

Transcript Details

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The Excimer Laser and the History of Lasik

You are listening to ReachMD XM157, The Channel for Medical Professionals. Here is a sample of the great shows airing this week.

I am Dr. Matthew Sorrentino, join me this week for a special segment on diabetes when I will be speaking to Dr. Hertzl Gerstein. We will be discussing the association between hemoglobin A1cs and cardiac death and heart failure.

This is Dr. Leslie Lundt, join me this week on our special segment on diabetes where my guest will be Dr. Rebecca Puhl. We will be discussing weight bias.

This is Dr. Maurice Pickard, my guest this week is Dr. James Gully, Director of The Clinical Trial Group at the National Institute of Health and we discuss immunotherapy treatment of cancer of the prostate by the development of vaccines.

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The EXCIMER laser was the key component to the invention of LASIK surgery responsible to returning nearly perfect vision to millions of people, how was the EXCIMER laser developed and how did it turn into a miracle capable of correcting vision.

Welcome to The Clinician's Roundtable on ReachMD XM157, The Channel for Medical Professionals. I am your host, Dr. Larry Kaskel, joining me today is Dr. Mani Bhaumik, world renowned physicist and co-inventor of the laser technology that made LASIK surgery possible. He is the author of the critically acclaimed Codenamed God which has been a bestseller in the US as well as in his native India. Dr. Bhaumik is the recipient of the prestigious Mahatma Gandhi Humanitarian Award for his contributions to science and humanity and is the creator and executive producer of a new animated series geared towards inspiring children's interest in science.

Dr. LARRY KASKEL :

Dr. Bhaumik thank you for coming on the show.

Dr. MANI BHAUMIK:

Thank you very much for having me and I want to also thank you for the nice introduction.

Dr. LARRY KASKEL :

You are quite welcome, I would like to back in time if we can to the time that you were involved in laser technology before the EXCIMER laser came to fruition. What type of work were you doing and what did you think was going to happen?

Dr. MANI BHAUMIK:

We were working on various types of laser and believe it or not it was actually for Reagan's Star Wars program at the time, this was trying to find a laser that would be capable of long-distance radar, it would be long-distance radar using a laser and that didn't of course grow as you know, the Star Wars program, I mean, but you know, as in life sometimes you look for something then something even better comes along.

Dr. LARRY KASKEL :

So what laser were you working on, what is the carbon monoxide laser, the ruby laser, YAG laser?

Dr. MANI BHAUMIK:

I was working on the carbon monoxide laser in fact at the time I was working at Northrop Grumman in Los Angeles and we built the highest power laser using carbon monoxide and then we shifted into the Excimer laser and I had the privilege of announcing the first conclusive evidence of the Excimer laser way back in 1973 in Optical Society Meeting in Denver, Colorado and I took along to come to fruition today to LASIK.

Dr. LARRY KASKEL :

What is an Excimer laser, how does that differ from another laser, help us understand that.

Dr. MANI BHAUMIK:

Good question, first of all let me tell you what the special feature of the Excimer laser that makes the LASIK possible. It is about the only class of laser that cuts cold without burning. As you know most lasers, when they cut, burns and also cauterizes at the same time, but we don't want that in the eye and in this case, the laser beam simply dissociates the molecular bonds and evaporates the cells to so speak without any burning or any physical scars. So that's the special feature that is used and the reason it is able to do that is because the individual light package what we call photon has the highest, one of the highest energy, so this is why it is able to dissociate these bonds by absorption and the Excimer stands for a type of laser that does not exist normally and is actually, Excimer is short for Excited Dimer, that means in the normal state, they are just single atoms, but they form a molecule when one of the part is excited. In the excited state, it is a molecule, then after lasing, of course they fall apart and become atoms again. So that's why the name is Excimer, which is short for Excited Dimer.

Dr. LARRY KASKEL :

I am wondering how you got from trying to blow up things in the sky to shaving off a tiny little layer of cornea from the eye. I mean was that your idea or was it someone else's idea, but used your technology.

Dr. MANI BHAUMIK:

Let me answer in 2 parts. One, when we developed Excimer laser, that used a very large piece of equipment that could not be put in a physician's lab, so one of the things we did is to reduce it down to practical usable version and I think that took some time and the second thing is that there was again another serendipity because when the Star Wars program kind of winded down, it was realized that the shorter wavelength of the Excimer laser is good for photolithography that is used for etching circuits on the computer chips and so a gentleman at IBM was working on photolithography in a dark room and accidentally a little beam fell on his hand and it didn't hurt him and later on he saw that just a little crater, but there was no burning and so it was pretty accidental and he was a physicist and he happened to mention that to some physician during the dinner as sort of a social conversation and the physician realized the importance of it and so he started working on tissues and then finally had a patent on it using laser for cutting tissues without any burning.

Dr. LARRY KASKEL :

If you have just joined us, you are listening to the Clinician's Roundtable on ReachMD XM 157, the Channel for Medical Professionals. I am your host, Dr. Larry Kaskel and I have the privilege of talking to Dr. Bhaumik, a world-renowned physician and co-inventor of the laser technology that made LASIK surgery possible.

Dr. Bhaumik you were involved in getting the laser to actually work in a normal temperature, is that correct?

Dr. MANI BHAUMIK:

We are talking about the carbon monoxide laser that usually used to be operated at liquid nitrogen temperature, but I was able to make it work at room temperature, but that's not the one that we are using for LASIK process.

Dr. LARRY KASKEL :

How did that come to you, were you in a deep meditative state and realized it could be done or was it you know a 5-year process to get it to work at room temperature?

Dr. MANI BHAUMIK:

It was a 5-year process, but as you know in most scientific discoveries intuition plays a great part even though scientists do not yet understand what intuition is, but it comes from probably from our subconscious where things are being processed without our knowledge and all of a sudden, you will get this Aha you know eureka I was of course thinking about how to improve the operation to a higher temperature and then various things came to my mind, but one of them clicked and to my surprise I thought it was a miracle almost when it started lasing at room temperature which nobody thought would be possible. So the Excimer laser was a similar thing, a lot of people tried and they thought that because of this large energy of the photon, it might destroy the molecule by absorbing before it can actually produce a strong laser and again we found that, in fact, in some molecules it actually does give a very high-power laser.

Dr. LARRY KASKEL :

When I think of laser, I think of when I give talks, I use a pointer which is a laser of sorts and what is unique about that laser that it will not cause any damage and/or hurt any one.

Dr. MANI BHAUMIK:

That one of course is a low-power laser, usually the diode laser. At the very beginning it used to be one of the ruby lasers, but diode lasers are much cheaper and its power is quite low and of course, if you directly look at it, obviously that is not good, because it can penetrate the lens and get to the retina and could cause some problems, so no matter how low the power is, at that kind of wavelength it is not advisable to look at it directly, but with the Excimer laser one of the other advantages that the cornea actually absorbs it, it doesn't allow the laser beam to go past the cornea or the lens into the retina which is the most sensitive part, in fact, lot of testing went on before FDA would approve the laser for the LASIK to make sure that retina is not damaged. One of the concern was that even though the Excimer laser itself could be absorbed by the cornea or the lens, but it could produce a longer wavelength fluorescence that could penetrate and damage the cornea, so actually for the LASIK the shortest wavelength possible that can go through the air, the argon chloride laser, that laser is set at 193 nanometer, that gets absorbed very thin amount of thickness of the cornea and also its fluorescence is long enough that it also doesn't go through to the retina to damage it.

Dr. LARRY KASKEL :

How long has LASIK been around, has it been about 20 to 30 years?

Dr. MANI BHAUMIK:

Well the first laser operation which they called photorefractive keratectomy before the LASIK, that was done in the late 1980s, but the first approval by the FDA came for near sightedness first because there you just flattened the curvature of the cornea ,which is easier to do in October 1995, and then 1997 they approved the laser for correcting astigmatism as well and then for the farsightedness the following year, November 1998, FDA approved it and then since 2000 it just went like a hot cake. About 15 million have got it done worldwide.

Dr. LARRY KASKEL :

How about Mani Bhaumik, has he had it done?

Dr. MANI BHAUMIK:

I am a stable patient and that's one of the thing one has to look for, that the patient is changing too fast, then we have to wait until it gets stabilized, so I think 95% of the people are eligible for it and more importantly that offers for example, they can improve their vision better than 20/20, up to 20/15 for example because they have this new wavefront technology WaveScan where they can have a detailed map of the laser and its all done in computer as you know the LASIK procedure actually takes place in a minute, because it is all fed into the computer and the computer directs the laser beam to the ablation.

Dr. LARRY KASKEL :

Dr. Mani Bhaumik thank you so much today for talking to us about lasers and Excimer lasers. I am Dr. Larry Kaskel and you have been listening to The Clinician's Roundtable on ReachMD and my guest has been Dr. Mani Bhaumik, a renowned physicist, and co-inventor of the laser technology that made LASIK surgery possible, also the author of the critically acclaimed Code Name God book which is a bestseller in the US as well as India.

If you tune into our web site, www.reachmd.com, you can download any of the pod casts available in our library and thank you for listening.

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I am Dr. Larry Kaskel on the next Lipid Luminations, I will be talking about sleep apnea and the heart, the most underrated risk factor for heart disease with Dr. James Ehrlich of Arthrotek Inc., please tune in.

I am Dr. Keira Johnson inviting you to join me this week with Dr. Renda Weiner from Dartmouth Medical School and we will be discussing glucose management in the critically ill.

And this is Dr. Bruce Bloom, join me and my guest Dr. Denise Faustman from Harvard Medical School and the Director of the Immunobiology Laboratory at Massachusetts General Hospital as we talk about a potential cure for type 1 diabetes.

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Hello this is Dr. Gerald Bernstein, MD, Vice President of Medical Affairs for Generic Sayo Technology and you have been listening to ReachMD XM157, Channel for Medical Professionals.