

jco/interviews

DR. BJORN U. ZACHRISSON

on Excellence in Finishing Part 2

DR. GOTTLIEB What is your typical retention regimen?

DR. ZACHRISSON I use two types of removable retainers and two types of bonded retainers (Fig. 17). In a typical Class II or Class I crowding adolescent case, in the upper arch I use a removable modified Hawley or what we call a Jensen plate. This is an acrylic removable plate with an .019" × .026" labial rectangular wire, which comes up flat against the cuspid and then is turned so it lies against the incisors. In addition, we like to have a wire extension, distal to the second molar, that is just a holding wire. The advantage of that retainer is that the patient can bite down on his own teeth, since there are no clasps or clasp wires, and we can take advantage of the normal intercuspation of the teeth for increased stability. The other type of removable upper retainer I use is in conjunction with a bonded retainer over four or six anterior teeth. This is a retainer with Adams clasps on the first molars and a wraparound labial wire soldered to the Adams clasps. It is worn at night in addition to the bonded retainer. Those are my two types of upper retainers—either a Jensen plate and nothing else or a bonded thin retainer plus the wraparound removable retainer to be used at night.

In the lower arch, my routine retainer is a bonded 3-3 made of the thick (.032") spiral wire, but only the cuspids are bonded in 80 to 90 percent of the cases. In other cases, I would use a 43-34 of the thick wire or—if there is a need to hold teeth together—I use a thin (.0215") spiral wire bonded to several teeth in the lower arch. That also would be used if one lower incisor had been removed and I want to hold the other three lower incisors together.

DR. GOTTLIEB For how long do you typically

use these retainers?

DR. ZACHRISSON The upper retainers would be used day and night for the first six months and then at night for at least one year. Then it is at the patients' discretion if they want to continue. The lower thick wire fixed retainer I like to keep in until the third molar problem has been solved or growth is completed. The thin retainer I like to keep in as long as the patient can tolerate it or accept it in severe retention requirement cases. In more routine types of cases, we might reconsider the whole matter after a two-year period. We may then remove the bonded retainer and give the patient a removable plate to be used at night as long as they want to wear it, or we can just continue having the patient come in on a yearly basis to check that the bonded retainer is in place. I see definite advantages in semipermanent—that is, long-term—retention, although I do not think that is an entirely realistic approach in a busy practice because you will end up with so many patients wearing retainers. If there is an area in orthodontics where I would really like to see a marked breakthrough it is in retention and long-term stability, so that we can reduce that period in the future. But at the present time I don't think I have that information. Maybe I over-retain in many cases, but I would rather over-retain than under-retain.

DR. GOTTLIEB How permanent is permanent retention?

DR. ZACHRISSON I use bonded retainers for permanent retention. The only problems may be to keep them clean and avoid breakage. No one has real long-term experience with these types of retainers. Our first publication was in 1977. It means that even we do not have more than 10 or 12 years of experience, which is not

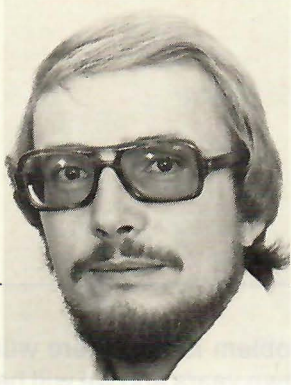


Fig. 17 Top row: Jensen retainer. Middle row: Thin (.0215") wire retainer bonded to six anterior teeth (left), and plate with Adams clasps and soldered wraparound labial wire (right). Bottom row: Thick (.032") wire retainers bonded to terminal teeth—3-3 (left) and 43-34 (right).

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a lifetime. If you take a 20-year-old, you have to think in terms of 40, 50, 60 years of retention. We do know that we are satisfied with the technique we are using today, and we are bonding retainers that will stay five or more years. If the retainer then breaks, we can always put in a new retainer. No one places a fixed bridge in a 25-year-old with missing incisors and expects it to remain for a lifetime. It must be redone at intervals, and the same could be said for the bonded retainers. All indications are that if I want to have permanent retention and if the patient wants a stable lifetime result, we have the means to do it—even if we might have to redo it at 10-year intervals.

DR. GOTTLIEB Does that imply that you have to keep seeing your patients for a lifetime?

DR. ZACHRISSON If you place a bonded retainer in a patient, I don't see how you can avoid the responsibility of checking that patient at least once a year. You could delegate some of the checks to a hygienist or a GP.

DR. GOTTLIEB It would develop into a management problem, even if you were paid for the annual visits and the replacements. It could get to be thousands of people.

DR. ZACHRISSON True, but I don't think thousands of people should be permanently retained. Permanent retention should be selected for those cases where you have severe retention problems—space closure as an alternative to bridgework, for example. Permanent retention for every case is overdoing it. It's not realistic.

DR. GOTTLIEB If patients were to agree that a small irregularity does not bother them, is that license to reduce or eliminate retention?

DR. ZACHRISSON I think so. One way of

thinking about this problem is that there will be a treatment time of two years and we will be retaining for about the same period of time. Then we tell the patient, "You have been through two years of treatment and two years of retention, and we have done what is reasonable to do. You are very much improved compared to where you started. Now you have a choice. Either we can remove the retainers and say you are through with treatment, or you can continue with retention and be checked once a year. It is up to you whether you want to use these retainers at night. If you don't want to do that and can accept some relapse, you can. If you find that you get relapse you do not accept, we can always retreat you if you want to do that." The choice should be the patient's.

DR. GOTTLIEB How well do permanent bonded retainers control lower anterior teeth in a vertical direction?

DR. ZACHRISSON That depends on what type of bonded retainer you are talking about. With a 3-3 retainer bonded only to the cuspids, according to Jensen a segment like that may re-elevate if you had a marked curve of Spee to start with, with the lower incisors well above the functional occlusal plane. That's a situation in which a 4-4 retainer might keep the six anteriors down. The question also has to be viewed in relation to the amount of overbite and the interincisal angle. With a very large interincisal angle, there is a greater tendency for the teeth to be able to erupt, whereas if you have a smaller interincisal angle they are tipping toward the upper incisors, and that itself limits re-elevation.

DR. GOTTLIEB The lingual bonded retainer does not control the labial direction. Do the upper teeth retain the labiolingual position of the lowers?

DR. ZACHRISSON That is the thought in using a 3-3 retainer where you are only bonding

the cuspids. Nothing prevents the lower incisors from relapsing in the anterior region, but the overbite should be enough to retain the lower incisors in the labial direction.

DR. GOTTLIEB Do you ever fabricate a bonded retainer directly in the mouth?

DR. ZACHRISSON No. It is extremely important to contour the wire so that it contacts all the teeth properly, and I need to do that on a stone model. With my type of retainer, the emphasis is directed toward placement of the wire in intimate contact with all the incisors, but not necessarily with the cuspids, since the bonding adhesive will fill any small space around the wire on the cuspids. This is different from the 3-3 bonded retainers where you have pads, and you have to have the best fit of the pads to the lingual surfaces of the cuspids in order to get a good bond. It is very hard to get that intimate contact with the incisors, and this type of retainer is clumsy. The most important point about bonded retainers is that they stay in place, especially when they are often going to be in place for many years. Therefore, I do whatever I can to get a bond that is superstrong. The major factor in bond failure is disturbed setting of the adhesive, and that can be eliminated if you first tack the retainer in place and then add the bulk of material. You can then be 100 percent certain that material will set totally undisturbed.

DR. GOTTLIEB When do you use the thick wire retainer?

DR. ZACHRISSON The thick wire retainer is designed to be a supportive wire for the lower incisors. Bonded retainers in the upper arch are always made with thin flexible wire. The distinction between the thin wire retainer and the thick one is that with the thin retainer you bond all the teeth in a segment, whereas with the thick retainer you are only bonding the terminal units.

DR. GOTTLIEB When do you decide to bond every tooth?

DR. ZACHRISSON The main indication for bonding every tooth is a spaced dentition—a median diastema or more generalized spacing such as we see in some adolescents or in periodontally involved adults. It is also used subsequent to space closure in agenesis cases or after accidental loss of incisors. There are other indications, too—severe rotations, impacted cuspids that have been moved into the arch, closed extraction sites in adults, lower incisor extractions.

DR. GOTTLIEB Why don't you use the flexible retainer all the time?

DR. ZACHRISSON Bonding each tooth in a segment produces a retainer that is more difficult to keep clean. You also have more sites that can break. So there are disadvantages. In a 3-3, I prefer to have as simple a retainer as possible. Also, I have no need to hold the four incisors together. You can see a lot of calculus accumulate over time in the lower incisor region in patients who have a tendency to develop calculus.

DR. GOTTLIEB If you have a properly bonded retainer fail in the course of years, will it fail because of wire breakage or adhesive failure?

DR. ZACHRISSON Generally, if you are going to lose a bonded retainer it will happen fairly soon and not after a couple of years. If you lose it after a couple of years, you probably have what we call Type 2 failure. The adhesive is worn off and the wire is exposed and detaches from the adhesive. The type of failures we see more frequently are the Type 1 failures between the enamel and the adhesive (Fig. 18). Those are due either to disturbed setting of the adhesive—which is the most important one—to moisture contamination, or to inadequate contouring of the adhesive. If the adhesive is contoured so that everything can slide

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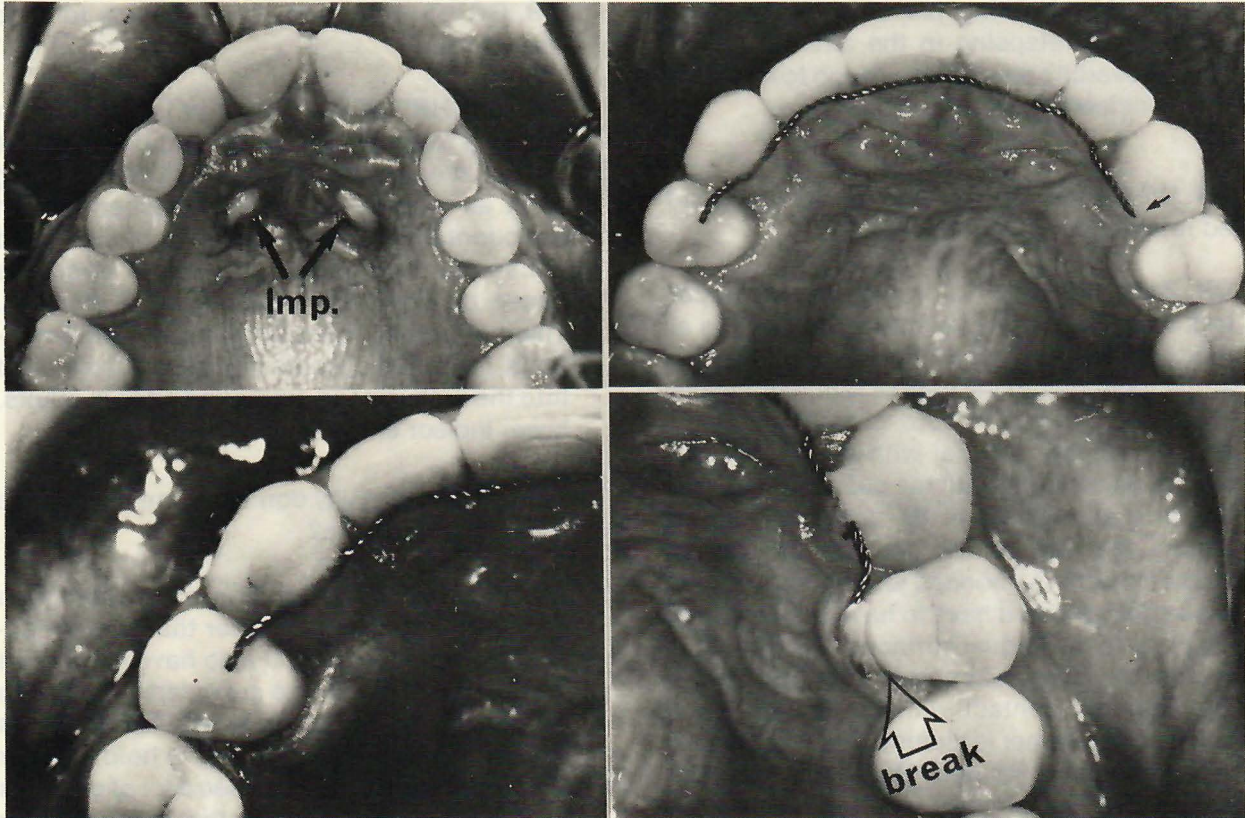


Fig. 18 Eight-unit thin (.0215") wire retainer to hold corrections of two palatally impacted cuspids (Imp.), bonded either in occlusal fissure or lingual surface of first bicuspid (bottom row). After Type I failure between adhesive and enamel (break), retainer wire was cut distal to the cuspid (top right).

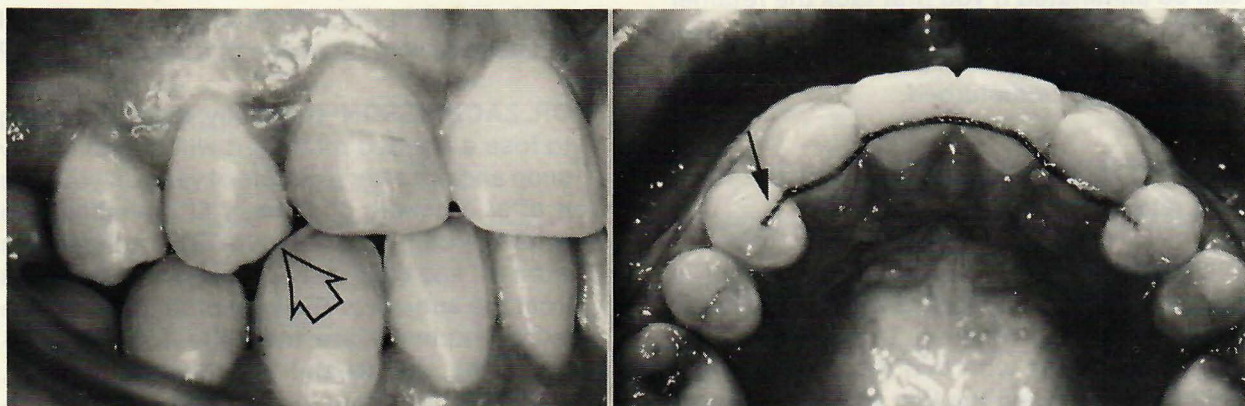


Fig. 19 Bite-raising contact between upper first bicuspid (in cuspid position) and lower cuspid is avoided (open arrow) by making small groove in mesial part of fissure (small arrow) before bonding six-unit retainer.

off, there is much less pressure on the retainer abutments.

DR. GOTTLIEB Bonding adjacent teeth without wire has not worked?

DR. ZACHRISSON No. We did studies on that several years ago in which we tried to bond teeth together in a variety of situations, using different types of sealants and composite materials for such splinting, and not one of them worked clinically. They usually broke up into small segments of two teeth. At about the same time, pedodontists in Sweden reported that acrylic pontics which were splinted at one end only were significantly more durable than those where both the mesial and distal surfaces were bonded to neighboring teeth. Obviously, the reason for breakage was inability of the larger units to withstand the normal physiological movements of the teeth within the periodontal tissues. Both findings were important in leading us to the use of the flexible type of thin retainers, where we had a chance for the teeth to function physiologically and independently without such splints breaking.

DR. GOTTLIEB Do you ever make a preparation on the tooth and bond a cleat or wire in a restoration to keep a diastema closed?

DR. ZACHRISSON Not necessarily in a restoration, but in the past few years we have been making small grooves to bury the bonded wire in certain cases (Fig. 19). An example would be if we had missing lateral incisors in the maxilla and we had moved the first bicuspids and cuspids forward. Then to hold the rotation of the first bicuspid we would include it in a bonded six-unit retainer. In those instances, I have sometimes made a small groove of 1/2 mm or so in the enamel so I can bond the ends of the wire in the mesial part of the fissure of the first bicuspids, even if the lower cuspid has a tight occlusion in this region (Fig. 19). Another situation in which I might do some slight grooving is in a deep

overbite in which the patient is biting on the retainer wire. If I need that retainer, I might make a slight groove and put the wire in it so that I can avoid occluding on it. It doesn't scare me to make that little groove because, as long as we are staying within the enamel, I don't see that we can create a lot of damage. I feel that the advantages in doing the small grooving will far outweigh the disadvantages.

DR. GOTTLIEB Do you ever place the bonded retainers on the labial side?

DR. ZACHRISSON In the posterior sections over extraction sites I generally do. In the anterior segments that would destroy the purpose. The main purpose of the bonded retainer is its invisibility. However, it has proven very helpful when patients have come in with some slight relapse of a spaced dentition or a median diastema due to a lost or broken retainer. Usually in those situations the teeth are still quite loose. What we have done with a degree of success is to etch on the labial, push the teeth together just by finger pressure, and bond a labial wire with the spaces closed. Then we take an impression and make a new bonded retainer on the lingual side. When the lingual retainer is solidly set, we just remove the one on the labial. That technique has been quite helpful in a number of cases, especially in adults. Rather than retreat the case, we just position the teeth back with our fingers and use the labial splint until we have made a new lingual bonded retainer. They could both be done at one sitting or the lingual retainer could be placed at a subsequent visit. Or we might leave the labial one on for an additional month to be sure that the new lingual retainer will hold up.

DR. GOTTLIEB An alternative technique is to place a figure-eight ligature around such teeth, move them together with finger pressure, and then tighten the ligature.

DR. ZACHRISSON It makes good sense to do

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that. It is much better to move teeth with your fingers than to retreat with appliances.

DR. GOTTLIEB When you strip lower anterior teeth and change the contact point to a larger, flatter contact point, a contact area, or a contact line, does that have any periodontal implications?

DR. ZACHRISSON If you move the teeth too close to one another and make the interdental bone septa too thin that might be true, but you can see the same phenomenon in crowded teeth and it doesn't seem to create major problems. We do not know the periodontal implications of changing contact points to broader contact areas, but I am not afraid of doing that.

The problem could also be viewed with respect to recent findings of Nyman and co-workers suggesting that loss of attachment in periodontal breakdown is unrelated to the presence or absence of the bony component of the periodontium.

DR. GOTTLIEB Apart from taking advantage of triangular shapes of teeth to create space, do you strip such teeth for other reasons?

DR. ZACHRISSON Triangular interdental gingival recession in the maxilla can be of major esthetic concern to patients. In the mandible it is rarely a major esthetic concern, and I don't think it is a major concern with regard to food impaction either. But if you are treating

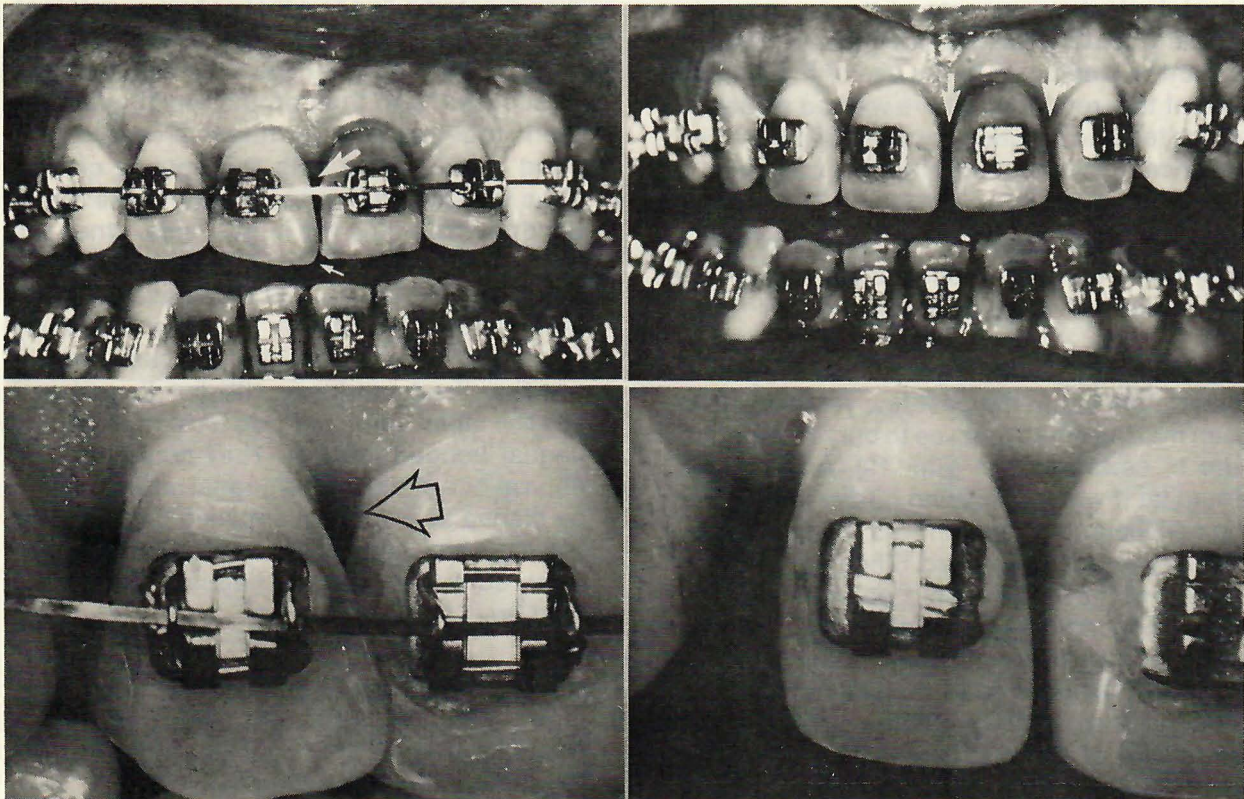


Fig. 20 Markedly triangular incisor morphology and uneven incisal edges necessitated extensive recontouring to allow gingival fill-in after treatment.

patients with crowding in the upper anterior region who had nice interdental fill-in to start with, and you resolve the crowding but create triangular spaces that were not there before—and if the patient shows a lot of that in smiling—you can really create severe problems for the patient who is not aware that can happen (Fig. 20).

DR. GOTTLIEB Do you inform the patient of what you are doing when you strip teeth to correct triangular spaces?

DR. ZACHRISSON Yes. I tell them about the purpose and the procedure (Fig. 21) and tell them it is not going to be painful. I may do just one or two teeth first to show them and then get their opinion of how much they need. Most of the time they crave perfection. If I am trimming an incisal edge, I ask them if they like what they see. They really want a perfect correction of the crowding—to a much greater extent than I used to think when I didn't do this kind of cosmetic finishing.

DR. GOTTLIEB The relationship of teeth is such a complicated situation—complicated by tooth shapes and sizes, overbite, shape of the arch—can you sometimes reduce triangularization and wind up with spacing?

DR. ZACHRISSON You have to have an overall evaluation before you do it; and, yes, you can occasionally wind up with spacing. If you reduce one dental arch by slenderizing the teeth, you have to take the other arch into consideration. There might be alternatives such as overextended fillings in the posterior region, but you can't just do single teeth or just one dental arch without considering the opposite teeth.

DR. GOTTLIEB Do you use any measurements—Bolton, Peck and Peck, or other?

DR. ZACHRISSON No. Enough studies have shown that correlation between tooth shape

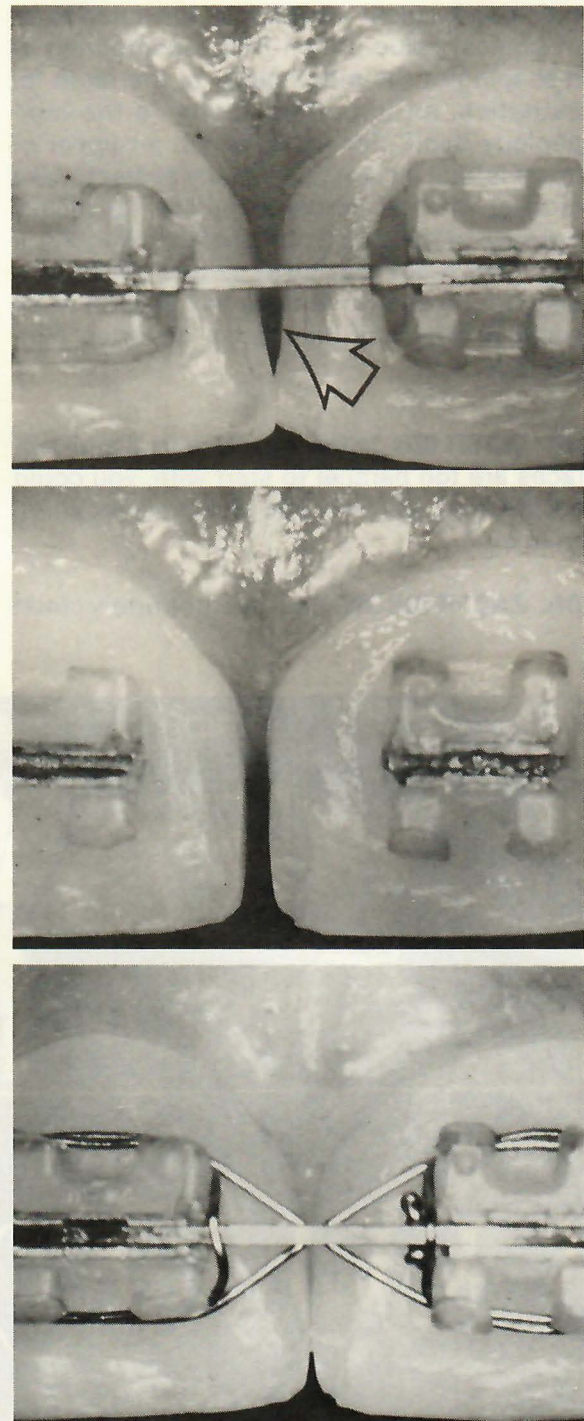


Fig. 21 Triangular interdental space removed during treatment by slenderizing mesial aspects of both central incisors. Note good gingival fill-in.

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ratios and incisor crowding is too small to be of clinical value. When I do recontouring or reshaping of the morphology of the teeth for esthetics, an important factor is the morphology itself. For example, on an upper or lower lateral incisor it is usually easier to take more enamel off the distal than off the mesial because of the shape of those teeth (Fig. 22). If you have teeth that have parallel sides, you may not be able to remove any enamel at all because you may then get a distorted morphology.

DR. GOTTLIEB If the mesial and distal surfaces are too parallel to start with, you could be creating steps if you removed proximal enamel.

DR. ZACHRISSON Yes, we definitely must

avoid steps. If you create interdental steps you create a plaque trap, you will have pulp reactions, and the pulp may eventually die. If you have any hunch that you have created a step, I would use light interdental anesthesia and go in and check. If yes, I would use a diamond to smooth the surface and eliminate the step.

DR. GOTTLIEB If the incisors are not suitable for gaining space and you want to do it, do you go farther back in the arch?

DR. ZACHRISSON Oh, yes. Posterior stripping is as worthwhile as anterior stripping. I do a good deal of posterior stripping, and that again boils down to the same criteria. I look more at the morphology of the posterior teeth than anything else. The real source of arch length can be in overextended amalgams. You

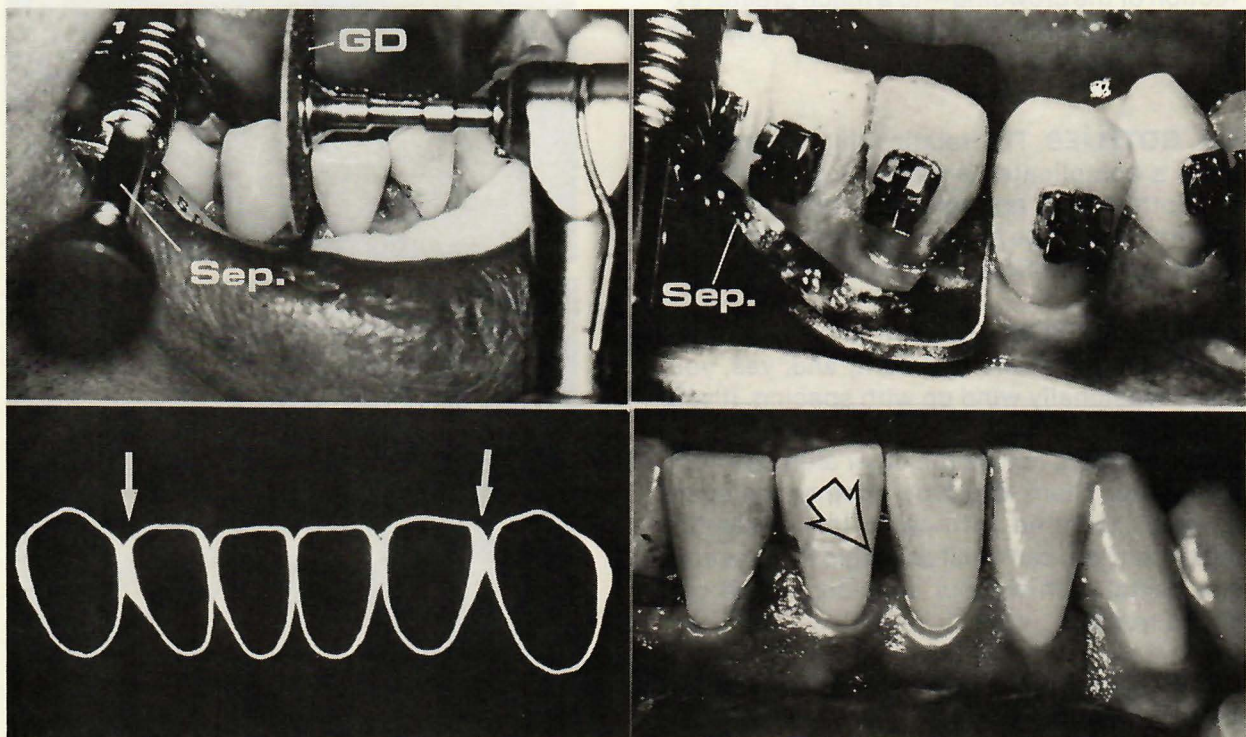


Fig. 22 Tuverson stripping technique uses anterior separator (Sep.) and snap-on garnet discs (GD). Differences in morphology may allow different space gaining on mesial and distal surfaces of same tooth (bottom left). Triangular morphology (bottom right) is well suited for enamel reduction.

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not only gain space by recontouring them, but improve on the shape of the teeth. If there are no amalgams, tooth morphology will often allow you to gain some space in the posterior region.

DR. GOTTLIEB How much enamel can you take away?

DR. ZACHRISSON There is no limit to the amount of enamel you can take away. As long as you have smooth, self-cleansing surfaces, I see no risks in removing a good deal of enamel thickness. The controlling factors may be tooth morphology; adequate cooling during the recontouring; smooth, self-cleansing surfaces; and I might put the patient on a fluoride program afterward. In doing so, I have not violated any biological rules. When we have recontoured cuspids to lateral incisors and removed about half of the enamel thickness, we were not able to demonstrate any pulp or dentin changes histologically. Studies prior to ours by Mjor and co-workers showed that you can remove the entire enamel layer without causing adverse dentin and pulp reactions, but of course in those instances you may risk discoloration problems.

DR. GOTTLIEB Are you concerned about removing the outermost surface layer of enamel because that's the layer that is most

resistant to caries, contains most of the fluoride, and is the hardest?

DR. ZACHRISSON That is an outdated concept. Researchers now see enamel as a more dynamic surface than a static one, and ground surfaces remineralize and reharden.

DR. GOTTLIEB What is your instrumentation and procedure for anterior stripping?

DR. ZACHRISSON I more or less follow Don Tuverson's guidelines (Fig. 22). A key is the use of a separator, which allows production of very nice anatomical contours rather than just slicing. If you have a crowded lower arch, the trick is to start in the area of least crowding, then proceed to the next least area of crowding, and finally end in the area that has the most crowding. One difference from the Tuverson technique is that I start out with a .10mm flexible diamond disc because extensive separation is painful to the patient. If you use a garnet disc throughout, you have to separate substantially more to fit the disc between the teeth. Having tried all the different means of stripping, I think the Tuverson technique is the technique of choice.

DR. GOTTLIEB Do you leave the surfaces flat with the idea that they are going to retain themselves?

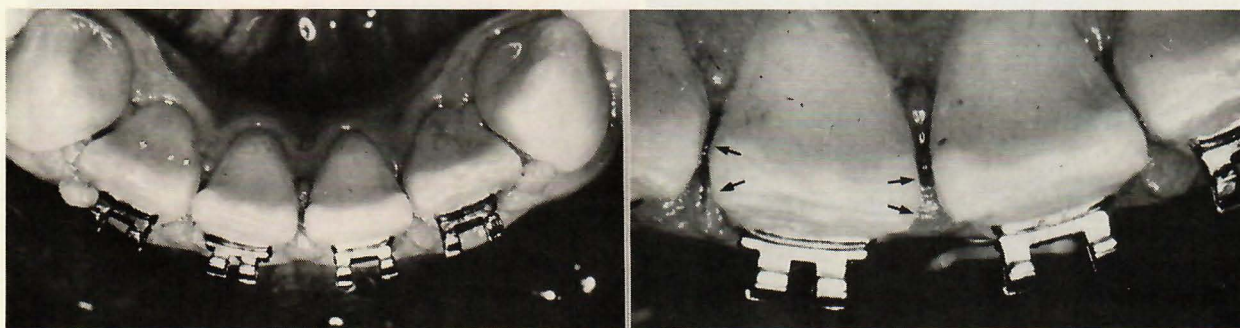


Fig. 23 Broadening contact points and rounding off mesial and distal surfaces (arrows) to provide increased stability while maintaining "normal" anatomy.

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DR. ZACHRISSON No. I am seeking to convert a small contact point into a slightly broader contact area and then round off the buccal and lingual contours so you still have an anatomical contour (Fig. 23). Substituting a contact area for a contact point will be enough for retaining, and I don't think you gain much additional by having a slice cut. The trouble with the slice is that you may risk a caries problem or a periodontal problem as a result. With the Tuverson technique, you also have more normal looking teeth.

DR. GOTTLIEB Do you treat the cut surfaces with fluoride?

DR. ZACHRISSON Normally we don't do that. When we use a garnet disc for anterior stripping, as the disc is worn down it acts as a polishing instrument. We don't see any need for more polishing or more treatment of the surfaces. All our patients are on fluoride mouthrinse on a regular basis, so we don't have to give them any additional fluoride treatment. Fluoride toothpaste and fluoride mouthrinse are good enough. We don't have to use gels or other treatment for the recontoured surfaces.

DR. GOTTLIEB Do you use electric stripping devices?

DR. ZACHRISSON No, I think hand-held guidance of the strippers provides better anatomical contours. Electric strippers just go back and forth.

DR. GOTTLIEB Do you protect the gingiva in any way or do you apply anything to the gingiva after the stripping procedure?

DR. ZACHRISSON No. I am constantly amazed at what you can do to the gingivae and how quickly they recover (Fig. 24). In a gingivectomy, you can remove substantial amounts of gingiva and a few weeks later it looks as if nothing has happened to it. So I have never seen any lasting or undesirable result from the cuts to the gingiva from stripping, and I do not treat them with anything. I am not at all afraid of the cuts made by the strips or the diamond disc. The only risk I could see would be from some kind of infection, but fresh bleeding counteracts that possibility, and I have never seen any side effects. So even if I had a cut in the gingiva, I would not do anything about it.

DR. GOTTLIEB To what extent do you use fibrotomy to try to create stability in rotated anterior teeth?

DR. ZACHRISSON That's an interesting ques-

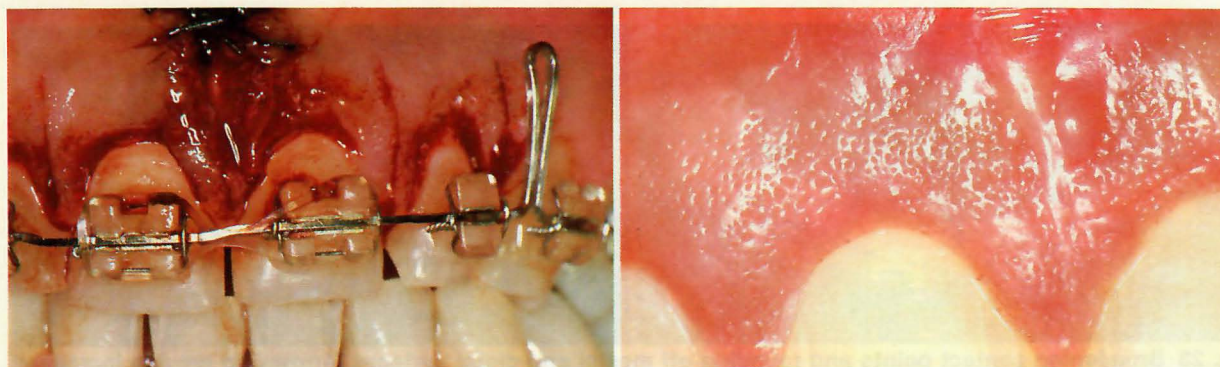


Fig. 24 Gingivectomy over four incisors to increase crown length. Note healing with intact stippling one month later.

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tion, because ever since the studies of Edwards showing that circumferential fiberotomy is effective in the short term to prevent crowding, the procedure has been of interest to orthodontists. A study by Joondeph claimed that in the long-term perspective (10 years or more) the effectiveness of fiberotomy is of only borderline significance. Maybe we have been overenthusiastic about the use of fiberotomy to prevent the rerotation of teeth. My feeling today is that I am still using it for severe rotations, but not for milder rotations. I am now using a technique that is simpler than the circumferential technique. This technique is advocated by Dragoo, who uses a vertical interdental cut rather than going into the sulcus (Fig. 25). It is a simple, safe procedure. There is no risk of labial or lingual recession and loss of attachment, and the effectiveness is reported to be equally good. I see more indication for fiberotomies in the upper arch than in the lower. Boese uses a combination of fiberotomy and stripping, and maintains he has had stable results for four to nine years without retention in the lower arch. I see the greatest indication for fiberotomy on severely rotated upper central and lateral incisors. It may be useful for crowding in the lower arch, but I do not use it to any great extent in the lower arch.

DR. GOTTLIEB Do you use it on upper centrals that are rotated inward mesially toward each other?

DR. ZACHRISSON Yes, I would do anything I can for a patient with centrals that are rotated in any way, who is concerned with that problem—even if I were not 100 percent convinced of the effectiveness of the procedure. I try to overcorrect the malposition as early as I can and incorporate some degree of retention in the treatment mechanics. I would also cut the fibers after treatment and put in a bonded retainer. By doing so, I am shooting all the arrows I have. Maybe all of them are not that effective, but at least I have done what I can.

DR. GOTTLIEB Would it make any difference if you did the fiberotomy earlier?

DR. ZACHRISSON I think it should be done after the teeth have been corrected. I would first correct the tooth position and then see that the periodontal tissues were perfectly healthy.

DR. GOTTLIEB What are your typical oral hygiene instructions to an orthodontic patient?

DR. ZACHRISSON Cooperation in treatment is difficult enough, so we try to be reasonable. We put most of our emphasis on toothbrushing. We ask a typical fixed appliance patient to use a small soft toothbrush, brushing two teeth at a time in a logical sequence from right to left side, telling them that the most impor-



Fig. 25 Modified fiberotomy technique (Dragoo) with interdental vertical cuts. Note healing after three weeks.

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tant area is along the gingival margins—not just to brush the brackets. Our concern is that they should not develop gingival defects, which I think come from using hard toothbrushes and long strokes. We also give them a disclosing tablet at the start of treatment, just to show them how difficult it is to keep clean. That would be the standard approach, and then we evaluate re-instructions according to the individual patient's needs. We might also give them a single-tufted toothbrush if we have complicated appliances or spots that are difficult to clean, but I think that one has to be realistic and not go overboard. Some may have or develop marked interdental hyperplasia and need instruction in the use of toothpicks to get their gingivae down.

DR. GOTTLIEB Do you instruct them in the Bass technique?

DR. ZACHRISSON No. We did some studies in children that indicate the most efficient toothbrushing technique in children is a horizontal scrub with the bristles at an angle of 90° to the teeth. If they try to get the bristles down into the sulcus, there is a risk of damage to soft tissues.

DR. GOTTLIEB Is oral irrigation of any value for orthodontic patients?

DR. ZACHRISSON We do not use that. Some orthodontists do, and some use it with antiplaque chemicals.

DR. GOTTLIEB Do they still use chlorhexidine in Scandinavia as an antiplaque agent?

DR. ZACHRISSON Not more than they used to, because chlorhexidine has some side effects like discoloration of fillings. Another disadvantage of chlorhexidine is that it is largely prophylactic and not therapeutic. You can't just give chlorhexidine to a problem patient, because it doesn't have much therapeutic effect. We like to start with clean pa-

tients and maintain them that way. The disadvantage again is that you are trying to get the chemical agents to work, but are losing them in normal toothbrushing. Chlorhexidine is also prescribed by many clinicians for the healing period after periodontal surgery, such as gingivectomy.

DR. GOTTLIEB What is your prescription for fluoride mouthrinses?

DR. ZACHRISSON All my patients are on daily mouthrinsing with .05 percent sodium fluoride solution.

DR. GOTTLIEB Any particular time of day?

DR. ZACHRISSON I don't think it makes any difference, but we do say they should rinse after they have brushed their teeth before they go to bed, so we have some lag effect during the night.

DR. GOTTLIEB Can something be done for white spots, decalcifications, and caries to reduce the poor appearance or even eliminate them after treatment? Can you remineralize white spots?

DR. ZACHRISSON Yes. The key is whether the surface is broken or not. A white spot is white because of an optical phenomenon. It is a dissolution of the hard tissue beneath the surface. Recent research has shown that there are small pores going from that harder surface down into the subsurface lesion. The chance to reverse a white spot and eliminate that optical phenomenon is by getting some remineralization in the lesion itself, which means that you must not obstruct the pores that lead down into the lesion. Therefore, in order to reverse a white spot one should not apply too much fluoride. That will only obstruct the pores, and you will never reach the deeper layers and never get rid of the white spot. By using a very weak fluoride solution or even just a fluoride toothpaste, you may reverse such

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white spots and even eliminate them.

DR. GOTTLIEB What are the possibilities if the surface is broken?

DR. ZACHRISSON In such cases you cannot get remineralization, but you could reduce the lesion by some grinding to smooth the tooth surface.

DR. GOTTLIEB When would you use a fluoride varnish?

DR. ZACHRISSON The only time we use a strong fluoride solution or a fluoride varnish would be for prevention of white spots. A fluoride varnish like Duraphat has a very high content of fluoride ions. If we have patients who are unable to keep their teeth clean, we apply the fluoride varnish as a preventive measure. But once the white spots are there, it is contraindicated to use a fluoride varnish. Even if you stop the caries attack, the varnish will just preserve the white spots and you will miss the chance to reverse them.

DR. GOTTLIEB White spots happen down at the gingival margin a great deal of the time, which is not a good area to be grinding in.

DR. ZACHRISSON No, but in the mandible white spots might be of lesser esthetic concern, and in many instances it might be acceptable just to leave them. For those that have already broken the surface, you can at least smooth them out so you don't have a rough surface to attract plaque.

DR. GOTTLIEB Does the orthodontist have to have patients come in for fluoride treatments?

DR. ZACHRISSON I don't think so. They can pay attention to the fluoride home care for four to six months. The orthodontist ought not to panic or feel guilty, but just explain to the patient that within six months white spots should

be reversed. Explain that in a calm manner and you will have eliminated the problem. While you are removing the appliances you would like to grind them off, but I think that is a mistake. Better to face reality and have some patience.

DR. GOTTLIEB Do you judge by eye or do you test the surface to distinguish between an unbroken surface and one that has been penetrated?

DR. ZACHRISSON I definitely do not think that you should go in with an explorer and try to open up the surface. I would very lightly touch the surface to see if it is broken. If you push hard you probably can break through the harder outer layer into the softer subsurface. If you try to grind it off, you find the more you grind the more color you get because you get down into the white subsurface.

DR. GOTTLIEB If it is a real problem to the patient in the end, a restorative solution should work.

DR. ZACHRISSON Yes, but I think in most instances it is better to have a white spot than a restoration. Most of them occur along the gingival margin and should have very little esthetic importance.

DR. GOTTLIEB How often do broken surfaces on white spots become carious?

DR. ZACHRISSON In essence, a rough white spot with a broken surface means you have a carious lesion. Whether or not it should be restored immediately may be determined in each case by evaluation of the expected future balance between resistance (hygiene, fluoride) and challenge.

DR. GOTTLIEB Can you get halos around brackets?

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DR. ZACHRISSON You could in patients with poor hygiene, and if the bonding technique is poor so that there are insufficient areas of adhesive under the bracket pad. We don't see that too often in our office because we use an efficient sealant. We have a protected surface underneath the bracket. With most commercially available sealants, you don't get that protection, and decalcification around and under bracket pads may be a problem in some offices. I use a sealant called Saga* or Newad** that contains acetone. As the acetone evaporates, oxygen can never come in contact with the sealant itself and you can polymerize thin layers of sealant. Most sealants in kits for orthodontic use, when smeared out into a very thin layer, become so thin that there is no polymerization in them. This sealant has been used in Scandinavia for more than five years and we haven't seen any allergic reactions or any other adverse effects.

DR. GOTTLIEB So many orthodontists say they can accept relapses as normal, and maybe they are, but not to the patient. The patient came with the expectation that the malocclusion was going to be corrected. Sometimes there are tiny things that don't bother us, but bother patients a lot. They look in the mirror and see things they spent all that time, effort, and expense to correct.

DR. ZACHRISSON I agree with Dick Riedel, who claims that to be realistic one has to tell the patients that we're going to correct the malocclusion and it will look all right when we are finished, but they have to expect that there will be some degree of long-term relapse. I think we might tell the patients we can straighten the teeth, but if they really want them to remain straight for the rest of their lives they would have to have permanent reten-

tion. As we approach the end of treatment, we can come back to the question and say, "We can bond a retainer you can keep for many years. As long as the retainer is in place the teeth will remain stable. After a few years if you get tired of it, we can remove it and you can have a removable plate which you can use at night for as long as you like." It does make good sense to ask patients what they are looking for.

DR. GOTTLIEB Incomplete correction, of course, almost guarantees a relapse.

DR. ZACHRISSON Yes. I call inadequate correction 9/10 orthodontics. The site of many problems is the contact point itself. If you look at long-term studies—10 years after retention—like the Seattle sample, you can see how not-quite-corrected tooth positions have relapsed (Fig. 26). There are similar indications from studies of untreated normal occlusions. If you see some teeth that have broken contact in a 10- or 12-year-old child and you check the same patient at age 25, you see that there is an increase of the crowding, and it is at the broken contact that you see more crowding later on (Fig. 27). There are many indicators that undercorrection is not going to be stable.

DR. GOTTLIEB What about 10/10 orthodontics?

DR. ZACHRISSON That may be sufficient in most cases, but in my hands definitely not if I have severe rotations or severe malalignment.

DR. GOTTLIEB Orthodontists as a group are pretty conscientious. How prevalent do you think 9/10 orthodontics is?

DR. ZACHRISSON My experience is that many—if not most—orthodontists are undercorrecting malocclusions, but they are not aware of it because they do not compare the end result carefully with the pretreatment plaster models before removing the ap-

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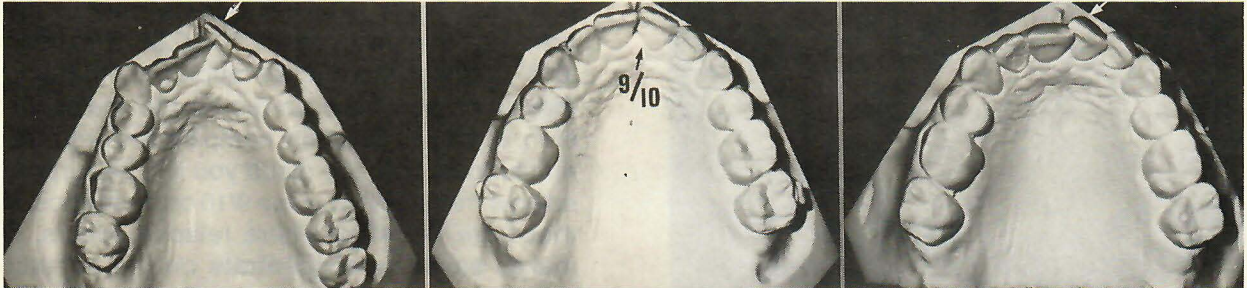


Fig. 26 Case from Seattle sample before and after treatment and more than 10 years out of retention. Note unintentional undercorrection (9/10 orthodontics) of left central incisor, and later relapse.

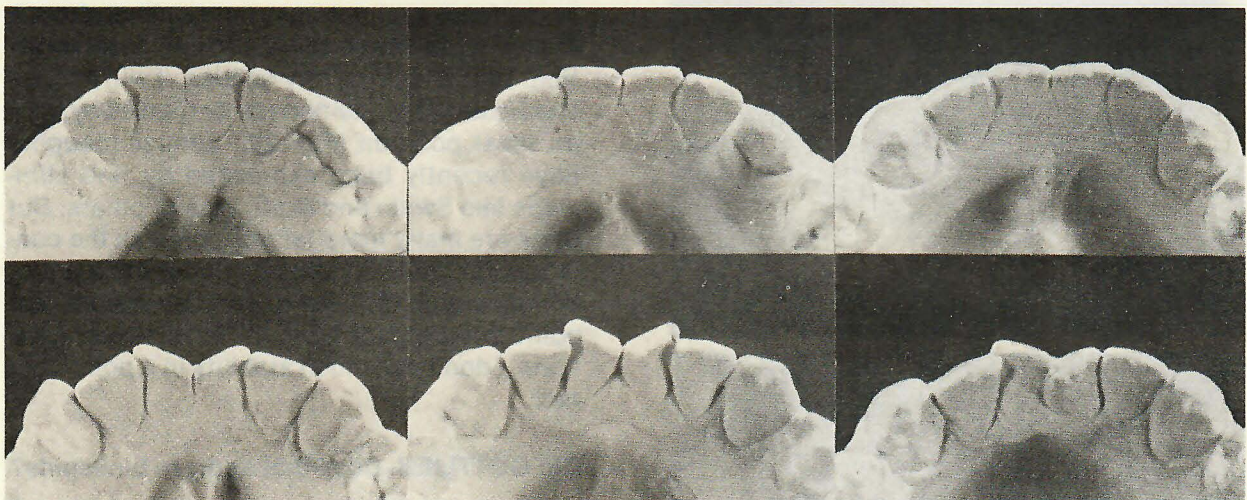


Fig. 27 Crowding during adolescence. Top row: 10-12 years of age. Bottom row: same cases at 24-26 years of age. Note how broken contacts provide predilection sites for increased malalignment. (From Humerfelt, A. and Slagsvold, O.: Changes in Occlusion and Craniofacial Pattern Between 11 and 25 Years of Age, Trans. Eur. Orthod. Soc. 1972, pp. 113-122. Reprinted by permission.)

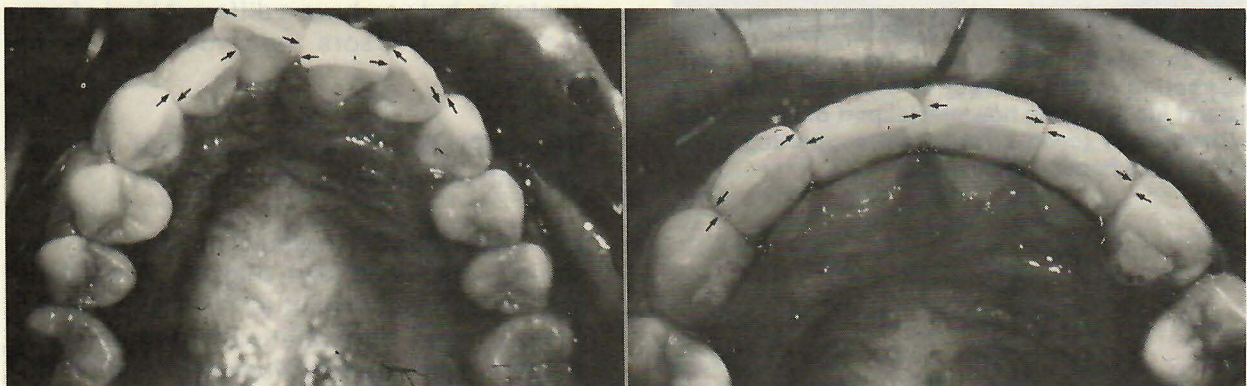


Fig. 28 Tooth positions at each contact are slightly overcorrected (11/10 orthodontics).

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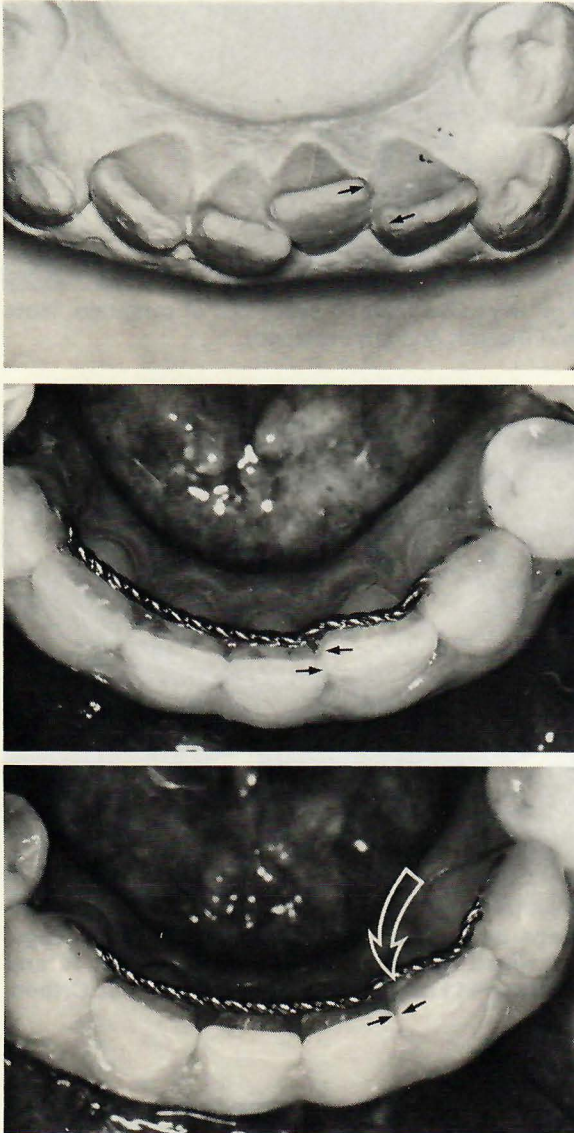


Fig. 29 Relapse toward ideal one year after 11/10 correction (small arrows) of crowded lower left lateral incisor. Note how mesial part of incisor has moved away (open arrow) from supporting thick (.032") wire bonded to cuspids.

pliances. There is always some play in the brackets. Even with an .017" x .022" wire in an .018" bracket there is so much play that you may think you have corrected the malocclusion, but if you carefully compare the pretreatment model with the result you will be surprised how frequently you see 9/10 orthodontics. If these are the sites where relapse occurs, it makes sense to concentrate on the contact points and try to overcorrect rather than undercorrect. To me, 11/10 orthodontics means slight overcorrection of those most important sites of relapse (Fig. 28). I want relapse to work in my favor and not against me. Therefore, it makes more sense to have slight overcorrection. Then if there is any relapse, it will relapse toward an ideal position rather than away from an ideal position (Fig. 29). Similar thoughts have recently been expressed by fine clinicians like Swain and Roth, among others. But there are many more factors, such as the contact point itself. A point, by definition, cannot be very stable. So I like to broaden the contact point to a contact area. If I have severe rotations, I don't see much stability in a point contact.

DR. GOTTLIEB Does that apply to bicuspid?

DR. ZACHRISSON It isn't as important in the bicuspid region. The patient is concerned with the upper six anteriors and maybe the lower six anteriors. That's where I really want to do the overcorrection. It applies to all types of contacts, but you have a different kind of contact in the incisors than you have in the bicuspid.

DR. GOTTLIEB When do you need 12/10 orthodontics—greater overcorrection?

DR. ZACHRISSON I would do that only for severely displaced teeth (Fig. 30). Toward the end of treatment I revert to 11/10, since otherwise it might be esthetically disturbing or simply prevent the achievement of a proper occlusion.

DR. GOTTLIEB Is failure to correct upper molar rotations a major contributor to 9/10 orthodontics?

DR. ZACHRISSON I see three types of undercorrections frequently, and maybe the most typical one is when we have one central incisor overlapping the other. It is very easy to undercorrect that. Second is undercorrection of rotation and torque of lateral incisors, and third is undercorrection of rotation of molars. When I analyze my cases that were treated several years ago, I more often than not see molars that were undercorrected. This has important implications for the space conditions in the arch. Therefore, even if I am using a straightwire appliance approach, I always make molar outsets. I use 15° distal offsets on my molar tubes, but in addition to that I constantly use an outset for upper first molars to really get those mesial cusps out. I don't think you can fail by overrotating upper molars too much. I feel we should use pretorqued and preangulated brackets, but still individualize the archwires in order to obtain individualized treatment results.

DR. GOTTLIEB If you do that much bending, why do you use preadjusted brackets?

DR. ZACHRISSON I can use a flat wire with pretorqued brackets. If you don't have the torque in your brackets, you would have a curved anterior portion of the archwire. If you make a step up in it, you also change the torque. Making up or down and in or out adjustments in a flat wire doesn't affect the torque. That's why I think the torque in the brackets is important. In-out is not that important, because you can adjust that. But in the future in orthodontics I think we will use different types of brackets according to the malocclusion, and not just one type of bracket for each tooth. We might have a selection of brackets to give us more control.

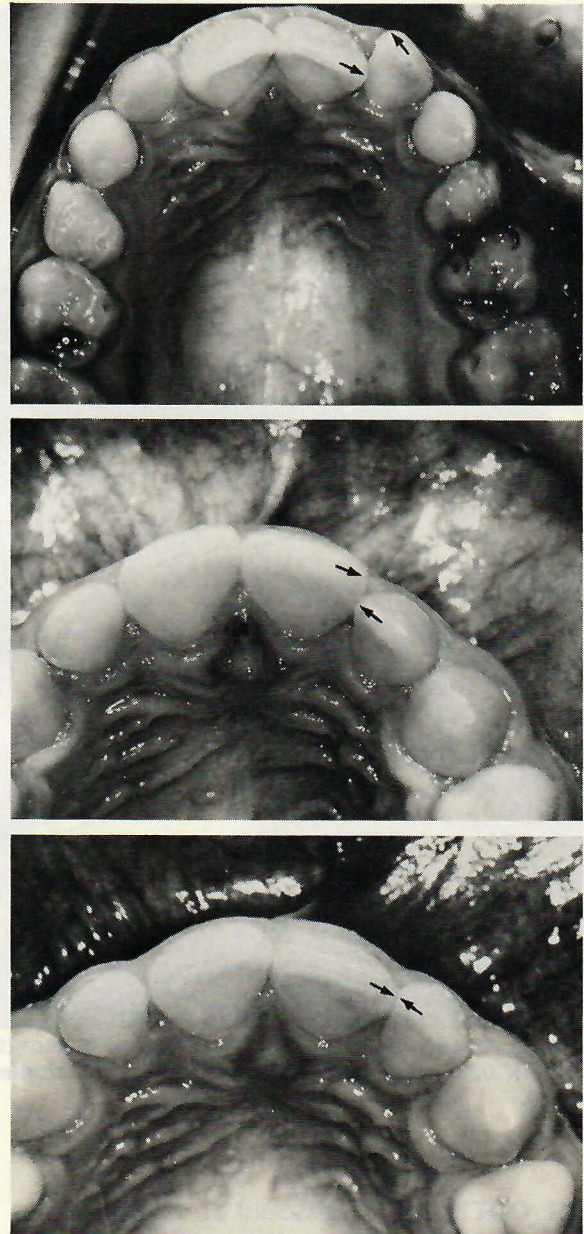


Fig. 30 Severely displaced left lateral incisor with 12/10 correction (arrows) has relapsed toward ideal about two years later.

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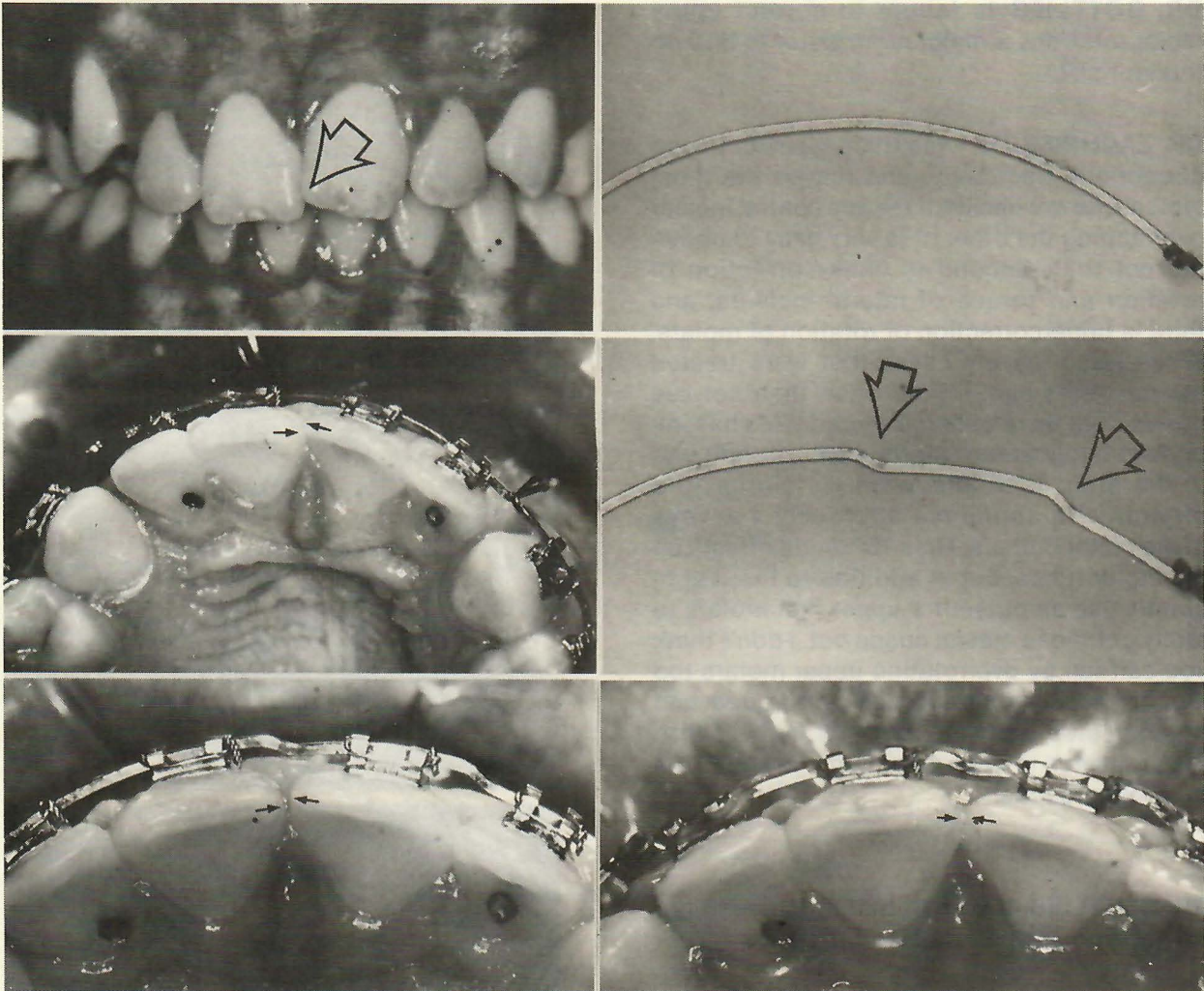


Fig. 31 Case with overlapping left central incisor (top left) was not fully corrected (left, arrows) with straight .016" x .022" archwire. Small archwire bends (middle right) positioned incisors correctly two months later (lower right).

DR. GOTTLIEB That would be a rational approach to putting what you want into the bracket. Otherwise you are depending on a long period of time for the brackets to work, and we may not be giving them nearly enough time in some instances.

DR. ZACHRISSON I am not afraid of wire bending. Bending the wires to produce the proper tooth positions is part of the game (Fig.

31). I am always thinking *tooth position* and not *bracket position*. It is the result that is important and not the process. I am often asked whether I use a lateral bracket or a cuspid bracket when I am moving a cuspid into the lateral space. My reply always is I don't really care what the torque of the bracket is. I look at the tooth position in terms of axial inclination, torque, height, and in-out. If they are not what I want, I put a little bend in the archwire where I



Fig. 32 Class II, division 2 case before and after treatment. Note good molar and cuspid occlusion with midlines coinciding. Rotations of upper lateral incisors are overcorrected (11/10). Note small interincisal angle after treatment. Molar bands are left in place during retention to allow use of headgear if needed.

need it. I don't think I can ever obtain the high-quality results that I am shooting for by just using a straight wire. Of course you should use what is most efficient for you, but you can never expect that you can get it without looking at the details of tooth positioning. A typical example is the torque of the upper laterals. If one upper lateral is in and one is out, you not only have a different in-out position, but most of the time you also have a different torquing problem. Maybe one root should be torqued out and the other one in. Rather than depend on a type of bracket, I put my torque into the archwire.

DR. GOTTLIEB In that situation you could overtreat one and undertreat the other.

DR. ZACHRISSON You are almost 100 percent certain to get a 9/10 result in that circumstance. You might think you have done a good treatment, but when you analyze it carefully, you may see that you have only a 90 percent correction.

DR. GOTTLIEB In deference to Larry Andrews, I am sure that he did not believe that you can place a straight wire and expect it to work automatically. He agreed that you have to adjust the archwire.

DR. ZACHRISSON In my experience, I can put the same bracket on the same tooth in the same malocclusion in two different patients and have two different results depending on the individual variability in tissue response of those two patients. There is so much variability that you have to look at teeth and not at brackets and wires.

DR. GOTTLIEB Is failure to completely correct midlines part of 9/10 orthodontics?

DR. ZACHRISSON The more the midlines are off to start with, the greater the need for overcorrection at the end of treatment. It should not be necessary to overcorrect small midline deviations. The longer I am in orthodontics the more attention I pay to the midlines (Fig. 32). I

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want the midlines to coincide with the midline of the face, and I want the upper and lower midlines to coincide. That is easier said than done, because to me that's an indication that everything else has been corrected. You may seat the cuspid well on one side and have a slight midline deviation because the cuspid is not seated on the other side. The reason most often is that you have inadequate incisor torque. For both upper and lower midlines to coincide, you have to have the correct amount of torque on upper and lower incisors and seat the cuspid properly on both sides. For this to occur, you have to correct rotation of the molars (unless you have a tooth size discrepancy). Everything has to be corrected for the midlines to coincide, and that's why I think that any midline deviation is a key indicator that I haven't really solved the problem completely and must look for the factor to correct in order for them to coincide.

DR. GOTTLIEB Rotations of incisors and molars, midline correction, and torque are three of the big considerations in undertreatment and in overcorrection. Failure to fully accomplish these three corrections compromises your treatment, because you cannot achieve your correction.

DR. ZACHRISSON That's absolutely correct. When we talk about the correct amount of torque, I am as occupied today with lower incisor torque as with upper incisor torque. Previously, when I did extract upper and lower first bicuspid, many times one of the reasons I could not obtain stable long-term results was that there was inadequate torque of lower incisor and, therefore, too large an interincisal angle. We had relapse in the vertical plane with increased overbite and crowding. I see less of that now. I am trying to have it all come together. Orthodontists may often be criticized by other dentists and patients that we are overly picky, but the only reason I think one should be very careful to have everything come

together is increased stability. If you overcorrect rotation of all the teeth, if you have the correct torque, if you have midlines that coincide, and if you have seated the cuspids properly on both sides the chances for stability are much improved (Fig. 32).

DR. GOTTLIEB Is it that rotated teeth occupy more or less room than they should in the arch and therefore compromise the arch?

DR. ZACHRISSON That definitely is true for the upper first molars, but you have to look at it in a more sophisticated manner than that. In an average case, I think the tooth sizes are such that in order to have a good Class I occlusion, the upper first molars must be rotated out on the mesial. The widest portion across the arch is across the mesial molar cusps rather than across the distal cusps, but that works only for the Class II type cases. As we discussed to start with, in a Class III you really want the upper tooth to occupy as much arch length as possible. Then you might purposely rotate the upper molars and bicuspid mesially. In a Class II in which you only extract in the upper arch, you also want to rotate them forward so they occupy more space in the arch. There is no doubt that the rotation of molars and bicuspid plays a role in arch length and has to be taken into consideration. This is but one example of the fact that in all my 20 years in orthodontics, I have never been concerned with problems I didn't see. So many times I have had my eyes opened to problems I had before but was not even aware of. Once someone pointed the problem out for me, I could never again close my eyes to that problem.

DR. GOTTLIEB Amen to that. It is the essence of excellence in orthodontics and orthodontic finishing. Bjorn, I want to thank you on behalf of our readers for this stimulating and informative discussion. □