Just Teeth and Technology

Introduction [00:00:01] RTI International's Justice Practice area presents Justice Science.

Voiceover [00:00:08] Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about forensic science, innovative technology, current research and actionable strategies to improve the criminal justice system. In episode one of our Unidentified Human Remains mini season, Just Science sat down with Dr. Kenneth Aschheim, Assistant Chief Forensic Ontologist for the New York City Office of Chief Medical Examiner, to discuss how dental evidence can be used to help identify human remains. Due to their strength, heat resistance, and lack of decomposition over time, teeth are one of the most resilient substances found in the human body. As a result, forensic odontologists can use the teeth of decedents to match the antemortem dental records in order to help identify unknown human remains. Listen as Dr. Aschheim discusses the process of forensic odontology, the benefits of using teeth alongside other methods of human identification and using technology to advance the field. This episode is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Some content in this podcast may be considered sensitive and may evoke emotional responses or may not be appropriate for younger audiences. Here is your host, Jaclynn McKay.

Jaclynn McKay [00:01:15] Hello and welcome to Just Science. I'm your host, Jaclynn McKay with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. Today we will be discussing forensic odontology and its application to identification of unknown remains. Here to guide us in our discussion is Dr. Kenneth Aschheim. Welcome, Dr. Aschheim. Thank you so much for being here today.

Kenneth Aschheim [00:01:38] Thank you for inviting me, Jaclynn.

Jaclynn McKay [00:01:40] Could you provide our listeners with an overview of your background?

Kenneth Aschheim [00:01:43] My interest in forensic odontology actually occurred later in my career. My background was in esthetic dentistry, and I had actually written three textbooks on the topic. But my true passion was the integration of technology into dentistry. However, and you didn't mention but I lived in New York City. My life, like so many other lives, changed after September 11, 2001. Because of my history of managing digital illustrations for my textbook, and despite the fact that I had not much forensic odontology experience, I was asked by the then Forensic Odontology chief at the time to help in the recovery operation, specifically in the image digitalization. So I joined the team at the Office of the Chief Medical Examiner for the City of New York, which we're going to call OCME to help train some of the forensic odontologists at the time to digitize all the X-rays. You have to understand this was 2001 and scanners were not very common and digital X-rays were just being introduced. So, forensic odontologists didn't have a lot of experience working with that stuff. So while I was there, I began training them in digitalization, and also I started training myself in the basics. So they trained me, I should say, in the basics of forensic odontology. You know, after a while it was determined that my skills in both dentistry and computers could be also utilized to help improve some of the digital tools we were using at the time. So I was assigned to be the liaison to the developers of the forensic matching software that we were using at the time, which was called WinID. It was developed by Dr. James McGivney. At the time I became more interested in the more complex algorithms of matching and helping identify because, you know, this disaster was orders of magnitude greater than any kind of plane crash or

anything else, so we started to develop new tools and used new ideas to do it, and I'd become involved in numerous projects in forensic odontology. Currently, I serve a number of different things, but I am the Assistant Chief Forensic Odontologist at OCME for the City of New York and my Chief Forensic Odontologist is Dr. Larry Dobrin, who has mentored me all along.

Jaclynn McKay [00:03:59] On some of our recent podcast episodes, we've discussed a variety of methods of human identification, including postmortem printing and DNA. Forensic odontology is another method that has been used for quite some time. Could you provide our listeners with an overview of forensic odontology?

Kenneth Aschheim [00:04:17] I mean, the simplest way to look at it is you have historical X-rays of a presumptive victim, which if it's someone that's passed away, we call those the antemortem or pre-death X-rays. But you know, you mentioned identification, it also could be some living individual who's a living amnesiac or something else and obviously in those case, we wouldn't call them antemortem, we would just call them historical radiographs. And we compare those to the postmortem radiographs if it's a decedent or current radiographs, if it's a living individual who can't identify themselves. You know, there are three scientific methods of identification: DNA, fingerprints and dental. But the one thing that distinguishes dental from other types is, first of all, we don't have an automated computer tool to read the dental radiograph. You know, you can do obviously, DNA as it's all automated. So we have to use the services of a specially trained dentist, which we call a forensic odontologist, and they actually manually read the radiograph and what they do is they look at certain details of the radiograph and they count them. They actually - we have codes and things like that. They assign coding to the attributes mostly for the attributes of fillings, mostly teeth that have been extracted, teeth and have had root canals, teeth that have had implants. So we code those so that that's a way for the software to do its matching algorithms. And the software, what it does is it looks for similarities and discrepancies in those coded features and what it does, it creates a hierarchy list of potential matches, and then the odontologist actually compares the antemortem and postmortem radiographs, he visually, or she visually looks at it and decides whether it's from the same source. The algorithms for these records have become very sophisticated, and usually we can find a match and maybe five or 10% of the records. And that's it in a nutshell.

Jaclynn McKay [00:06:12] So, I know you spoke about some of this, but would you mind describing what are some of the identifying features that can be determined through teeth?

Kenneth Aschheim [00:06:22] So well, of course, the most common feature we're looking at are fillings. Since dentists carve each filling individually at the time of placement, really no two fillings are identical. Therefore, those little imperfections in the shape of each filling are usually sufficient to individualize individuals. Then a trained forensic odontologist can distinguish those differences, and more importantly, if they see discrepancies, they can form an exclusion.

Jaclynn McKay [00:06:49] So we know that forensic odontology has been performed for a very long time, but could you describe to our listeners why teeth are such powerful tools of identification?

Kenneth Aschheim [00:07:00] Well, first, as I mentioned, teeth contain fillings, each of which has a unique shape to them, as well as the teeth themselves have a unique shape. In addition, we have the historical ability to correlate images to those fillings with

individuals. And really what I'm saying is, there's something called a dental record. So not only do we have this individualization, but we have somewhere stored that information. However, the actual value of teeth as an identification tool has a lot to do with the composition of teeth themselves. First of all, they're the hardest substance in the human body. In mass fatality incidents, especially transportation incidents and things like that, they're extremely resistant to crushing. That's why we're able to eat with them. And they're also very resistant to heat, they're a ceramic. In addition, as you know, from skeletal remains, they don't degrade over time. And you know, something we don't think about, but as an esthetic dentist I do, they're white. So they're easy to find in soil, ashes and other types of dark debris. So they're easy to distinguish. And, you know, even if we can't utilize them for dental identification, they serve as a hard ceramic casing surrounding a highly vascular pulp chamber. And you know what that means? They are often an excellent source for DNA analysis.

Jaclynn McKay [00:08:20] So Ken, you brought up your experience with the 9/11 disaster and the fact that forensic odontology can be used as a means of identification in mass fatality incidents, and you have eloquently described how forensic odontology is actually performed, but could you talk a little bit more about how it is done in a mass fatality incident? What are some of the steps involved with that?

Kenneth Aschheim [00:08:47] Well, you know, historically, human identification by dental means in mass fatalities has been one of the most cost effective and fastest ways to identify an individual, because unlike many of the others, once they bring us the X-rays and we have a presumptive I.D., we can do it in minutes, you know, so to speak, or we can do at least an exclusion in minutes. But, you know, again, it's very quick, it's very easy, and people understand it. And it's especially useful in cases where there's been skeletonization or incineration. Obviously, skeletonization, you can't get fingerprints, but incineration sometimes it's very difficult to get DNA, as you know, because of the high temperatures involved. Unfortunately, we don't benefit from the public databases that are contained in fingerprints and DNA, but we do quite often benefit from the fact that most mass fatality incidents are semi-closed or closed incidents. So family members know and family members do have access to that information. So basically, unlike fingerprints, which most next of kin can't really give you fingerprints, dental records are easy for next of kin to obtain. And often, you know, they can be sent digitally by secure email to the Victim Identification Center. We don't even physically need anything anymore, especially newer digital X-rays. Most family assistance centers will have a dental station there for next of kin to drop off the radiographs and assist them in collecting the information and to critique the data if they need to get more updates and things like that. And even if the next of kin do not know the dentist’s name of the decedent, they can often contact employers because employers give them dental insurance. They can contact dental insurance companies and sometimes even state agencies like Medicaid and Medicare, if they've had any interaction with their dental treatment or even their medical treatment. Because, for instance, we could use a skull X-ray or something like that, that has dental information on it. And the other thing is that most states have dental retention requirements, that you can't just throw the dental chart away. And usually they're sufficiently long time that the records are available, even if it's been a number of years. So that's how we obtain our antemortem information, and then the postmortem information obviously we have specially trained dental technicians or dentists, we have hygienists, dental assistants that are trained in taking radiographs on decedents and now with some of the newer techniques like extraoral cone beams in this, we can do it almost as we would say, touchlessly get some of that information.

Jaclynn McKay [00:11:36] You've also talked about forensic odontology in comparison to other scientific methods like DNA or fingerprints. Are there any other unique attributes about dental identification as opposed to the other scientific methods?

Kenneth Aschheim [00:11:52] The goal of scientific identification and its name implies that it is to make identifications. But more importantly, it is to make exclusions, okay? So sometimes an exclusion is more important than an identification. For example, we mentioned that the most common method for making a definitive dental identification is the use of dental radiographs, but you don't have to use dental radiographs. You can use, for instance, for all of you who have had orthodontics, you can compare the models of teeth. As you know, they have casts or models of teeth and we have done dental identifications, some of us kind of nicknamed it the Cinderella method because the shoe fits, so to speak, with the upper teeth into did you tape properly with the lower models, the antemortem lower models or vice versa? Sometimes we use photographs, especially photographs of exclusions where we can see in the antemortem that a tooth was missing and the tooth is present. And in some cases we use dental prosthesis where we have a partial denture and it slides right into the decedent because these are all custom designed or more importantly, it doesn't and it only can sit in the specific mouth. We've talked about things like night guards. Kids have sports guards made up. If we get a sports guard that doesn't fit, that clearly was used yesterday and it doesn't go in the mouth and the mouth is intact, that's important information. So, you know, parents, unfortunately, God forbid a child is involved, these are things we want to think about; retainers, things like that. Those are things that we want to think about. You know, we can even get other clues from dental radiographs that may not lead to a identification. Sometimes it may suggest an identification. So, you know, if we get cases where it's intact teeth and there's no fillings and the teeth are very generic, we may say this is a possible or a case where we have a very common situation is the antemortem shows that the wisdom teeth are missing and the post mortem has the wisdom teeth, and as you know, you can't develop another full set of wisdom teeth, so that's an exclusion and therefore the presumptive victim and the decedent don't match. The other information that we can get is we can look at a victim and we can assess their age. We can get a dental age assessment for them, an age estimation. So if we have a decedent, we can pretty accurately get an age range of that decedent based on the development of the teeth. I mean, as you know, you look at an eight year old and they're missing the two front teeth and, you know, they're eight years old, or at least if you're dentists, you know, they're eight years old, and those are the kind of things. Another technique used when you don't have any radiographs is something called OdontoSearch, and OdontoSearch.com is a website and this was work that was based on Dr. Bradley Adams, he's our Chief Forensic Anthropologist at OCME in New York, this was based on his doctoral thesis. He helped develop this when he worked in Hawaii when it was called JPAC, the Joint POW/MIA Accounting Command, and it was part of the Department of Defense whose mission was to help identify unknown soldiers from past wars and conflicts. The theory behind OdontoSearch is that the rarer a dental pattern is in the population, the more likely a dental match would occur in cases where the radiographs are missing and the only information that we have is a dental charting of the condition of the teeth. So, for instance, if you have a case with a victim and decedent where the filling pattern occurred in, say, 0.005% of the population, it's statistically more likely to be a "match" than a filling pattern that occurs in 30% of the population. We recently had a case in New York where the individual was found in advanced state of decomposition. The presumptive ID was that he happened to be a Korean War vet and he was unclaimed and instead of burying him in the unclaimed body, we wanted to bury him in a veteran's cemetery, and we needed to give some kind of scientific basis for it. And they said, no problem, we have his dental charting for when he entered the service. And

as you know, the Korean War was in the mid 1950s. So the dental record was almost 50 plus years old, but it turns out that all of the fillings were identical, except he had one new filling. In all those years, he had one additional filling. And again, the pattern was so rare in the population, so what is the likelihood of finding two people with that rare pattern and the presumptive ID? And he was found in his apartment, so we were able to see that he had a proper veteran's burial. So these are cases that we use other types of information, other types of dental information to make dental IDs.

Jaclynn McKay [00:16:57] Along those same lines, I know you spoke about how you can use fillings in the teeth and that the teeth in and of themselves are resilient, but are there any other features in the jaw or the mouth that can be used to help establish identification?

Kenneth Aschheim [00:17:12] So again, I mentioned this earlier, the real fundamental difference between dental information and other scientific identification information has to do with the stability of the data. And as you're aware, DNA and fingerprints don't change. But buy and large, dental information is - there is some lack of stability, because when you go to the dentist, they take some X-rays, they detect a few areas of decay and they repair them with fillings. And therefore the radiographs for the decedent often doesn't match the dental radiographs taken before treatment. So this creates an interesting problem because dental identification software has to be smarter, it has to be different. It has to take into account those explainable discrepancies. And this is really one area where it developed in recent years that we've seen a lot of changes, is the algorithms for matching of data has become far more sophisticated and leading to more rapid dental development. So that's really the major difference between dental, DNA, and fingerprints.

Jaclynn McKay [00:18:15] When you are talking about OdontoSearch and how the rarer the features are, the more likely a match can be made, it reminded me the statistics that can be applied to DNA samples. Can you speak to how long statistics has been able to be used in the field of forensic odontology?

Kenneth Aschheim [00:18:38] So there are two areas where statistics have borne out and I want to just make one thing clear, OdontoSearch does not give you a match. It gives you the likelihood of something occurring in the population. So we like to consider it contextual evidence, the same as you would find maybe a wallet on an individual or an ID card or this. It increases the likelihood, but it is not a scientific method. So the two areas, like I said, is OdontoSearch and the other area really has to do with age assessment because age assessment takes into account large populations and what you're doing is you're taking a statistical analysis of, you know, for lack of a better word, an average, so to speak. We are getting a little more sophisticated in our ability to read that, but we're also getting better at collecting the data. Some of the historical tables are historical tables now with computers in this, the ability to get - collect large samples of radiographs, to collect large samples of historical data to not depend on recording, because sometimes people don't always report accurately. That's another area of statistical analysis. But right now, as I mentioned, when it comes to identification, when it comes to the final phase, it's a individual looking at two pictures and saying whether there's enough points of concordance to make a determination.

Jaclynn McKay [00:20:11] Can you describe to our listeners what sorts of limitations there might be to forensic odontology and human identification? I know you mentioned that you're able to do age assessments, but for younger individuals who may not have radiographs or fillings, does that pose a challenge?

Kenneth Aschheim [00:20:32] It definitely poses a challenge. We've had multiple fatality cases in New York City. We've had fires where children were involved and we had no access to the antemortem radiographs. Quite often you have to consider two things; we can do the age assessment of the individual postmortem. We know the decedent's age, and if there's a distribution of sex or other external factors that we can use, so we've had fires with multiple child victims, but let's say we have a boy that's a three year old and a boy that's a seven year old and in between is a girl that's six years old that we can look at the sex and look at the ages and differentiate the three, because this is a close population. So, again, these are not scientific. It's not that we do that. But again, if the medical examiner determines that it was a close population and there's certain other features, you know, height, you know, size, weight, then we put all of these pieces together. So quite often it's not just one piece of evidence. It's building up a case, or as they would say in the legal terms, the preponderance of the evidence for an I.D.

Jaclynn McKay [00:21:51] Ken, are you able to determine biological sex through the teeth or is that information coming to you from a medical examiner or anthropologist?

Kenneth Aschheim [00:22:01] So this is where my esthetic dentistry background comes in, because when we do an esthetic makeover, so to speak, we have some societal biases of what we expect female teeth to look like and what we expect male teeth to look like. So we have certain ideal situations. And again, as you know, it's population based, but female teeth tend to be more rounded. Male teeth tend to be more squared off. I mean, I could go into that. Obviously, older teeth tend to be more yellow, younger teeth tend to be whiter and this. The problem comes in is that there is a part of the population that just doesn't conform to that. So it's really very dangerous. So there have been a lot of studies that talk about it and you can make an estimation, but I warn against doing it. As an esthetic dentist, I try to strive for that, but I can't tell you that I haven't had female patients say, you know, could you make them look a little squarer? So because that's what they want. And I'm not talking about even from a restorative point of view, I'm talking from an esthetic. Sometimes we do what's called selective grinding, where we don't - we just take the teeth and reshape them with a handpiece. So there are some "norms", but that leads to trouble if you consider it scientific. So the answer is possibly, but you've got to be very careful.

Jaclynn McKay [00:23:25] Can you mention that you need to have a presumptive identification as the source of antemortem X-rays? But is there a way of dentally identifying individuals if you do not have a lead?

Kenneth Aschheim [00:23:37] Well, the short answer is yes, but it is sometimes. And actually you dealt with it a little bit in your previous podcast with Lori Bruski, who mentioned NamUs. So this is a vast database of missing individuals and unidentified individuals, and it has dental data. They're very good about collecting dental data. They have a actually a very qualified forensic odontology team that handles the data. And many forensic and odontologist that I know have presented success stories concerning cold cases of dental identification based on leads that they got from NamUs. The hope in the future with a possibility they talked about of adding a more robust search capability, the ability to review potential matches will be even greater. So we'll be able to do the quite unknowns. The second area of potential leads is social media. Organizations like the National Association for Missing and Abused Children, they are NCMEC. They provide forensic odontology services free of charge, by the way, so if you ever need them, you can contact them. They will provide forensics odontologists for minors, and they will actually provide social media services to local agencies so that dental data can be published to local or even national dental organizations there. We've had cases where they've put a

request into the American Dental Association and the American Dental Association has printed the X-rays and said, do you know this individual? So this is another area when you don't have leads. And then, of course, there are national and international organizations of forensic odontologists. One of the things and I know Bryan mentioned it, is Interpol. It's a huge resource. So the answer is yes.

Jaclynn McKay [00:25:26] How easy or hard is it to obtain dental records, especially when you're dealing with restrictions? Are HIPAA laws at play in any of that?

Kenneth Aschheim [00:25:37] Let's start with the United States, okay? Let's start with HIPAA, since it's something we all know. There is actually an exception within HIPAA that allows a practicing dentist to release records if there is a belief that it may lead to a dental identification. So there's an actual paragraph within HIPAA that gives the exemption. And some other countries also have that based on their privacy rules. As a general rule, when it comes to that stuff, forensic odontologists all over the world are aware of what they can and cannot do. So nobody's going to do this off agency, and yes, you're right, sometimes it will require them dealing with a bureaucracy and dealing with those privacy rules. But, you know, when it comes to this stuff, again, people want to get closure. And I can't tell you how many times, as heartbreaking as it is to tell people that their loved ones were involved in these things, For us personally, we feel we're giving them something. And I know you're interviewing people with - for all different walks doing human identification, but it sounds terrible to say in those tragedies to bring some kind of closure to the families is something that all the bad that's involved with doing it, it just makes up for it.

Jaclynn McKay [00:26:59] As someone who didn't set out to initially become a forensic odontologist, could you speak to some of the training and requirements that are in place in order to become one?

Kenneth Aschheim [00:27:12] There are certain subspecialties that are recognized by the American Dental Association. Forensic odontology is actually not recognized as a subspecialty. So certification comes from the American Board of Forensic Odontology, the ABFO, which you'll hear them called, and they get their certifying powers by the Forensic Specialty Accreditation Board, which is a recognized certifying board for all of the forensic specialties that don't fall under the purview of professional specialties within medical and dental. So they are the ones that do the training. It's essential for dental practitioners who render forensic odontology opinions to take some kind of advanced specialty training for the field. I mentioned to you that one of the things I'm involved with is standards and actually we just about finished drafting today a standard which we hope will be passed through the standards organization that will define the educational requirements and it'll be open to actually the public comments sometime early next year so that we've defined what those requirements are for becoming a forensic odontologist. The practice of dentistry is governed by state law, as is the practice of medicine. So theoretically forensic odontology comes under the practice of dentistry, so you can theoretically practice odontology and only two of the specialties fall under that; medicine and dentistry because those require state licenses.

Jaclynn McKay [00:28:53] Are there any resources or guidelines for forensic odontologists with regards to body identification?

Kenneth Aschheim [00:29:00] Yeah, there are. First and foremost, there are many continuing education courses given on forensic odontology and human identification. In fact, Bryan Johnson, your fingerprint expert, and I participated last year in an annual

lecture on Human Identification, which was presented in July at the International Association of Coroners and Medical Examiners meeting. That's an excellent starting point if you just want to get a background in all of human identification, because we cover all the fields and many dental meetings focus on one or two areas of forensic odontology. I strongly suggest that if you have any interest in this that you join the American Society of Forensic Odontology. The good news about them, there's no requirements. You just have to have a small amount of money. They have one meeting a year. The next level of participation would be the American Academy of Forensic Sciences, and that's really the granddaddy of all the forensic sciences and they have a forensic odontology section. Again, the meeting is once a year and the ASFO meeting is in conjunction with the Academy meeting. Finally, as I mentioned, is the American Board of Forensic Odontology, and that's the board accrediting body field. They, of course, have very stringent academic and experience requirements, and you have to take a multi board exam, both written exams and oral exam, to become a diplomat. Resources in terms of documents. The first place to start is the ABFO for website. They have the diplomatic resource manual, which is an excellent source of recommended practices for forensic odontology. The ASFO and the Academy also have it. Finally, is standards and guidelines. There are robust resources available in this area. I've been fortunate the American Dental Association has a forensic odontology informatics subcommittee, which I've chaired for the last 15 years. The ADA has been a world leader in publishing standards, technical reports and white papers, not only in forensic odontology, but every aspect of dentistry. So, finally, there's also the American Academy of Forensic Sciences. They have an Academy Standards Board which just recently established a forensic odontology consensus body to handle standards that are outside the scope of the ADA. And the ASB has been an phenomenally valuable resource for forensic standards in all fields of forensic sciences. And the granddaddy of all standards is ISO. So believe it or not, there are forensic odontology and there are forensic standards that are agreed to worldwide. Finally, one of the most unsung heroes is what is called the NIST coordinated Organization of Scientific Area Committees for Forensic Sciences, okay? And it's called the OSAC. And there is a forensic odontology subcommittee. And what we want to consider this is really the incubator for forensic odontology standards and technical reports. And the beauty about that is that the government funds them to create these documents.

Jaclynn McKay [00:32:17] Thank you so much for that robust list of resources. We'll make sure that we link all of them on the landing page for the podcast episode. So Ken, thinking about the future, do you have any visions for the future of the field of forensic odontology?

Kenneth Aschheim [00:32:34] You know, although there's been tremendous improvements in DNA and fingerprint technology, forensic odontology is still one of the least costly, high reliability and most rapid means of dental identification, especially in cases of decomposition or incineration, which I mentioned, where fingerprints and even DNA are not - may not be available. DNA can't provide the solution in mass fatality cases where you have a lot of co-mingling. Bryan mentioned this a few weeks ago, and I agree with him, identifying individuals is a team sport. It's not an individual sport. Each specialty team is called upon at the appropriate time to utilize their unique talents in making an identification. Where I see improvement is artificial intelligence. I think I mentioned to you that right now the dentist reads and has to code the teeth and that is time consuming. I'm currently involved in a project where we're using artificial intelligence to determine the decedent's age range in dental radiographs because again, the staging was done by the individuals. It has to be looked at and we've actually developed software and it's going to go into beta sometime next year that can look at the radiographs and decide which stage it is and do the correlation. So it eliminates the human subjectivity of ranking how you know,

whether a root is half developed or three quarters developed or fully developed. I used to joke about it is - some forensic odontologist who would look at it and say, well, that root looks have developed and I would say, can you tell me when my child reaches half their adult height? You know, because it's a little bit arbitrary. One of the other areas of development is in the area of augmented intelligence software and this is mainly being used in newer types of radiographs. They're called cone beam radiographs. And what they can do is they can take a 3D image of your mouth. So they can get the roots, they can get everything. And as that becomes more common, the beauty with that is those type of images can be compared digitally. They can be compared through augmented intelligence. So that's another area where we are seeing development. In addition, I published a paper with a Hungarian team about otologists outlining the use of 3D intraoral scanning. Basically, what they do is they make digital study models of the mouth for lab fabricated restorations. And in fact, we've discovered that you don't even actually need the actual 3D data, that if you take a few measurements digitally off of those X-rays, we can use that as a screening method to narrow the scope of possible decedents or presumptive decedents in a dental identification.

Jaclynn McKay [00:35:27] Ken, would the 3D radiographs, remove the backing cards that they have to stick in your mouth when you're taking their 2D radiographs?

Kenneth Aschheim [00:35:36] The beautiful thing is those cone beams are all extraoral so that you don't have to go in the mouth anymore. So the answer is yes. And I mentioned those 3D intraoral scanners. So if you remember those days when you had braces and they stuck that soft material up in your mouth and it hardened? This is now done digitally. It's done optically. So we put a little wand in your mouth and you don't have to gag on that. So the one good thing about dentistry is we're getting away from gagging our patients.

Jaclynn McKay [00:36:04] That is beautiful. Dr. Aschheim, thank you so much for speaking with us today and for sharing your insight. This discussion has been very informative.

Kenneth Aschheim [00:36:13] And thank you.

Jaclynn McKay [00:36:14] If you enjoyed today's episode, be sure to like and follow Just Science on your platform of choice. For more information on today's topic and resources in the forensics field, visit forensicCOE.org. I'm Jaclynn McKay and this has been another episode of Just Science.

Outro [00:36:31] Next week, Just Science sits down with Neil Parsons to discuss rapid DNA analysis. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.