Introduction
- Announcer: Welcome to Mayo Clinic's ECG segment Making Waves
Continuing Medical Education podcast.
Join us for a lively discussion on the latest
and greatest in the field of Electrocardiography.
We'll discuss some of the exciting
and innovative work happening at Mayo Clinic
and beyond with the most brilliant minds in the space,
and provide valuable insights
that can be directly applied to your practice.
Welcome
- Dr. Anthony Kashou: Welcome to Mayo Clinic's ECG segment making waves.
In this episode, we explore the rapidly evolving field
of atrial fibrillation therapy,
focusing on pulse field ablation,
or PFA, a modality that has transformed the landscape
of atrial fibrillation catheter ablation.
Joining us as an expert
and cardiac electrophysiologist here
to provide insights into
how pulse field ablation differs from traditional thermal
based techniques, its recurrence rates,
and the most common causes of reduced procedures.
We'll also discuss how pulse field ablation may evolve in
the coming years to improve durability and outcomes.
But first, let me introduce you to our guest today. Dr.
Nicholas Tan completed his undergraduate degree in
biomedical engineering at Johns Hopkins University,
following which he completed medical school
and a master's degree in biomedical investigation from the
Cleveland Clinic Lerner College of Medicine.
He then did his internal medicine, cardiovascular medicine
and cardiac electrophysiology training here at the Mayo
Clinic in Rochester in July of 2023.
He was hired on staff within the Division
of Heart Rhythm Services.
His research interests include developing device-based
therapies for pacing defibrillation
and cardiac ablations, as well
as electrophysiology considerations in cancer patients.
Additionally, he is completing a master's degree in medical
device innovation from the University of Minnesota.
Dr. Tan, thank you so much for joining us today.
- Dr. Nicholas Tan: Thanks a lot for having me.

- Dr. Anthony Kashou: You know, well, you know, PFA
or Pulse field ablation is really changing the landscape.
But before we get into it, just
to get our audience on the same page,
let's kind of go to the basics.
What exactly is pulse field ablation
and how is it different from the more established methods
like radiofrequency or cryoablation?
- Dr. Nicholas Tan: That's a great question.
So just to go back even further a little bit,
cardiac of patient first started with DC shocks.
So direct current energy that was applied to the tip
of a catheter to induce myocardial ablation.
Now obviously that was a little traumatic
when it first occurred in 1980 or so.
And so radio frequency ablation
developed from there where you basically
deliver heat energy to the tip of a catheter
to ablate ablate tissue.
Cryoablation is sort of on the opposite, on end
of the spectrum where you're cooling tissue to the point
where you cause myocardial death.
Now, both these modalities have
something in common in that heat transfer always occurs
and heat will always move in other directions
and usually in directions that you don't don't want.
So you can cause collateral damage to the coronary arteries,
to nerves to the esophagus,
and those are complications that we really try
to shy away from.
Now, pulse fuel ablation is different in that instead
of delivering a long pulse of electricity,
you're delivering multiple short pulses
to your target tissue.
And it turns out that cardiomyocytes tend
to be much more sensitive
to its effects biologically compared
to most other tissue types.
And so what that hap, what happens then is
that you can induce myocardial death either through necrosis
or through apoptosis without causing any heat transfer.
And, and this has led to the development
of these PFA based catheters
where you can effectively kill myocardial tissue without

injuring any of the neighboring structures.
So because of that, it has significantly transformed the way
that we have practiced PFA was clinically used in Europe
or has been used in Europe for the past few years,
and we recently had it f FDA approved.
And it's really transformed our practice in many ways.
- Dr. Anthony Kashou: And, and it, it seems like this is, you know, already
as you mentioned, transforming practices in terms
of your practice and you know,
what you've seen across colleagues.
How do you see how this has changed in terms
of recurrence rates for somewhat the atrial fibrillation if
they come and, you know, are having a PBI
with this method versus prior techniques?
Yeah. Are we seeing better outcomes?
Are the challenges similar to what you described previously
with, you know, the heat exchange
Recurrence Rates
- Dr. Nicholas Tan: In terms of recurrence rates?
That's something in the US at least, that's something
that we are starting to learn about
because for the most part,
most centers started using PFA only last year
after it was FDA approved.
And so this year is when we start seeing the one year
recurrences, but based on prior trial data
and based on data from Europe, what we have ascertained is
that the recurrence rates pulling PFA is fairly comparable
to the other previous modalities.
And this is, and,
and keep in mind that this is a relatively new technology.
This is including operators who may not be necessarily
as experienced with PFA compared to other,
the other established modalities.
And despite that, recurrence rates tend to be similar.
And so generally speaking, the numbers that have
of shaken up across these studies
and trials is about 30% over a one year course.
And, and again, that is very, very comparable to what we see
with RF or cryoablation.
- Dr. Anthony Kashou: And so 30% recurrence
after a year, similar to other modalities
and ablation techniques, yet probably minimizing the risk
of more serious injuries, maybe the esophageal, you know,

complications or, or things along that, that is correct.
In terms, in terms of, you know, redo
after this index pulse field ablation,
are you seeing also similar reasons
for why there might be recurrence?
- Dr. Nicholas Tan: For the most part, that,
that certainly seems to be the case.
Reasons for recurrence
Again, we, we need more data from the US side
to, to see if there are any significant differences between
that and this other studies that performed elsewhere.
But for the most part, the recurrences, about two thirds
of them would tend to occur in the pulmonary veins.
So again, the, the, the, the main goal of
AFib catheter ablation is to target the pulmonary veins,
hence the main pulmonary vein isolation of PBI.
So it turns out that in the patients that you do bring back
to the lab or redo procedure
after an initial PFA ablation,
the pulmonary veins are the most common sources of,
of these, these brain two, these recurrences.
And, and so that may be due to incomplete ablation
with the initial ablation procedure
or some healing that occurs subsequently, it may have to do
with the, the differences in terms of
how we ascertain whether
we cause reversible versus irreversible
damage to the muscle.
And that is a new one that we are starting
to understand a little bit more.
And then in the other one third of cases,
you have other areas that can be, that can serve
as triggers for AFib.
And, and again, those will require t novo ablation such
as the posterior wall.
Sometimes you can have floods that occur as well, and,
and those will need to be assessed
and dealt with accordingly.
- Dr. Anthony Kashou: And so now that we're learning more, as you mentioned,
about a year into this, starting to collect some of this
recurrence data
and understanding more maybe similar recurrence rates,
where do you see the,
the field going over the next few years?

Do you see kind of new tools
and protocols as you better understand the underlying,
you know, process of, of what's going on
New tools and protocols
or what are your thoughts?
- Dr. Nicholas Tan: It's this, this podcast is actually timely
and we very recently acquired
a novel catheter system from Medtronic,
so it's called the Ferra system.
It's, it's a mapping
and ablation catheter that can perform both RF ablation
and and PFA.
So how this can be helpful is that there are certain areas
that are probably still better for
RF ablation such as flood lines.
One main issue that we see with PFA in, in areas
where the coronary arteries are close by is
that you can actually cause the coronary arteries to spasm
and you don't normally get that effect with RFA.
So having a catheter that can toggle between PFA
and RFA is very helpful in this regard.
And that's for atrial ablations.
So we are also starting to look into ventricular ablations
for PFA using PFA,
and again, two new tools are being developed to try
and tackle that problem.
And again, that's a totally different beast
because when you think about the atrial tissue, it's,
it's relatively thin.
Ventricular tissue can be much thicker, it's more complex.
So that will be another growing arena
of research and that that, you know, is kind of right
for the taking at this point.
- Dr. Anthony Kashou: Wonderful. Wow.
Well, it's an exciting field, a lot of development.
And you know, Dr.
Tan, thank you so much for joining us
and sharing about the innovation in PFA Pulse field ablation
in its impact on atrial fibrillation therapy.
Dr. Tan provided valuable insights on
how pulse field ablation differs from traditional ablation
techniques, the challenges of recurrence rates.
And we're still learning a lot about that,
about a year into this that's similar

and the most common causes of redo,
that's still another area that we're trying to understand.
He also shared the vision, you know, of the future
of pulse field ablation, these new tools that are helping us
map and understand it.
And the ventricular arrhythmias are
another beast, as he mentioned.
Dr. Tan, thank you so much for sharing your expertise
and providing a clear
and thoughtful overview of this transformative technology.
We look forward to having you back in the future
to discuss further developments in the
field. Thank you again.
- Dr. Nicholas Tan: Thanks a lot. Appreciate it.
- Announcer: Thank you for joining us today.
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and suggestions about the
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This has been a Mayo Clinic podcast.