Article:
Vrajesh Pandya.
Transdermal GFR Signals a New Horizon in Renal Diagnostics.
Clin Chem 2025; 71(12): 1281–2. https://doi.org/10.1093/clinchem/hvaf106

Guest: Dr. Raj Pandya is a Board-certified Clinical Chemist, Medical Director of Clinical Chemistry and Toxicology at ARUP Laboratories, and an Assistant Professor of Pathology at the University of Utah.

Bob Barrett: This is a podcast from *Clinical Chemistry*, a production of the Association for Diagnostics & Laboratory Medicine. I'm Bob Barrett.

Chronic kidney disease, or CKD, affects an estimated 14% of the U.S. population. Unfortunately, 90% of people living with CKD don't know they have it, hindering intervention efforts designed to slow disease progression.

Currently, renal function is assessed by measuring or estimating glomerular filtration rate. Measurement is the most accurate, but this requires administering an exogenous tracer and collection of serial samples to monitor its removal from the body. Estimation is more appealing from a logistical standpoint, but the analytes measured for this purpose aren't sensitive to acute change. As a new alternative to these two conventional options, a recent FDA-approved transdermal GFR device allows monitoring of tracer removal over an extended period of time without requiring serial sample collections, increasing patient convenience and potentially capturing additional insight into the pathophysiology of CKD.

A News & Views article, appearing in the December 2025 issue of *Clinical Chemistry*, evaluates this new device, describing its pros and cons and identifying opportunities for its integration into routine care delivery.

In this podcast, we welcome the article's author. Dr. Raj Pandya is a Board-certified Clinical Chemist, Medical Director of Clinical Chemistry and Toxicology at ARUP Laboratories, and an Assistant Professor of Pathology at the University of Utah. He's particularly interested in biomarkers of kidney disease, and today, he'll be talking with us about Transdermal GFR, or TGFR, and Dr. Pandya, let's get to the basics. Just exactly what is TGFR?

Raj Pandya: So, TGFR stands for transdermal glomerular filtration rate, and TGFR is a new technology that represents transdermal fluorescence detection to assess glomerular filtration, in other words, kidney function.

Bob Barrett: So how is this measured?

Raj Pandya: Yeah, that's a good question. TGFR, like I said, is a new technology. Let me explain exactly how it works. TGFR is measured using a standalone point-of-care device called MediBeacon and this device was developed by Dr. Richard Dorshow and his colleagues based out in St. Louis, Missouri. The system has three components. So the first component is a fluorescent tracer. That's called relmapirazin. It's also known as a brand name of Lumitrace, which is injected via an IV route. The second component is a TGFR sensor, which has a light source and a detector, and the third component of the system is a TGFR monitor that calculates and displays the GFR, right?

So at the beginning of the session, the TGFR sensor is affixed or placed on the skin, on the chest, and the cable that's going to the monitor is secured to the patient's body via a removable tape, and this is really important, because any movement of the sensor that's placed on the chest can lead to inaccuracies in the measurement.

And what happens next is that the sensor takes a baseline measurement to account for the patient's skin tone, and once the baseline is established, the fluorescent tracer, Lumitrace, is injected via IV, and then the device starts to detect Lumitrace in the patient's blood via transdermal fluorescence detection, and then it displays the first value of the GFR.

And what happens next is that data points are collected every 15 minutes, and those are displayed at that interval on the display, and the entire session of TGFR ends when the tracer that was initially injected has been cleared from the body to the point where the sensor can no longer detect it via transdermal fluorescence. And this can take anywhere between 8 and 24 hours, and it just depends on how fast the patient's kidneys are able to clear that tracer, and at the end of the session, you get the average session GFR.

Sorry, that was a long answer, but I wanted to explain how the system works because it is quite a bit different from how traditionally mGFR or eGFR measurements are done.

Bob Barrett: Absolutely, and I'm sure we've all heard of estimated glomerular filtration rate [eGFR]. So how is TGFR different from eGFR?

Raj Pandya: Yeah. So traditionally, GFR is either measured by injecting tracer compounds such as iohexol, inulin, or iothalamate, which are all exogenous tracers. And after injecting these compounds, a series of blood and/or urine draws are done to quantitate clearance of the tracer that was injected. And this, again, can take several blood or urine draws and this process is referred to as measured GFR, or mGFR. And mGFR is the

most accurate way of assessing glomerular filtration, but it is unnecessary in most cases. Typically, it is used for kidney donor evaluations.

Now, the second way, as you mentioned about eGFR, is to estimate GFR, is by estimating it, and the way it is estimated is by using endogenous markers, such as creatinine or cystatin C, and both creatinine and cystatin serve as a body's endogenous tracers. Right? Unlike exogenous tracers, such as iohexol or inulin, and there are blood tests that are available for both creatinine and cystatin C. You collect blood and you measure either creatinine or cystatin C or both, you get a concentration value, and you can plug those values in equations that are validated and these equations include CKD-EPI 2021 or EKFC GFR equations. And once you plug those values along with patient's age and sex, you get an estimated value of the GFR, also known as eGFR.

Now, to your original question, how is TGFR different from EGFR? So TGFR is different because it uses exogenous tracer and transdermal fluorescence to estimate kidney function, as opposed to laboratory-based quantitation of endogenous markers that is creatinine and cystatin C. It is also different from mGFR, because unlike mGFR, you don't need to do serial blood draws or urine collections and then take all those specimens in a specialized laboratory to quantitate them. You can essentially quantitate the decline of fluorescence over time as the fluorescent tracer gets cleared by the kidneys.

Bob Barrett: Doctor, what are the limitations of TGFR?

Raj Pandya: Yeah, that's a great question. So TGFR is a new technology, and before we go into the limitations, I think it has several benefits and advantages. So, it's a great innovation because it only requires one injection of the tracer, but like I said before, no subsequent blood draws or urine collections, and importantly does not expose the patient to any kind of radioactivity, unlike some radioactive tracers that are used in mGFR measurement. So that is a big plus for TGFR.

Also, as soon as the TGFR system detects Lumitrace, which is the fluorescent tracer, it starts to give you a real-time value of GFR, which is updated every 15 minutes. So you are getting a real-time value of GFR, unlike mGFR where you collect all of the specimens, and at the end of the session, you get an mGFR value by plotting graphs and making calculations and so on. So that's a big plus.

Now, it does have some limitations because it's a new technology. So, first of all, the measurement you get with TGFR is not as accurate as mGFR. Its accuracy is actually more closely aligned with eGFR in the present state. The second limitation of TGFR is that any movement of the patient

can unfortunately interfere with the test, and when you consider that an average session can last between 8 and 24 hours, it's a significant time for a patient to restrict their movement.

So, these are some of the limitations, but I want to re-emphasize that this is a new technology and we don't want perfection to be the enemy of good at this point, because as there are more developments that happen, and refinements in technology happen over time, it is going to become easier to take a more accurate measurement of GFR via this technology.

Bob Barrett: Well, finally, Dr. Pandya, let's bring this back into the laboratory. Does TGFR measurement affect other laboratory tests?

Raj Pandya: Yeah, Bob. That is a very good question. The simple answer is, we don't know at this stage whether TGFR measurement affects other laboratory assays or not, and it's a good question because the tracer compound that is injected into the patient's blood is fluorescent in nature and this compound may have a potential to interfere with laboratory-based tests. And as you know, many of our laboratory-based tests do actually use fluorescent detection, especially for immunoassays, and chemistry assays that we use in the laboratories, make use of spectrophotometry.

So, like I said, there is a potential for the tracer compound to interfere with laboratory-based assays. We just don't know which assays are affected, which platforms are affected, which platforms are not affected, et cetera, et cetera, at this stage. But I think this is a great area of ongoing research and we need more studies to find that out.

Bob Barrett: That was Dr. Raj Pandya from ARUP in Salt Lake City, Utah. He wrote a News & Views article in the December 2025 issue of *Clinical Chemistry,* describing a new device for transdermal GFR assessment. He's been our guest in this podcast on that topic. I'm Bob Barrett. Thanks for listening.