

PURPOSE

Skin thickness and aging features vary substantially across the face, directly affecting laser penetration requirements. This systematic review examines evidence for region-specific wavelength selection in facial rejuvenation.

Central question: Do distinct facial regions require distinct wavelengths, and can evidence-based protocols be derived from the literature?

METHODS

PubMed · EMBASE · Cochrane · 2005–2024 · 10 wavelengths (532–10,600 nm)

2,847
Articles Identified

33
Studies Included

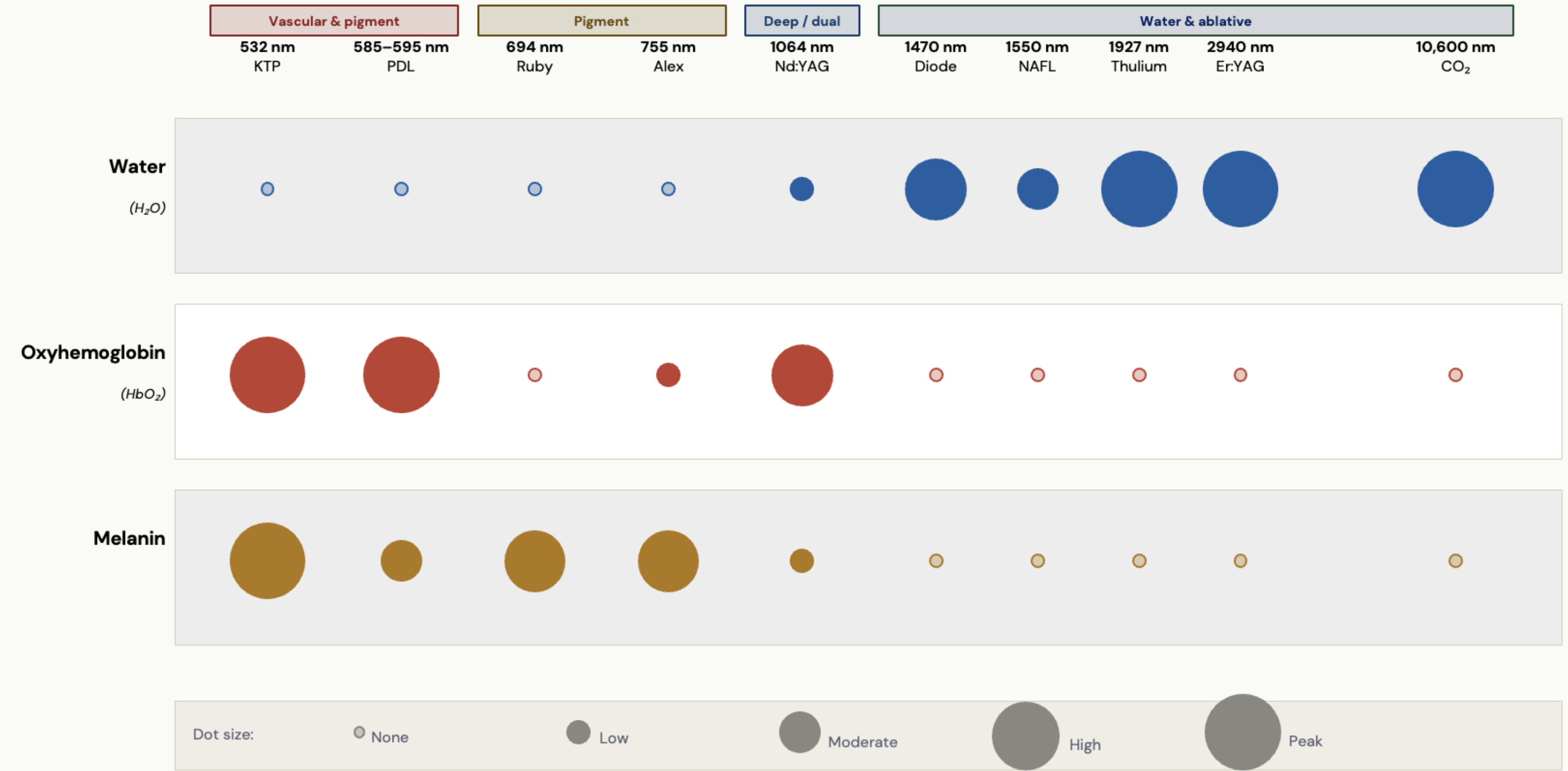
10
Wavelengths

4
Facial Regions

CHROMOPHORE SPECTRUM

Chromophore Absorption by Laser Wavelength

Dot size = relative absorption level



RESULTS

Wavelength selection by facial region and clinical indication	
Periorbital ~0.5 mm · thinnest zone	Midface 1.85–1.97 mm · cheek / infraorbital
RHYTIDES - RESURFACING 2940 nm Er:YAG Jurenovic 2021 · Pro Karsai 2010 · RCT 10,800 nm CO ₂ Wu 2025 · RCT	VASCULAR LESIONS - ROSACEA 532 nm KTP Nguyen 2024 · Pro 585/595 nm PDL Sodha 2021 · RCT Husein-ElAhmed 2021 · SR/MA 1064 nm Nd:YAG Kwon 2018 · Pro
LAXITY - COLLAGEN REMODELING 1550/1565 nm NAFL Dierickx 2010 · RCT Ozkoca 2021 · RCT Jia 2025 · RCT 1064 nm Nd:YAG Trelles 2005 · Pro	PIGMENT - MELASMA - LENTIGINES 755 nm Alexandrite Hu 2020 · Retro Wat 2019 · Pro 1927 nm Thulium Brauer · Li · Ho · Vingan 4 studies · Pro/Retro
PERIORAL 1.82 mm · muscular rhytides	LOWER face / neck Thickest zone
DEEP MUSCULAR RHYTIDES 2940 nm Er:YAG Burns 2019 · Retro	SKIN LAXITY - CONTOURING 1470 nm Diode Nilforoushadeh 2024 · SR Heller 2022 · Pro 1064 nm Nd:YAG Hong 2015 · RCT Urdiales-Galvez 2020 · Pro
NLF - PERIORAL TEXTURE Er:YAG SMOOTH mode Moftah 2020 · RCT Ebrahim 2018 · Pro 1550 nm NAFL Mohamadi 2025 · Pro Tidwell 2018 · Pro 1064 nm Nd:YAG Trelles 2005 · Pro	RHYTIDES - NECK LINES 10,600 nm CO ₂ Oram 2014 · Pro
Universal fallback — 1064 nm Nd:YAG All 4 regions · FST I–VI · non-inferior to PDL for vessels · [24,25,27]	
Individual study findings — not pooled statistics. Reference numbers correspond to poster reference list. Systematic review n=33 PMD-verified references.	

Fitzpatrick skin type (FST) — evidence by skin type across included studies

FST range	Wavelengths with evidence · no post-inflammatory hyperpigmentation (PIH) reported	Complication notes
FST I–III	CO ₂ fractional · 1550/1565 nm NAFL	No PIH reported across 4 studies [8,18,32,33]
FST I–IV	1064 nm Nd:YAG · 1927 nm Thulium · 1565 nm NAFL · Picosecond 1064 nm	No PIH across 7 studies — strongest safety signal in dataset [5,10,14,15,25,26,28]
FST III–V	CO ₂ fractional · 755 nm Alexandrite · 1927 nm Thulium · 1550 nm NAFL	PIH risk noted for CO ₂ ; reduced with low-energy high-density protocol. No PIH for 755 nm or 1927 nm [6,16,21,22,29]
FST V–VI	No dedicated evidence in any of the 33 included studies — Largest evidence gap identified in this review	

19 of 33 included studies reported Fitzpatrick skin type. 14 studies did not report FST. No study enrolled FST V–VI patients. Individual study findings — not pooled statistics.

KEY FINDINGS & CONCLUSIONS

No statistically significant efficacy difference was identified between ablative and non-ablative approaches in systematic review; selection should be driven by downtime tolerance, FST, and region-specific risk³¹.

Perioral is the only region where three independent studies confirm the same wavelength class (Er:YAG) across different delivery modes – ablative¹, SMOOTH mode¹², and intraoral prospective¹⁷ – providing the strongest region-specific evidence base in this review.

Midface requires non-overlapping wavelengths for distinct indications: 532–595 nm for vascular/rosacea, 755 nm or 1927 nm for pigment/melasma, and 1550 nm for texture. A single-device approach cannot address all three simultaneously.

1064 nm Nd:YAG is the most versatile single platform: safe FST I–VI, non-inferior to PDL for vascular indications²⁴, and 45.1% wrinkle reduction confirmed by RCT²⁵. Evidence spans all four facial regions.

FST IV–VI patients were underrepresented across included studies – dedicated evidence present in only 5 of 33 included studies. Non-ablative protocols and Q-switched 1064 nm carry the strongest support; PIH risk mitigation is essential.

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