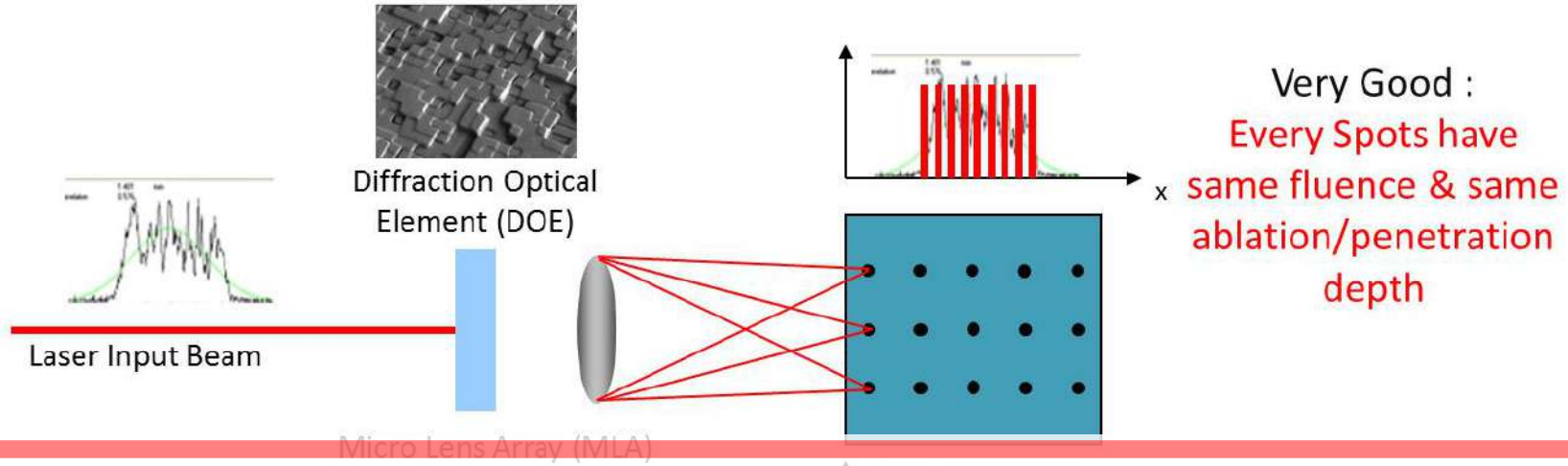
Advantages of PICOHI™

True fractional beam by MLA (VMLA, ZMLA) &DOE



Advantages of PICOHI™

True fractional beam by MLA (VMLA, ZMLA) &DOE



The advantage of the laser spot formed by DOE :

→ **Fluence or energy of each individual fractional beam is optically uniform**

→ **resulting in *equal distribution* of the fractional energy to the skin**

→ **penetration of the skin in an *uniform pattern***

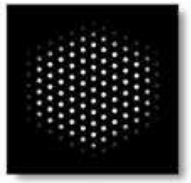
→ **lowering the side effect (PIH, burns, scar and hypo-pigmentation)**

Advantages of PICOHI™

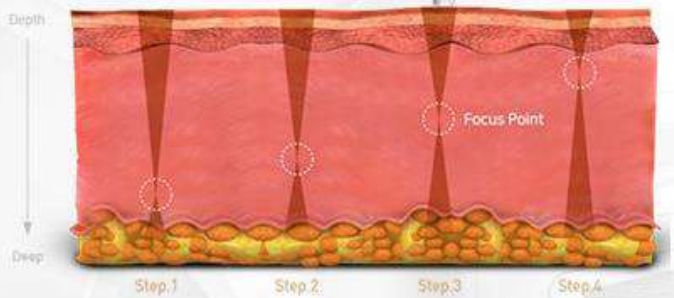
▶ True fractional beam by MLA (VMLA, ZMLA) &DOE

PICOHI 300

VMLA	Feature	ZMLA
Depth depending on the target can be adjusted (0.5mm)		Adjustable Beam Size depending on the treatment (4~12mm)
Precise treatment at different layers from Deep dermis to Epidermis	Function	Adjustable Beam Size depending on the treatment for effective results



Beam mode image



[ZMLA LASER TOP VIEW]

Beam Size	4	5	6	7	8
Energy (mJ)					
Beam Size	9	10	11	12	
Energy (mJ)					

Advantages of PICOHI™

▶ True fractional beam by MLA (VMLA, ZMLA) &DOE

MLA(VMLA, ZMLA)	PICO Fractional	DOE(532nm, 1064nm)
Very High	Energy Efficiency	Relatively Low
Relatively Low	Energy Uniformity	Very Even
Scar Curing Rejuvenation Pigmentation	Scope of Use	Pigmentation Rejuvenation Scar Curing

Output Energy : 500mJ / 5Hz

PICOHI provides **MLA, DOE for selective use** for effective treatment

Advantages of PICOHI™

High Convenience

RMS system (Remote Maintenance System)

Patient History Record

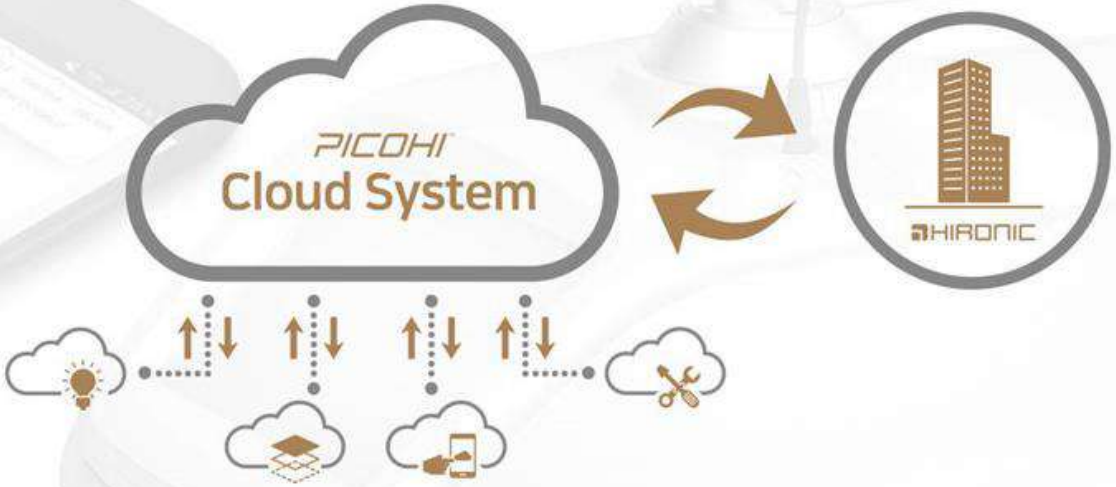
Fast and smart treatment is possible as the parameters for previous treatments will be recoded and memorized. The saved parameters can be managed through history for future treatments which may be a similar case.

Real Time Device Record Check

Advantages of PICOHI™

Remote Management through Cloud System

- Lamp and consumable replacement notice
- Protocols saved
- Self diagnosis and inspection
- Malfunction prevention and assist functions



Advantages of PICOHI™

Easy & Intuitive GUI

Treatment Information

Treatment Malfunction Prevention (coloring system)

Different colored GUI (Blue for 1064nm, Green for 532nm) for exact and safe treatment.

Easy to Use

JOURNAL OF COSMETIC AND LASER THERAPY
https://doi.org/10.1080/14764172.2021.2016846

Taylor & Francis
Taylor & Francis Group

CASE REPORT

Efficacy of a laser with a pulse duration of 300 ps in skin rejuvenation and treatment of pigmentation disorders in Asians: a series of four cases

Jie Hoon Kim[a], Soo Eun Jung

Dr. Kim's Skin and Laser Clinic, Suwon, Korea

ABSTRACT

The photothermal effect of lasers is minimized and the photoacoustic effect is maximized as the pulse duration is shortened. Therefore, picosecond lasers with a short pulse and high peak power can be used to effectively treat various pigment disorders by reducing tissue damage. The first picosecond lasers were used for tattoo removal; they are also widely used for pigment treatment because of their reduced side effects compared with nanosecond lasers. Recently, picosecond lasers have been shown to be effective in the treatment of various skin conditions such as acne scars and large pores. There are many studies on picosecond lasers; however, there are no studies on a laser with a pulse duration of 300 ps. This report describes the use of a 300 ps Nd:YAG laser for treating pigment disorders and for skin rejuvenation in four Asians, with no side effects. Determining the clinical significance of the 300 ps pulse duration through comparative studies with various picosecond lasers is needed.

ARTICLE HISTORY
Received 7 December 2020
Revised 22 November 2021
Accepted 7 December 2021

KEYWORDS
Picosecond laser; 300 ps; melasma; post-inflammatory hyperpigmentation; rejuvenation; pigmentation disorders

Efficacy of a laser with a pulse duration of 300 ps in skin rejuvenation and treatment of pigmentation disorders in Asians: a series of four cases
Jie Hoon Kim. et. al.
J Cosmet Laser Ther. 2021 Aug;23(5-6):159-162.

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ Introduction
- ✓ About Hironic Co.
- ✓ Advantages of PICOHI™
- ✓ **PICOHI™ for pigmentary disorders**
- ✓ PICOHI™ for skin rejuvenation
- ✓ Conclusion

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- Tattoo removal
- Laser toning for melasma with little risk of complication
- Treatment of PIH
- Combination Tx with nano second laser
- Tx of Dermal Melanocytosis
- Epidermal pigment

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- **<u>Tattoo removal</u>**
- Laser toning for melasma with little risk of complication
- Treatment of PIH
- Combination Tx with nano second laser
- Tx of Dermal Melanocytosis
- Epidermal pigment

300 picosecond laser for tattoo removal

F/27
Amateur tattoo on hand

▶PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)

Zoom handpiece
3mm spot size
1.5 ~2.0 J/cm2
3 months of interval
After 2 sessions (2 mo later)

300 picosecond laser for tattoo removal

300 picosecond laser for tattoo removal

F/27
Professional colored tattoo on chest

▶PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)

Zoom handpiece
3~4 mm spot size
1.5 ~2.5 J/cm2
2~33 months of interval
After 5 sessions (1 mo later)

300 picosecond laser for tattoo removal

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- Tattoo removal
- **<u>Laser toning for melasma with little risk of complication</u>**
- Treatment of PIH
- Combination Tx with nano second laser
- Tx of Dermal Melanocytosis
- Epidermal pigment

Melasma and PIH Treatment c low fluence Qs Nd:YAG laser

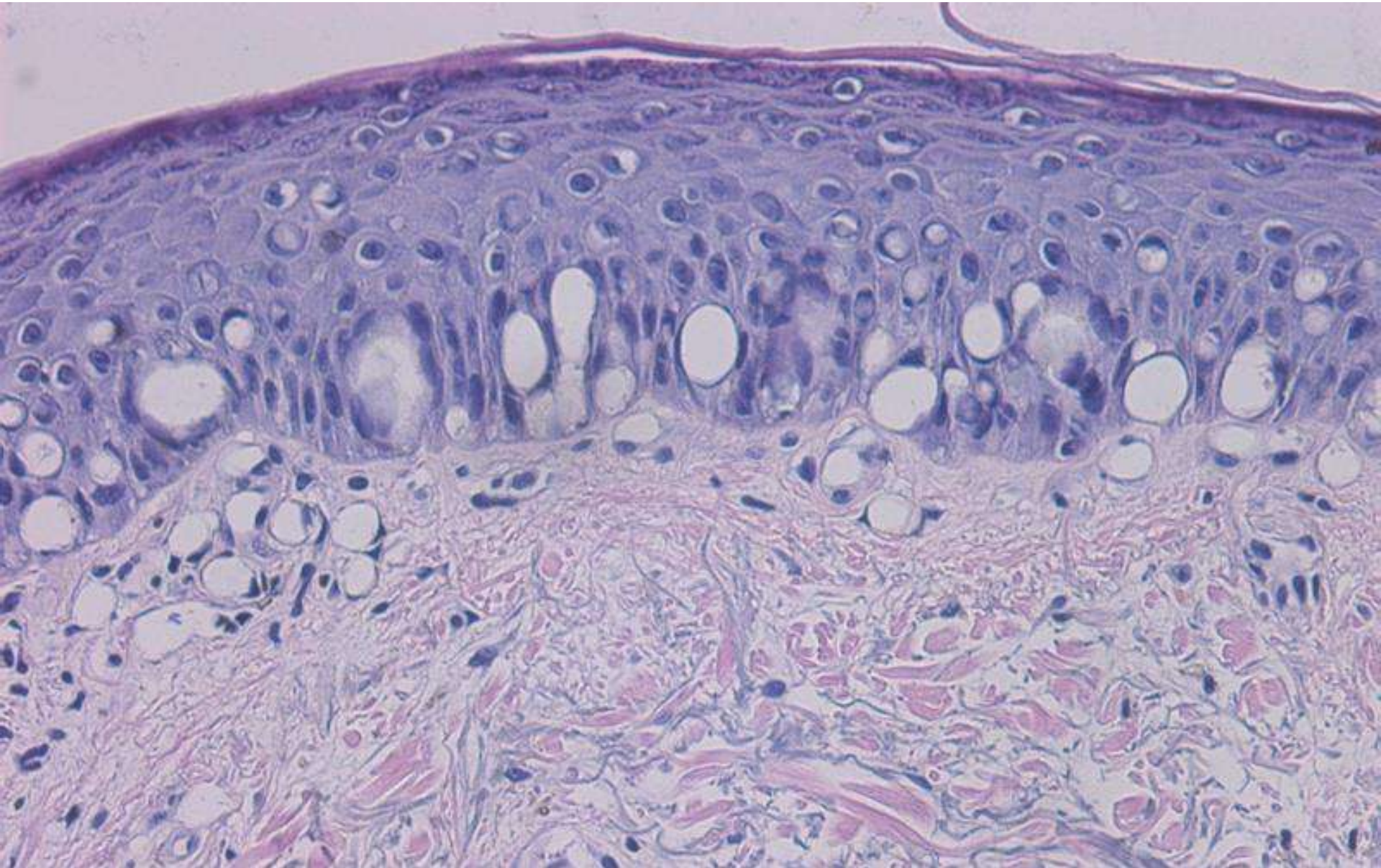
Melasma and PIH Treatment

with low fluence Q-switched Nd-YAG laser (Laser Toning)

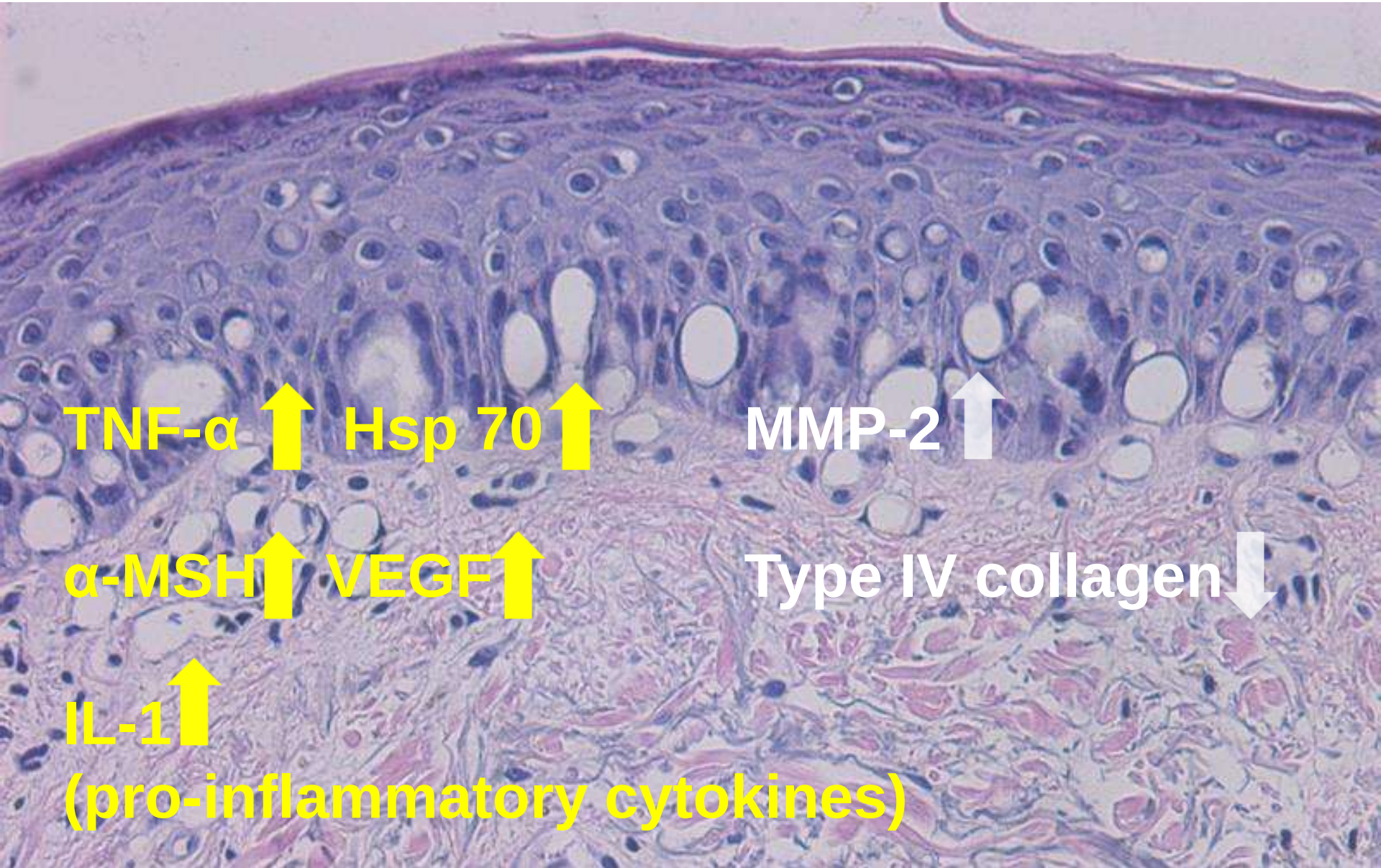
***Jie-Hoon Kim* et al.**

Pigment Cell Research *Vol 22, No 3, 347 - 348, June 2009*

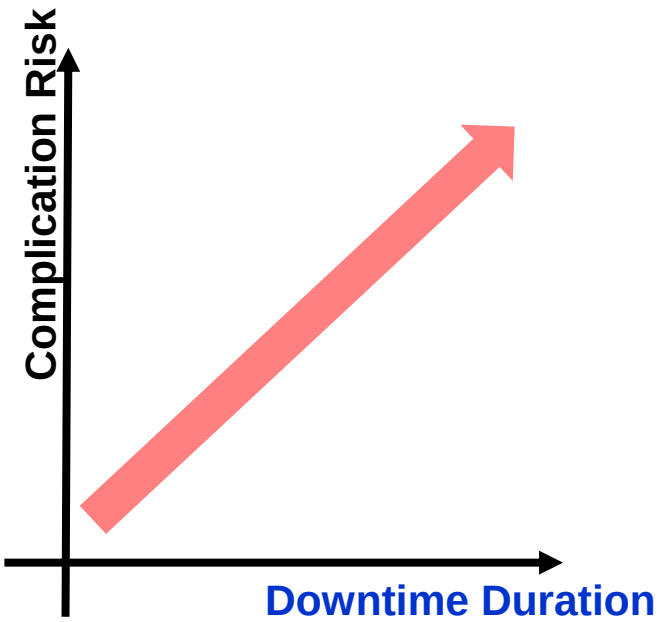
Histopathologic Finding after Laser Irradiation

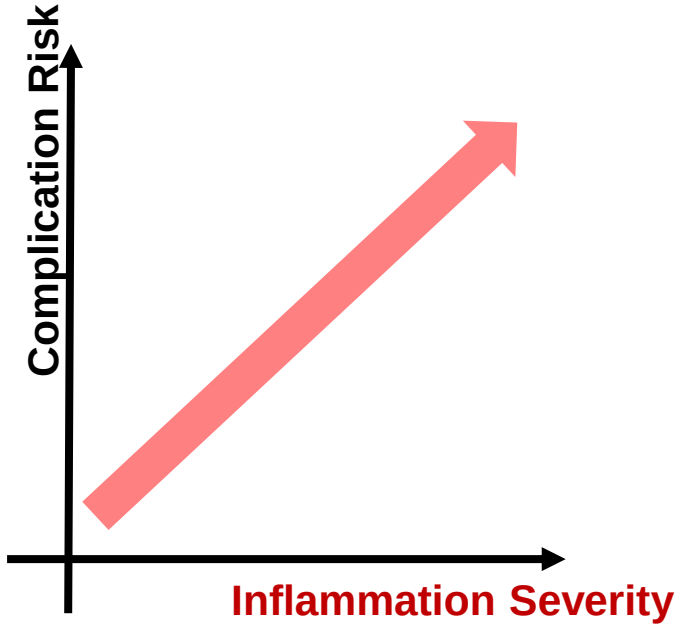


Biological changes after Laser Irradiation



Complication Risk (Downtime & Inflammation severity)





Risk Factors of PIH after Laser Treatments

Post Infl. Hyper- or Hypo- : Closely related with inflammation severity & downtime

Complication of laser toning

Mottled hypopigmentation

A case of mottled hypopigmentation after low-fl uence 1,064-nm Q-switched Nd:YAG laser therapy

Journal of Cosmetic and Laser Therapy 2013;15(5):290-2

HWA JUNG RYU[1] & JIEHOON KIM[2]

[1]Department of Dermatology, Korea University College of Medicine, Seoul, Republic of Korea, and

[2]Dr. Kim ´s Skin &Laser Clinic, Dermatology, Suwon, Republic of Korea

Figure 1. (a)
A 48-year-old woman with mottled hypopigmentation within a pre-existing melasma lesion after repeated treatment with a 1064-nm Q-switched Nd:YAG laser at a low pulse energy.


Skin Biopsy at the lesion site (leukoderma)
A

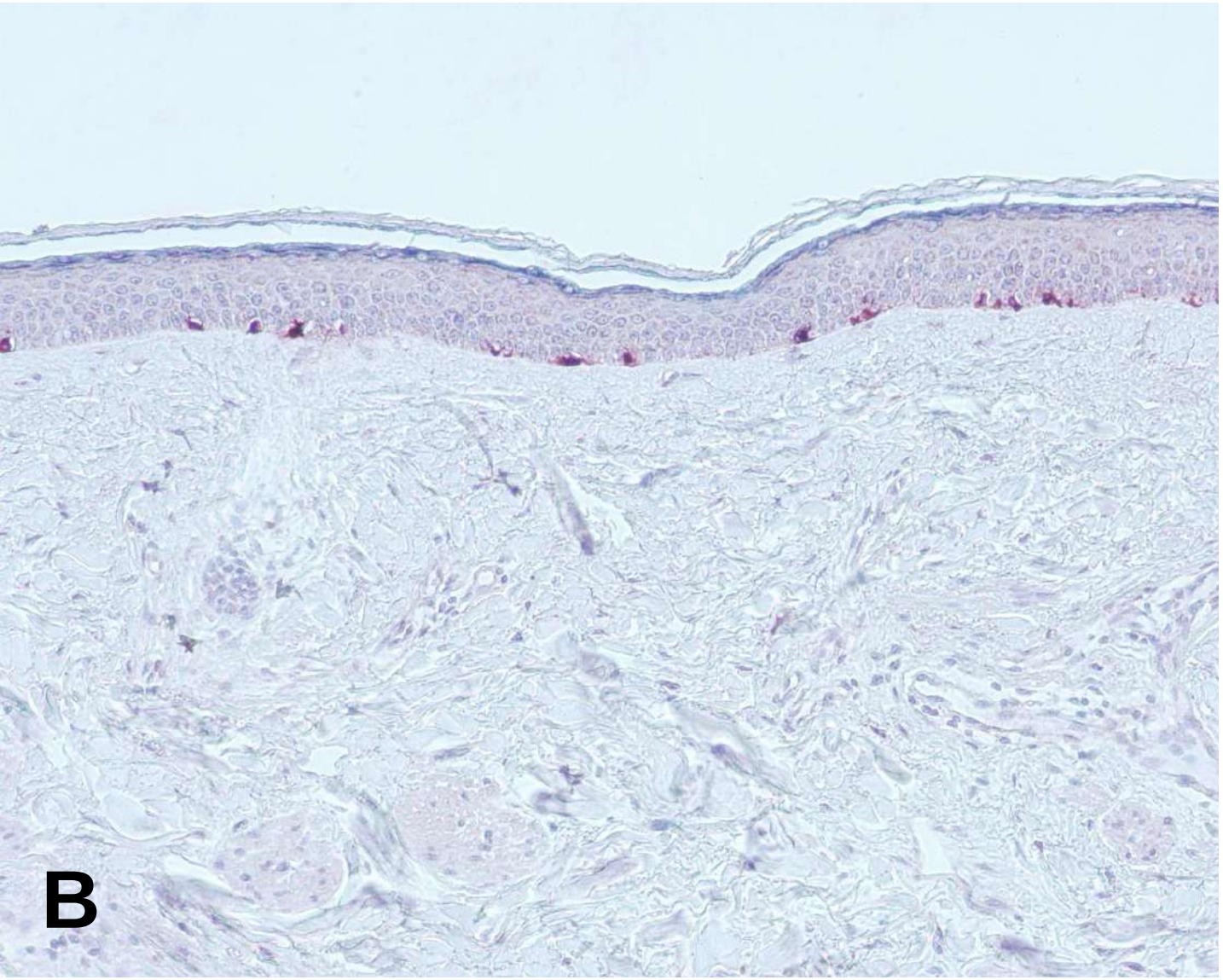


Figure 1. (b)
MART-1 staining of a biopsy specimen from the hypopigmented lesion shows active melanocytes (X200).

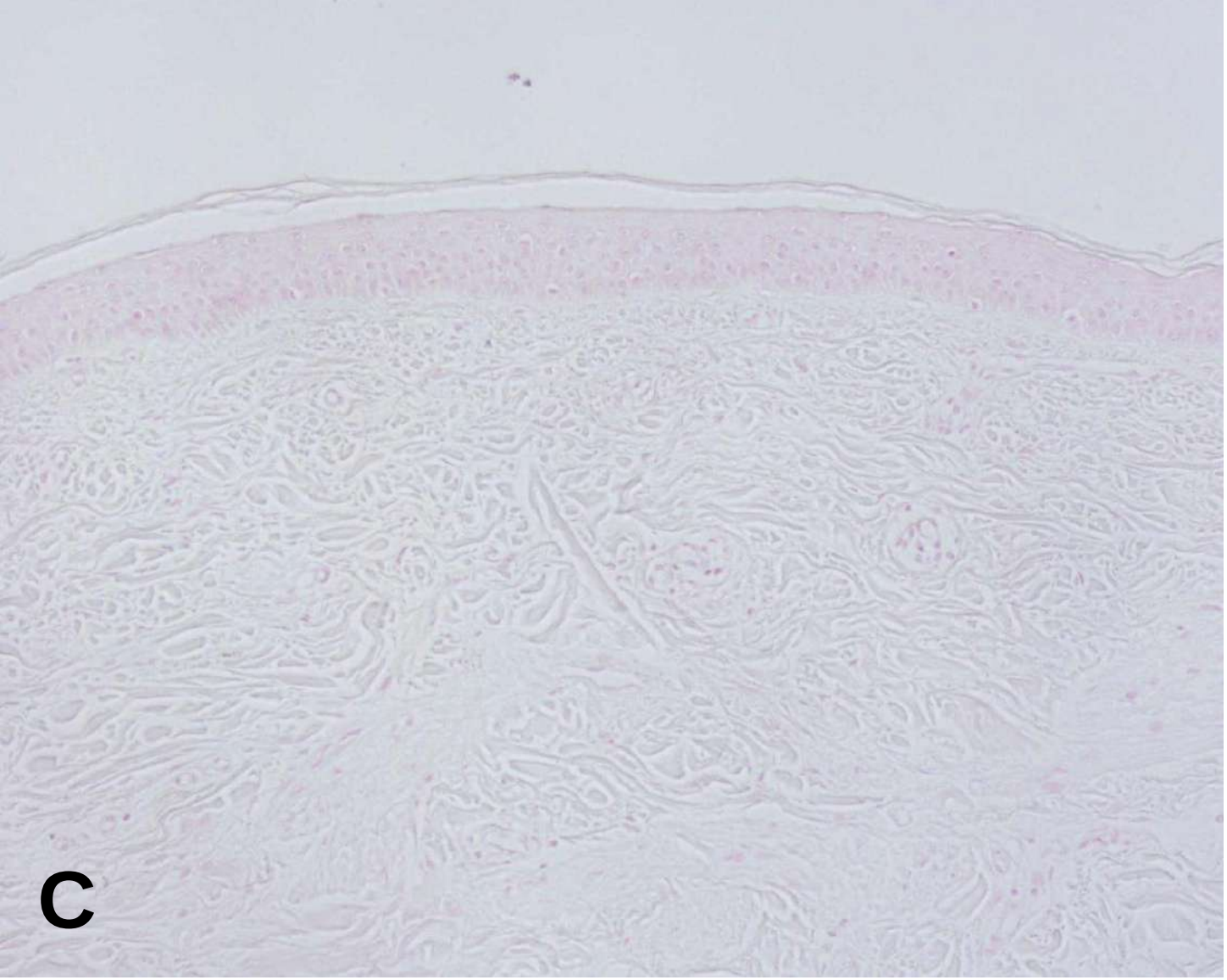
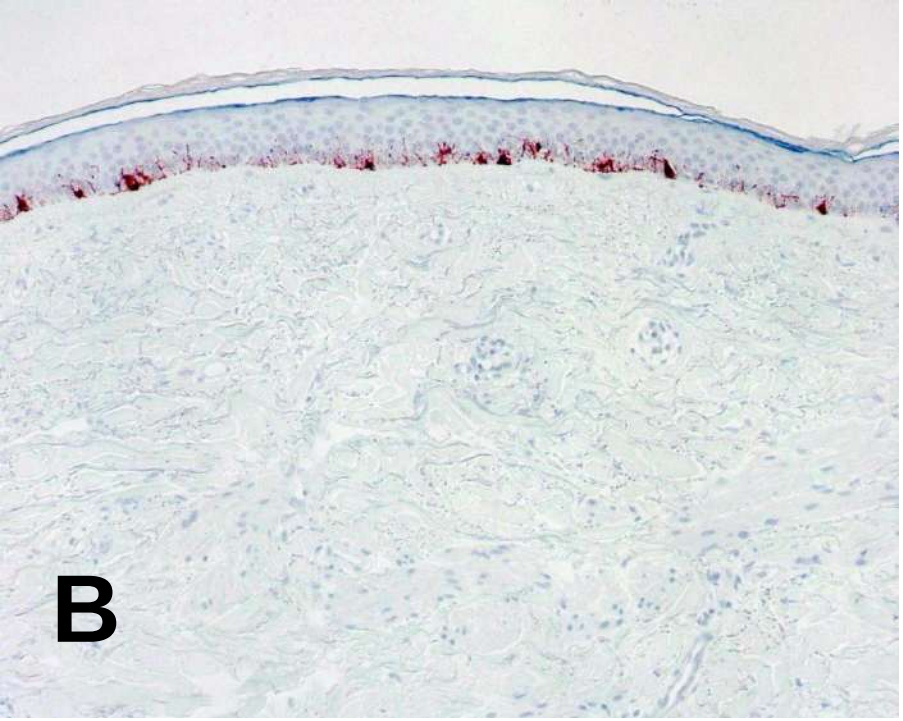
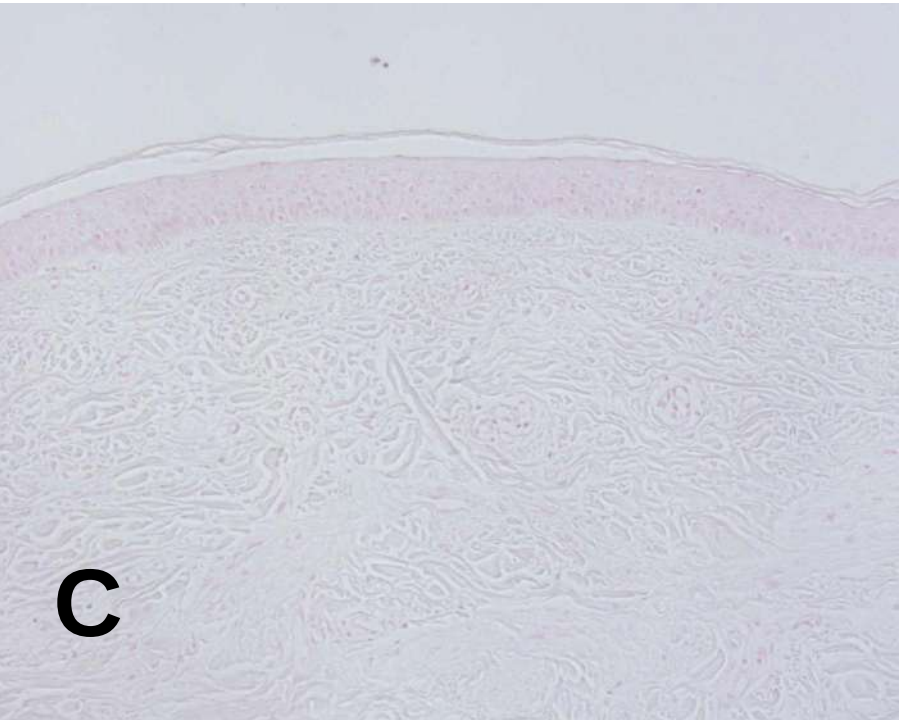


Figure 1. (c)
Fontana-Masson staining of a biopsy specimen from the hypopigmented lesion was negative (X200).





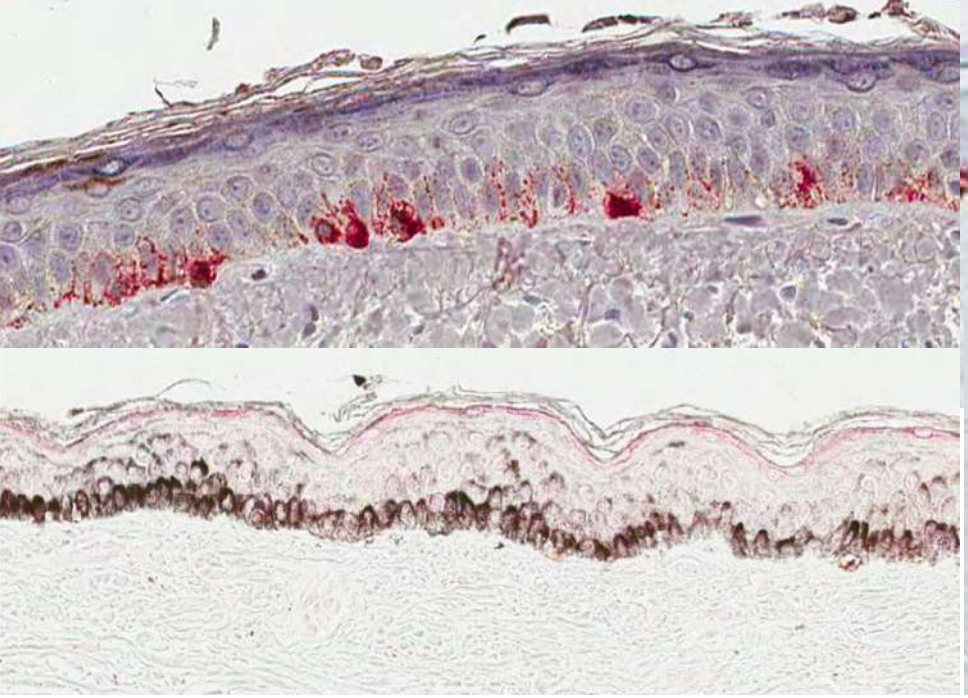
Biopsy findings:

(1) MART-1 staining (+)

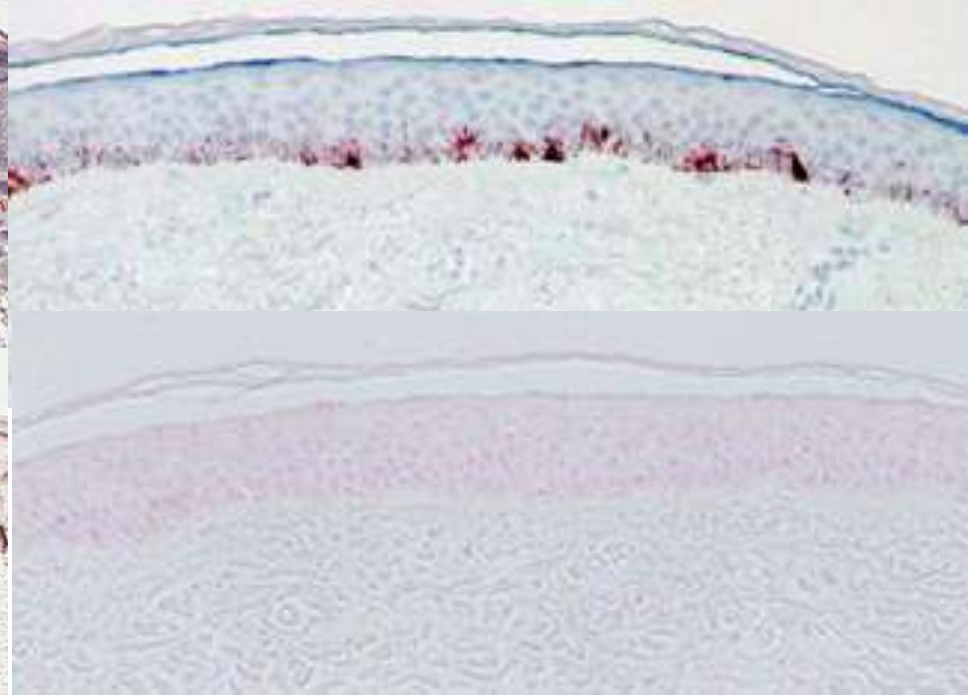
→ melanocytes: remained intact (2)

Fontana Masson staining (-)

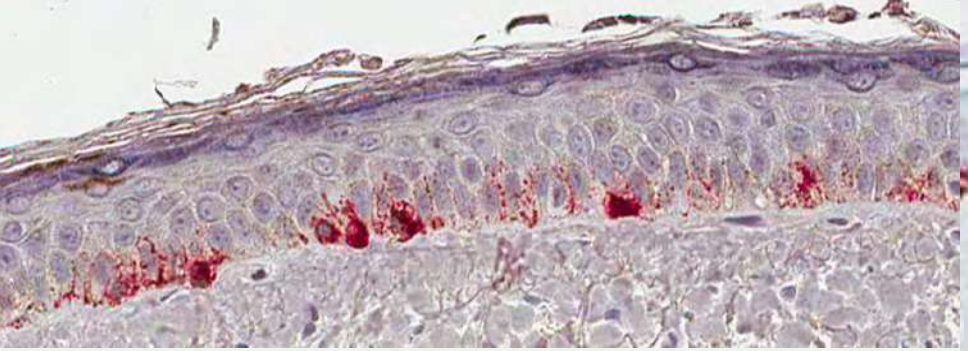
→melanosomes: destroyed

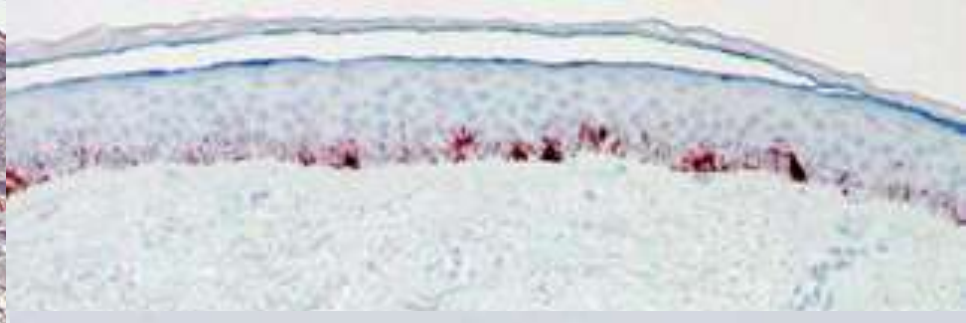


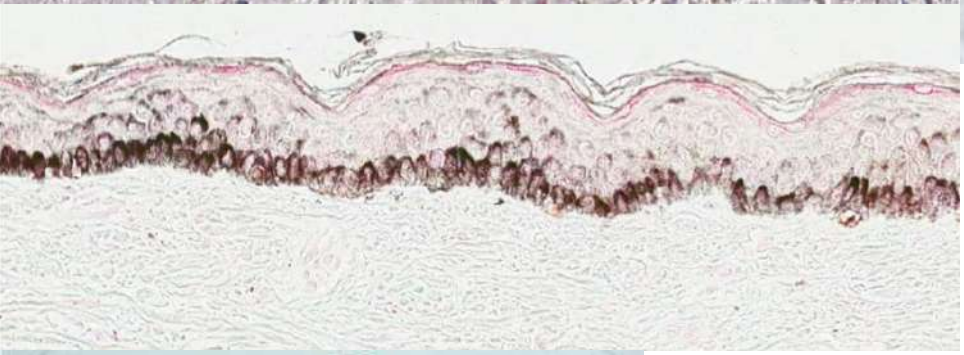
Melasma



Leukoderma after LT







Melasma

Leukoderma after LT

Pico laser toning for melasma with little risk of Cx.

▶Laser toning for melasma with little risk of complication

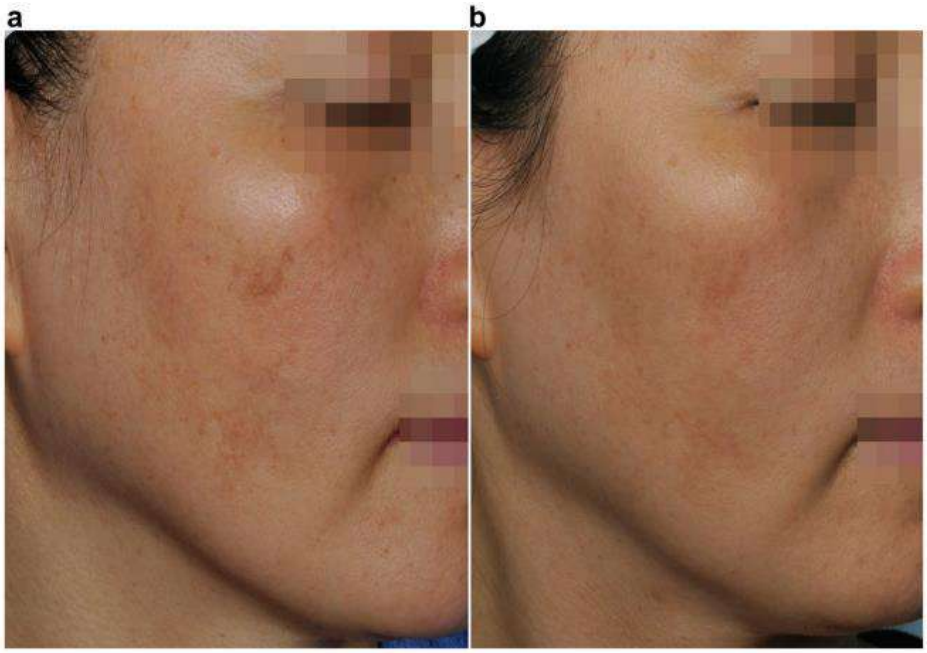


Figure 4. Case 3: A 38-year-old woman with melasma. (a) Before treatment, (b) After treatment.

Case 3

A 38-year-old woman visited our clinic with complaints of light-brown-colored, poorly demarcated pigmented patches on both cheeks (Figure 4a). She had not received any treatment with topical agents or laser/light devices. After examining the pigmented lesions, we made a clinical diagnosis of melasma. The patient then underwent 1,064-nm picosecond Nd:YAG laser treatment. Without applying any topical anesthetics, using a PICOHI device (Hironic Corp.), several pulses of the 1,064-nm picosecond Nd:YAG laser were delivered to the pigmented lesions with the parameters set at a spot size of 10 mm (collimate handpiece), fluence of 0.3–0.4 J/cm^2, and pulse rate of 10 Hz using a sliding and circular technique until mild erythema appeared. She underwent treatment every 2 weeks for a total of 12 treatments. Immediately after treatment, an ice pack was applied to cool the treated area; no prophylactic topical corticosteroids and antibiotics were prescribed. The patient was advised to avoid excessive exposure to sunlight and to apply broad-spectrum sunscreens during the treatment period. After laser treatment, the melasma became brighter without notable side effects (Figure 4b).

Jie Hoon Kim. et. al. Journal of Cosmetic and Laser Therapy 2021

Pico laser toning for melasma with little risk of Cx.

- **Laser toning for melasma with little risk of complication**

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- Tattoo removal
- Laser toning for melasma with little risk of complication
- **<u>Treatment of PIH</u>**
- Combination Tx with nano second laser
- Tx of Dermal Melanocytosis
- Epidermal pigment

Use of pico second laser

▶ Treatment of complications of conventional laser therapy

Figure 1. Case 1: A 47-year-old man with post-inflammatory hyperpigmentation (right-side view). (a) Before treatment, (b) After treatment.

Figure 2. Case 1: A 47-year-old man with post-inflammatory hyperpigmentation (left-side view). (a) Before treatment, (b) After treatment.

Case presentation

Case 1

A 47-year-old man visited our clinic with complaints of dark-brown/black-colored, well-demarcated pigmented patches on both cheeks (Figures 1a, 2a). The patient had received intense pulsed light therapy and laser toning; but the treatment proved ineffective as the patches worsened. The pigmented lesions were visually diagnosed with the aid of a wood lamp (320–400 nm ultraviolet light, Cho Yang Medics, Co. LTD., Seongnam, Korea) as post-inflammatory hyperpigmentation (PIH) secondary to intense pulsed light therapy.

The patient underwent 1,064-nm picosecond Nd:YAG laser treatment. Without administering any topical anesthetics, using a PICOHI device (Hironic Corp., Yongin, Korea), several pulses of a 1,064-nm Nd:YAG picosecond laser were administered to the pigmented lesions, with a spot size of 10 mm (collimated handpiece), fluence of 0.3 J/cm^2, and pulse rate of 10 Hz until mild erythema appeared. The patient received this treatment a total of 8 times at 2 week intervals. Immediately after the procedure, the treated area was cooled with ice packs. No prophylactic antibiotics were prescribed. The patient received this treatment several times at intervals of 2 weeks. Moreover, Kligman's formula, which is a combination of drugs that inhibit melanin synthesis (Melano cream, Dong-A ST Co., Seoul, Korea) and a topical corticosteroid cream (Titibe cream, Hanmi Pharmaceutical Co., Ltd., Seoul, Korea), was applied twice a day (day and night) for a period of 3 months. The patient was advised to avoid excessive exposure to sunlight and to apply sunscreen throughout the treatment period. The patient's PIH lesions had almost disappeared without notable side effects (Figure 1b, 2b).

Jie Hoon Kim. et. al. Journal of Cosmetic and Laser Therapy 2021

IPL complications & managements

Thermal injury after IPL treatment
Clinical feature: second degree burn like feature with pain, erythema and blister

IPL complications & managements

Blister → Crust → PIH

IPL complications & managements

M/45
PHx: 6 Mo age, IPL treatment (other clinic)
→ continue PIH
→ Laser toning treatment for 5 times (other clinic) → No effect

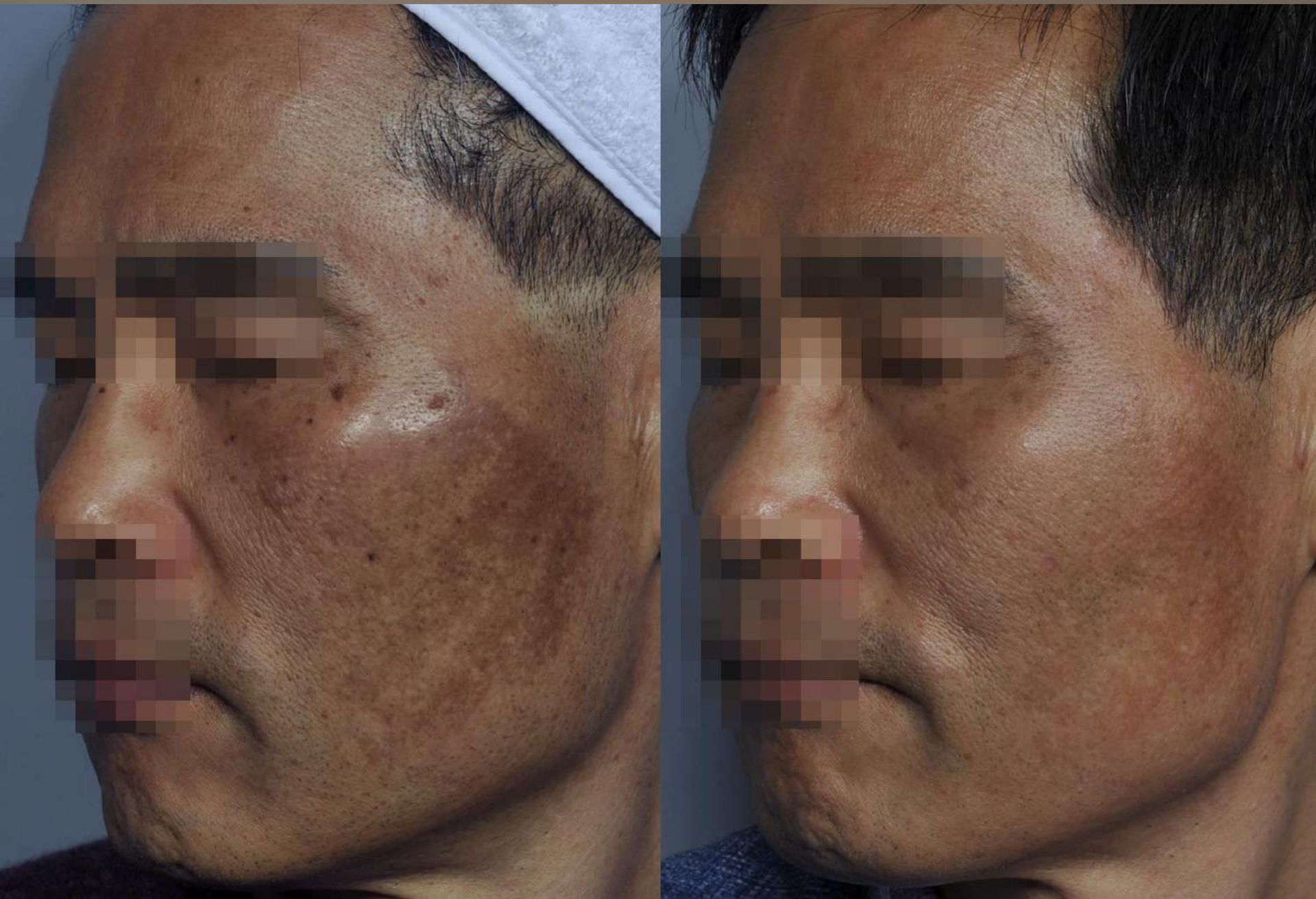
IPL complications & managements

M/45
PHx: 6 Mo age, IPL treatment (other clinic)
→ continue PIH
→ Laser toning treatment for 5 times (other clinic) → No effect

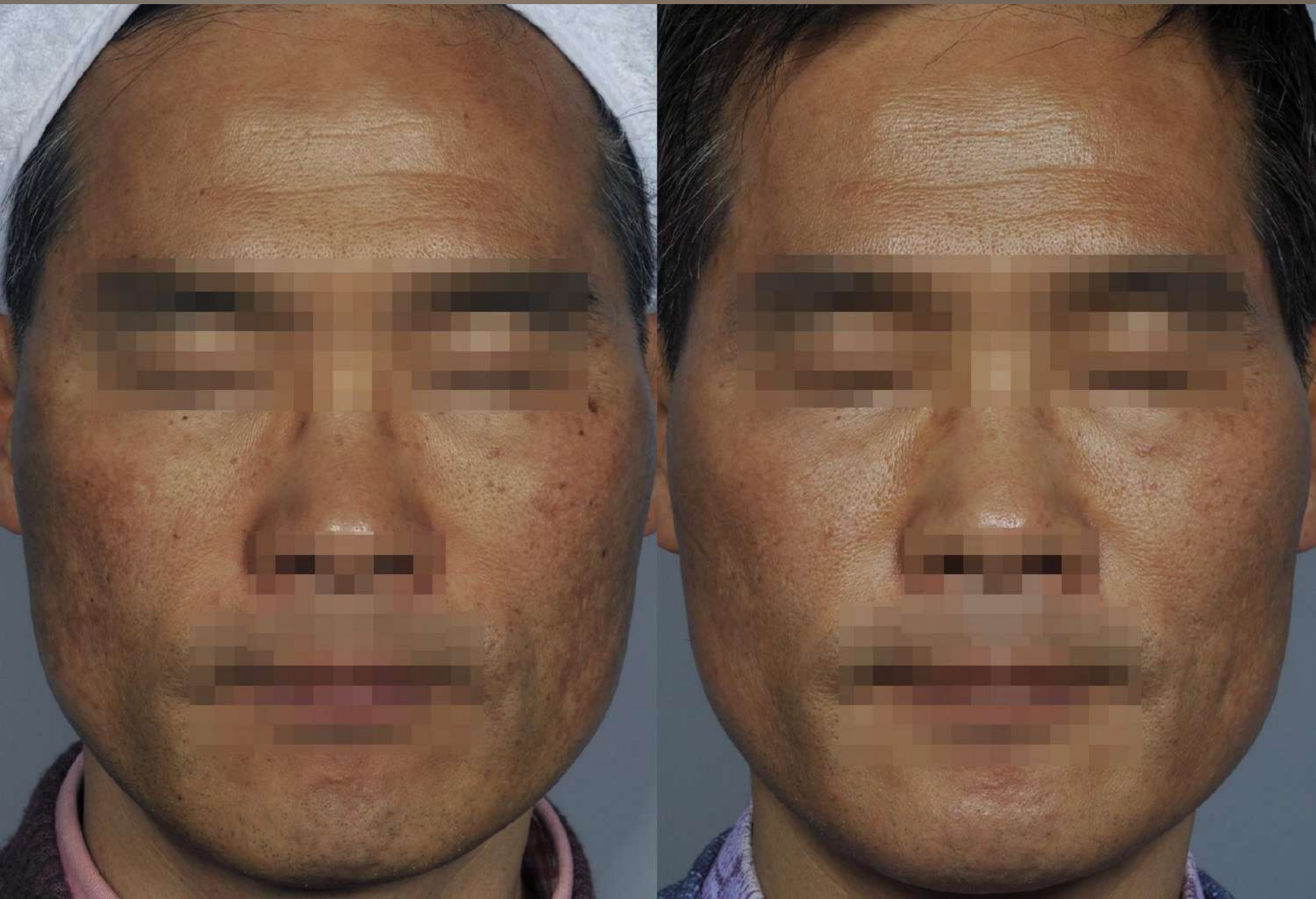
▶Pico Toning c PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)
10 mm spot size,
collimate HP, 0.3 ~ 0.4 J/cm2,
sliding and circular technique,
1,000~1,200 shot (each session)
※ No pulse stacking

→ 6 sessions later (pigmentation was almost improved)

IPL complications & managements



IPL complications & managements



IPL complications & managements

PIH after conventional treatment

M/49
PHx: 3 Mo age, Pico 532nm (other clinic)
→ continue PIH

PIH after conventional treatment

F/49
PHx: 3 Mo age, Pico 532nm (other clinic)
→ continue PIH

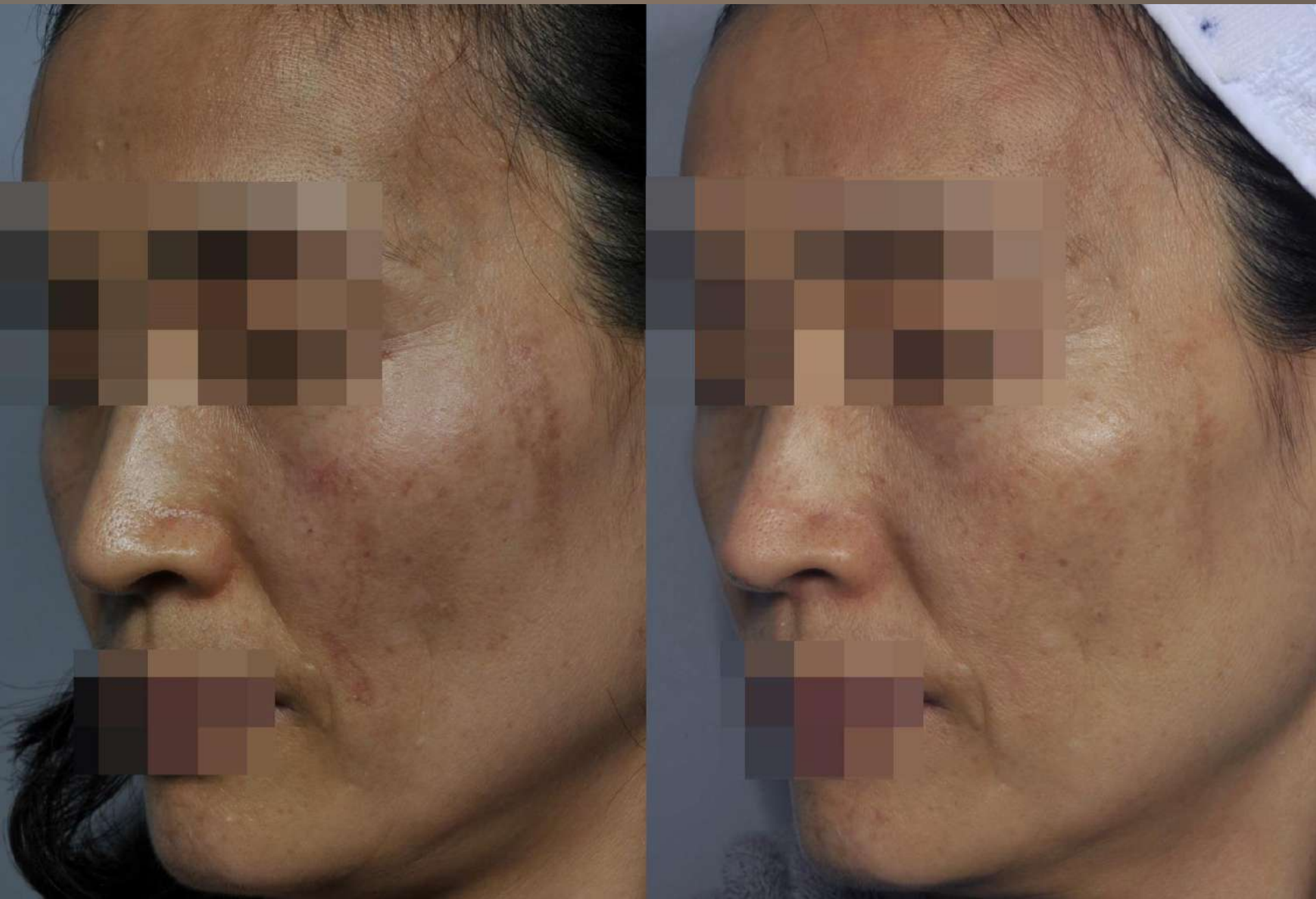
▶Pico Toning c PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)
10 mm spot size,
collimate HP, 0.3 ~ 0.4 J/cm2,
sliding and circular technique,
1,000~1,200 shot (each session)
※ No pulse stacking

→ 5 sessions later (pigmentation was almost improved)

PIH after conventional treatment

PIH after conventional treatment

PIH after conventional treatment



PICOHI™ for Pigmentation and Rejuvenation:

- ✓ **PICOHI™ for pigmentary disorders**
  - Tattoo removal
  - Laser toning for melasma with little risk of complication
  - Treatment of PIH
  - **Combination Tx with nano second laser**
  - Tx of Dermal Melanocytosis
  - Epidermal pigment

IPL

1064/532 nm Q-switched Nd:YAG laser
785 nm picosecond Nd:YAG aser

PICOHI
1064/532 nm Picosecond Nd:YAG laser
HIRONIC, Korea

694 nm Q-switched Ruby laser

10,600 nm CO2 laser

2,940 nm Er:YAG laser

810 nm Diode laser for hair removal

Full face Laser Parameters

2,940 nm Er:YAG laser

10,600 nm CO2 laser

694 nm Qs Ruby laser

IPL: 560 nm 3 msec

810 nm Diode laser for Hair removal

Toning Parameters (GPT, LT -> Pico Toning)

1,064 nm Qs Nd:YAG laser
→ Laser toning parameter

1,064 nm Qs Nd:YAG laser
→ GPT (Higher fluence LT) parameter

PICOHI (300 pico sec 1,064 nm Nd:YAG laser)
→ Pico toning parameter

Combined pigmentary problems Treatment Strategy :

(1) Full face laser c Conventional technique

Nevus removal c CO2 Laser, 2,940 nm Er:YAG laser

Lentigines Tx c 694nm Qs-Ruby laser

Hair removal c 810 nm diode laser

IPL (560 nm 3 msec)

(2) Combination Tx c GPT,(Higher fluence of LT), LT & Pico Toning:

2-1) GPT & LT (ABNOM, lentigines… → GPT, other areas LT)

▷GPT:

Qs Nd:YAG laser 1064 nm, collimate HP, 8 mm spot size, 2.7 J/cm^2, 10 Hz, 2~3 seconds pulsed stacking technique

▷LT:

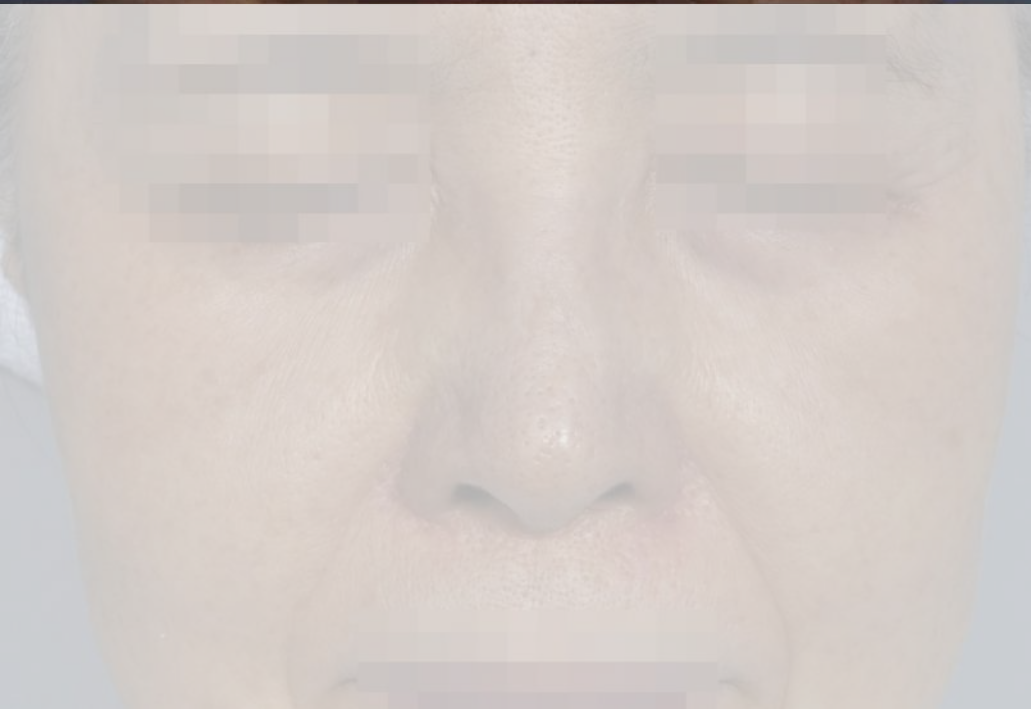
Qs Nd:YAG laser 1064 nm, collimate HP, 10 mm spot size, 1.7 J/cm^2, 10 Hz, sliding technique

2-2) Pico Toning

pico second Nd:YAG laser(PICOHI, 300 ps), 1064 nm, collimate HP 10 mm spot size, 0.3 J/cm^2, 10 Hz

→ dark area: 2~3 seconds pulsed stacking technique, other areas: sliding technique

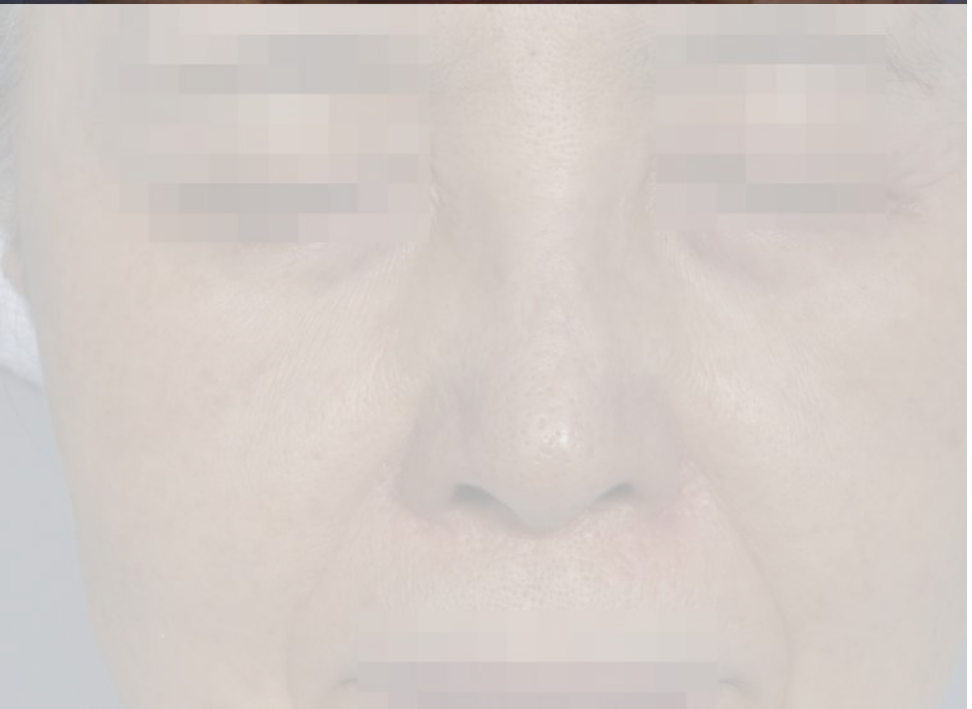
(3) Continue 2-1) & 2-2)



- Tiny Seborrheic keratosis
- Lentigines

Combined pigmentary problems

(F/63)



(2) Combination Tx c GPT, LT & Pico Toning:

2-1) GPT & LT: lentigines

→ GPT, other areas LT

▷GPT (Higher fluence laser toning):

Qs Nd:YAG laser,

1064 nm, collimate HP,

8 mm spot size,

2.7 J/cm^2,

10 Hz,

2~3 seconds pulsed stacking technique

▷LT:

Qs Nd:YAG laser,

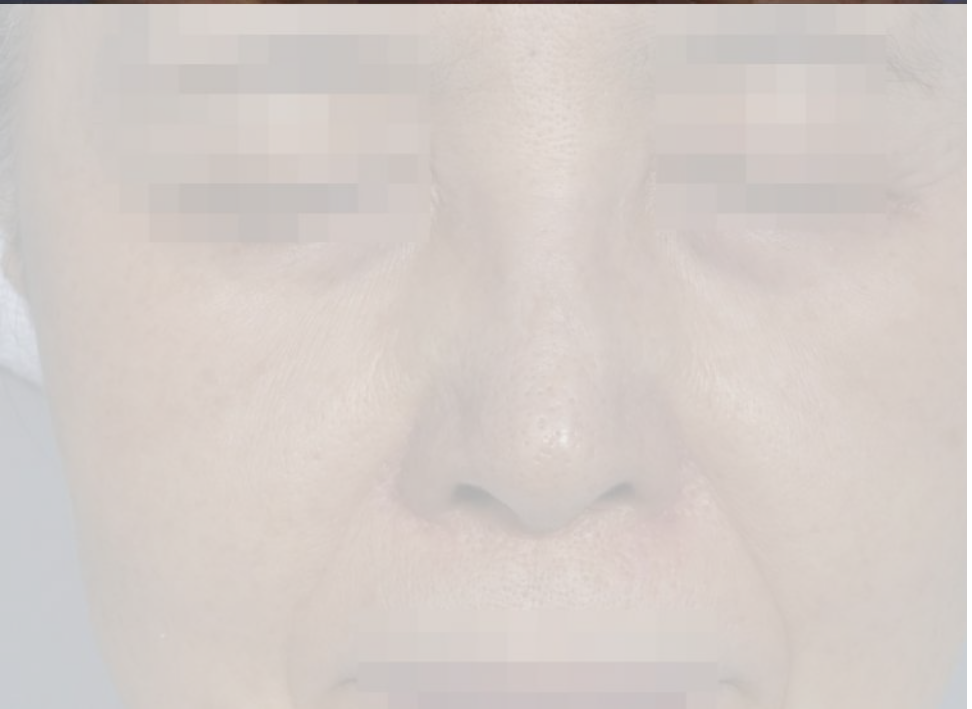
1064 nm, collimate HP,

10 mm spot size,

1.7 J/cm^2,

10 Hz,

sliding technique



(2) Combination Tx c GPT, LT & Pico Toning:

2-2) Pico Toning

pico second Nd:YAG laser (PICOHI),

1064 nm, collimate HP,

10 mm spot size,

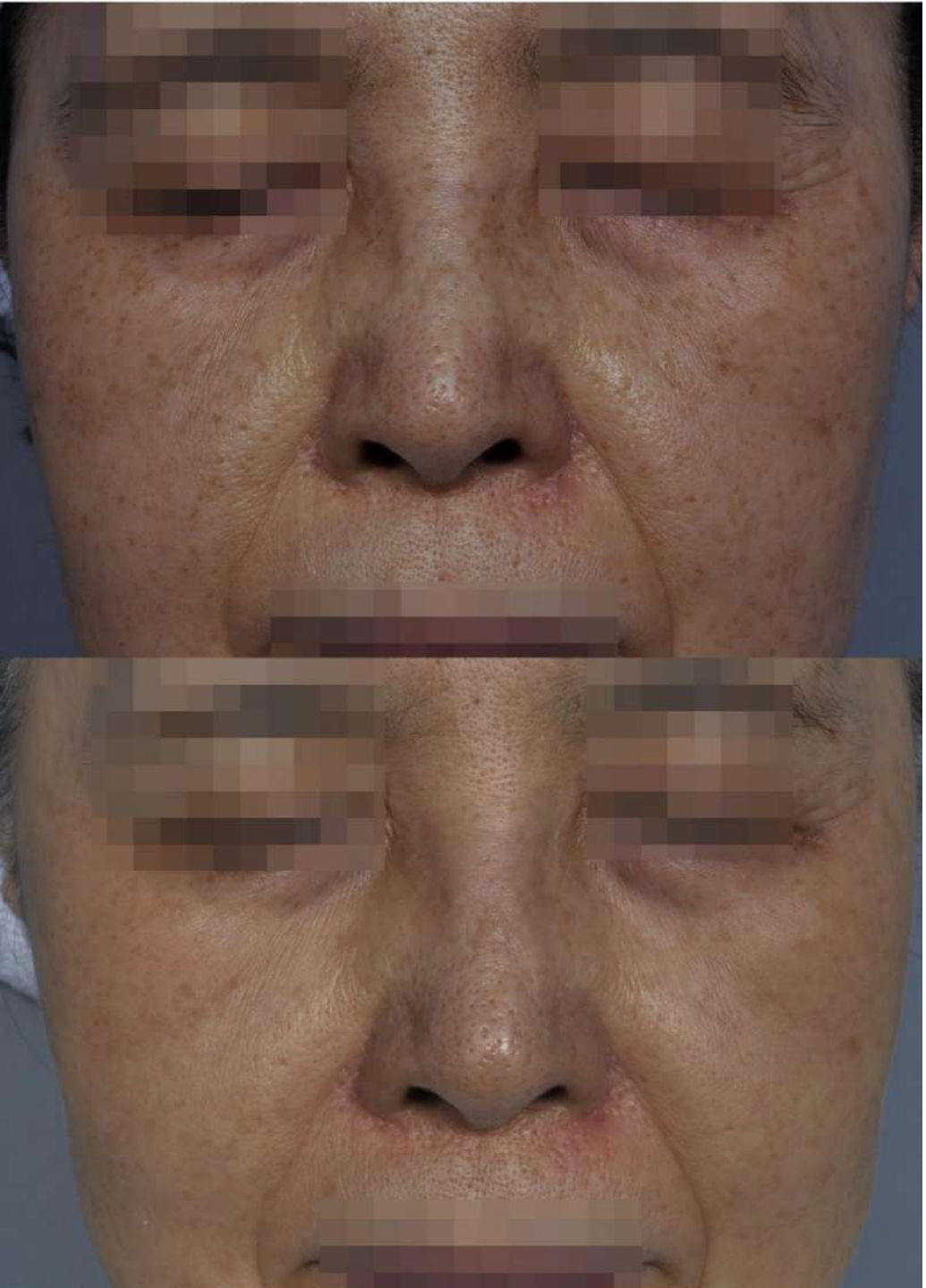
0.3 J/cm^2,

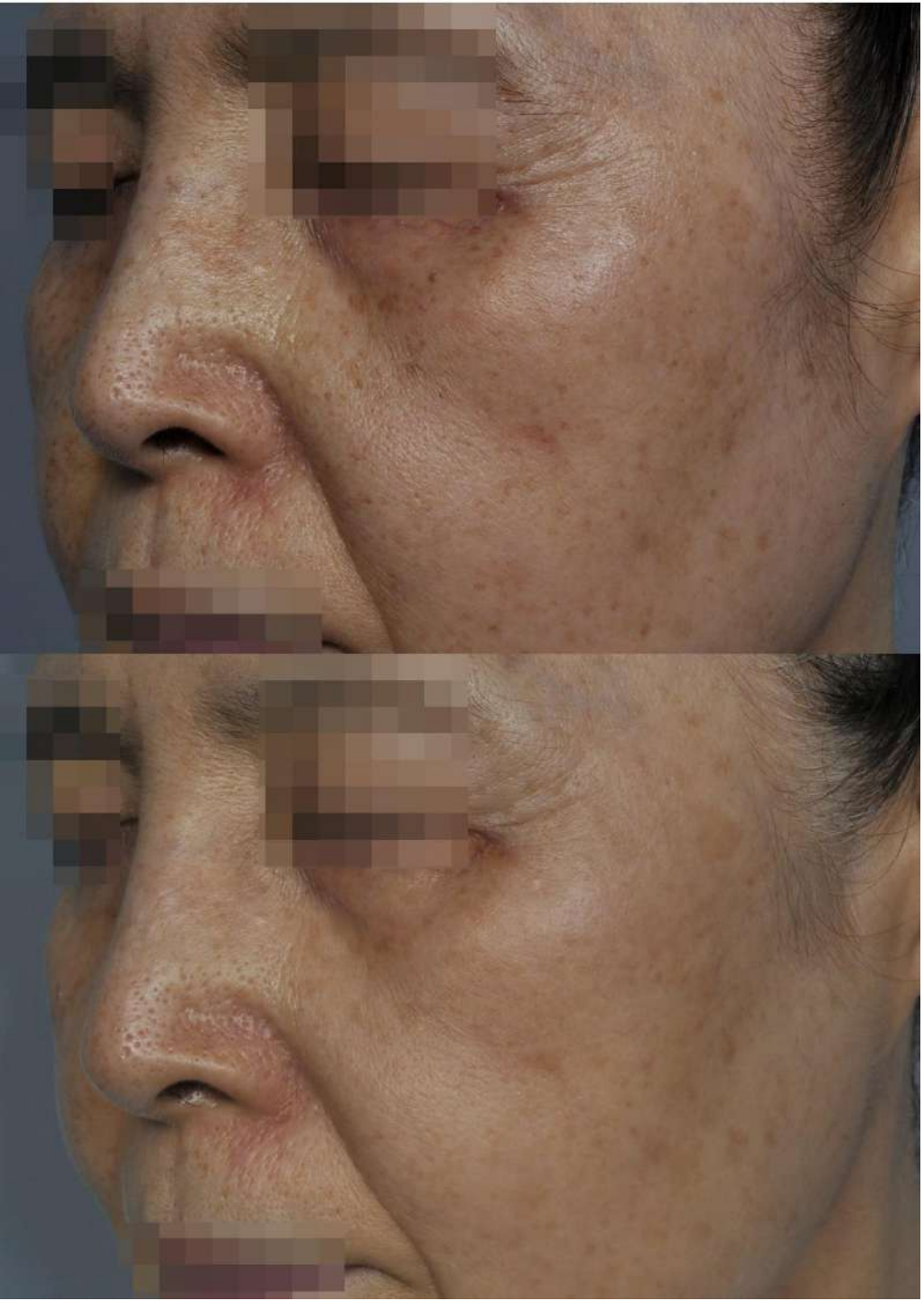
10 Hz

→ dark area: 2~3 seconds pulsed stacking technique

→ other areas: sliding technique

(3) Continue 2-1) & 2-2)





Darker skin phenotype c seborrheic skin

- Seborrheic keratosis
- Pigmented nevus, Intradermal N
- Lentigines

 # Darker skin phenotype

 # Seborrheic skin

(M/54)

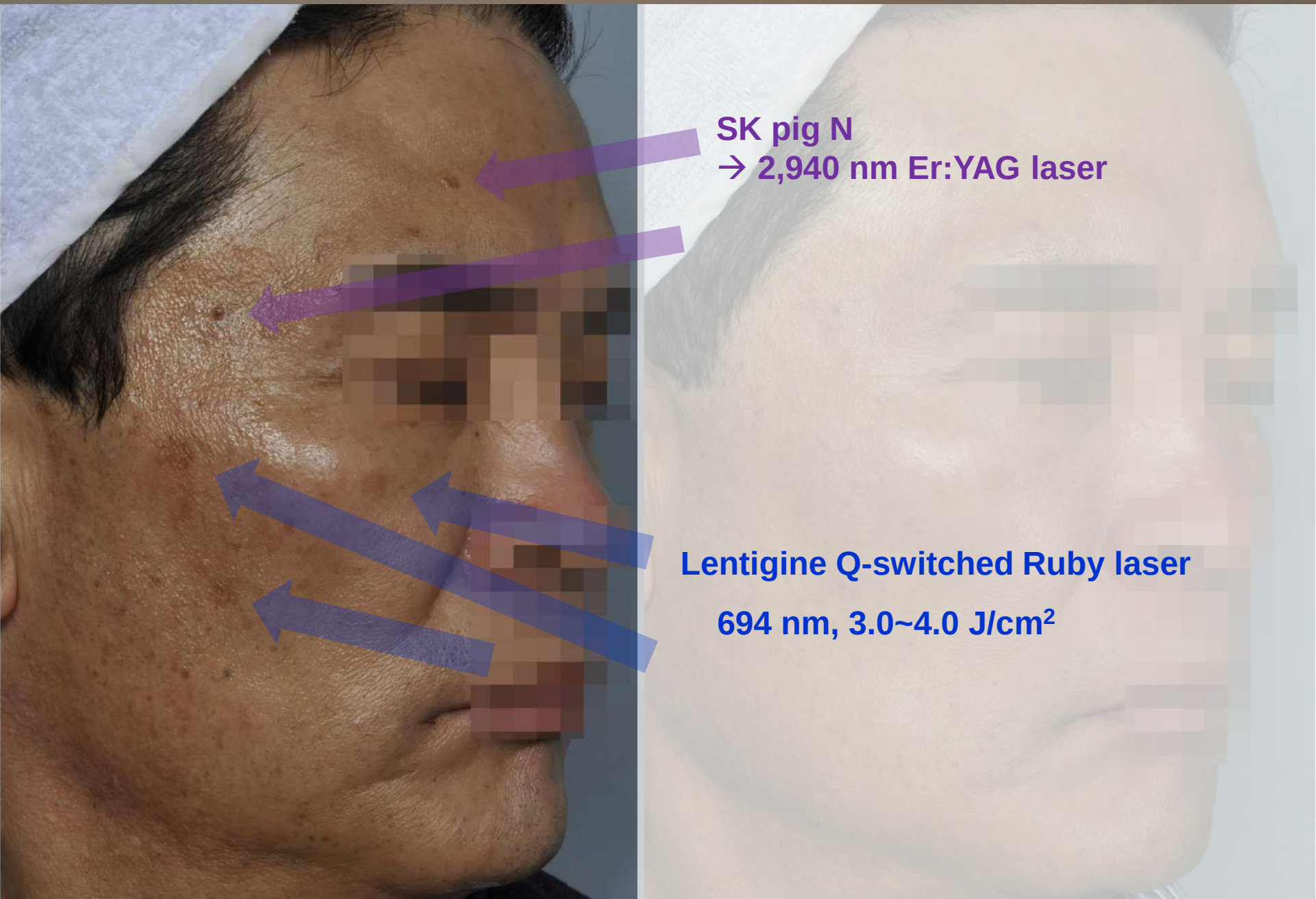
cf)

Skin type V high risk patient

Seborrheic skin

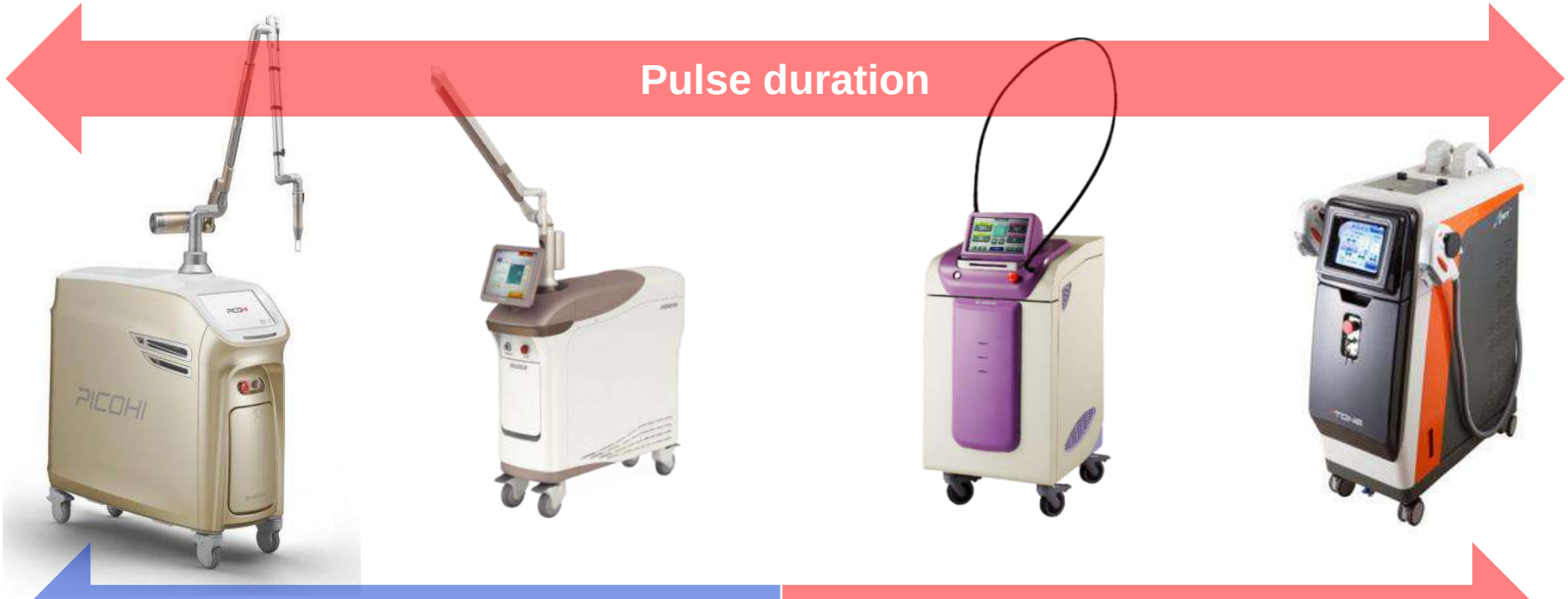
→ Good prognosis

Darker skin phenotype c seborrheic skin



Darker skin phenotype c seborrheic skin

Different pulse duration/Different treatment target



Pico second laser

Q-swiched laser Nano second

Long pulse laser micro second

IPL mili second


Different pulse duration/Different treatment target
Pico
Nano


Nano
Pico

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- Tattoo removal
- Laser toning for melasma with little risk of complication
- Treatment of PIH
- Combination Tx with nano second laser
- **<u>Tx of Dermal Melanocytosis</u>**
- Epidermal pigment

Figure 3. Case 2: A 30-year-old woman with acquired bilateral nevus of Ota-like macules and lentigo. (a) Before treatment, (b) After treatment.

Case 2

A 30-year-old woman visited our clinic with complaints of brown-colored pigmented spots on both cheeks and the nose (Figure 3a). She had never been treated with any topical medications, laser, or light devices. The pigment disorders were diagnosed as combined pigmentary lesions of acquired bilateral nevus of Ota-like macules (ABNOM) and lentigo. She underwent 1,064-nm Nd:YAG picosecond laser treatment. Without using any topical anesthetics, the 1,064-nm picosecond Nd:YAG laser, using a PICOHI device (Hironic Corp.), was delivered to the pigmented lesions.

For the treatment of ABNOM lesions, the parameters were set at a spot size of 10 mm (collimate handpiece), fluence of 0.6 J/cm^2, and pulse rate of 10 Hz, using the pulse stacking technique for 2–3 s. In the same session, lentigo lesion treatment was administered, and the parameters were set at a spot size of 10 mm (collimated handpiece), fluence of 0.3 J/cm^2, and pulse rate of 10 Hz. Using the sliding and circular technique, the laser beam was repeatedly passed over the lesions until mild erythema appeared. She received this treatment every 2 weeks for a total of 12 treatments. Immediately after treatment, an ice pack was applied to cool the treatment area; systemic or topical corticosteroids and antibiotics were not prescribed. The patient was advised to avoid exposure to sunlight and to apply sunscreen during the treatment period. The treated ABNOM lesions and lentigo had almost disappeared after laser treatment (Figure 3b).

Lentigiens and ABNOM (mixed)

F/30
ABNOM on both cheek
(with combined lentigines)

▶ **Pico Toning c PICOHI**
1,064 nm pico second Nd;YAG laser (PICOHI)

For ABNOM
10 mm spot size,
collimate HP, 0.6 J/cm2,
Pulse stacking for 2~3 seconds

For Lentigines
10 mm spot size,
collimate HP, 0.3 J/cm2,
Sliding and circular technique

2 weeks of interval
Total: 12 treatments

Lentigiens and ABNOM (mixed)

Lentigiens and ABNOM (mixed)

PICOHI™ for Pigmentation and Rejuvenation:

✓ **PICOHI™ for pigmentary disorders**

- Tattoo removal
- Laser toning for melasma with little risk of complication
- Treatment of PIH
- Combination Tx with nano second laser
- Tx of Dermal Melanocytosis
- **<u>Epidermal pigment</u>**

Lentigines (epidermal pigmentation)

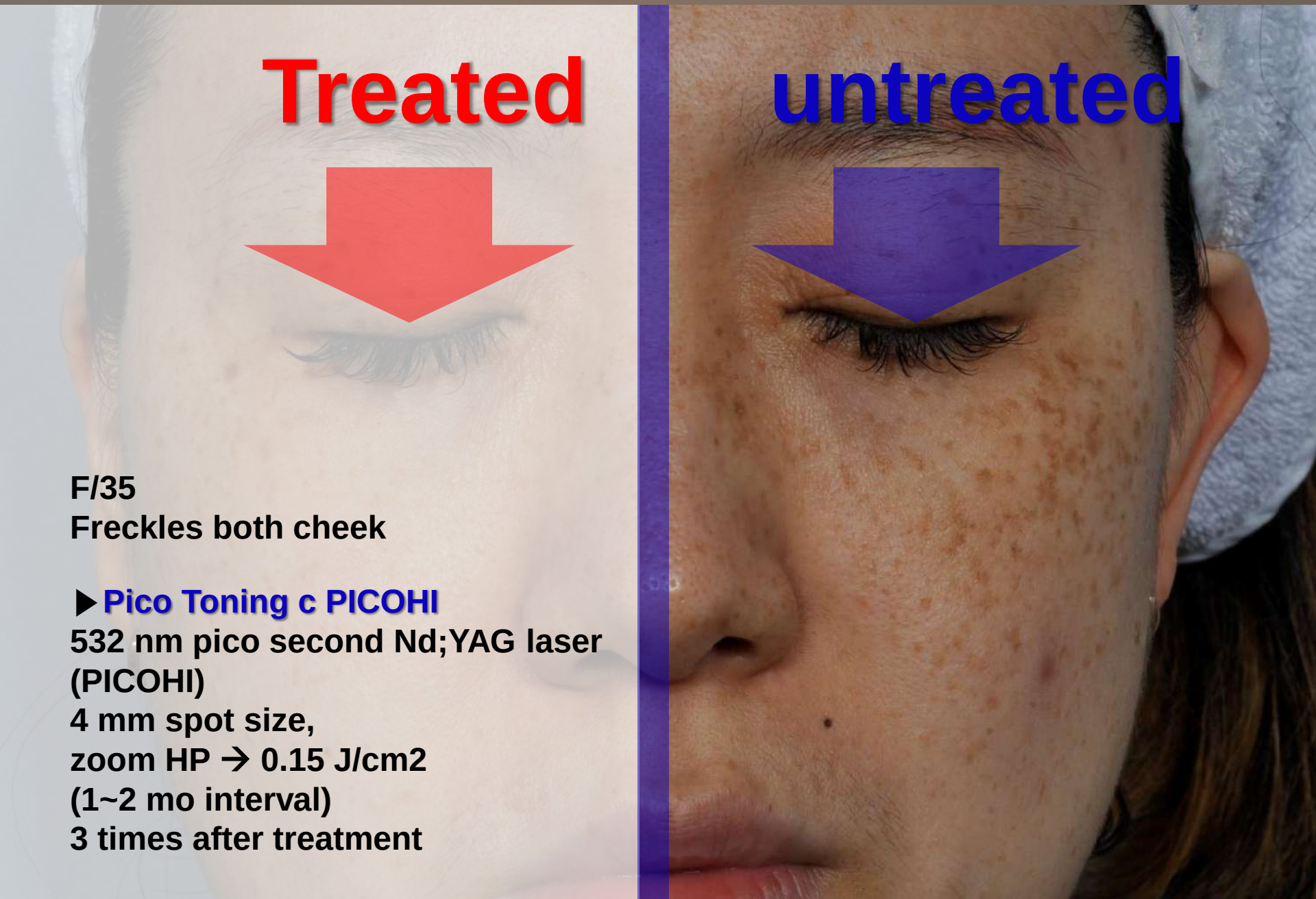
F/64
Lentigines, Rt periorbital area

▶Pico Toning c PICOHI
532 nm pico second Nd;YAG laser (PICOHI)
4 mm spot size,
zoom HP, 0.20 J/cm2, → 0.15 J/cm2
(2 mo interval)

Lentigines (epidermal pigmentation)

Lentigines (epidermal pigmentation)

Freckles, Split face trial



F/35
Freckles both cheek

▶Pico Toning c PICOHI
532 nm pico second Nd;YAG laser (PICOHI)
4 mm spot size,
zoom HP → 0.15 J/cm2
(1~2 mo interval)
3 times after treatment

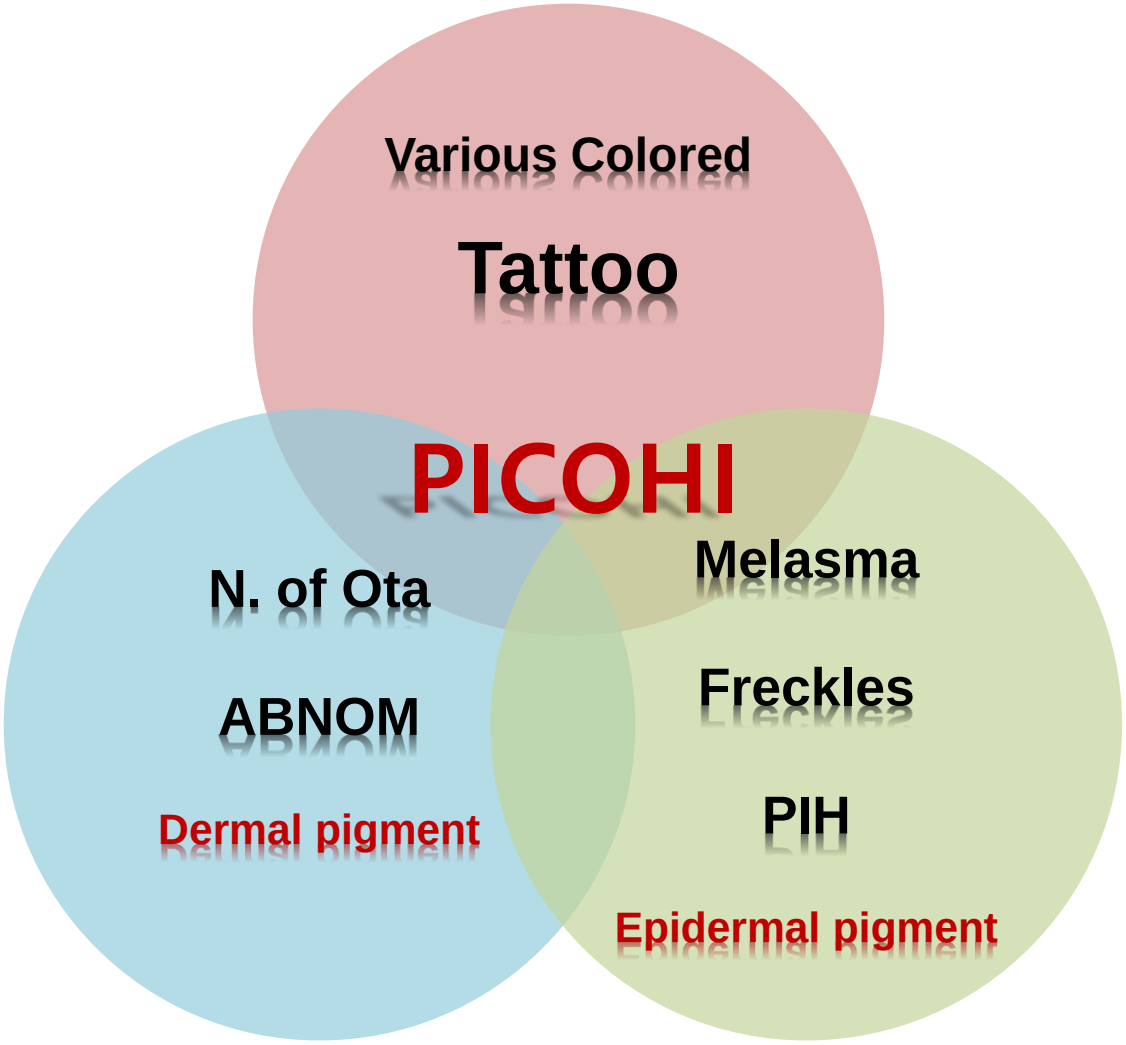
Freckles, Split face trial

PICOHI™ for Pigmentation and Rejuvenation:

- ✓ Introduction
- ✓ About Hironic Co.
- ✓ Advantages of PICOHI™
- ✓ PICOHI™ for pigmentary disorders
- ✓ **PICOHI™ for skin rejuvenation**
- ✓ Conclusion

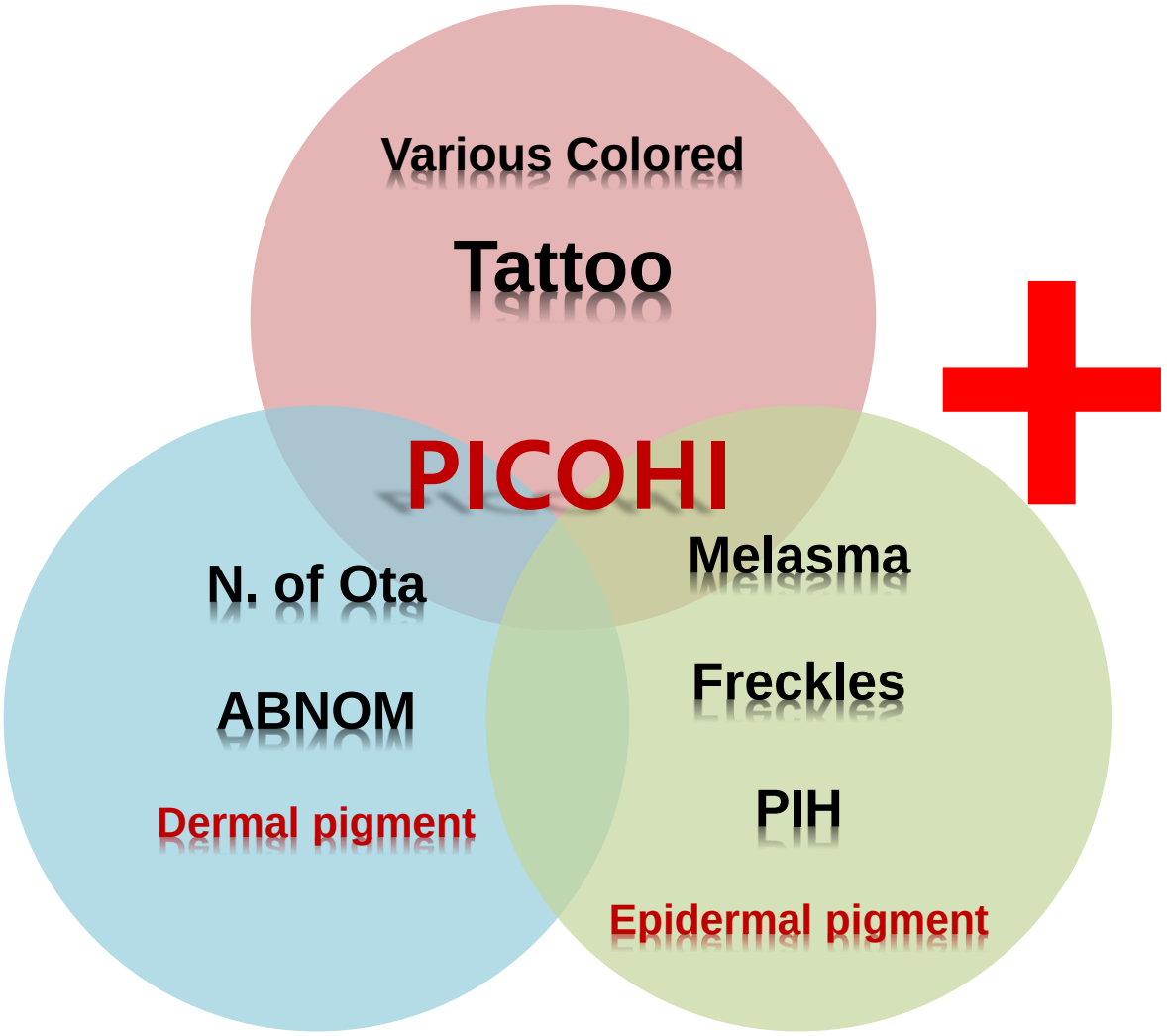
PICOHI™ for skin rejuvenation (LIOB)

FEATURES- Indication of use



PICOHI™ for skin rejuvenation (LIOB)

FEATURES- Indication of use



PICOHI™ for skin rejuvenation (LIOB)

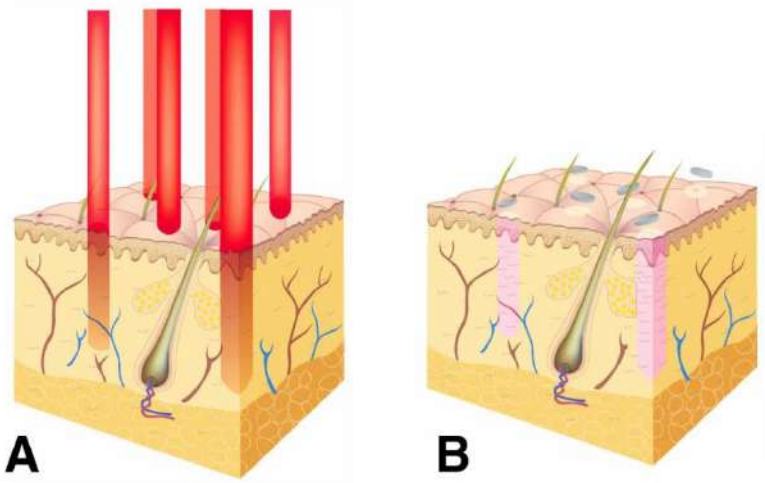
Fractional Photothermolysis

Intradermal focusing of near-infrared optical pulses: a new approach for non-ablative laser therapy

Huzaira M, Anderson RR, Sink K, Manstein D

Lasers Surg Med ; 2003, 32 (Suppl 15) : 17–38

Mechanism of Fractional Photothermolysis :



PICOHI™ for skin rejuvenation (LIOB)

Skin Rejuvenation by MLA fractional → based on LIOB

J. Biophotonics 5, No. 2, 194–199 (2012) / **DOI** 10.1002/jbio.201100083

Journal of BIOPHOTONICS

FULL ARTICLE

Minimally invasive non-thermal laser technology using laser-induced optical breakdown for skin rejuvenation

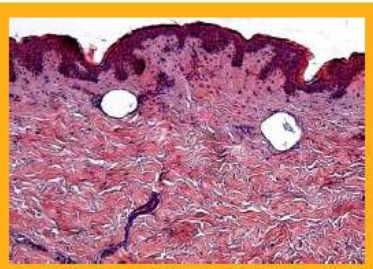
Louis Habbema[1], *Rieko Verhagen*[2], *Robbert Van Hal*[2], *Yan Liu*[2], *and Babu Varghese*[*,2]

[1] Department of Dermatology, Medisch Centrum 't Gooi, Bussum, The Netherlands
[2] Care and Health Applications group, Philips Research Europe, High Tech Campus 34, 5656 AE Eindhoven, The Netherlands

Received 12 September 2011, revised 5 October 2011, accepted 6 October 2011
Published online 1 November 2011

Key words: skin rejuvenation, laser-induced optical breakdown, collagen, wrinkle reduction

We describe a novel, minimally invasive laser technology for skin rejuvenation by creating isolated microscopic lesions within tissue below the epidermis using laser induced optical breakdown. Using an in-house built prototype device, tightly focused near-infrared laser pulses are used to create optical breakdown in the dermis while leaving the epidermis intact, resulting in lesions due to cavitation and plasma explosion. This stimulates a healing response and consequently skin remodelling, resulting in skin rejuvenation effects. Analysis of *ex-vivo* and *in-vivo* treated human skin samples successfully demonstrated the safety and effectiveness of the microscopic lesion creation inside the dermis. Treatments led to mild side effects that can be controlled by small optimizations of the optical skin contact and treatment depth within the skin. The histological results from a limited panel test performed on five test volunteers show evidence of microscopic lesion creation and new collagen formation at the sites of the optical breakdown. This potentially introduces a safe, breakthrough treatment procedure for skin rejuvenation without damaging the epidermis with no or little social down-time and with efficacy comparable to conventional fractional ablative techniques.



Ex-vivo skin specimen treated with the new prototype device, stained with haematoxylin.

J. Biophotonics 5, No. 2, 194–199 (2012)

Laser-Induced Optical Breakdown (LIOB)

▶ **Principles:**

Tightly focused near-infrared laser pulses (**sub-nanosecond pulse of 1064 nm**)

→ create optical breakdown in the dermis while leaving the **fully intact epidermis**

→ resulting in **cavitation** and **plasma generation by multiphoton**

→ **explosive vaporization and mechanical expansion in the dermis**

→ this **stimulates a healing response of dermis**

→ consequently **skin remodeling**

→ resulting in skin rejuvenation effects

▶ **Advantages:**

1) **no or little social down-time**

2) **efficacy: comparable to conventional fractional ablative techniques**

3) safe, breakthrough treatment procedure for skin rejuvenation without damaging the epidermis

J. Biophotonics 5, No. 2, 194–199 (2012)

PICOHI™ for skin rejuvenation (LIOB)

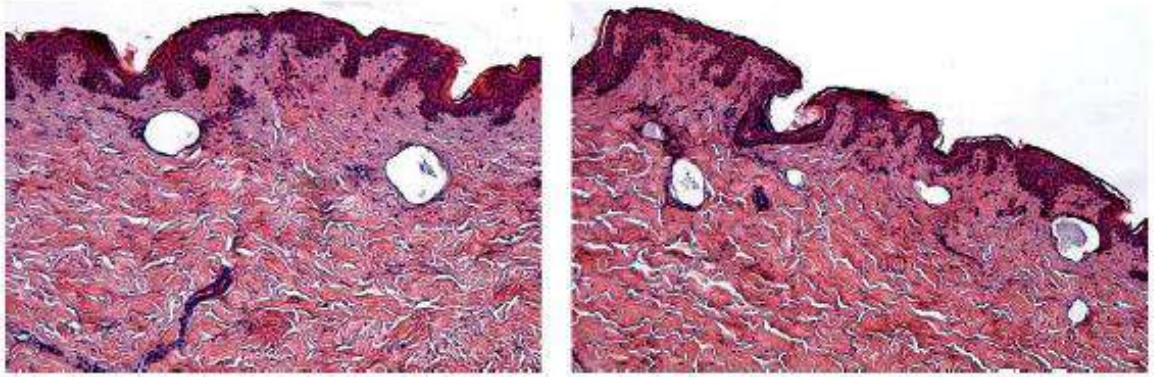


Figure 1 (online color at: www.biophotonics-journal.org) *Ex-vivo* skin specimen treated with the new prototype device, stained with haematoxylin and eosin (H&E) demonstrating the creation of lesions inside dermis of human skin.

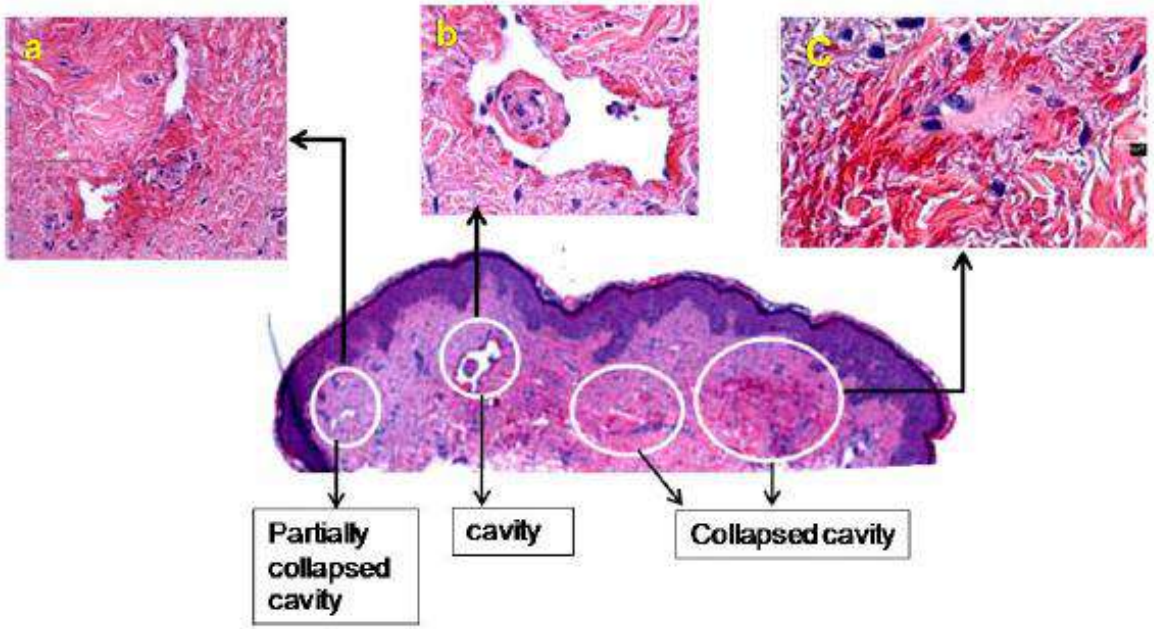


Figure 2 (online color at: www.biophotonics-journal.org) Specimen from Subject 5, 30 minutes after treatment stained with H&E. Lesions are characterized by cavity, partially collapsed cavity, or collapsed cavity. Insets depict the features of partially collapsed cavity (**a**); cavity (**b**) and collapsed cavity (**c**), where large amount of erythrocytes accumulated in the damaged zones are clearly visualized.

- damaging the dermis without damaging the epidermis

J. Biophotonics 5, No. 2, 194–199 (2012)

PICOHI™ for skin rejuvenation (LIOB)

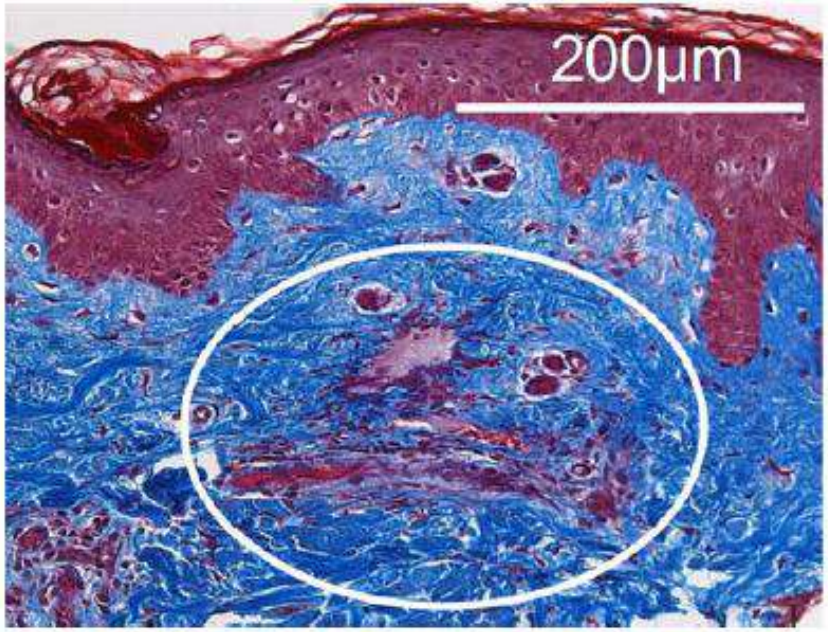


Figure 3 (online color at: www.biophotonics-journal.org) Specimen from subject 1, 30 minutes after the irradiation, stained with Masson Trichrome. Damage is identified by a lesion accompanied with large amount of erythrocytes (circled zone). Damage occurs around 200 µm below skin surface while the epidermis and stratum corneum remain unaffected.

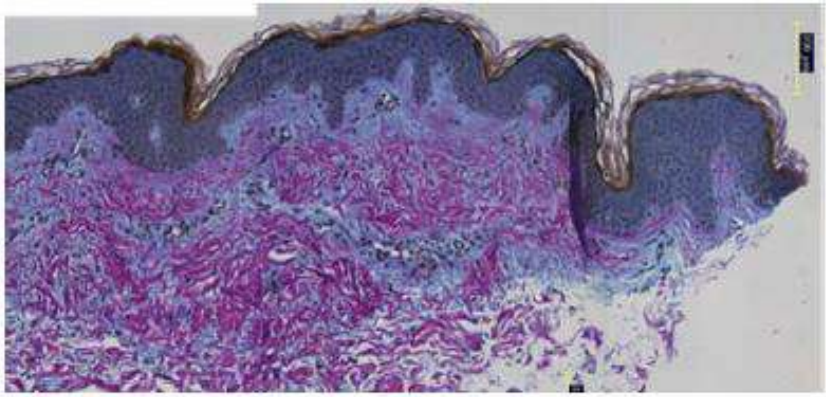


Figure 4 (online color at: www.biophotonics-journal.org) Skin specimen taken at 30 days after treatment was stained with Herovici staining. The mature collagen (collagen I) stained in red whereas the young collagen (collagen III) stained in blue.

- new collagen formation were detected (indicator of wound healing)

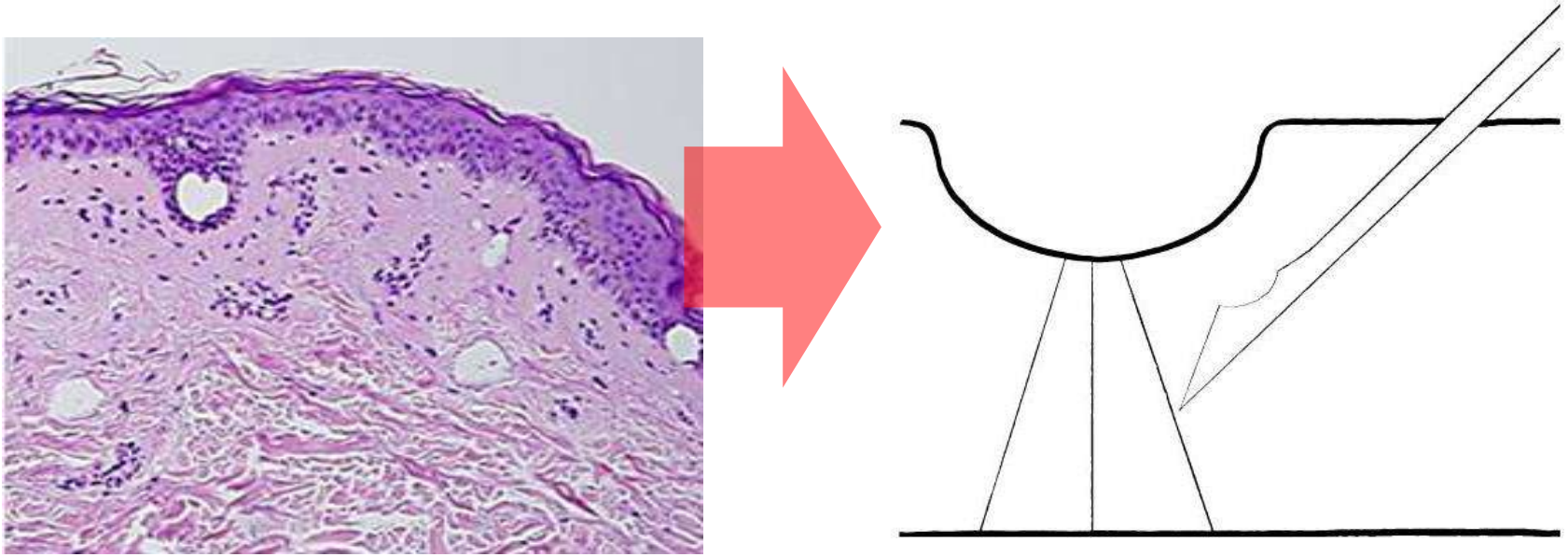
J. Biophotonics 5, No. 2, 194–199 (2012)

PICOHI™ for skin rejuvenation (LIOB)

Effect of LIOB

Laser-Induced Optical Breakdown (LIOB) of MLA (or DOE) fractional

→ **subcision like effect on upper dermis**



PICOHI, Role of Rejuvenation

Picosecond Nd:YAG laser (PICOHI)

→ originally developed for the treatment of pigmentary disorders

→ use of **fractional mode of picosecond laser**

→ concepts of **Laser-Induced Optical Breakdown (LIOB)**

→ new indication for the rejuvenation with fractional mode of picosecond laser

→ **Dual effect of PICOHI : Bleaching & Rejuvenation**

PICOHI™ for skin rejuvenation (LIOB)

- **LIOB → new indication for Rejuvenation with many advantages with little downtime.**

Case 4

A 27-year-old man visited our clinic with complaints of multiple depressed scars on both cheeks and temporal areas (Figure 5a). The patient had not received any treatment using laser/light devices. After examining the lesions, we diagnosed the patient with acne scars (ice pick and boxcar scars).

A topical anesthetic was applied, and using a PICOHI device (Hironic Corp.), the 1,064-nm picosecond Nd:YAG laser was delivered to the scar lesions, with a spot size of 13 mm (variable microlens array fractional handpiece), fluence of 0.20–0.25 J/cm^2, and pulse rate of 10 Hz. For mild lesions, the sliding technique was used until erythema and petechia appeared, and for severe lesions, the stacking technique was used for 2–3 s. The treatments were performed at 2 to 3 week intervals depending on the patient's condition for a total of 14 treatments. Immediately after treatment, an ice pack was applied to cool the treated area; prophylactic systemic or topical corticosteroids were not prescribed. To control the acne skin lesions, the patient was prescribed 200 mg of doxycycline daily for 1 month. The patient was advised to avoid excessive exposure to sunlight and to use broad-spectrum sunscreens during the treatment period. After laser treatment, the patient's scars improved without notable side effects (Figure 5b).

Figure 5. Case 4: A 27-year-old man with acne scars. (a) Before treatment, (b) After treatment.

Jie Hoon Kim. et. al. Journal of Cosmetic and Laser Therapy 2021

PICOHI™ for skin rejuvenation (LIOB)

M/27
Acne scar

▶PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)

13 mm spot size,
Microlens array fractional handpiece
Fluence: 0.20~0.25 J/cm2,
2 ~ 3 weeks of interval
Total: 14 treatments

PICOHI™ for skin rejuvenation (LIOB)

PICOHI™ for skin rejuvenation (LIOB)

M/35
Acne scar

▶PICOHI
1,064 nm pico second Nd;YAG laser (PICOHI)

13 mm spot size,
Microlens array fractional handpiece
Fluence: 0.4 J/cm2

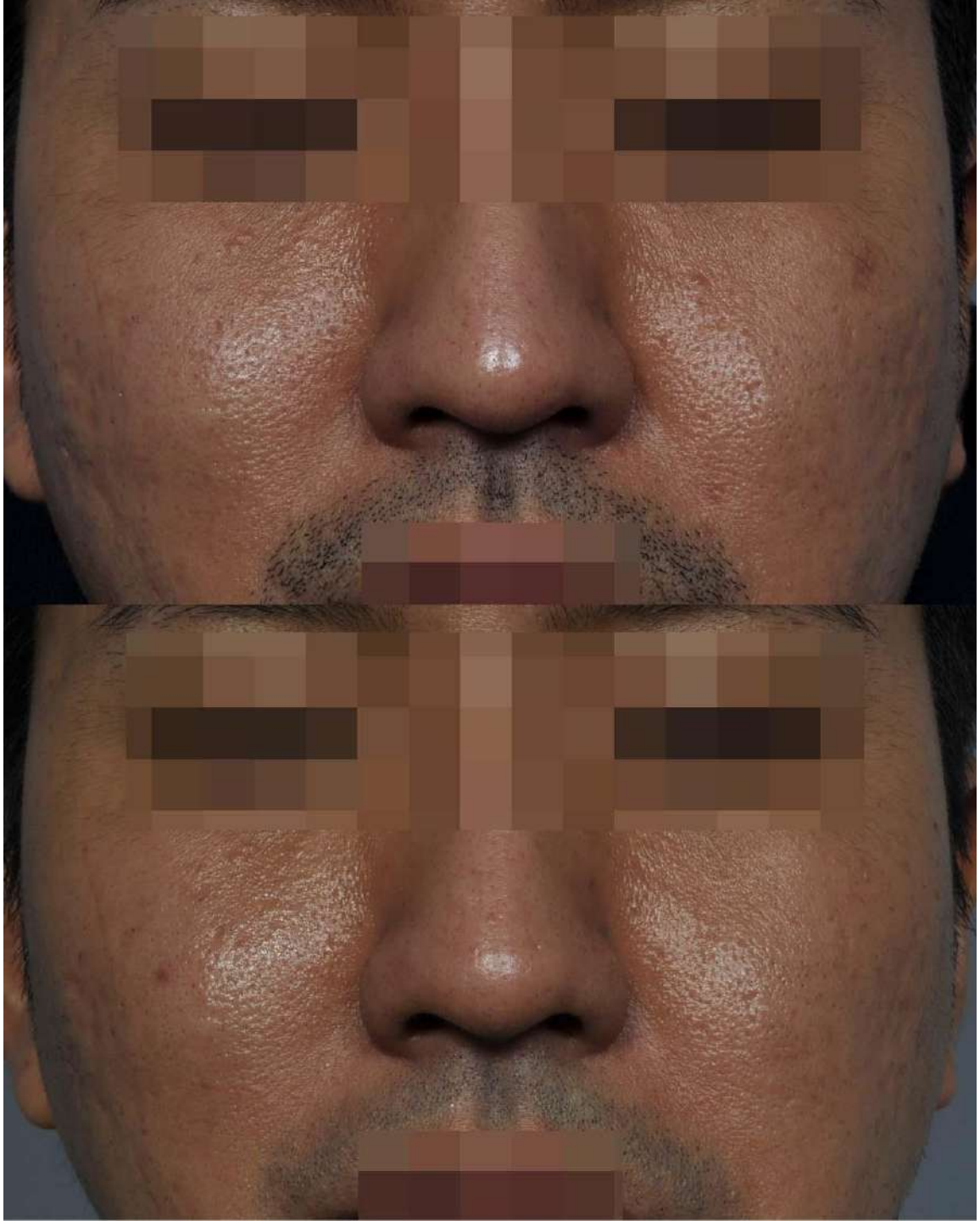
higer fluence, pulse stacking
→downtime

 # but result is good
→ High Risk, High Return

PICOHI™ for skin rejuvenation (LIOB)

PICOHI™ for skin rejuvenation (LIOB)

PICOHI™ for skin rejuvenation (LIOB)



PICOHI™ for Pigmentation and Rejuvenation:

- ✓ Introduction
- ✓ About Hironic Co.
- ✓ Advantages of PICOHI™
- ✓ PICOHI™ for pigmentary disorders
- ✓ PICOHI™ for skin rejuvenation
- ✓ **Conclusion**

Advantages of PICOHI™

- ✓ **Real 300 ps pulse duration**
  (maximum photomechanical effect)
- ✓ **Higher peak power and stable pulse duration**
- ✓ **Variable handpieces (collimated, MLA, DOE…)**
- ✓ **Easy & intuitive GUI**

PICOHI™ for pigmentary disorders

- ✓ Excellent in Tattoo removal (especially for colored tattoo)
- ✓ more effective treatment than nano second laser
  - fewer treatment sessions
  - less side effect
  - less discomfort
- ✓ Laser toning for melasma with little risk of complication
- ✓ Combination Tx with conventional laser treatment
- ✓ Treatment of complications from conventional laser therapy
- ✓ Treatment for resistant pigmentary disorders (melasm, PIH, CALM, Lentigo)

PICOHI™ for skin rejuvenation

PICOHI: originally designed for Pigmentary concern

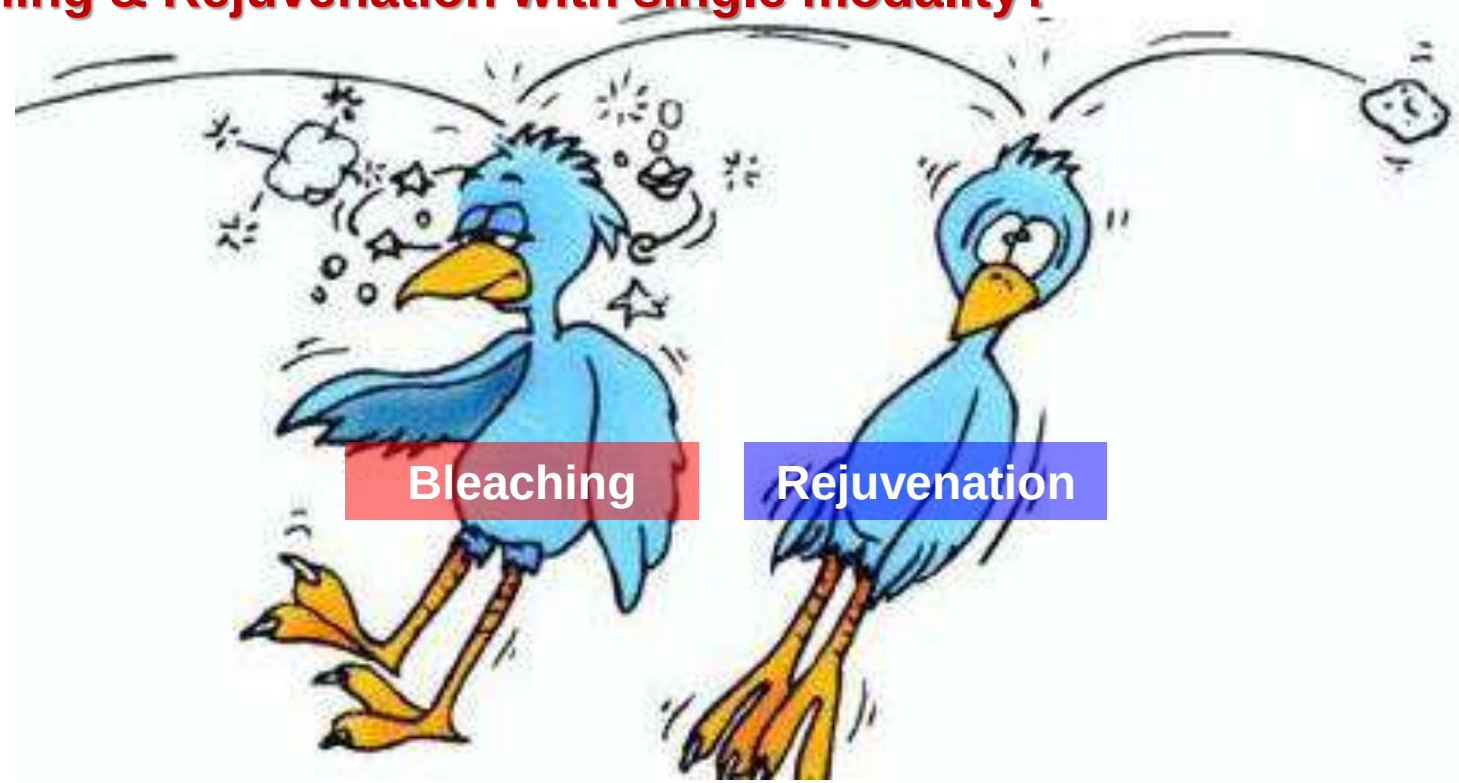
“Bleaching Laser”

一石二鳥

PICOHI™ for skin rejuvenation

Old Sayings: Kill two birds with one stone.

Bleaching & Rejuvenation with single modality?



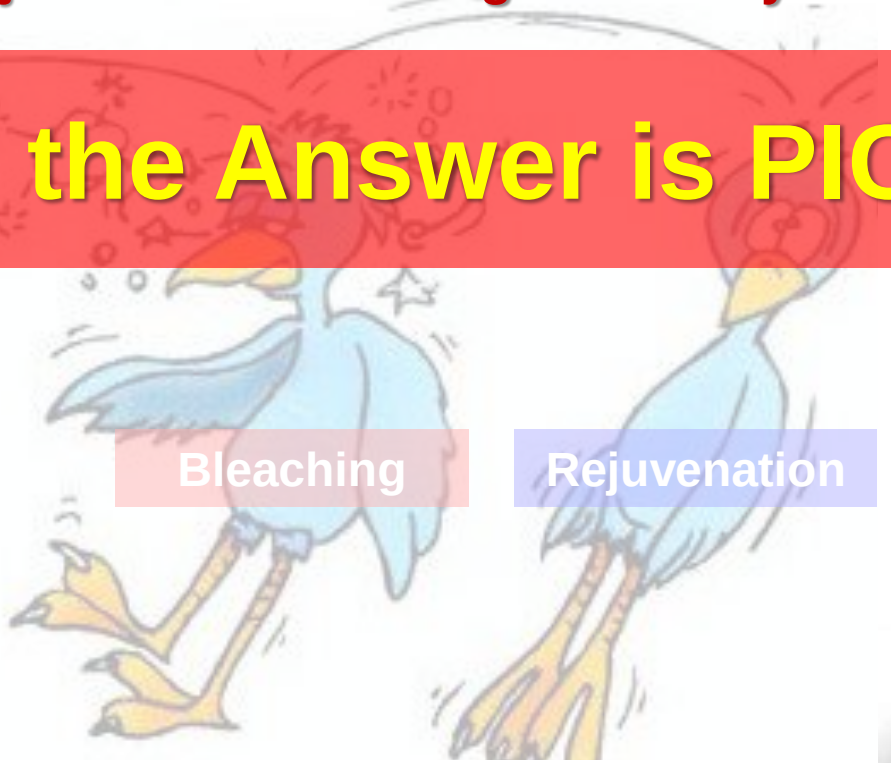
一石二鳥

PICOHI™ for skin rejuvenation

Old Sayings: Kill two birds with one stone.

Bleaching & Rejuvenation with single modality?

the Answer is PICOHI



一石二鳥

RF+IR combination stimulrater (New MIDAS)

CO2 Fractional Laser (MIXEL)

Intense pulsed light (MIPL)

808nm Diode Laser for Hair Removal (MIDEPI)

Acne photo therapy (Miraclear)

PICOHI

1064/532 nm Picosecond Nd:YAG laser
HIRONIC, Korea

HIRONIC

Cryolipolysis (MICOOL & MICOOL-A)

FUE Hair Transplant (EASYMO)

2nd Generation HIFU (V-RO, doublo & doublo-S & doublo-m)

HIFU Vaginal-plasty (doublo-v)