

## jco/interviews

# DR. VINCENT M. KELLY on Lingual Orthodontics

**DR. GOTTLIEB** Vince, how did you get started in lingual orthodontics?

**DR. KELLY** About four years ago, I found myself spending a great deal of my quiet time thinking about the concept of lingual treatment. Once we had the ability to bond brackets to teeth, that opened a whole new world of possibilities. Brackets could now be placed somewhere other than on the face of the tooth. I spent many sleepless nights trying to figure out what it would be like to work on the lingual. What really got me to the point where I said, "OK, I'm going to try it", was when *Woman's Wear Daily* ran a little blurb in October 1979 saying, "There's a new hero, and it's Craven Kurz, who has developed invisible braces". At about that same time, Kinya Fujita from Japan published an article on lingual orthodontics. It didn't show very much of his hardware, but he did make some very interesting points in his article, and these things kept me encouraged about lingual treatment.

I had said to several people, "I'm going to treat somebody from the lingual. I think I can do it. What do you think?" Everybody I asked said, "You're crazy. We don't need that. Nobody wants it. It'll never work"—and they would always give reasons such as, "The tongue won't allow it." "The patient won't be able to speak." "Every time the patient closes, he'll bite the brackets off." "You can't work on the lingual, that anatomy is too varied;" There were a jillion reasons why you couldn't work on the lingual. But as I thought about them one by one, none of them seemed to be valid reasons. So I set about that week to try to design a lingual system. Since I am edgewise trained, that's the only way I was thinking. I handmade a set of brackets by tacking edgewise brackets to a sheet of mesh material and cutting the mesh to size, and I fit these to a set of models.

**DR. GOTTLIEB** How did your hardware develop from there?

**DR. KELLY** We have now been through six generations of hardware development. After my crude first attempts, Unitek provided me with what we thought would be streamlined, low-profile bracketry, preferably the smaller the better. We kept the bases small enough to accommodate all the variations in lingual contour. You don't normally see big marginal ridges and supplementary anatomy on the labial, but on the lingual it's rampant. We rebonded the patients who started in my original prototype hardware, and leveled the cases to this first generation Unitek hardware. It was only about two weeks later that we discovered we had some major problems. Because the bonding bases were so small, bracket failure was incredibly high. The tie wings were so small that you couldn't ligate on the lingual gingival—and this is an area that you will be concerned with in treatment, because the lingual gingival is quite short. For example, think of how little coronal height you have on the lingual cusp of a lower first bicuspid. Even on a 16-year old's lower incisor there is sometimes hardly enough clinical crown showing to allow placement of the bond and still have the gingival tie wing up above the exposed gingiva enough to permit you to get an elastic under it.

From there we went to the third generation, where we really tried to get a little more

sophisticated. We were aiming toward what we thought would be the ultimate straight wire lingual appliance, which would not require a bend in the wire ever. All the torques and insets and offsets would be accounted for.

**DR. GOTTLIEB** In Dr. Fujita's article, he described a mushroom arch shape.

**DR. KELLY** My first attempts were with a mushroom arch, because I was using standard edgewise brackets and to go from the cuspid to the first bicuspid on the lingual you have to make that tremendous offset bend. To eliminate the mushroom arch and go to the straight wire concept, we built a pyramidal-shaped cuspid bracket that was cantilevered away from the tooth. Those worked quite well, except that by bringing the bracket away from the tooth as far as we did the lever arm between archwire and tooth was significantly lengthened, and the torque in the bracket was incorrect. When you use rectangular wire and pass from the incisors to the cuspid and onto the bicuspid, you get a compounding of torques. You simply cannot make that corner and handle it as you do on the labial. We worked 18 months with the cantilevered bracket and could not solve the problem until we went to new hardware with the correct torque, the mushroom arch, and the gable bend. Now we've developed a template as a guide in coordinating one side to the other as you make your bends, to make sure that you have the same amount of offset on both sides. If you coordinate one side to the other on this template, then the upper and lower will also coordinate. I was pleasantly surprised to find that the lingual arches coordinate just as well as the labial arches do.

**DR. GOTTLIEB** Are you completely satisfied with your current generation of hardware?

**DR. KELLY** No, we're going to a seventh generation now. There's one more change that I think is going to take place. I think we're probably going to spend one more generation on tipping. These have the correct torques, but you have to tip the bracket manually, and we want to preangulate it. The seventh generation hardware will include all of these factors.

**DR. GOTTLIEB** Do you use single brackets?

**DR. KELLY** The upper central is a Siamese bracket. The lateral is a single width, and the cuspid is now a single width. They're about half the width of posterior single-width edgewise brackets. On the upper bicuspids, the lingual cusp tends to cant off to the mesial. When you try to bond to that cusp, the bracket has to be canted to follow the contour, so you have to angulate the upper bicuspid bracket. It's a twin bracket, and we've cut our slot on the bias because of that cant. On the upper first molar, we're using an extra-wide twin. Like the other posterior brackets, it has an enlarged gingival hook so you can get in there with a ligature. The upper appliance terminates with a buccal tube on the second molar.

On the lower arch, all the brackets are single edgewise until you get to the first molar. It is a Siamese just like the upper, and the second molar carries the buccal tube.

**DR. GOTTLIEB** Do you bond all attachments?

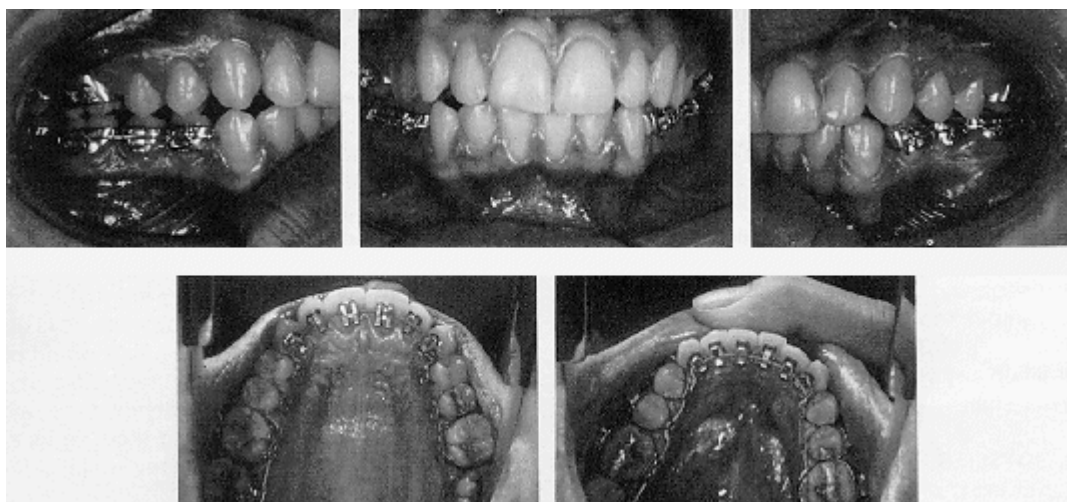
**DR. KELLY** At this time, we're banding the lower first and second bicuspids and lower first and second molars. Patients don't generally show the lower bicuspids, and this allows us to put hardware on the buccal of the lower bicuspids if we want to. But primarily it is done because the anatomy of the lower bicuspids varies so much, even from one side to the other. We usually put that bracket quite high on the band.

**DR. GOTTLIEB** Do you ever skip teeth with your appliance?

**DR. KELLY** We've done about everything. We've done some where we just hooked up the six anteriors and the first molars— we call that a 2-by-6 hookup. That might be for a situation in the upper denture where you have a diastema and want to close it from the lingual. It works really well.

**DR. GOTTLIEB** Do you have any special bonding procedures?

**DR. KELLY** First of all, we scratch the lingual surface of the teeth. That enhances the acid etch on the lingual. You don't grind them. You just use a very slow speed and scratch the surface. I etch for 90 seconds on the lingual, partly because of the difference in the microscopic appearance of the lingual surface of the incisors compared to the labial surface. When I paint the sealant on— and I want a very thin layer— I don't blow the sealant off. I suck it off with my aspirator. When the chemists at Unitek heard I was doing that, they said, "You ought to keep that in your technique". Apparently, the chemistry of the sealants is such that they shouldn't have extra oxygen, so removing the excess sealant with the aspirator works better.



**Lingual Appliance.**

**DR. GOTTLIEB** You've talked about the lingual surface being greatly different from the labial surface. How did you cope with the widely varying contours when you designed the appliance?

**DR. KELLY** Unitek now has a computer that architects use, which has the ability to take any part of a graphic and reduce, enlarge, or change your point of view of it. We programmed into the computer the lingual anatomy of 50 different cases, and we selected our bonding pads and lingual contours from the computer. It really did a beautiful job. We were struggling until we got that computer.

Our technique calls for modification of the lingual surface of those teeth that have bizarre lingual anatomy. There are some that have huge tubercles and cingulums. A little composite restorative in there can just smooth some of those out right away, and we can bond right onto that composite restoration. Or you can smooth some of the irregularities with a small diamond stone.

**DR. GOTTLIEB** There's a lot of fear and trepidation on some orthodontists' part that they're going to go into the pulp if they grind down those tubercles, but I've never found a pulp in there. They seem to be solid enamel.

**DR. KELLY** I have never had a problem. In fact, we don't use an anesthetic when we are grinding them down, and I believe that the patient would warn us far in advance, if we were approaching exposure of the pulp.

**DR. GOTTLIEB** Which teeth need these modifications the most?

**DR. KELLY** We're finding that mostly the upper denture needs modification. Lower incisors are pretty uniform and there's not much variation in the anatomy of lower cuspids.

**DR. GOTTLIEB** Is tooth anatomy on the lingual uniform enough, generally, so that you can make up any differences with the bonding procedure?

**DR. KELLY** Yes. Our bonding base is a malleable base. We adapt it to the stone model first. You just push it against the stone model, which will contour the mesh pad enough so that it adapts quite closely to the tooth contours. Then you fill up any void with your composite bonding material.

**DR. GOTTLIEB** How did you start on patients?

**DR. KELLY** I first put a full appliance on myself to test out some of the problems I had heard about. I had no difficulties in four and a half months of wearing the appliance, so we had a patient in and I bonded each bracket on one at a time. It took me two and a half hours to get the case bonded up, and then an hour to bend the first archwire. I was really exhausted at the end of that session. After I bent that first archwire and tied it in, I thought, "It's probably not impossible, but it's very difficult". But I was determined that I would treat a case from the lingual. Things leveled out pretty quickly, and I got a little confidence. I hooked up two or three more, including my daughter Leslie. We took her to the Dallas Mid-Winter Meeting that was held in January 1980 in Dallas, and we surprised a few people.

**DR. GOTTLIEB** How did those first patients react?

**DR. KELLY** The patients were enthusiastic. They were excited to be a part of the development of this new system, and their friends all envied them. The people we have hooked up, who I think are true devotees of lingual treatment, are the people it was made for—the attorneys, the doctors, the real-estate salespeople, the adults out there in the business community. We have one attorney who told me, "As chief counsel for an oil company and a woman, it's difficult enough for me as a woman to have the credibility and the force you need to represent the company. But to be a woman wearing braces, I just didn't think I could pull that off. What you offered me was a chance to get my teeth straightened—and do what I wanted to do all my life, but hadn't—and still be able to function as a practicing attorney". It's a funny thing that these patients go to considerable expense and effort to get invisible hardware, but we found that the first thing they do after you hook them up is go to a cocktail party and say, "Hey, look what I've got", and they're showing their braces to everybody. I've asked them about that, and they say, "Well, yes, but it's me allowing them to look, rather than everybody violating my smile".

**DR. GOTTLIEB** How many cases have you treated so far?

**DR. KELLY** We have approximately 55 in treatment now, and we've finished ten cases. I'm trying not to hook up new ones right now, because I have a fairly active labial practice. My goal eventually is to have a pure lingual practice and just treat from the lingual. I think that would

give the appliance the credibility that it needs. One of the things that I have done in my approach to the appliance is to treat every kind of a case you can find. We have in treatment or have completed treatment on surgical cases, Class IIs, Class IIIs, four-bicuspid extractions, and, of course, nonextractions.

**DR. GOTTLIEB** Do you treat children as well as adults with this appliance?

**DR. KELLY** Yes, we do. Our fees for lingual treatment are about double the fees for labial treatment. That alone should limit the appliance to an adult in the business or professional community who wants treatment very desperately, and is willing to pay the extra price to do it. But, for some reason, it doesn't. There are parents out there who are willing to spend the money for their kids to have hidden braces. I was amazed at that, because we charge them the full fee for it. In the beginning, I wanted children in my sample. I thought that growing children would treat out more rapidly; that their time availability factor was much greater—that they could come in any time to get their appliances checked and adjusted; and that, if there were some errors in the treatment, we would pick them up pretty quickly on a growing child. After we reached a point at which we really felt confident in the appliance, I tried to discourage children and develop an adult practice in lingual. But, at this point, out of the 65 people we've treated, I'd say that 15 of them are 17 years of age or under.

**DR. GOTTLIEB** Why discourage children?

**DR. KELLY** The disadvantage with treating children is that the clinical crown on the lingual has not erupted sufficiently, especially in the lower bicuspid and upper cuspid and bicuspid areas, so you don't have enough clinical crown to allow you to place your bond as far gingivally as you need to. The bracket height on the lingual is more critical than it is on the labial. As you violate the need to be gingival in the cuspid-bicuspid regions and you bond more occlusally, you tend to create a lateral open bite in the bicuspid area. The way we overcome that, of course, is with step-ups and step-downs, but it's another bend you have to make on the lingual. Yes, we have kids in treatment, but I really designed the appliance for adults.

**DR. GOTTLIEB** Of course, lingual treatment probably has a place for young adults, who can be late teenagers.

**DR. KELLY** There seems to be a sort of vacuum in that particular age group, probably because those young adults are just going out on their own and they don't have the money to do everything they want to do. We're getting the 14-, 15-, 16-, and 17-year-olds, and then we're breaking until age 26 or 27. We seem to miss out on that whole 10 years in there.

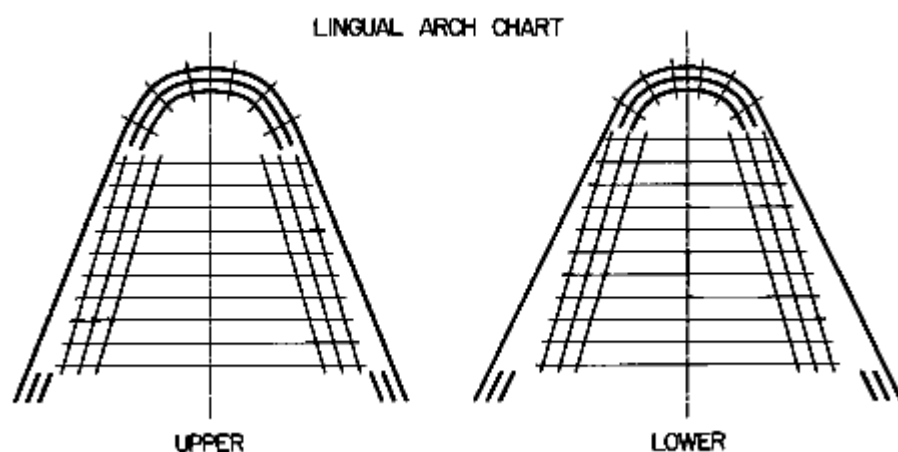
**DR. GOTTLIEB** Do you see orthodontists going into lingual because of the higher fees?

**DR. KELLY** Well, lingual orthodontics is a chance to increase your income with fewer patients. The public is pretty much aware that it costs more, that it's harder to do, and they're willing to pay for it. However, I don't think we should approach lingual treatment simply because it's a way to charge a higher fee, because I think you're going to earn it.

**DR. GOTTLIEB** Can you now treat lingually in the same amount of time you would treat the same case labially?

**DR. KELLY** Close to it. I'd say that I'd add 10 or 20 percent in months at this time. In hours, I'd

probably add 30 percent. That's a hard thing to say, though, because until just recently the majority of my lingual patients were in primitive, early hardware, and we spent much time changing them over to the more sophisticated seventh generation material. A good deal of their treatment was done in third and fourth generation development hardware that didn't have all the bugs ironed out—the torques and tips were wrong. Now, in the sixth and seventh generation hardware, we've got all those problems ironed out. They're easy to hook up, the brackets stay on, the torques are right. The patients are sailing through treatment. So, I probably don't yet have a true handle on how much time I spend on a case that is hooked up properly. All the time I spent in the early days was spent on hardware that was incredibly difficult to ligate, that simply was not designed for lingual treatment, and it was really tough going. In addition, I photographed every single step. When you take five before and five after photographs of everything you do on 30 patients—which was my original sample—it eats up an awful lot of chair time. I don't think it is going to be nearly as difficult for anybody else as it was for me to go through this learning curve.



### Lingual Arch Chart.

**DR. GOTTLIEB** What procedures in the lingual technique can you assign to auxiliaries?

**DR. KELLY** Our auxiliaries are allowed to cut and tuck ligatures. They are not allowed to tie in. We use them primarily as chairside assistants. In other states, they could ligate, because our ligation is with chain elastics and it's not anything that is going to damage a tooth or hurt a patient. They could also fabricate the archwires in the laboratory, with some guidance. It's just as easy on the lingual as it is on the labial, once you know the scheme of treatment. To make it even easier, we're now starting to prefabricate archwires. They'll come in several sizes.

**DR. GOTTLIEB** You spoke earlier about objections raised to the lingual concept. Did you eventually answer all these objections?

**DR. KELLY** Yes, I found that they were myths and none of them were true. The first myth was that the patient's speech would be severely impeded. One of the reasons I put the appliance on myself was to test that premise, and I found that I had no trouble speaking. I went right ahead and continued to practice orthodontics, and do case presentations and consultations and new patient exams. There certainly are some modifications in speech that you have to make, but that happens if you put in a retainer or a lingual arch. We put lingual appliances on one of my

chairside assistants who wanted treatment, and we taped her speech before we put the braces on, immediately after, four hours later, 24 hours later, and two weeks later. We can't tell the difference between the tapes made before treatment and two weeks later.

**DR. GOTTLIEB** I've run into the idea that the lingual appliance is an expansion appliance.

**DR. KELLY** That's a second myth, that the lingual appliance is basically an expansion appliance; and we've been brought up to believe and to treat to the philosophy that expansion is evil. I'm speaking of anteroposterior expansion, lateral expansion, and vertical dimension expansion. When I heard that criticism of lingual treatment, I gave it a lot of thought and couldn't see why it would have to be expanding. You can take out teeth to resolve an expansion problem, whether your appliance is on the lingual or on the labial. So, I really wanted to monitor that problem very carefully. What I discovered was that, if there is a criticism in that area, the problem is constriction and not expansion.



**Upper and lower lingual arches coordinate bend for bend.**

**DR. GOTTLIEB** Does that have to do with the nature of the tie at the cuspid and its effect on the wire configuration?

**DR. KELLY** I explain it with the idea that when you put hardware on the labial surface of the teeth, the patient can't take the lips away from the braces, so nothing changes as far as the muscle forces of the tongue/lip complex are concerned. But, when you put the hardware on the lingual of the upper and lower incisors, the patient has the option of removing the tongue from

behind those teeth. I found that it's uncomfortable to have the tongue rubbing against those brackets all the time, so you keep the tongue back. Now the lips are the overriding force and they tend to constrict the denture. You have to fight that constantly during treatment to keep the arches expanded out to the proper dimension.

**DR. GOTTLIEB** Suppose you want to expand?

**DR. KELLY** You can if you want to, but the trick is to control arch form. You could expand inadvertently if you're not careful in using the arch chart, for example. We have an arch chart for lingual treatment, and we just Xerox the patient's models and use that to make sure we are not expanding the denture in our arch construction. With the new hardware and with our new concept of arch form, we treat with no posterior expansion or constriction. We can keep the arch form right on the money, just as we do with labial treatment. But, we had to be aware that there was a tendency toward constriction in the anterior component of the denture, and probably some tendency toward expansion in the bicuspid area.

**DR. GOTTLIEB** What about the idea that you can't wear Class II elastics with lingual hardware?

**DR. KELLY** We found that myth wasn't true either. You can attach Class IIs to hooks that we can crimp on the archwire on the lingual just as easily as you can on the labial. On certain cases, we have bonded a clear plastic button on the labial of the upper cuspids. We're banding the posterior teeth— lower molars and bicuspids and upper molars. We can hook the Class II elastic from the lingual or from the labial up to those buttons. We haven't put those clear buttons on very many people, but we do have several wearing Class II elastics on the buccal. The Class II vector is a little more effective on the buccal, because it's a little longer; it's more vertical on the lingual.

**DR. GOTTLIEB** Do you get any constriction action out of those lingual Class IIs?

**DR. KELLY** No, we don't seem to. We counterbalance the lingual pull against the lower molars by putting a chain elastic on the buccal, so you don't roll the terminal molar at all. If you were to see any constriction, you could just switch over to the buccal.

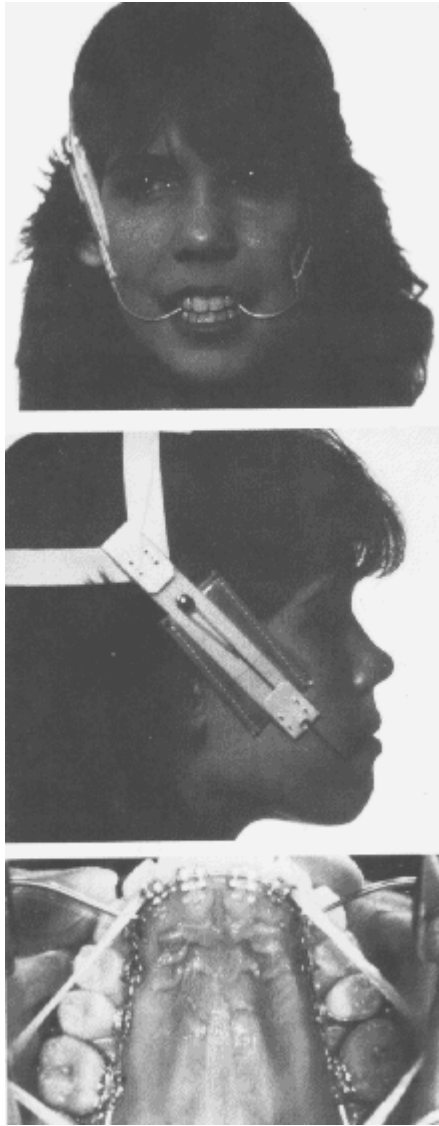
**DR. GOTTLIEB** Do patients object to having the elastics on the buccal?

**DR. KELLY** The patients don't seem to object to having elastics on the buccal. I really think that a lot of them who truly want lingual, hidden hardware are probably not wearing their Class II's during the day anyway. But, for some reason, Class II elastics seem to me to work about three times as effectively on lingual cases as they do on labial cases. That probably is because the tongue is no longer any kind of influencing factor on the upper denture.

**DR. GOTTLIEB** Does it make a longer span, since you routinely band second molars?

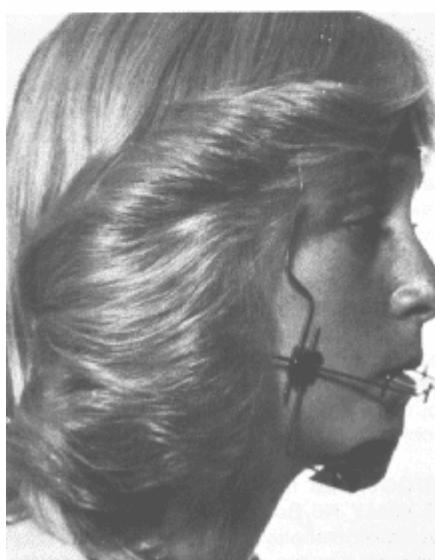
**DR. KELLY** I always band second molars, even with my labial treatment, so the span is actually shorter for me on lingual, unless I go to a labial button. But those who said the Class II elastics couldn't work and wouldn't work were wrong; they work better, I think. We are also able to hook headgear on the archwire using a J-hook; we do that a lot.





**High-pull headgear and Class II elastics attached to lingual arch.**





**Reverse pull headgear attached to lingual archwire.**

**DR. GOTTLIEB** Another criticism of lingual I've heard from people who haven't used it is that it promotes extraction.

**DR. KELLY** I found it to be just the opposite. It does modify your philosophy of extraction a little bit, probably due to this tongue-lip interaction problem. In several of the cases that to me should have been routine four-second-bicuspid extraction, mild crowding, 4mm cases— which ordinarily would have treated out in 18 months — we found that the profile was being altered significantly. We had to go to a reverse-pull headgear to pull the denture forward in the face, because the lips were just forcing those anterior teeth back. So we did learn a little bit about selecting extraction cases. My mechanics on the labial, generally speaking, is not a distalizing force in the upper denture. Normally, in a Class 11 case, I would rather extract upperfirst bicuspid than try to distalize upper molars. When I first started treating from the lingual, I found that this action of the lips against the anterior teeth, when you remove the tongue as the opposing muscle system, resembles the old lip bumper and it tends to distalize the upper denture, whether you want it to or not. So, some of the cases that were one-, two-, or three-millimeter crowding problems, where there would be some question about which tooth to take out, aren't extraction problems at all. They can be treated nonextraction because the denture will distalize

itself, and without headgear.

**DR. GOTTLIEB** What about the idea that the occlusion would dislodge the lingual attachments?

**DR. KELLY** I heard the myth that the patients would shear the brackets off; that you couldn't use lingual in a Class II deep bite case, for instance, because the brackets would be bitten off every time they close their teeth. Well, it doesn't work that way at all. The shearing forces against the teeth are on the labial; on the lingual they are not shearing forces, they are compressing forces. Because of the angulation of the teeth, when the lower incisors bite into the upper incisors, it tends to compress the bracket into the lingual of the teeth, rather than shear it off. We haven't lost any brackets because of the patient's overbite. In the beginning, when I did treat a couple of Class II division 2 patients with deep bites, I just started on the lower denture and leveled the lower arch first. Then we went ahead and bonded the upper. We soon found out that that wasn't even necessary. You can bond the upper and let them bite on those brackets, and they can chew on those brackets as well as they can on their own teeth. It holds them open until they level, but they level very, very quickly.

**DR. GOTTLIEB** Have you figured out whether, when you bite on the brackets, you're intruding uppers and lowers, or intruding uppers more than you would normally?

**DR. KELLY** I think it's kind of a trade-off. The lower incisors are smaller teeth with more pointed roots, so it seems to me that they would tend to intrude more than the uppers. However, the vascularity of the upper denture is greater than the lower, and upper teeth tend to move better than lower teeth, so I think it is probably a little of each. One of the things that lingual treatment has done for me is to awaken in my mind a tremendous source of future master's theses— all the different things that we've never paid any attention to on the lingual surface of teeth. We took some electron microscope blow-ups of the lingual surface of enamel, and there is a tremendous difference in the make-up of the enamel rods on the lingual compared to the labial. We don't know what the difference is, but it is different. You can see it.

**DR. GOTTLIEB** Speaking of different anatomy, what about the charge that the arch on the lingual is so small that you can't work in it?

**DR. KELLY** Of course we found that the space is smaller, but you can operate on the lingual. Our counterparts in the medical world are doing microscopic surgery and learning fabulous new techniques. That's how I see lingual orthodontics. There will be orthodontists out there who are willing to take the time, who will learn the technique, who will modify it.

**DR. GOTTLIEB** Doesn't the smaller interbracket distance make a difference?

**DR. KELLY** It certainly is less. The radius of the circle on the lingual is a whole lot smaller than the radius of the circle on the labial, but there is enough interbracket distance on the lingual.

**DR. GOTTLIEB** Do you use low modulus wires to overcome that problem?

**DR. KELLY** Yes, I do. In the early stages of leveling, I'm using Unitek's standard stainless steel wire. When I get up to my rectangular wire, though, at the third or fourth appointment, I am using Nitinol from Unitek or TMA from Ormco. I start with an .014", then an .016", then an .018", and then an .018" × .025". I am using an .022" slotted bracket. We plan to come out with

an .018" × .022" slotted bracket in the very near future.

**DR. GOTTLIEB** Do you find any problems with crowding?

**DR. KELLY** Crowding is a problem only while the crowding exists. Presumably, your treatment is going to do something about the crowding. Either nonextraction— where you're uprighting teeth and using compression coils or something else to open the spaces— or with extraction to compensate for the crowding. While the crowding is present, there will be certain teeth you can't get on. If you have one lower incisor that is 3mm out in front of those on either side of it, and those two are closed in behind it, you've got to open the space up and get to the tooth before you can bond it and bring it back in. So, that's a problem, but it is only a transient problem.

**DR. GOTTLIEB** Is leveling a problem?

**DR. KELLY** No. Because of the tremendous torque considerations on the lingual, the bracket is at such a severe angle to the long axis of the tooth that the path of insertion for the archwire could be either occlusal or horizontal. I have experimented with an occlusal insertion bracket, and I have four people wearing them right now. Occlusal insertion is a trade-off, because a lingual insertion path into a horizontal slot in your bracket allows you to parallel roots very easily — but it's more difficult to correct rotations. With vertical or occlusal insertion, you have more control over rotations, but you lose control of your tipping and leveling. So, at this point, we're staying with the horizontal insertion bracket and finding that leveling is not difficult. It seems to be just about as easy to achieve as with labial treatment.

**DR. GOTTLIEB** Does this bracket angle cause a peeling force that breaks your bonding material?

**DR. KELLY** Well, when we talk about "the torque", we're building 50-70 degrees into the bracket, depending on the bracket, just to be passive. With these very flexible rectangular wires like Nitinol, the force, while it gives you the twist you want, is gentle enough that it doesn't fracture your bonding base. I think there's another element at play here that would also be nice thesis material, and that is whether the fact that you're bonding to a concave surface, rather than to a flat surface, enhances the bonding. I think it does, but it's something that has to be researched.

**DR. GOTTLIEB** Are the pads larger than on the labial?

**DR. KELLY** Our bond pads are a little longer proportionally on the lingual than they are on the labial.

**DR. GOTTLIEB** Is it a problem to control the vertical, either closing an open bite or inadvertently opening one?

**DR. KELLY** You have to have almost zero overbite to function in this appliance, to keep the lower incisors from interfering with the upper hardware as you're approaching Class I occlusion. In labial treatment, usually you'll go ahead and treat while you still have quite a bit of overbite. I said that when you put this hardware on the backs of incisor teeth, the patients tend to reposture their tongue. Probably some of that reposturing is in a lateral tongue thrust position, because in the early days of treatment, almost everybody I treated started out with open bites in the

cuspid-bicuspid region. Now, as I have gotten more proficient at using the appliance, and as this new hardware has been put in the patients, we don't see any tendency toward that anymore. I don't know whether it was because of bracket placement because we weren't putting them gingivally enough in the cuspids and bicuspids - or whether it was the tongue posture. I think you have to be aware of both factors. I'm not saying you should treat to an open bite; you can close them with vertical mechanics, and you do have the option to put some clear buttons on the bicuspids and use vertical elastics if you have to. But that is a problem that's going to be seen in lingual treatment. Anybody who is just getting involved, after they get a few hooked up and get comfortable with lingual treatment and see that they have to be aware that there is a tendency toward open bite, they'll stop seeing it happen. We certainly don't see the lateral open bites anymore.

**DR. GOTTLIEB** Would you treat an anterior open bite with lingual?

**DR. KELLY** Not at this time. After I get a couple of hundred cases under my belt, I might. I don't want to treat any high angle cases with it right now, either. The only exception would be if it was likely to be a surgical case. Then I wouldn't hesitate to treat it, because I would have an out in the end.

**DR. GOTTLIEB** Is there anything about lingual mechanics that tends to open the mandibular plane angle?

**DR. KELLY** We haven't seen that on the headplates that we've traced, and I've traced quite a few. I've not seen the FMA increase. Rather, the majority of my finished cases showed an average decrease in FMA of 2 degrees.

**DR. GOTTLIEB** Another problem that someone interested in lingual might worry about is simply the physical strain of working on that side of the teeth. Is that going to make a doctor's aching back even worse?

**DR. KELLY** I've already got a buffalo hump on my back from 25 years of labial practice. The people that I see trying to do lingual treatment are trying to turn themselves upside down to get in there. If you watch me work, I don't do that. I use a mouth mirror a lot. Dentists work in a mirror all the time, but we generally don't in orthodontics. However, you can learn to work in a mirror again, and it will save your back. I try to sit upright, because it will tear you up if you let it.

**DR. GOTTLIEB** In the patient category of lingual problems, I don't believe we've discussed hygiene yet.

**DR. KELLY** At first we thought that lingual was the answer to all of our hygiene problems. I was basing that on my own experience in wearing lingual appliances and on the patients I treated in the first six months. I know that there are patients out there who will have string beans and spaghetti hanging off every contact and wear it all day long. I'm not that kind of person. I picked at it constantly, and I thought that everyone was that way— and that feeling food on the lingual with your tongue and being constantly reminded of it, you would be very fastidious. The first patients we hooked up were that way, but they were the creme de la creme of patients— they really were aggressive, top-notch people who wanted this treatment and knew that they were being photographed all the time. Now, after we've been in it for almost three years, we're seeing

people to whom we have to talk about hygiene every time they come in.

**DR. GOTTLIEB** Does poor hygiene create greater problems on the lingual?

**DR. KELLY** The problem with hygiene on the lingual is the same as with hygiene on the labial. You get inflammation and swelling of the lingual gingiva, and when you do it's hard to ligate. If you lose a bond and have to rebond, it's almost impossible. You have to wait and let the tissue subside, and you might end up taking the archwire out for a week to let the tissue calm down, if they're really not doing their part. We have encouraged our patients to use the Water Pik, and we've really spent a lot of time lately on their hygiene, where we didn't in the beginning. One advantage of lingual is that the ravages of poor hygiene are not as devastating to the patient postbonding as they are on the labial. If you get some etching around a bond on the lingual at least nobody sees it; but if you were to see this on the face of a central incisor that the patient will carry with them for the rest of their lives, you really feel rotten about it. I believe that hygiene on the lingual is every bit as important as it is on the labial.

**DR. GOTTLIEB** Do you give your patients a whole list of things to avoid eating?

**DR. KELLY** No, we don't restrict them on any of their diet, except that we don't want them cracking ice cubes and chewing the bark off trees. We just ask them to be careful with the appliance. We do tell them to chew sugarless gum, because it exercises the periodontal membrane. The tenderness leaves the teeth a lot quicker, and I think it promotes the healing of the insult to the periodontal membrane and the bone when you have them chew and exercise the denture immediately after adjustments of the appliance. We know that people who get on a baby food kick because they are wearing appliances have sore teeth all the way through treatment. The people we put on chewing gum to start exercising right away don't ever experience periods of discomfort like that. We do that with all of our patients, labial and lingual. In fact, we dispense gum at the first banding/bonding appointment, and encourage them to chew it as soon as they leave.

**DR. GOTTLIEB** Do you ever use a combination of lingual upper and labial lower?

**DR. KELLY** Yes, we've done that in about five cases. It works pretty well. It is not a bad way to treat cases in which the patient does not show any lower incisor during speech or smiling.

**DR. GOTTLIEB** How do you handle rotations?

**DR. KELLY** If rotations are a problem, the clear plastic buttons we spoke of before, bonded to the labial surface, are a neat gadget to help rotate teeth. I also designed a little wedge that we're producing to go along with our bracket; we call it the K-wedge. That wedge is a piece of elastomer with a wire through it, and you tie it under the wire around the bracket. It's a very effective little rotating device.

**DR. GOTTLIEB** Do you use positioners following lingual treatment?

**DR. KELLY** Certain of my lingual cases I'm finishing on positioners; some I'm not. For retention, we're bonding the lower cuspid-to-cuspid lingually, and since they don't want to show their retainer, we are not having them wear the standard Hawley retainer. On the upper, they wear a Hawley at night. When we do have them wear the positioner, we use that little Ortho-Tain, and nobody wears that more than six weeks. We put it in at the time of debanding,

they wear it for two weeks and come back, and we check to see whether it's doing what we wanted it to do and to insure that they are wearing it properly. If they're not wearing it, we go right into Hawley retainers. If they are wearing it and it looks as though things are coming along nicely, we have them wear it another four weeks, and then we go into Hawley retainers.

**DR. GOTTLIEB** How would you suggest that an orthodontist get into lingual treatment?

**DR. KELLY** For the orthodontist who wants to start in lingual treatment, I would suggest you start slowly. Don't start with a difficult Class II. Don't start with a high angle case or an open bite case. I would get my feet wet with a Class I mild crowding or spacing case, just something simple, and then build on your skills. As you see that you can do these things, go to more difficult cases. Even after you have been in it only four or five months, you'll feel a lot more confident. As soon as you get somebody wearing Class II mechanics, then you'll know that you can really sail with the appliance. But, you're not going to hook up somebody on Wednesday and have them in Class IIs on Friday, either. It's going to take months to get to that point in the treatment.

**DR. GOTTLIEB** Would you say that an orthodontist starting in lingual should avoid mixing lingual with labial patients in the beginning?

**DR. KELLY** I think it would be a good idea to say to themselves, "I want to hook up two or three or four cases. Thursday afternoon's my afternoon off, and I'm going to give up my golf game for a couple of months, and just see what it is like". There would be no rush on that afternoon. He could get the patient in and have them for an hour or more, and just see what it's about. I wouldn't try to integrate lingual treatment with other patients in the beginning. In our practice, we no longer pay any attention to when they are coming in. Nobody even says, "Hey, we've got a lingual patient here". If it's a lingual case, we just work on the lingual. It's very easy once you cross the sound barrier, so to speak, to be able to cross it at will.

**DR. GOTTLIEB** Does someone starting out in lingual need to come up with a contract for the patient to sign, which takes care of the possible contingencies?

**DR. KELLY** In the beginning I was quite unsure of myself and I didn't want to get in over my head. There had never been a book written on how to treat from the lingual. There'd never been a course given on it. There wasn't anyone who could even converse with you about it. So, I felt that I needed to be able to bail out if I had to. One of the first patients that I hooked up was the attorney I mentioned, and I had her prepare an agreement between herself and myself, which I could also use for all my patients. I said, "Now make it a two-way deal", and she did.

AUTHORIZATION FOR RELEASE OF  
ORTHODONTIC RECORDS

I, \_\_\_\_\_, hereby state that I am knowledgeable of the fact that the orthodontic methods being used in treatment I am receiving under the care of Dr. Vincent M. Kelly, commonly known as "invisible braces", represents a new and unique approach to correction of orthodontic problems within the profession.

Therefore, in consideration of having been selected for and provided orthodontic correctional treatment through the use of "invisible braces" by Dr. Kelly, I hereby specifically authorize Dr. Kelly to release any and all records, case histories, photographs, medical opinions, X-rays

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I further agree to cooperate, where possible, in any reasonable request of Dr. Kelly to provide information or otherwise assist in the perfection of this orthodontic treatment method.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_.

\_\_\_\_\_  
PARENT OR GUARDIAN IF UNDER 18  
YEARS OF AGE

**DR. GOTTLIEB** What is a "two-way deal"?

**DR. KELLY** The two-way deal was that anytime in the course of treatment if I felt that it was not in the patient's best interest to continue with lingual treatment, I had the prerogative of saying, "OK, at this point it isn't working. Let's get it off and we'll finish you with conventional hardware". That same agreement said that at any point in the course of their treatment, if they did not feel it was in their best interest to continue with lingual treatment, they had the prerogative of saying, "Get this hardware off my teeth. I can't stand it. It hurts my tongue" — or

whatever — and we would take it off and finish them with conventional treatment at no change in fee. At that time the lingual patients were only charged the regular fee. This same agreement which they signed also had a paragraph which said, "I also release to Dr. Kelly all my records so that he can publish this treatment. I understand it's experimental, it's new" and so forth. When they found out that they might be included in some publication, they wanted treatment right now.

**DR. GOTTLIEB** There is an element of informed consent here, too. With something as new as lingual, I would think that maybe orthodontists would want to have something in writing.

**DR. KELLY** I feel comfortable enough with lingual treatment now that I don't have them sign a contract. I don't have them sign anything for labial treatment either. I'd like to stress that, after doing as many cases as I've done, I can handle lingual just as well as I can labial. It doesn't bother me a bit. I still like to have them sign the release of their records to me, so I can publish them if I wish to.

**DR. GOTTLIEB** Are there cases for which you feel lingual is contraindicated?

**DR. KELLY** I have attempted to treat all types of malocclusions and I haven't seen anything that doesn't look as if it will treat out with lingual. The ones I tend to steer away from — and this is unfortunate, because a lot of adults fall into this category — are mutilated cases. So many have extreme periodontal problems with a tremendous amount of crown and bridge work and still have deep overbites and protrusions. Part of their problem is because of their untreated malocclusions. They need treatment, but I don't feel comfortable getting involved in those cases. Beyond those, the ones I don't think lend themselves well to lingual treatment at this time, at this stage of the development of this appliance, are high angle cases and open bite cases. But those are tough to treat from the labial, too. I think you have to use a little common sense in this.

**DR. GOTTLIEB** Has patient cooperation been a problem?

**DR. KELLY** Cooperation has not been any problem whatsoever. That may be because we are dealing with a group that desperately wants treatment and is willing to do some unusual things to get it. I'm sure that there are some uncooperative lingual patients out there, just as there are uncooperative labial patients. In trying to document our patients as closely as I have, we've asked a lot more of them than we have of anyone else. Many of them were appointed for ten days after we did something, just to see how it turned out. Now we're getting to the point where we're seeing them at five-week intervals.

**DR. GOTTLIEB** Do you find that lingual patients are missionaries for the practice and recommend other lingual patients?

**DR. KELLY** Absolutely. After every party they go to, we seem to get two or three more calls, and it is mushrooming. The response from the people of Tulsa and from the whole United States, just from the little "PM Magazine" piece, is remarkable. We received a bushel basket full of mail from that program — people who wanted to come to Tulsa and get braces. One lady said she wanted to come here from Australia. Why would somebody do that, except that the public wants it desperately? On the one hand, I don't want to appeal to the public for this appliance. I want to appeal to my peer group orthodontists and say, "Let's quietly and slowly work this out, and see if we can offer a viable treatment option for our patients". On the other hand, the public will almost not let us do that. You just need to have one person out there with lingual hardware on,

and the phone starts ringing off the wall. They won't let you keep it quiet.

**DR. GOTTLIEB** About those lingual patients recommending others — they not only recommend others who are interested in lingual, but they recommend others who can afford it, because that is the circle they travel in.

**DR. KELLY** Exactly. You know, our profession is spending a lot of time and money trying to promote the image of orthodontics and trying to generate interest in adult orthodontics. Well, now we've treated many of those adults. Lingual treatment opens a whole new era, a whole new source of future patients, because now we can treat the patients who didn't want orthodontic treatment when the appliances were visible.

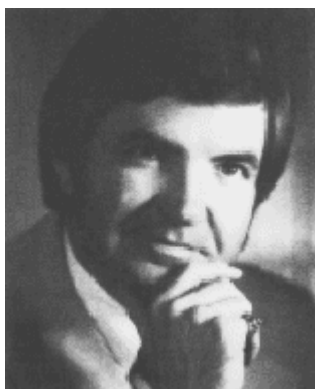
**DR. GOTTLIEB** What does the future hold for your lingual appliance? How close is it to being available on the market?

**DR. KELLY** We're probably a year from what I would call a true market. At this point, we want to bring orthodontists on board to evaluate the appliance. We're going to supply them with materials for maybe two cases a month for the next 8 to 10 months, and then go into production. Our first lingual course was in June in San Francisco, followed by one in July in Florida, then one in Boston, and we're going to go around to different cities and cover regions across the country. I anticipate that around November we will be giving all the courses here in Tulsa. It gives them an opportunity to see my patients in treatment, which I think would help them, and we have a good facility here where we can sit down and work.

**DR. GOTTLIEB** Thank you, Vince, for giving us so complete an insight into your approach to lingual orthodontics.

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**KELLY**



Dr. Kelly's address is 4550 South Harvard, Tulsa, Oklahoma 74135.