



predictive aesthetics™

Skin Signals & Early Detection

Reading what's coming before it shows up. Five categories of sub-visible signals.

[/ 01 · ABSTRACT](#)

Reading what's coming before it shows up.

Visible aging is a downstream signal that lags underlying biological change by months to years. This paper documents the sub-visible signals that precede observable aging — sub-surface pigmentation, micro-inflammation, vascular changes, collagen-density decline, and barrier dysfunction — and presents the imaging methodology used at NAS Aesthetics AI to read them. We argue that early-signal reading is the foundation of the Predictive Aesthetics category and present a framework for translating signals into intervention timing.

[/ 02 · INTRODUCTION](#)

The lag between biology and visibility.

By the time a client perceives a wrinkle, the underlying pattern of muscle activity, dermal collagen loss, and photoaging has typically been progressing for 18-60 months. By the time pigmentation is visible in standard lighting, sub-surface melanin deposition has often been progressing for years. The client's *visual* consultation, therefore, is a lagged report. The most consequential aging is happening below the threshold of unaided observation.

Imaging technology — multi-spectral, cross-polarized, fluorescence-mode, and high-resolution dermal — allows the practitioner to see what is happening today, not what has accumulated to visible threshold. Early-signal detection is the foundation of every meaningful Predictive Aesthetics™ intervention.

[/ 03 · SIGNAL CATEGORIES](#)

Five things you can read before they show.

Five categories of sub-visible signals

SIGNAL CATEGORY	MODALITY	LEAD TIME
Sub-surface pigmentation	Cross-polarized + UV	2-5 years before visible
Micro-inflammation	Fluorescence + RGB	12-24 months
Vascular changes	Cross-polarized red	6-18 months
Collagen density decline	High-res dermal	18-36 months
Barrier dysfunction	TEWL + visual	Months to weeks

Each signal category has a distinct imaging modality and a distinct lead time before the underlying biology manifests visibly. The lead times above are approximate and individual variation is wide — they represent typical ranges in our clinical observation, calibrated against the underlying literature on each modality.

/ 04 • TRANSLATION

From signal to intervention.

Translating signals into intervention timing

A signal read is not yet a treatment recommendation. Translation requires: (a) the severity of the signal, (b) the typical progression rate of that signal in that client's demographic, (c) the lead time to visible threshold, (d) the treatment options available at each progression stage, and (e) the cost gradient across those options.

Sub-surface pigmentation detected at low severity in a Fitzpatrick II patient in her early 30s, for example, typically progresses to visible threshold over 3-5 years. Topical intervention (tretinoin, vitamin C, hydroquinone, strict SPF) at the sub-visible stage will arrest or reverse the signal in 70-85% of cases (internal practice data). The same patient presenting at the visible stage typically requires energy-based intervention (IPL or fractional resurfacing) in addition to topicals — a 4-6x cost gradient.

The cheapest treatment is always the earliest one — but only if you can see what to treat.

/ 05 • IMPLICATIONS

What changes when you can read early.

The imaging modalities described in this paper are commercially available and increasingly accessible. The barrier to predictive aesthetic care is not technological; it is procedural. Practices need to (1) integrate imaging into every intake, (2) document signals as part of the Aging Read™, (3) translate signals into Driver Maps, and (4) sequence interventions against the timeline the signals suggest. Each step is documented in subsequent papers in this volume.