The subjective nature of one of the mainstays of skin typing, the Fitzpatrick Skin Type (FST) scale, presents a particular challenge to light-based practitioners looking for consistent, reproducible aesthetic results across their patient base. Even seasoned specialists’ “eyeball” assessment of skin type, coupled with patients’ self-reporting on sun exposure, which is sometimes sketchy, often fail to provide sufficient objective data to establish ideal baseline treatment parameters. What clinical benefit might result from more accurately measuring skin melanin density before each treatment when tanning and other UV exposure may have occurred between treatment visits? At the 2012 American Society for Laser Medicine and Surgery annual meeting, an expert panel roundtable related their experiences with recently FDA-cleared melanin indexing technology, and described how having objective data on melanin levels in real time has enhanced their ability to better guide selection of photodermatologic treatment settings to minimize risk while achieving desirable aesthetic endpoints.

Panel Members

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Panel Moderator
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Dr. Ross: The Skintel™ Melanin Reader, the only FDA-cleared melanin reader, is a culmination of about 10 years of research and development work at Palomar® on reflectance spectrophotometry (Image 1). One of the challenges with any device is trying to make it reproducible so that you can place it on a patient’s skin and obtain predictable melanin measurements. The objective of the original research was to quantify the erythema and the melanin and, of course, with our measurements, take erythema out of the equation. The device is solely intended to help you with guiding treatment settings so as not to damage the epidermis. Ultimately, the goal is to have algorithms that you can use with light-based devices to optimize your treatments so you’re not under-treating or over-treating.

Image 1. The Skintel Melanin Reader Determines the Average Melanin Density of Skin in a Quantitative Manner Prior to Treatment

Practitioners using the Skintel Melanin Reader take three sample readings on skin of the targeted treatment area which are then averaged into a Melanin Index (MI) value. This MI value is communicated wirelessly to the Palomar Icon™ Aesthetic System. The practitioner then chooses a suitable pulse width based on clinical conditions; the Palomar Icon system will then suggest a starting test spot fluence (Skintel Value).

The foundation of the Skintel device is cleverly using skin reflectance. Melanin measurements of the skin are made by measuring the amount of light that’s reflected from the skin at various wavelengths. The Skintel reader uses 640 nm, 700 nm and 910 nm wavelengths (Illustration 1). Skintel does not simply interrogate the skin to get feedback from those wavelengths—but it takes those wavelengths and applies a complex algorithm. This gives you a measurement called the Melanin Index (MI), which is intended to be reproducible from patient to patient and is not going to vary depending on what individual Skintel you use. In other words, each Skintel reading should be exactly like another Skintel reading as long as the melanin concentration is the same. In different patients—or within the same patient—it should be able to measure those differences reproducibly. Lighter skin, represented by the purple line (Figure 1), is going to give you more skin reflectance than darker skin.

Dr. Ross: The Skintel device is placed against the skin and it sends in those three wavelengths of light to give you a measurement that’s representative of the amount of melanin in the skin. It interrogates the melanocytes and the melanin in the skin. It’s really measuring optical density or how opaque the epidermis is. If you take a light-skinned epidermis and actually take it off of the skin and hold it up, it would be like a very, very fine shower curtain with just a frost. If you took a very dark patient and took that same epidermis off and slid it off the skin and held it up, it would be more of a darkened type of translucent layer.

Illustration 1 and Figure 1. The Skintel Reader Works by Measuring Melanin Optical Density (MOD) through Skin Reflectance

The Skintel Melanin Reader measures the skin’s diffuse reflectance at three unique wavelengths of light (Illustration 1). These values are computed into an MI value that corresponds to a Skintel fluence as a suggestion for a starting test spot fluence.

Image provided by Palomar Medical Technologies, Inc.

Fitzpatrick, Quantified: Melanin Indexing and Skin Type

Employed by skin specialists for a generation, the Fitzpatrick Skin Type (FST) scale was developed by Harvard University dermatologist Thomas B. Fitzpatrick in 1975. The FST scale’s numerical classification schema measures several components as a means to classify the response of different skin types to UV light: genetic disposition, reaction to sun exposure, tanning habits and the practitioner’s visual assessment. Its precision, however, hinges in large measure on patient awareness and accurate self-reporting of these parameters.

The “gold standard” method of assessing skin pigmentation is spectrophotometry; however, even as early as 1961, Monash et al recognized the potential for this measure to be confounded by blood vessel dilatation. The red reflectance captured by reflectance spectrophotometry introduced an uncontrollable variable when measuring the tanning/pigmentation response of skin tone/color. Room temperature induced increased or decreased blood flow through the skin, altering spectrophotometer findings. Other blood flow variables included recent exercise and emotion-based flushing and blushing. Since these conditions were difficult to reliably control on sun-exposed extremities, spectrophotometry was not a practical method to assess change in melanin over time.

The Skintel instrument provides a read-out of melanin indices (MI) as a function of the absorbance characteristic of human skin, with the MI increasing as the skin becomes more pigmented. In the graph below, the numeric FST classifications are overlaid on their corresponding melanin index “brackets.” The following graph provides the range of MI values per FST.

“When you look at this graph, you see a lot of overlap between skin types with the same melanin index. If you look, for instance, at an MI between 10 and 20, you have skin types II, III—even some IV patients within that scheme. That means you could be all over the place in assessing the patient’s skin tolerance with estimated fluence based just on skin typing. The Skintel reader reduces that variability in the equation.”

—E. Victor Ross, MD

Illustration and figure provided by Palomar Medical Technologies, Inc.

Image provided by Palomar Medical Technologies, Inc.
The Power of Three

**Dr. Ross:** The three wavelengths are important. There are a lot of different devices that have, in the past, measured melanin. None of those were commercially paired with a certain type of light-based device. The problem is most of those are not as sophisticated and don’t use three wavelengths. The advantage of three wavelengths is that it accounts for all the little perturbations in the normal skin’s behavior during the day. It’s sort of like having the three credit scores. If you have all three wavelengths, you’re able to get a really good feel and normalize for all those little variations. So, if I took a reading with this device from one day to the next, I should get the same measurements—if the patient’s not tanning. That’s one advantage of a device like this.

Palomar performed measurements on a range of melanin indices and actually looked at skin typing. Skin typing is really more of a subjective test. When you ask somebody in a questionnaire how they tan, I’ve found most people overestimate how they tan. People tend to believe they were darker than they are. So, skin typing is flawed because skin typing is based, not just on the eyeball of the patient and of you looking at the patient, but also on the patient’s input. The Skintel reader takes this out of the mix. No more worrying about a patient telling you they can tan or a patient going to the beach. Now we’re looking at a real-time assessment of melanin, which is far superior than trying to guess.

The Skintel Reader Protocol

**Dr. Ross:** First, you have to have the hand piece you’re going to use with the machine. The Skintel takes three sample measurements on the skin; the Skintel reader won’t transmit the measurements back to the base unit unless it takes three measurements. The average of those three measurements—or whatever number of measurements you take before you hit the transmit button—is going to establish the MI. You want to take those measurements from the same representative area as far as pigmentation. If you start on the back of the arm, for example, you should do all the measurements on the back of the arm, if that’s the area you’re assessing, to find the safe test dose fluence. Then transmit the MI measurement you took on the patient via Skintel’s wireless connectivity. Next, you choose the pulse width you want to use, for example, 10 ms or 15 ms, and it automatically gives you a suggested start test setting for that patient in that particular anatomic region.

Know the Endpoint

**Dr. Ross:** Here’s a particular patient of mine who’s a good case to show where the Skintel device is especially helpful.

This patient has a slight tan—typical San Diego—and has some lentigines, some low-contrast and high-contrast lesions. In this case, the Skintel MI was about 17 and it told me to treat at 30 J/cm² and 15 ms. On the right is the patient about 30 minutes later—a really nice endpoint, giving you the maximal improvement in skin, but zero crusting in the background—just crusting of the photodamaged skin.

And this photo at the left is what you want to avoid, so if you over-treat, this is typically what does happen. Now, fortunately, most of these wounds will heal uneventfully, but it takes months for this pigment to homogenize. What the Skintel reader can do is help you reduce these types of situations.

Case Study #1: Dr. Weiss

**Hair and Eye Color Cues**

**Dr. Weiss:** This patient was perfect for the Skintel device: her hair and eye color made me cautious. The patient could go either way, Fitzpatrick III or IV, and it was hard to tell by history and eyeballing. Hers would be a typical presentation at the end of summer—no voluntary sun exposure, just incidental. You would have guessed a melanin index of 15 or so, but, in testing three areas on both temples and mid-forehead, the device delivered a surprising reading of an MI of 19. I would have set the parameters on my MaxG™ for 20 ms, 36 J/cm², but these were reset after the Skintel reading for 20 ms, 30 J/cm².

This setting avoided the side effects of footprints and we achieved good results for the patient with no downtime. You can see the improvement in the pigmentation. Our eye is very poor at assessing background pigmentation and, here, the Skintel reader really saved the day. Especially in auburn-haired patients with those greenish-to-brown eyes—it’s especially helpful.
Case Study #2: Dr. Cohen

Rocky Mountain ‘Sweet Spot’

Dr. Cohen: Living in Colorado, we have over 300 days of sunshine a year, and we take care of patients who have significant outdoor lifestyles. Recognizing that there’s more UV penetration for every thousand feet, we treat patients on a regular basis who may come in slightly tanner than where they were on their baseline treatment. So, I think it’s important for us to recognize that and be able to document that objectively to our patient.

Over the past six months in our practice, the Skintel reader has really helped us find the “sweet spot” in treatment rather than just going with an overall “gestalt.” It also gives an objective way to sometimes postpone a procedure when the situation’s not right and somebody is significantly darker and more tan compared to their initial visit. Being able to check the melanin index at each visit is important, and being able to check the melanin index in different treatment regions is very important. Many of us see patients who have a long drive to work and the left side of their face may actually have a totally different color than the right side. Many people wear sunscreen on their face, but not on their chest, or, they might wear a hat much more compliantly than they wear sunscreen (such that their forehead is several shades lighter than their checks). So, recognizing that, we can use specific melanin index readings for each area of the face or body that we are actually treating.

The doctors in our practice have been using Palomar equipment for a while and were comfortable with the settings. Last summer, we had a new physician join us who was new to the equipment. We initially organized it so that we were there with the new doctor to review settings. Then, six months ago when we got the Skintel reader, I think it made it much easier to integrate somebody into the practice who may be newer to a device and have them feel comfortable. After the initial few months of assistance with settings from the other physicians, Skintel then made the new doctor feel more comfortable and gave the new doctor—and all of us—a way to double-check if our settings are in an appropriate range.

This case pictured at left is really just an example some of the pitfalls and complications we can see in our practices from someone using settings that are too high or not noticing tanned skin. This is a very difficult issue to treat. I’m just starting to treat this lady who was treated in another facility and I think the Skintel reader is going to be helpful in terms of getting the appropriate settings in each of these areas of striping on the back of her arm to hopefully help match her a little bit. So, if we can avoid these types of things by giving ourselves the confidence of going with the MI and figuring out the appropriate settings to use based on that index—that’s desirable. The Skintel reader has been so helpful in our practice. It gives us objective data to use as one factor in determining what the appropriate settings are for that specific region that we’re treating and for how the patient looks that specific day.

Case Study #3: Dr. Kaufman

Very Fair? Beware

Dr. Kaufman: Like Dr. Cohen’s practice, in Miami, we have a lot of sun so we have the same kind of problems. People come in and they swear to me they haven’t been in the sun, they’re not tan, and when I go back and I check their MI now, I see usually I’m right about it. But people never want to admit that, yes, they might be tan—or they don’t realize it. So, for my case, I’ve picked a patient who’s very fair. She’s really a skin type I to II, very fair, always burns in the sun. This is actually a week before we got our Skintel, so, I said, “Okay; easy to treat. I can go with my fairly aggressive settings, no problems.”

She texted me this second picture on the right a couple days later, and she really does have block crusting as opposed to crusting of the pigmented lesions. We had her come back and I had just gotten my Skintel reader, and looked at some of the skip areas. I tested her with the Skintel reader and actually, in her non-sun-exposed areas, she was really a type I—15 on the MI. Then, when I checked some of her pigmented areas, she was a 20, and, in the darker areas, she was about a 24. So, she was really dark even though she doesn’t look like those lentigines are classically dark, stand-out lentigines. I guess the melanin stacking really
makes them much darker, which is why she burned as opposed to getting the optimal treatment. So, for me, it’s been helpful with darker skin because those are patients that I have typically undertreated. But, it surprised me that it actually really helped me with some of the lighter-skinned patients that I was probably going a little aggressively on because I didn’t realize they were tanned or that their pigmented lesions were dark.

After a couple of treatments she had a huge improvement, and lots of those lesions cleared and she was back to her regular MI of 15. The Skintel reader has become very useful in Miami in our practice with some of our lighter skinned patients who tend to chronically tan.

**Case Study #4: Dr. Adatto**

**A World of Skin Types**

**Dr. Adatto:** I’m based in Geneva, Switzerland. We don’t have a lot of sun, but our patients love outdoor activity in the winter. And those who don’t ski in the winter come here to Florida to enjoy the sun. We have sun from June through September and everybody’s outdoors. It’s the same problem in San Diego and other sunny places. We also have a lot of mixed population as Geneva has one of the main offices of the UN, so we have people from all around the world and all skin types.

One case type where I like to really use the Skintel reader is represented by this 20-year-old Asian female pictured above with dark coarse hair on her axilla areas. As you know, Asian skin type is difficult to treat. Is she a skin type III or a skin type IV? It’s always difficult to tell and they are really prone to post-inflammatory hyperpigmentation (PIH). Here, the Skintel really helps us to make the right decision. The MI that we measured was 32 prior to the first treatment. As it was coarse hair, we decided to choose the MaxR™ hand piece and the Skintel reader’s suggested parameter options were 36 joules at 60 ms, 28 joules at 40 ms, or 24 joules at 20 ms. We did the session according to the Skintel reader and, one month after the first treatment pictured above on the right, the result was very good. There was already a decrease in the denseness of the hair, and my main worry with this patient was allayed, as there was no PIH at all. For this case, the Skintel reader was really helpful due to her skin type.

**Photos courtesy of Joely Kaufman, MD, FAAD**

You can see some discreet lentigines in the right upper chest and then, after just one treatment, pictured on the right, she cleared these discreet lentigines and she was thrilled.

So, a couple of things that the Skintel reader has taught me; one is that when light-based settings are given by companies, they are typically very conservative. But something the Skintel reader has taught me is that I can achieve the same endpoint I want with a lower fluence, so perhaps we don’t have to “blast” people, so to speak, to achieve darkened pigment or closed blood vessels—our
desired endpoints. Number two is that your eyes can really deceive you. I had a Puerto Rican patient with very light eyes, lighter skin—you would swear she was lighter than I am and I’m an MI 14 or 15 and she was a 19. So, if I had treated her with settings like I would have treated myself, I would have given that stamped appearance. The last point is that patients really have loved the Skintel device in our practice. They start asking me, “Oh, what’s my melanin index?” at their next visit. It’s really helping me build my practice.

Dr. Ross: The clinical application is really the most important part of this device. The device will actually help you to be better with your eyeball. What you’ll find is this sort of positive reinforcement. You use the device, you get the number and the next time you see a patient, you kind of know what the number is going to be. You can train your eyeball to make very, very subtle sort of differences—little changes based on your Skintel feedback. The Skintel reader will allow you to be better at really guessing how dark people are.

Case Study #6: Dr. Vasily

The Challenge of Fitzpatrick V

Dr. Vasily: Just to give you some background on how I’ve found the Skintel reader to fit into my practice, I’ve actually used a colorimeter to determine pigment ratios for many, many years and we treat based on algorithms for each handpiece used. The problem with the older version xenon arc colorimeter we have used was that it really didn’t read very accurately on darker skin tones. We had a lot of trouble using it on type IV, type V or type VI skin. The readings were just unreliable. The Skintel reader has really taught us that we were probably under-treating a lot of these patients. It is not only an advance in terms of using quantitative data, in contrast to Fitzpatrick skin types, to determine dosimetry, but also in regard to some of the earlier colorimeters. The physical geometry and the tri-stimulus LED device is a significant advance over simple colorimeters in my opinion.

This case pictured above is a difficult one involving a patient with very dark skin, with a V - VI Fitzpatrick skin type with Skintel readings of 73 to 75. Based on our readings with a colorimeter, I probably would have treated this patient very conservatively at a fluence of 10 J/cm² with the MaxRx™ hand piece at 60 ms. We were able to treat her successfully at the Skintel-suggested reading of 12 and then gradually increase the fluence each time because her readings stayed relatively consistent. Ultimately, we were able to work the fluences up almost 6 J/cm² from the baseline suggested, so there is some wiggle room, but you have to go very slowly, do test doses, and work your way up in fluences. She had a really nice result after about 4 treatment sessions, as pictured on the right above. She had significant hair reduction, no crusting, and was very, very happy. This points out again the usefulness of this device in darker skin types. It’s very useful and has been a real plus compared to earlier instrumentation that we used to read skin color. Also, a clinical pearl is that if you’re treating the décolleté area or higher-risk areas, especially with a MaxG™ or a MaxX™ hand piece, I would tend to stay closer to the suggested readings because on those higher-risk areas—lateral neck, mandibular jaw line, the lower extremities with tan lines—there can be a lot of variation. I’m sure all of you have had the experience where you’re treating lower legs and you’re fine and then, all of a sudden, around the knee or the anterior tibial region, you’ll get branding or crusting. It’s good to do the Skintel readings from multiple sites because, actually, you may change your fluences based on those readings. Finally, we are always conservative and use lower-than-suggested fluences in patients with new tans.

Case Study #7: Dr. Dover

Turnabout in Tanners’ Treatments

Dr. Dover: We’ve been using the Skintel device for a little bit less time than some of the others on the panel, but it’s already changed my practice. I measure every single patient with it now. It’s incredibly easy to use, it takes 20 seconds or so. Turn it on, do three measurements, hit the button and it tells you the MI. Then, all you have to do is punch in the pulse duration you want to use—which is your choice—and the device tells you what the test dose setting would be for that pulse duration. We use it, record it in the chart, and then, when the patient comes back for subsequent treatments, we use the Skintel reader again to see if they’ve actually been tanning or not. Then, we can adjust our fluence depending on how the Skintel measurement changes. We find it very helpful for very light-skinned patients whom I might be under-treating.

This is a lovely woman, pictured in my case study above. She looks a little lighter, but she has a lot of lentigines and some background color. She does a lot of outdoor activities and so let’s look at the numbers. Her Skintel measured 20 and suggested we...
treat her at 20 ms and 28 J/cm². She came up higher because she’s tan, not because she has more constitutive pigment. You can push it a little bit in these patients, but if you’re just starting out and you’re learning, stick with the settings that the Skintel device recommends. These patients did not have crusting or blistering, scabbing. They had the usual “coffee grounds” and healed beautifully.

I, unlike Vic, work in a part of the country where people, for the most part, can avoid tanning. In the past, if patients were lightly tanned or bronzed, I would not treat them. Now, I use the Skintel to help guide me and I start treating them at 20 ms and around 20 J/cm². I think it’ll be a huge advantage for those of us who have this device. It will separate you from the competition.

**Dr. Tanghetti:** I use that device in just about all my patients. The reason is that I like to know how my patients changed since their last treatment. So, if you have a baseline and then, sometimes in the spring, late summer, you don’t know how they’ve changed. It’s very hard to remember exactly where they were in order to determine if you can use the last fluence. So, if their number changes significantly, I’m going to go reevaluate my parameters. I think where it’s also helpful is if you get a patient that you’re not quite sure of. It kind of brings some clarity to where you’re starting. There’s some leeway up that you could certainly go to, but it gives you a guide and you know where to stop. And, if you go beyond that guide, you’re going to put one or two pulses and just look at their response to make sure that you’re ok.

**Dr. Ross:** That’s right. And the critical thing is to measure the average background skin color where it’s pretty bad. Don’t go down where the breast meets the rest of the skin because then your settings are obviously going to be too high.

### A Practice Game-Changer

**Dr. Weiss:** Looking at how accurate and reproducible this is, having the device, it’s almost that we should probably come up with another index of skin types based on the readings that we get with the Skintel reader as we get more experience. I think that could really benefit dermatologists and others as well and really contribute to the literature.

**Dr. Tanghetti:** And the next step that we’re going to work on is something to give you real-time numbers, so you get the theoretical, where you should be, then you’re going to hit them and then have a thermal image of what actually happened during the treatment. Then you’re even more accurate. I think that they’re making great steps forward in this. The Skintel reader is actually very important because it brings an added safety feature; it brings the experience of an expert treater to the table for even the novice. The important thing is that it gives a real-time number to a patient over a series of treatments—not just one treatment, but over a series—to make sure that if you’re building up their treatment—that you understand that they haven’t had something happen to the target in the meantime that will alter it.

**Dr. Dover:** It would be wonderful to have a small, hand-held Skintel device to take with me from room to room and have a reader that told me my Skintel measurements in all my patients. It would be a way to have a whole series of pictures from Skintels in the world from 1s to 50s and we might actually finally improve on the Fitzpatrick paper from 1973. If we had a number and said: “She’s a 19,” we’d all know exactly what that meant, right? Rather than: “She’s a skin type III, but she tans well, but she’s not been in the sun” sort of thing. It’d be very nice to have that number on all your patients whenever they’re having a procedure.

**Dr. Adatto:** I think the Skintel reader is also really helpful to avoid conflicts with patients. We all have patients who tell us, “I am not tanned. I didn’t go out in the sun.” And we usually lose time and energy telling them that, “Yes, I’m sorry. You are tanned.” Just a Skintel measurement will solve the problem. Since we have had the Skintel reader at my practice, each patient who comes for a treatment with the Palomar Icon system has the Skintel measurement and it’s recorded. We do that with the Skintel reader for each subsequent visit to see if they are stable and it really helps us. Also, the patients are very happy to see that we have some objective measurement to set up our parameters. It makes our treatment look much more professional than before.

### Faculty Disclosures

**Drs. Adatto, Cohen, Dover, Green, Kaufman, Tanghetti, Vasily and Weiss** have received honoraria from Palomar. **Drs. Green and Kaufman** have served on the Speakers Bureau for and received research funding from Palomar. **Dr. Cohen** has served on the Speakers Bureau and has been a clinical trial participant for Palomar. **Dr. Ross** has received honoraria, research support, and loan of equipment from Palomar.