So I’d like to share with you a little bit about salivary endoscopy and where we’ve been in the last few years with it but I do have a disclosure in that I do consult for Hood Laboratories having designed this salivary stent that I have a relationship with Hood over.

I’m going to talk a little bit about the history of the procedure, some pertinent anatomy, radiology, the technique and how we do it, other modalities that can be employed other than salivary endoscopic for this minimally invasive modality and some of our results and complications.

My own story with salivary endoscopy actually begins as a resident, people sort of say, you know, how did you get started in this thing. In 1989 when I was at PGY4 I was at the Academy meeting and there was a instructional course on salivary endoscopy which sounded pretty cool to me and so I went and was very impressed with Dr. Katz, Dr. Katz is a French radiologist who was one of the initiators of the technique and that instructional course then became his 1991 paper. When I got home I was amazed to find out that, you know, you can’t do this in the United States.

So despite the fact that this was going on, you know, in the late 80’s, publication starting in the 90’s, it took a long time to become something we could practice here. 1992 was really the initiation of shock wave lithotripsy by Dr. Iro’s group who was the pioneer and certainly the largest proponent. Intracorporal lithotripsy was tried in 1993 but with problems with ___ rupture and trauma. It was sort of abandoned for external techniques.
Marchal who’s one of the grandfathers a name you read constantly if you read the salivary endoscopy literature developed a really state of the art working set in about 1996 in his New England Journal article in 1999 really set the stage for people thinking about it in the states. 2004, Zenk, a German equivalent of Marchal who’s in Switzerland started publishing as well and ___ is the other name you have to be aware of, those are pretty much all the big players in the early days that have sort of pioneered the technique is an Israeli who also has huge experience.

And how far we’ve come as you know, just a recent Laryngoscope article looking at 5000 patients in a multicenter study. So people think of it as a new technique or you know new, it’s only really new if you’re in the United States. It actually has been around for quite some time, FDA-approval came in about 2005. A little bit about the anatomy. You know we have to start by thinking about the ducts in a way that we don’t usually think of them when we’re extirpative surgeons all we really think about is ligating the duct at the end of the procedure. We don’t really think about how big is the duct, what kind of instrumentation might fit in the duct. But the parotid duct is smaller than the submandibular, it’s about 3 mm and it has some curves that are important to realize, the main one being the masseter curve where the duct branches around the masseter muscle and sometimes that is a rate limiting step for the procedure.

The carotid duct as you know carries the name of Steno, Nicolaus Steno who was an anatomist, he was actually studying the lymphatic system in the 1600s and in 1660 he was looking for lymphatics in the face, he found this little duct and the probe went right into the mouth. So he said, wow, I’ve
really found something, he went to his mentor who was another famous anatomist of the time and immediately his mentor said you just created that hole or it was an artery or you’re pushing too hard, you know, you’re not dissecting well. But eventually when it was clear that this was the real thing, his mentor took credit for the discovery.

Steno went on to be a geologist and I think given the fact that we’re talking about stones here, it turns out to be an important part of what we’re talking about, he actually made some very important geologic discoveries which were difficult at a time when he was trying to explain how you could find a seashell at the top of a mountain in a way that the church could accept as science and he got in a lot of trouble over that. Interestingly enough, he just has his 374th birthday and last month he had a doodle on Google’s page of the day which I couldn’t put up here because of copyright infringement.

The other duct you need to know about is Wharton’s duct, it’s bigger, generally around 4 mm, it was described by Thomas Wharton when he paid to have his own treatise published called The Description of the Glands in the Entire Body which is just incredible. The last one being Bartholin’s Duct, Bartholin’s Duct is not currently navigable but you know we see it when we do some mandibular endoscopy, you need to be aware of it and since I started doing this, you know, something I never thought I’d see but this is a stone in the sublingual gland. I now have about 3 or 4 of these, didn’t think they existed but they actually make up maybe 1 percent of stones when you look at the literature.
So what’s the incidence of stones? It depends on who you read, there’s not a lot of good studies but McGurk’s group put out about 1 in 15 to 1 in 30,000 people, so that’s not so infrequent that you’re not going to see it. In autopsy studies have been pretty veritable, one putting it at 1 percent.

What are they made of? Patients always ask me what they’re made of. You know they’re made of the salts that are in your saliva, I actually that they might be the same stuff that the dental hygienist takes off of your teeth a couple times a year. We haven’t studied it but we are trying to get together to do a comparison of the stone and that material to see if its exactly the same, it kind of looks the same. I don’t see why it would be necessarily different. But this is the – if you studied these stones which we don’t generally do when we remove them, these are the kind of salts and makeup that we see with a little bit of difference between submandibular and parotid.

Currently we’re looking at how hard are these stones. So this is a research setup that I’m doing with a couple of the medical students here one of them sitting down front and we’re looking at how hard these stones are for the reason that we’re trying to design new instrumentation and in order to have new instrumentation you have to have some idea of what the properties of that instrumentation has to be, so we’re crushing some stones that are removed to get some force requirements so we can go to _____ and talk to them about what our needs are.

A little bit about how we work them up, certainly when I was a resident they all got plain films, plain films you know is where this idea that only 70% of stones are radio-opaque comes from. So I still
get a lot of referrals for people who have non radio-opaque stones. Non radio-opaque stones is a plain film era concept. Okay? In the era of CAT scans, all stones are radio-opaque. The only limitation being that you can have a stone that’s too small to be seen on CAT scans. But it’s not that it’s not radio-opaque. An example would be, you know, I just had a case not too long ago that had a 4 mm stone and a 1 mm stone and I didn’t see the 1 mm stone but once I took the 4 mm stone out I could see it endoscopically so people talk about 1 mm, maybe 1.5 mm as the rate limiting step.

CAT scan is what’s currently in my armamentarium, we’ll talk about some other options as well. It’s certainly great when you have you know giant stones like these, you know it’s very impressive or even some of the stenotic patients, you can see how the duct narrows down in multiple areas with CAT scan pretty easily.

Sialogram is you know more again of historic interest not many sialograms being done in the country anymore. They’re invasive, they can’t really be done if the patient’s acutely infected. They’re technically challenging not only to perform but to read and so most radiologists would rather not have you order them.

So what’s come along to sort of replace it would be I’d say MRI sialography and this is a study by Marchal’s group, Minerva Becker is his radiologist and most of the initial pioneering work in MRI sialography is through their group. They looked at glands for accuracy of the technique, they had stones and stenotic areas and combinations of the two and Sjogren’s patients and what they found
was they had a fairly good sensitivity specificity for finding these stones and even better when they looked at their accuracy for stenosis.

MRI sialography uses the saliva itself as the contrast agent. So there’s the noncontrast scan and then you do volumetric reconstruction to show the ductal system. We haven’t really gotten the quality of the images that have been reported in Europe. It does require time, its labor intensive, your radiologist has to be interested in back table work after the scan. It certainly has all the standard issues of MRI of cost, there are magnetic issues, claustrophobia, dental implants, what have you.

So what imaging to use? You know this is out of a 2000 report. Basically in the United States I would say, still unenhanced and enhanced CT scan is the workhorse. With MR, MR Sialography being used to a very small extent in some of the centers of people who are doing a lot of salivary endoscopy. Certainly CT being used primarily for inflammatory disease and we use MR for when we have neoplasms.

Ultrasound is really what’s used throughout the world for all salivary gland disease. So except for the United States everybody uses ultrasound for both neoplasms and inflammatory disease and there’s hope that at some point just like it has in endocrine that ultrasound will overtake these other modalities and become the modality of choice.
Alright, so getting ready for the procedure, a couple things you have to do sort of beforehand, you have to decide where you’re going to do it. In the United States there are a couple of centers that are doing it in the office as they do in Europe. Again, Germany, Zenk’s group does a lot of office salivary endoscopy. Part of the reason that I haven’t done in the office salivary endoscopy is the scope is very expensive and fragile as you’ll see. And the sterilization process is a little bit arduous for an office based practice so I’d just as soon do it in the operating room. But I certainly do it either under sedation or a general anesthesia sort of depending on the case and also depending on the patient’s preference and tolerance to instrumentation.

You can pretty much get an idea of what people will let you do when you start to examine their salivary system in the office and whether or not they’re a candidate for sedation. We have done some patients under local in the operating room which is also an option. You have to avoid all the drying agents that the anesthesiologists love to use because the saliva can be extremely helpful when you’re struggling to get started with the procedure. You have to, if they’re going to sleep, give some thought to which gland you’re doing. Some of the procedures we do 4 glands at the same time or bilaterally procedures and so you have to be ready to put the endotracheal tube either nasally or in a location that doesn’t get in the way of the procedure.

Whether awake or asleep you need some way to keep their mouth open for the procedure to find the papilla. I find at my age that loops are essential, I really – I could do the parotid, I definitely couldn’t do the submandibular gland without magnification and good lighting. When you are getting started
you want to avoid creating things that look like the opening to the saliva gland, and these are generally done where being too aggressive with the dilator system that we are going to show, grabbing with forceps makes little tiny holes that look like openings and injecting a local when you are doing it under local can also be distracting.

So Stenson made his papilla easy for us to see but Wharton did not, so this is sort of a standard dilation technique. This is using a Marchal's dilator. The Marchal’s dilator, which is the dilator system that comes on the set are these straight rods, they look like a lacrimal probes but they are completely same diameter top to bottom, so basically what has to happen is that each time you go up and these dilators start at negative 4 zeros all the way up to number 6, they are like a 10 step process, these dilators just require you to get a larger one in every time that you just got it. So frequently what you’ll have to do with this dilator system when you get stuck is to use something like a punctal dilator from the lacrimal set to allow you, and that’s what you see here, to allow you to make the jump. And that usually occurs at about a size 0 to 2.

So this is why – this is why I invented some new dilators that I’m going to show you, this is what they look like and these are available from Carl Stores, I don’t have a relationship with Carl Stores about this product but basically what happens with these dilators is they start from 1 to 5, the ring here tells you what number you’ve picked up and then there are numbers here as well. They are maximal in their fluted dilation by these black lines, so if you get to the black line you don’t have to advance it to the hilt, in fact you don’t really want to be advancing any of these dilators very far
because you either push down deeper into the gland or you run the risk of perforation. So this is a maximum dilation fairly quickly and then each subsequent dilator drops down a size so that it can be inserted and in this way you don’t have to go to the papillary dilator very often but it’s available if you get stuck.

When you get stuck drop down a size. The main thing is to keep your eye on the ball, to be always looking at the papilla because as soon as you take your eye away you don’t see the thing anymore. I mean it’s very, very easy – amazing how soon as you take this out how it sort of disappears. And this is using these new dilators, basically what happens is somebody is holding the – I put in a number 2 let’s say like you see here, somebody holds the 2 and just pulls it out just as I gradually get there with a 3, and then as you see it doesn’t go in very far and that avoids the risk of perforation. You have to have a variety of tricks because you get stuck all the time. And the papilla can be the rate limiting step, it actually can take as long as the case sometimes.

So you have to be patient, there is a group in the country that does – gets frustrated right away and just does a cutdown on every duct. I’d discourage it, it has a number of problems. First of all that group has had a lot of granula formation postop and they wonder why, but I think that’s probably the reason. Also you know the procedure itself is done completely with constant water or in the case of a local case local being injected through the scope so that it requires sort of a hydrodilation for you to be able to see, and if you do a cutdown there’s a lot of leakage into the mouth, the patient has to deal with that if they are awake as well as the fact that you can’t get good pressure within the system.
So we use milking the gland to try and help us with finding the system. Sometimes a little bit of local just off of the papilla into the floor of mouth will stiffen the papilla enough that you can do a better dilation. Methylene blue has been studied scientifically as a way of seeing the papilla more vibrantly, but I have to say I have not been that impressed. When all else fails I will go to a Seldinger technique using a guidewire and then there are some metal bougies that can be introduced at that point. The basic Marchal set has pretty much everything you need and I would say that you do need pretty much everything that’s on the set.

Once you are inside, as you can see here you know just getting started here is the scope, here is the light as it’s making its way back toward the submandibular gland, you’ve got to be aware of the turns in the duct and you’ve got to be aware of the teeth. The semi-rigid nature of a 1 mm endoscope is that it is somewhat flexible even though it’s rigid, that means it’s also breakable. And we have certainly broken scopes although most of our scopes have been broken during the sterilization process and you have to really, really meet with people and get a system down to prevent that from happening. The teeth just like in laryngoscopy can be a rate limiting step in terms of access.

So you get these stones, people will say to me you know how fast do they grow? There’s not a lot of good natural history data but you know out there is this idea that they grow a millimeter a year, so this is a lady who I saw the week before I went to take the course in how to do the technique and I said hey, you know what, I’ll be back in a week, I’m going to go take a course, you could be my first
case. She didn’t like that, but I came back, I called her, she said you know what they are really not bothering me anymore. So she kept them and then I measured their growth when she came back and they were a little more bothersome, so I would say that the growth rate now that we have about 2 or 3 people that have waited and we get about .9 mm a year, so I think 1 mm a year is probably correct. So when somebody comes to me with a 27 mm stone I tell them you’ve probably had this 25 years and that’s probably true you know when you talk to them.

So this lady then came in and she said you know, she came in to have it done and she was wearing a band-aid on her face. I said what’s that? Oh, she – I had a pimple, kind of embarrassed. So I took off the band-aid, and there was the stone. It eroded right through, came out so we didn’t have to do the case. That’s the only one of those I had. So she really just waited long enough.

What does a routine case look like? This is the one that the resident did just last week, so this is a small stone, we’ll talk about small stones, medium stones and large stones. So here you see it being trapped in these wire baskets, and then it can be pulled up to the front but you’ve got to recall that you know this stone which is 3 mm is still way too big to come out of the papilla so they, almost all stones require some degree of a papillotomy at the end, so you’ve got to release the stone. In a standard case like this with a routine papillotomy we don’t use any stent, just like you would you know always take these things out in the office when they would present to you with obstruction and a very easy stone right at the papilla.
So stones that are very easy and palpable in the end of the submandibular gland we’ve been taking out in the office for years and I don’t think that you have to necessarily change that. But what I’ve learned over the years is that this stone doesn’t have to be here when you go to take it out. In other words just because that’s where it was on the CT scan day, or at the CT scan time and you have a stone like that you have proximal dilatation of the ductal system. So that stone can go wherever it wants back all the way to the hilum and so I frequently will have patients who come in with that scan and somebody has explored them and is very shocked to find that the stone wasn’t just right there, okay.

So when I’m going to do a stone even in the office now what I do is to fixate the stone before it’s removed. So I do that either with forceps or a suture or something that prevents the stone from going retrograde. It’s almost impossible to do an office based procedure for parotid stones unless it’s really right there, visible at the papilla, in the papilla. You can’t really fixate it very well, and once you get started it really turns into a mess so I really very few times find somebody who is a candidate for a procedure in the parotid. But this stone on the bottom, you know that’s right at the end of the duct can be done very safely in the operating room with an extended papillotomy. You are not going to be able to get your instruments and your dilation and all that done with that kind of proximal extent.

So here is you know another point that this makes is you know this is a patient who presented to an outside institution with a stone in the floor of mouth, they had their submandibular gland removed. About 4 weeks later they present with an abscess in the neck and the reason is that the stone was not
recovered as part of the procedure. People have this idea that you know if you take the gland out you can’t have problems anymore, but we find we do 3 cases a year of people who present either with an abscess or a draining fistula in the neck or recurrent pain, swelling related to a stone that wasn’t dealt with at the time. So you – the duct itself secretes product, obviously there is a highway from the floor of mouth into the papilla for bacteria are still available to the system, so you know in general I would say if you are going to take somebody to the operating room the stone has to be dealt with and in – as you can see when you think about a case like this it almost does no good to take the gland out. So really the only thing you need to do is take the stone out.

When I first started writing papers on this topic the reviewers would always say there is no reason to save the gland, it’s dead, it’s defunctionalized. These glands don’t work, you know so we had to educate the reviewing public on to studies that show that these glands are completely functional, you can do radionuclide studies that show that the glands are active. Certainly the salivary function can be demonstrated in the office, so the gland preservation even with very, very large stones is possible and recommended.

So this is that case that I just showed with the large stone. It’s really – you know that was a 5 mm stone, so this is a stone forceps being used to grasp the stone and to bring it into the papilla, and these forceps again are something that’s available on the standard set but we’ll talk now about – a little bit about what does that all mean. And what it means is there are a variety of sizes of scope and a variety of toys. And not all toys fit through all scopes. So there is a diagnostic scope that’s just a scope with
a rinsing channel that’s .9 mm, pretty small. The working scopes are depending on who your instructor was the Marchal scope is 1.3 mm, it’s an all in one scope that has a working channel and a rinsing channel. The Zenk Euro scope from Erlangen’s group is a little bit smaller, it’s 1.1 mm. Both of those scopes will allow for stone baskets that I showed with that small stone case to be inserted and for the stones to be removed. For whatever reason they don’t accept the same stone basket, so the Erlangen scope has it’s basket and the Marchal scope has its basket and you cannot fit them in each other’s scope.

When you are using this forceps or what we will show later balloons for dilating stenosis those only fit through giant scopes, and giant in the scope world is 1.7 mm, which doesn’t sound very big until you try to get into a human being. And I can tell you it is enormous. So these kind of things with forceps can at this point only be done if you can get a really, really giant telescope in.

What are options for sort of intermediate stones? So as we said at the beginning parotid 3mm duct, submandibular 4 mm duct, so those size stones will come through those size openings, no problem. What about when you get a little bigger than that, so your options are either lithotripsy, and lithotripsy has been around for a very long time as we said at the beginning, you know this is – there are a variety actually of lithotripters, this one from Stores, the Minilith is a available, okay, by available I don’t mean in the United States because there is no FDA approved lithotripsy yet in the United States but it’s available for a long time in Europe obviously. What kind of results do they get? Well with some of them, with a mean of 4 sessions, 30 minutes outpatient, no anesthesia and an
average size of 6 mm they get 31% complete disintegration and 55% success meaning that they are symptomatically better but they still have ultrasound demonstrable fragments.

Iro’s group, which has done a huge number of patients, you know looking at 2000 patients have about a 50% success. As you see they do a little better with parotid stones than submandibular stones, not entirely clear why that is. And then Iro looked at long term data on these patients meaning 10 years, how do these patients do over 10 years: 35% of the patients had no stone on ultrasound and no symptoms, 15% had mild symptoms and stones, 13% had recurrence of their pretreatment symptoms and 38% had to have something else done and it doesn’t necessarily mean removal of the gland but something in addition to lithotripsy. There are very few adverse events. For the procedure some petechial hemorrhages, some localized swelling, however if you use a renal lithotripter which is available in this country apparently all your fillings fall out. So they had some initial problems with that even with these smaller lithotripsy devices that are being used in Europe.

McGurk in his review of 455 calculi pretty much found that if your stone is 8 mm it is not a good candidate, likelihood of success is very low. But most people use 7 mm as sort of a cutoff for the device. I have sent 2 patients to Germany who didn’t want to have anything else done and went over there and had it done because as I say we have no option at this point in the U.S., in North America actually, the Canadians aren’t using it either.
The other option is laser, and we are using laser for lithotripsy. This is actually one of the larger studies out there with laser, this is from Nahlieli’s group and they had 21 stones that were treated. As you see people talk about fully fragmented versus still have some pieces but symptomatically better, but fairly high success rate.

This is our first laser case. What you see is I kind of pulled back to show you why this stone which looks like it’s just floating there and should come out has to be done with laser, and that is that there is a stenosis in front of the stone and it just won’t – you know I had already tried to bring it through that area and you cannot do it. And what do I mean by cannot do it? Well there have been 2 cases in the U.S. of if you grab it and just pull a little harder just to get it through that area that the parotid duct just avulses off the parotid. This is a very bad thing, it cannot be repaired and you have to go and take the parotid out. So there is a limit, right now I’ve got the laser fiber actually embedded in the stone sort of showing you that it won’t come. These things are actually fairly soft compared to kidney stones, and you tend to get these multiple holes. In fact one of the reasons we are doing this hardness study that I showed you at the beginning is to see if we can use that fact that you can drill a hole through the center to then put a different instrument into the center and cause fragmentation rather than some of the things that we are doing.

The laser is frustrating, it’s very slow, it takes a long time, it’s easy to get damage, it’s a contact laser so anything you contact will be injured so you have to be very, very careful of the ductal wall. I do most of them as a staged procedure, so it takes a couple of times to do it and to get to the point where
like you see here that we can get the stone out. This is the settings I’m using on the laser. Basically this is the same laser that I borrow from the nephrologists and you know we are using 150 micron fiber, 4 to 6 watts, 8 hertz for you know these kind of power settings, anything more than that and you start to get soft tissue injury.

Now here is another laser issue and that is you can damage your scope. All right so this is the end of my telescope, yes, my telescope, now it’s trash. But this is the end of the scope, this is the water channel, this is the working channel, this is where the stone baskets and things go through and this is the lens, okay. So the lens is not supposed to look like this because this is what your image looks like when your lens has been fried with the laser, okay. Not so good. And you can see that I have caused thermal damage to the end of the – where the laser fiber comes up, all right. So this is the lens cleaned up, image getting a little better but nothing I can do about this and what happens is that some of the instrumentation will no longer get through this channel because of the deformation. So we are currently doing a study with Carl Stores on safe use of the laser and distances and fibers and energy levels and what have you. So that’s in the making because there is really no current, despite the fact that a lot of people are using the laser there is no real guidelines in terms of how far the laser has to protrude from the end of the scope, what kind of irrigation you should be using, etc.

All right, so that’s small and intermediate stones, what about large stones? For large stones Marchal introduced in 2007 what he called a combined approach or a hybrid procedure using the scope and some kind of incisional technique, so this is what – where we start. This is a submandibular case,
and what you saw there is the first thing you have to do is to really elevate the gland, so you need an
assistant to bring the gland right into the floor of mouth and then you can begin to dissect the
sublingual gland laterally, find the lingual nerve and take out the stone safely. So he uses a 2 cm
incision, he puts the scope in at the beginning for the submandibular cases but I worry too much
about leaving my scope there while I’m working and having it break over the teeth or what have you
so I generally do the initial part with just one of the dilators sort of showing me where the duct is.

The assistant elevates the gland as you saw, you have to get the lingual nerve out of the way.
Sometimes very large stones get the nerve out of the way for you, when you are having trouble vessie
loops on the duct will help you along as well. So this is what it looks like if you are going from the
back, or looking from the back, the front of the mouth is here. This stone is in a basket but too big to
come out so here is the stone basket combination and you’ll see right adjacent here we want to get
the lingual nerve in view so this white structure here is lingual nerve, this is the stone in the basket.
You can make an incision over the combination, deliver the stone basket combo into the floor of
mouth like so and then just release the stone, here it comes and everybody feels good. Sometimes
you know I do these cases and we spend an hour and a half and then I hand them this little stone and
the nurses are just like I can’t believe this is how you spend your day.

All right, Marchal’s data has been pretty good, 92% symptomatic improvement in parotid, 69% in
submandibulars, there is a percentage that does go on to gland retrieval due to a failure. For the
parotid it’s a little more involved, okay. The parotid I do put the scope in because the parotid you
really need everything you can to get this to go very well, so I like to put the stone – the scope at the stone and ideally I like to trap the stone in a basket and leave that whole complex in place and then begin my external thing. We use a SMAS flap much like a parotid only maybe a little less, kind of for those of you who do a facelift parotid incision it looks sort of like that.

At the end of the case you want to – you know why do you need a scope? You want to use your scope to look for little stones or fragments that might have come off when you remove this. In addition you’ve got to do a watertight closure of the duct at the end, and irrigating through the scope allows you to demonstrate that you are watertight. Marchal reduces the, you know when they are really big stones reduces the mucosa if it’s dilated or puts a vein patch if it’s stenotic. I really just close it and I have been happy with that.

This is our sort of facelift approach, and so this what the procedure looks like. What you get used to after a while is what normal healthy ducts look like and this is a normal healthy duct, that was our first bifurcation, we’re going through so we are already past the masseter bend, first bifurcation, keep driving along; second bifurcation, you know is their standard anatomy like a bronchoscopy? Not quite but there is sort of a familiarity to the procedure. The stones are never down these little tiny openings, or if they are you can’t get to them. So here we see it about the 4th order bifurcation, we are just underneath the ear lobe at this point and we’ve got a stone, and again it looks like a stone that might come out, it’s 5 ½ mm but you can see as I start to pull it you get to this Chinese finger trick, and the more you pull the tighter this duct gets, okay. And I’ve learned from experience because I’m
One of the people who had a duct avulsion that do not pull, okay. You can release it, re-grab it, try to change the orientation and see if you can put it into the basket in such a way that it will come out but you know if you are messing, messing around, forget about it.

One of the advantages though of getting it into the stone basket with the scope is first of all it can’t go somewhere else in the gland, secondly you can put it kind of where you want it. In other words instead of having to remove something that’s in your glandular I can now work right at the front edge of the gland. So now we’ve made that incision, we’ve dissected the buckle branch, we are looking at this stone basket combination. I make a little flap of SMAS here, here is the duct, we’ll incise the duct, remove the basket stone complex and then these are just like a little bit of Bellucci scissors or some of the ophthalmic knives work well off the ophthalmic sets for some of this microtechnique and then I repair it with 6-0 nylon. So here it comes, and you just need to make a big enough opening to deliver the stone, whatever that takes and then irrigate at the end to make sure that the duct repair is sound and then replace this flap for, for assurance. I drain all these cases but I do send them home.

So afterwards you know just kind of irrigating the system, making sure everything is working, we talked a little bit about that. So I find it very effective. You know when we looked at our first 100 patients with big stones we had 20 that had a combined approach, this hybrid technique, 70% were submandibular. You can see the size range up to 29 mm in our successes. We had some failures and it doesn’t mean that it’s because it’s too big, actually the big stones are actually somewhat easier than
the small stones but sometimes an intermediate stone that’s around the corner and stuck into a duct bifurcation like this submandibular case can be a failure. Sometimes it takes forever. I’ve had a couple of outliers where I’ve been there longer than I can really want to admit. One of them was a parotid case that had been infected for 6 months and somebody had been instrumenting them a lot and their gland was just like a rock and it just was impossible to feel anything. I couldn’t trap the stone and I was trying to feel it and it really was very stressful.

We had a temporary lingual nerve symptom, one duct avulsion and we’ve had some failures with gland removal, so this is sort of my algorithm. If you have a floating stone like you see up in the corner just take it out. If you have a medium stone, if the FDA approves it you could go to lithotripsy. Right now we either do a hybrid approach or a laser approach depending on the location, patient habitus and whether the stone is palpable. If the stone isn’t palpable these techniques are very, very difficult. So a big large person with sort of a small intermediate stone may not be a very good candidate for a hybrid approach, large stones there’s nothing other than a hybrid approach that can be used for these patients.

We’ll talk a little bit then about other things that we use it for. Stenosis, stenosis is something I didn’t think very much of when I was being trained, I don’t think we ever talked about it but there is certainly a history of people talking about people who have problems related to strictures in the duct rather than a stone. You know this was an early case, it was a description by radiologists treating it, just like they would avascular stenosis. And more and more literature, this is again Nahlieli’s group
from Israel on strictures and kinks being a not uncommon finding. So they looked at their own results with strictures, made up 26% of this early group and patients would have recurrent infections. He has his own technology, Nahlieli, so he uses a Sialoballoon from an Israeli company and a Sialostent from an Israeli company and you know he’s had fairly good success as well with some patients requiring multiple dilations, but few patients going on to gland retrieval. All of this stuff, stones and stenosis has fairly recently been agreed by a multi-institutional, multiernational group as far as a classification system and I think most people are going to be using this classification system going forward.

What does a stenosis look like in terms of a balloon dilatation, remember that as I said balloon dilatation is done through a very, very large scope so this is a parotid case that I did after radioactive iodine, you’ve got to get the 1.7 mm scope and then for those who are doing balloon sinus cases you know the reality is that sometimes it takes multiple levels of doing the balloon to be able to get it to really the narrowest segment, so just kind of getting your balloon further and further into the stenosis is important. These balloons were off the market until about a week ago for a problem at the factory that made the balloons also did something that required latex and so they had a latex violation. But they just came back on the market. This particular balloon is from Carl Stores. I haven’t done very well like using Fogarty with it and the problem is getting most of the different balloons down your telescope.
You know what do these cases look like? This is a lady who came to see me from South Carolina. Obviously a very long-standing stenosis with a great deal of dilatation inside the duct and she was told that you know this duct, this gland is hopeless, you should just have it removed. But I can say that removing this gland wouldn’t be any fun either, okay, and the likelihood of a fistula when all of the channels are enormous is quite high. So what I do for these somewhat challenging cases is after I dilate them and I put in a stent I Botox the gland to kind of put it at rest for a couple of months while things are healing so that there is not an overwhelming amount of saliva at the beginning.

So this her case, not a radioactive iodine case, and her stenosis was so tight that at the beginning I couldn’t even get this guidewire, this is a .4 mm guidewire, remember the scope itself is about 1.1, but you know with patience you can kind of dilate these up and now we are inside that enormous cavity that’s filled with debris. Actually there was even a stone inside of this cavity.

Radioactive iodine has become an increasing part of what we do in terms of helping patients minimally invasively with this technique, and what’s great about it is there’s nothing else. I mean what are you going to do for these patients? You know why do they get this problem? It’s because of the same thing that helps the thyroid gland take up radioactive iodine exists in your salivary glands, so there’s this transport mechanism and so the salivary glands concentrate the radioactive iodine and there is debate about you know when should they start sucking on hard candy to try and get the radioactive iodine out of their saliva gland? But these are the kinds of things that they complain about. A lot of the patients will have an immediate problem that they will notice swelling
of the glands or pain in the glands or a foul taste, but most of the time they present to us actually in a
delayed fashion, 6, 9 months later with difficulty.

There are very few studies on the technique for this population, this one out of Korea with just 6
patients that were all successfully treated. This is what these patients look like to compare it to what
a normal stone patient looks like. You can see it almost looks like a cadaver, this pale, white almost
dead looking duct because the duct feels the salivary – I mean the radioactive iodine, they have this
horrible inspissated debris that is sometimes so thick that I have to use stone baskets to remove it,
and these patients really benefit quite a bit, they look very similar to this kind of patient. This is a
classic CT of a patient of mine with Sjögren’s syndrome that we see all the time, this kind of
appearance with these multiple calcifications and their ductal system looks very similar to the
radioactive iodine patients.

So we presented our first 12 of these patients, 32 glands were scoped, meaning that most of these
patients had multiple glands involved and the success rate was about 84%. So symptom relief 75%
of them, 84% were successful in terms of the endoscopy, 75% symptom free which compares pretty
well to the literature. Dave Isaly has a paper out this month on this technique as well.

So this is how this stuff really begins, it begins in the laboratory with learning the technique. This is
Rohan Walvakar who has done most of the initial publications with me and we teach all of our
courses together and of course we both took courses from Dr. Marchal in Geneva which is essential
to before you start to take 1 or 2 of these courses to sort of get the – all the different options in your armamentarium. And these courses now are given throughout the world and so they are available to people who are interested in moving forward.

So in conclusion salivary endoscopy has been around for a long time, like 1988 was when I started thinking about it, but FDA approval in this country is relatively recent so people have just been talking about it for the last 5 to 7 years. It’s a tremendous move forward in terms of gland sparing technique. You’ve got to recall that the submandibular gland, the main reason that it’s removed is not for tumors, 65% of the time it’s removed for inflammatory disease. So I’m going to predict that much like our residents are not very slick at doing an external ethmoidectomy because of endoscopic sinus surgery they don’t know how to do that operation anymore, the residents are going to be less slick at doing a submandibular gland resection because most of them were coming out during inflammatory disease, you know though there is some done from malignancy but it’s a smaller percentage and even a neck dissection, that triangle of course is not always dissected. For stones you have to have an algorithm in terms of size of the stone, so small stones are the ideal case for local or sedation because we know that these will come out very easily. Stenoses, the cases take a little longer, the radioactive iodine patients tend to have very small papilla for whatever reason, so the cases take a little longer to get start, same thing for the Sjögren’s patients but it’s really the only thing that’s available for most of these patients to take care of their problem.
When you look at extra patient of stenotic cases or inflammatory cases, you know there is a good studies out of this department that suggest that a total parotid is required, and a total parotid in an inflammatory case is not fun, nobody wants to do them. So they are great cases for the scope. Autoimmune, Sjögren’s primarily, they become the third most common indication in our practice. These patients have a chronic problem so their disease doesn’t go away and they should think that they will probably get more than one of these over the lifetime of their disease. We haven’t been doing it long enough to know that, what the natural history is going to be but I suspect that they will come back every 5 years or so for treatment.

You know these patients not only get removal of debris they sometimes have stones and then at the conclusion we infuse the gland, actually inflate the gland with Kenalog which seems to give them a lot of relief. I think that the next advance in salivary endoscopy is going to be the infusion of different medications into the gland with the device whether it’s something that might be protective for external radiation patients or post-radiation patients. I think there is a lot of area for research in terms of medications that could be infused. Right now we are just using steroids.

Our pediatric partners here in town do children. Children get stones obviously, but they also get something called recurrent parotitis of childhood and so all of those patients are going to Dr. Meda at Children’s Hospital here in Pittsburgh and he’s published his experience as well and the I131 patient that you just saw, most of the patients that we see with this condition if we nurse them along with sort of standard medical fare they will do quite well. So hydration, you know massage, those sorts of
things, most of them if they can make it to 9 months don’t require anything. Their symptoms will start to abate but those who are still increasing between 7 and 10 months we will take them to the operating room for a salivary endoscopy.

Laser, actually the laser is not approved for salivary gland but we are using it for salivary gland, S wall is the neck technology that I’d love to come to the United States for some of these intermediate cases. And as I said we are constantly thinking about new instrumentation to improve this minimally invasive technique. So I want to thank you all for your attention, and I’d be happy to answer any questions.