1. What do the lips look like on a patient that is a thumb sucker?
   The lips are open at rest, the upper lip has a ‘reverse’ contour at resting lip, and the lower lip may be “fatter” than the upper and ‘smooth’ from being wet.

2. Why do we treat to a level curve of spee in orthodontics, how is this documented and how is it done?
   A flat curve of spee results in normal overjet and overbite when the teeth are in a class I occlusion (and the arches are ‘coordinated’ (same size and shape)). You document this when choosing the positioning prescription in your treatment plan, stating you want to leave a moderate curve of spee (Open bite 0%), a slight curve of spee (Average 0%), a flat curve of spee (Deep 51%), or reverse curve (Deep 81%). Following the bracket placement height prescription (computer) when placing the brackets with IP bracket positioning gauges, you should get near the desired final curve.

3. When is a lower utility arch used and why?
   Mixed dentition to intrude the lower incisors (to level a curve of spee or to uncouple incisors to enhance differential horizontal growth without the upper teeth moving forward), or to tipback the lower molars (to make more archlength).

4. When is a lower lingual arch used and why?
   a) Mixed dentition: as a method to,
      a. Maintain E space, gaining archlength
      b. Preventing lingual drifting of lower incisors after premature loss of lower C(s)
      c. Retainer following lower utility arch treatment. (allowing lower anterior brackets to be removed, and change to 4-6 month observation visits)
d. Retainer following lower advancing arch (allowing lower anterior brackets to be removed, and change to 4-6 month observation visits)

b) Not used anymore for increasing molar anchorage, since it did not work very well for this purpose.

c) To control the transverse width in the lower arch. For example, the lower 7s are in a lingual position with the 6s in buccal position with posterior crossbite. Place a LLA 7-7 to maintain their width as the archwire constricts the molar.

d) When lower bicuspids are mesial rotated and you do NOT want the molars to expand during alignment. LLA to maintain the width of the 6 or 7s, as the nitie alignment wire derotates the bicuspid mesial rotations.

* The archwire expands the molars buccal when deflected into the mesial rotated bicuspid (below)

Example below did NOT have a LLA and the molars expanded as the mesial rotated bicuspids aligned.

The lower lingual arch will (should) maintain the space between the 6s (or Es) and incisors. It is possible that in a growing patient, the entire lower arch (6-2-2-6) can drift forward together with a LLA in place.

5. Explain the eruption path of upper 8s into the extraction space of upper 7s. At what age does this eruption become unpredictable?
Age 30 the eruption of upper 8s becomes unpredictable. The upper 8s move MESIAL until they contact the distal surface of the 6s and then they travel down the root of the 6s.

6. Explain the methods of correcting deep bite
   a) **Intrude the upper anterior teeth**: upper utility arch (but this does not always intrude the incisors that effectively. Upper utility does extrude the upper molars, IF the muscles of mastication allow it (not usually). Reverse curve 012N can also intrude upper incisors. The only reliable way to intrude upper anterior teeth is with skeletal anchorage from the piriform rim supporting nitie closed coils.
   b) **Intrude the lower anterior teeth**: lower utility, reverse curve 012N, or skeletal anchorage supporting nitie closed coils.
   c) **Extrude the upper posterior teeth**: not easy to do. Some try opening the bite (anterior bite plane) and vertical elastics, but this is clumsy at best. Utility arches are quite weak at this job. Class III elastics extrude the molars and open the bite, but this can also be from upper incisor advancement.
   d) **Extrude the lower posterior teeth**: same as extruding upper molars except class II elastics (instead of class III), and then you have the anterior EXTRUSION, deepening the bite with the inter-arch elastics (class II or III).
   e) **Advance the incisors**: Very easy to do this and one of the best methods, assuming the patient can tolerate the incisor advancement in facial appearance and lower labial tissue.

7. On the skeletal overlay, when the occlusal plane changed in a clockwise direction, what does this mean and is this desirable or undesirable in class II treatment? This means that either the lower molars extruded, and/or the upper anterior extruded as you would see with class II elastics. The clockwise direction of occlusal plane change is considered Undesirable (and poor ortho) in the specialty. It is supposed to NOT be stable in retention and this clockwise rotation makes more class II as the mandible “swings down and back”.

8. How does the ANB measurement showing ‘skeletal class II’ relate to the treatment of a class II case, upper 4 extraction with maximum anchorage retraction of the upper incisor?
   Class II skeletal is defined as ANB equal or greater than +5 degrees. This is considered in the specialty (and previously in POS) to predict skeletal resistance to obtain a class I occlusion in class II cases. BUT, ANB has nothing to do with the palatal anatomy, and has nothing to do with the incisor inclination, both of which determine skeletal (cortical bone) resistance when
retracting an [upper] incisor. Skeletal resistance is best defined by range of bracket torque templates referenced to the incisal edge with the bracket torque (determines inclination) you plan to use.

9. Describe and outline the circumstances where you finish with the molars in a class II position. Class III molar finish.
   When you extract bicuspsids in the upper arch ONLY, leaving one bicuspid in the upper quadrant and 2 bicuspsids in the lower quadrant, this is a class II molar finish. If you extract bicuspsids in the lower arch ONLY, leaving one bicuspid in the lower quadrant and 2 bicuspsids in the upper quadrant, this is a class III molar finish (upper 5 fits into buccal groove of lower 6). Both are assumed to finish class I cuspid.

10. Why should tooth separators be radio-opaque on an x-ray?
    In case one gets “lost” in the gingiva during banding procedures, you can see there is a separator on a progress x-ray.

11. What progress x-rays should be taken during an orthodontic treatment and why? How often should they be taken?
    2 bitewings every 6 months to check bone levels and for possible decay.
    2 periapical x-rays of the incisor roots upper and lower every 6 months (starting at end of the first year) to screen for possible root resorption. (nice to have a starting x-ray to compare with)
    Panoramic x-ray to check for bracket position at the end of alignment stage and when checking on eruption or molar uprighting.
    Lateral ceph: to reevaluate (and overlay) to check incisor position, bite opening, or any surprise during treatment.

    **this is a standard established by POS to protect the patient and practitioner against these unwanted consequences.

12. Describe the protocol when you notice root resorption on progress x-rays
    Make a decision if the root resorption is severe enough to have future consequences and if so, treatment objectives need to be modified for an earlier finish. Consider reducing treatment time (removing brackets) on affected teeth, to return later for finishing.
    Document in the chart what you have decided, and that you informed the patient.
    Consider changing the monitoring schedule from 6 months progress x-rays to 4 or even 2 month intervals.
Special note: the BIG problem is if the treating dentist never finds the root resorption starting and lets it go until it is severe. This is a common legal problem in the specialty.

13. What is the “base arch” in asymmetry diagnosis?
The arch that is the most symmetrical, or the easiest to make symmetrical. It could be the upper OR lower arch. Once you determine the ‘base’ arch, you “fit the other arch to the base arch” in your diagnosis thinking.

14. What could be the problem and who pays when a tooth needs endodontic treatment during orthodontic treatment?
It is rare when orthodontic forces would cause an endodontic problem, although there are teeth that have been suspect of this happening. Usually, the tooth has had a history of trauma, and may even have a (small) fracture. This should be the patient’s responsibility IF you have documentation that there was a pre-treatment cause. If not, then it may be best for you to simply complete the endodontic treatment without charge to the patient. Of course later, there may also be the issue of who pays for the crown??

15. Who pays when a fixed bridge or crown (that is bonded or banded) falls off during treatment and cannot be recemented?
If there is documentation in the original diagnosis that the patient is responsible, then the patient is. If there is NO documentation, then there can be an argument that the braces caused the bridge or crown to fail and therefore the treating dentist is responsible. This is one reason why adult treatment should be a higher fee, and you must be careful to document at the start “what if”.

16. Can you move a second molar forward through the maxillary sinus? If yes, how is this done?
Yes, it can be done. This is how:
1. Molar buccal tube: TipD to prevent the crown from tipping forward
2. Archwire: 19x25ss (stiff) to avoid distortion.
3. Incisor torque: Retraction limit where you want the incisor to finish (or even more proclined). After the retraction limit is reached the incisor must move bodily, resisted by the palatal cortical bone
4. Apply step 3 or 4 force (heavy) from nitie closed coils from the molar to KH loops. Document distal ends cut every 8 weeks and reactivate the coil the amount of distal ends cut.

17. What does the term “molar substitution” mean?
Extracting a damaged molar (6 or 7) in favor of a replacement (usually third molar takes one of the 2 molar positions) that is not damaged.

18. If you see class I [cuspid and or molar] on one side and class II on the other, explain the possibilities and what [extra steps] you may need to do in the diagnosis.

The possibilities:

a) Dental asymmetry in the upper arch (look to see if the upper midline is ‘off-center’.
   Confirm on model measuring with archwire centered)

b) Dental asymmetry in the lower arch (check model measuring)

c) Dental asymmetry in both arches upper and lower

d) Functional shift of the mandible (document with a frontal ceph)

e) To confirm a functional shift, you need ‘corrected records’. Disclude the teeth with flat plane splint or other method you like, to center the mandible in the fossa, then check any changes (take new photos and frontal ceph, remount models)

19. How do you determine if a patient with facial asymmetry has a functional shift or skeletal asymmetry?

a) Look at the frontal ceph tracing, comparing measurements right vs. left, vertical, plane cants, menton off to one side from the sagittal plane. If there are major discrepancies, then this is the best indication of a skeletal asymmetry.

b) Take corrected records to confirm the bite is with the condyles seated in the fossa and is a true representation of the bite

Corrected Records: flat plane splint to confirm the bite
20. How do you confirm there is a functional shift of the mandible to one side?
   
   Suspected on the screening frontal ceph, confirmed with Corrected records...see above.

21. Explain what you look at on the frontal ceph to determine symmetry or asymmetry.
   
   a) Menton to sagittal plane. If this is off, suspect a functional shift of the mandible (or a true skeletal asymmetry, the mandible is LONGER on one side than the other.
   
   b) Plane cants: occlusal plane cant is the first one you look at, seeing if the molars are at a more superior position right vs. left.
   
   c) Vertical: Zygoma to antegonial notches. If this measurement is off more than 3-4mm, then you may see a vertical asymmetry right vs. left in the face and expect to see the double inferior of the mandible on the lateral ceph, maybe not due to head positioning error, but true asymmetry.
22. When are you allowed to asymmetrically extract bicuspids (4 on one side, 5 on the other) in a dental arch? Asymmetric Molar extraction? ONLY when there is documented asymmetry in that dental arch. Follow this rule and you will not make mistakes that are all too common on these types of cases. Same molar or asymmetric bicuspid extraction.

23. What does a wits -11 mean to you when treating a class III case non-extraction? The upper and lower jaws are not well related. There may be a “dental compensation” of the teeth to the skeletal class III. This is an excessively proclined upper incisor AND/OR retroclined lower incisor on finish.

24. What does a wits -11 mean to you when treating a class III case with bicuspid extraction? You can expect skeletal resistance to some of the incisor tooth movements, especially in the lower arch. This can be controlled or reduced by incisor torque diagnosis (accept a more retroclined lower incisor on finish to avoid the skeletal resistance).

25. If a class III case is treated with orthognathic surgery, describe the pre-surgical orthodontic setup. Why is anterior overjet important? Why is the width of the upper vs lower arch (transverse) important? You need to ‘decompensate’ the incisors, which means to get them at the normal inclination (“over the bone and move the bones”). We have a very nice reference for this, the Roth ideal inclination (dotted line on the RBT templates). If you have to extract to decompensate and create more negative anterior overjet, then this is what needs to be done, although we would all prefer a non extraction setup. If the pre-surgical ortho setup does not establish enough negative anterior overjet, then this limits the ability of the surgeon to move the jaw(s), changing the appearance of the patient (to not look class III anymore).

Transverse molar (and cuspid) width is important in class II and III surgery since moving the mandible forward (class II case) requires more maxillary width to accept the advancing mandible, and the reverse is true in mandibular setback or maxillary advancement. The teeth need to FIT TOGETHER when the jaws are set, and that includes the transverse (width). We have an easy check on this, the molar width measurements in model measuring...they will tell you if the molars will fit together properly or if the upper will be too wide for the lower (problem in class III surgery).
26. What are the adult normal ranges for maxillary length, mandibular length, and lower face height? Why are these important in class III diagnosis?

The numbers for maxillary length, mandibular length are found in the tables below (also in your ‘photos for section 3’ document. If you are using reverse headgear, nice to know that the maxilla is deficient. If you are treating with orthognathic surgery, nice to know that you are moving the correct jaw!

Normal lower face height is about 60mm for girls, 65mm for boys.

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27. Explain the difference in treatment effect when applying Reverse (protraction) headgear in an adult patient vs. a child age 8.

In a child, the applied force will move the maxilla as the sutures are immature. The force is less (1 Rhino elastic per side from the molars is about 400 grams) and the treatment effect greater.
In an adult, the sutures are mature, so the movement is ‘dento-alveolar, the teeth and surrounding alveolar bone move forward in response to the force, the maxillary denture base is stable.

28. Explain the protocol when changing the diagnosis (eg. Non extraction to bicuspid extraction)
First of course you must have a set of new records, a new diagnosis and dental vto, plus agreement with the patient. Then you must re-evaluate the appliance as the same appliance is not used for non extraction as extraction. This would include incisor torque diagnosis and molar buccal tubes, possibly even a change in cuspid torque (lower may have Ne).

Growth

29. Explain the locations on the growth curve of sesamoid, Capping, and DP3union relative to CVM stage 3 in Boys
   CVM stage 3, indicated by the SOLID arrow on the boys curve comes just before the peak velocity (height change per year), and is the same as the appearance of the sesamoid. Capping is still stage 3, but at peak velocity. DP3 union is after stage 4 in boys.

30. Explain the locations on the growth curve of sesamoid, capping, and DP3union relative to CVM stage 3 in girls
   CVM stage 3 is the solid black line on the growth curve which is located at the peak velocity of height change. Formation of the sesamoid comes before the peak velocity, between stage 2 and 3. Capping is at stage 3, DP3u is between stage 3 and 4.
31. Explain how to distinguish between CVM stage 1-3. Between CVM stage 3-5.

CVM stage 1-3 has 1, 2, or 3 curves on the inferior of C2, C3, C4. C3 and C4 are either trapezoidal or rectangular horizontal in shape.

CVM stage 3-5 is all based on the shape of C3+C4 since all stages have curves on the inferior border. Stage 3 has rectangular horizontal shape, the height being shorter than the width. Stage 4 has at least one of C3 or C4 with ‘square’ shape. C5 has at least one of C3 or C4 with the height taller than the width (rectangular vertical).
32. If growth is added to the Ceph at the start of phase I, then why should growth be added again to the ceph at the start of phase II?

   If you did not see the patient at the start of phase I, and followed the rule in the McGann estimated system that you add DHG millimeters to all patients passing through stage 3, then you would add this #mm to the patient at the start of stage 3 (start of phase II).

   I am investigating the possibility that there is a TOTAL DHG for a given patient and depending when you start on the growth cycle, you may someday add different #mm DHG to the prediction. As of this writing, we are not that far advanced to know.

33. On the skeletal or A point overlay, when you see the occlusal plane changed in a counter-clockwise direction, what does this mean and is this desirable or undesirable in class II treatment?

   Counterclockwise change in the occlusal plane is favorable for DHG and this generally results in less class II, so counterclockwise is favorable. Growth without treatment NORMALLY has a counterclockwise rotation of the occlusal plane. Clockwise rotations can be considered due to [negative] treatment effect.

34. When differential horizontal growth was under-estimated on the treatment decision dental vto, what changes do you expect to see on the lower incisor range of bracket torque made on that vto prediction? Upper incisor?

   When DHG is UNDER-estimated, there is MORE than was planned, then the LOWER incisor will finish more retroclined than predicted, which could be further back in the round wire range or at the retraction limit.

   The upper incisor will finish further forward than predicted, more proclined in the round wire range, as far proclined as the advancing limit.

35. When differential horizontal growth is over-estimated on the treatment decision dental vto, what changes do you expect to see on the lower incisor range of bracket torque made on that vto prediction? Upper incisor?

   When DHG is under-estimated and there is LESS than was planned, then the lower incisor will finish more proclined (forward) in the round wire range, up to the advancing limit...you can also get labial bone remodeling.

   The upper incisor must finish further back than predicted, more retroclined in the round wire range, as far retroclined (back) as the retraction limit of the archwire/bracket combination.
36. What are the problems you might expect to see in retention when debanding a Boy at stage 3 growth? Is this the same for girls?

   Boys have a longer experience with DHG, so if there is good coupling of the incisors on finish and normal anterior overjet, you can expect to see lessening of the anterior overjet and recrowding of the lower incisors (or spacing of the upper incisors). In most cases, the upper teeth and dento-alveolar bone will follow the extra growth of the mandible, but any ‘lag’ in this upper advancement will result in the changes just described.

   In Girls, they have a rapid change from stage 3 to stage 4, although there may be a significant amount of DHG during that time. After stage 4, the DHG slows in girls, so there is less negative effects, the same as described above for the boys.

37. What stage of growth should you deband your cases for the best retention experience? Is this the same for boys and girls? Why?

   Girls could be debanded at stage 4 and/or when they reach menarche, since in general there is less DHG after that time period. In Boys, Debanding at stage 5 would be preferred, since there is usually DHG continuing from stage 4-5, but this is not very practical. If you can wait until stage 4 in Boys and Girls, as a general rule of preference, you will have a better retention experience.

Model measuring and dental vto predictions

38. When making a distalization prediction, how much can you move 16/26M dots back without extracting the upper 7s?

   “maybe” 2mm is realistic.

39. When making a distalization prediction, how much can you realistically move 16/26M dots back if you DO extract the upper 7s?

   Maybe 3-4mm is realistic with traditional orthodontics, but with the use of skeletal anchorage, time and anterior [palatal] cortical bone resistance is probably the only limit.

40. How much lower incisor advancement can be tolerated in a treatment decision dental vto?

   From a strict “what is best for retention” policy, no incisor advancement should be tolerated. Practically, you should be able to advance lower incisors 2-4mm as long as the lower incisor tissue is not too thin (risk of recession), the lips are not hypertonic (tight) and the skeletal resistance of the archwire bracket is not “severe” as determined by RBT templates.
41. Explain why the anterior bite deepens with incisor retraction and opens with incisor advancement on the dental vto prediction

   Because the incisors are programmed to rotate at the apex as the incisal edge moves forward and back...this is very REAL in dental overlays when teeth are moving in the round wire range (most of the time they do).

42. Explain the problems in obtaining an ideal occlusion in the presence of deep bite, and why a dental vto with significant deep bite is NOT an acceptable [treatment decision] picture

   Because the lower incisor prematurely hits the cingulum of the upper incisor and/or the lower incisor brackets contact the lingual of the upper incisors prematurely (meaning the posterior is not yet class I), then it is impossible to get a class I posterior occlusion without the freedom in anterior overjet. Attempts to obtain a class I occlusion may result in forcing the mandible back, resulting in long term TM joint problems. This is why a prediction with significant deep bite is NOT an acceptable treatment decision picture.

43. Explain how differential growth can reduce the deep bite shown on a non-growing dental vto

   Differential growth is usually downward and forward, with the vertical change being often more than the DHG. With a change in vertical, relief of deep bite is possible.

44. Explain what the changes in 16/26M dots moving forward mean in a non-extraction [growing] class I case

   This represents the upper arch of teeth (and alveolar bone) following the EXTRA horizontal growth of the mandible (vs. maxillary denture base). McGann hypothesized the upper teeth and bone are moving independent of the maxillary denture base, some call this McGann drift.

45. What mechanics are consistent with 16/26M dots moving forward in your treatment decision model measuring?

   If the teeth are in a class I occlusion, this will likely happen all by itself and you do not need to apply any mechanics. Class III elastics or RHG would be consistent with 16/26M dots moving forward, if needed.

46. Explain what mechanics are consistent with 36/46M dots moving forward on the treatment decision model measuring in a non-extraction lower arch.

   Class II elastics are the most common used to apply a force to move the lower arch forward, OR lower labial skeletal anchorage.
47. Explain what mechanics are consistent with 50:50 space closure (dots ½ way through the bicuspid or molar extraction space in the arch being considered).

   *PDS nitie closed coils activated step 3, from 6-KH loop.*

48. Explain what mechanics are consistent with 75:25 space closure (anterior teeth retract 75%, dots remove ¾ of the extracted bicuspid or molar in the arch being considered)

   *PDS nitie closed coils, activated step 2, from 6-KH loop*

49. Explain what mechanics are consistent with 100%, maximum molar anchorage space closure (anterior teeth retract 100%, dots remove the full extracted bicuspid or molar, in the arch being considered)

   *Skeletal anchorage stabilization of the molars OR do not apply force to the molars, pull from the bone plate anchor directly.*

50. Explain what mechanics are consistent with 25:75 space closure (anterior teeth retract 25%, dots remove ¼ of the extracted bicuspid or molar in the arch being considered)

   *Incisor torque diagnosis with the Retraction limit at the final intended position of the incisors on the dental VTO. Then PDS nitie closed coils, activated step 3 from 6-KH (anterior anchorage concept)*

51. Why is excess anterior overjet unacceptable on the treatment decision dental vto?

   What do you do if the dental vto prediction has excessive overjet?

   *Patients will notice anterior overjet and think you did not do your job well. “My upper front teeth stick out” is not what you want to hear at the end of an ortho case. If you see this on the dental vto, even if you moved the dots for the exact amount of class II or evenly upper and lower for a class I case, you need to adjust the dots until there is no anterior overjet. This will then be your anchorage planning by the dots reference.*

52. Explain how to place the ‘dots’ for 36/46M+D when the lower 6s are missing for an ‘alignment’ vto.

   *The most important is that the 36/46M dots are placed on the distal of the second bicuspid (5), as if there was a tooth there. If you leave any space between the distal of the 5 and the mesial dots of the 6s, the computer will fill that space up by retracting the anterior segment 100% of that space. The distal dots can be an ‘estimate’ of the size of the 6s, possibly placed on the mesial of the 7s, if available.*
53. Explain how to place the ‘dots’ for 36/46M+D when you plan to close the molar extraction space with moderate anchorage space closure. How about Minimum anchorage space closure?

**Moderate anchorage:** 36/46M dots are placed ½ way through the molar extraction space. 36/46D dots are placed on the mesial of the 7s. The 7s move forward ½ the space, the anterior teeth are aligned on the curve you selected (archwire) and if any space remains, then the anterior teeth are retracted (archwire moves back, program measures changes in the archwire position).

**Minimum anchorage:** 36/46M dots are placed on the distal of the 5s, just like there was a tooth in that position. The second molar must then move forward 100% of the space.

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**IP Appliance**

54. Explain how to do phase I APPLIANCE diagnosis in a mixed dentition case

a) **Classify rotations on the available permanent teeth**

b) **Mark as “P” for primary on any primary teeth**

c) **Incisor torque diagnosis using RBT templates for the preliminary diagnosis (change only if the diagnosis changes at the start of phase II)**

d) **Molar buccal tube diagnosis for the preliminary diagnosis**

e) **Positioning diagnosis for the preliminary diagnosis**

At the start of phase II, add rotations for 3-4-5 as diagnosed on the spot from your backup inventory. Cuspid torque diagnosis is also made by ‘looking’ on the spot.

55. Explain the differences in deep bite 51% and deep bite 81% positioning and when each is used

The lower 3-3 brackets are placed 1/2mm more incisal in 81% vs. 51%

The upper 3-3 brackets are placed 1/2mm more incisal in 81% vs. 51% (reason why I use more 51% since this gives you a little less torque control as the bracket moves incisal).

51% deep bite is used in cases where you want a flat curve of spee and you may see some mild deep bite on the dental vto. 81% is used in more severe deep bite cases and where you see some significant deep bite on the treatment decision dental vto (but are not using skeletal anchorage).

56. Why can it be an advantage to use a more tapered archwire in the upper (vs lower, non coordinated archwires) in a big class II case? Does the skeletal class II have any influence on this decision?
The more tapered archwire will maintain the anterior overjet better, allowing for the correction to class I in the posterior segments. Then in finishing, you can coordinate the archwires to get rid of the extra anterior overjet.

In skeletal class II cases, the upper jaw is forward of the lower (or lower more retruded than the upper), so there is a built in “bony” discrepancy in the width in the cuspid and molars, similar to the importance of transverse discrepancy in mandibular advancement surgery. If the archwires are coordinated upper and lower, and then you move the upper archwire forward (class II skeletal), the width 3-3 and 6-6 in the upper is now wider than the corresponding lower width (lower arch is tapered to be smaller as you move anterior). A more tapered upper archwire will have the teeth fit better with the lower in a skeletal class II case.

57. Why should non coordinated archwires (more tapered on the upper) be used in cases with a TPA expanded for added molar anchorage?

The palatal bar (TPA) will naturally add some expansion to the posterior teeth, and this to the ends of the archwire. Expanding the ends of the archwire also results in some expansion in the cuspid area of the archform. This can be compensated by using a tapered upper archwire (relative to the lower). For example, lower medium ovoid and upper medium tapered is a good combination.

I found this out when we made the transition from an expanded archwire practice (ovoid non ext#1 on every case unless I altered the archform myself at the chair in response to an arch coordination problem), to a coordinated archform practice. It took about 1 year for the expanded practice with “expanded archwire disease” to recover to where the archforms were now generally coordinated (palatal cortical bone filled in during the expansion and then it was a slow recovery with palatal bone remodeling to recover). There were about 10% of the cases that did not recover after 1 year and these were ones with TPA and skeletal class II.

58. How do you know, and when do you diagnose Roth torque for the upper cuspids? Lower cuspids?

We know how to diagnose cuspid torque from reviewing the experience on previous cases, since there is not a range of bracket torque method available to see when the archwire engages the slots of the cuspids. In general, if the upper cuspids are “upright” and look good that way, we use Roth torque (probably in the round wire range!).

On lower cuspids the Roth ‘lingual limit’ is such that the crown will be very lingual inclined. Probably more lingual inclined than you wish. But in general, if the lower cuspids look good at their starting inclination, then Roth should be ok, IF YOU are applying an archwire to maintain the starting archform and shape.
But, due to many of the lower cuspids that are more lingual inclined than I personally would like to see, I tend to use Ne on lower cuspids in non extraction arches (or arches where we extract lower 5s or 6s) and Li in bicuspid extraction arches.

59. How do you know, and when do you diagnose Li torque for the upper cuspids?
Lower cuspids?

**Li upper torque is used when**

a) The upper cuspids are high or impacted: extrusive force on an upper cuspid will make the crown tip lingual. Li compensates once you get to rectangular archwire

b) The upper cuspids crowns are lingual inclined (more than your personal feeling of what they should look like).

c) When using a tapered archwire in the cuspids area. The constricted archwire will push the crowns lingual. To compensate for the lingual crown tipping, use Li.

d) First bicuspid extraction cases since the extraction mechanics tend to tip the crown lingual.

**Li lower cuspid torque is used when:**

a) The crown is lingual inclined

b) The tissue thickness is ‘thin’: push the root lingual (Lingual root torque)

60. When do you diagnose La torque for the upper cuspids? Lower cuspids?

**La for upper cuspsids** is done when the upper cuspids crowns are inclined labial (flared out) either due to blocked out eruption position or previous expansion treatment.

**La for lower cuspids** is used when an expanded archwire is diagnosed for the lower arch. Expanded archwires can tip the crowns of the cuspids labial and then suffer relapse in retention. La brackets will keep the roots moving labial with the crowns, within the limits of the labial cortical bone, reducing the tipping of the crown over the top of the crestal cortical bone.

61. When do you diagnose Ne torque for the lower cuspids?

In non extraction lower arches, or arches with extraction of lower 5s or lower 6s (where the arch is non extraction in the cuspid area). Ne bracket has less distal root tip than Ron Roth added to the cuspid bracket, intended by Roth to compensate for tipping of the cuspid crown into the extraction space, keeping the roots parallel (one criteria of good ortho in extraction cases). I also designed the Ne bracket with “more” lingual root torque than the Roth bracket to keep the crown more upright. In many non extraction
cases, vertical elastics are used to close (or settle) the bite, a force that will tip [cuspid] crowns lingual.

62. When should you consider banding a bicuspid tooth (instead of bonding)?
   a) When the clinical crown is short (and tight muscles usually go hand in hand with short bicuspids). If you check short clinical crowns on LOWER 5s in question 5 of the IP tab, characteristics of the malocclusion, the program will give you a band on these teeth.

   b) When there is a severe rotation: it is easier to reposition a band than a bonded bracket plus you can easily add a welded lingual cleat to the band to place chain, one of the methods used to derotate bicuspids.

   c) When bonded brackets have failed: bands are used to resist the forces of occlusion in areas where there may be heavy forces

63. Describe the design features of a “UP” molar buccal tube versus a Roth molar buccal tube. What do these features do for you?

   UP molar buccal tube, one of the two original designs of McGann where I invested in a metal injection mold to make, you have “more than Roth” MORE buccal crown tip (or lingual root torque) to upright the crown to the buccal, MORE distal crown tip (5 degree tip weld, the bracket slot is the same zero degrees to the occlusal table as Roth), and MORE mesial-buccal rotation, to compensate for the tendency for the tooth to rotate Mesial-lingual when forces are applied to close lower 6 spaces (or class II elastics, or advancing a lower molar or arch).

   These features keep the crown and tooth ‘upright’ in all 3 planes of space as you move a molar forward, or upright an already tipped molar.

64. Describe the design features of a “CIIE” molar buccal tube vs. a Roth or UP molar buccal tube. What do these features do for you?

   This is the other molar buccal tube that McGann invested in the injection mold since it was not made anywhere in ortho and there was no choice but to make it myself (molar buccal tubes are ‘cast’, not cut like the IP brackets, so it is more difficult to make new designs). This bracket was designed to compensate for the use of class II elastics (thus CIIE name) and to close lower 5 extraction spaces.

   Relative to Roth type bracket design, CIIE has MORE crown tipback (3 degrees) which is done as a weld and MORE mesial-buccal rotation to prevent the crown from rotating into the lingual cortical plate. (previous to this bracket design, we had to use chain to
the lingual cleats of the lower molars to control this rotation when closing lower 5 space, OR increase the buccal sweep on the archwire). CIIE has the SAME torque as Roth type bracket design in the buccal-lingual direction. Of course the torque is not effective unless the rectangular archwire engages (binds) in the bracket slot.

65. What is the purpose of a ‘tipback’ (tipD) weld in non-extraction cases? Extraction cases?

TipD weld is used on upper 6s or 7s and lower 7s. This weld is a 5 degree weld from the standard zero degree (occlusal table), tipping the molar crown to the distal (roots may also move mesial, especially if the crown is prevented from tipping distal).

In non extraction cases, the TipD weld is most often applied to the upper 6s, the purpose being to tip the crown back (relative to Roth type zero degree weld, which results in a mesial molar inclination) to make a better fit of the upper cuspid into the lower cuspid class I position.

In extraction cases, the same weld is used to increase molar anchorage (resistance to mesial molar movement) and to prevent tipping of the crown into the extraction space. This is standard when closing upper 5 or 6 extraction space, or when moving a root through the maxillary sinus.

66. Why do you want to use 16/26tipD when extracting upper 5s?

To keep the crown from tipping into the extraction space, instead closing the space with the roots parallel with the 4s. This is especially important if there is maxillary sinus (floor) interference with the mesial movement of the first molar root.

67. Which molar buccal tubes have tipback welds and how severe are they?

a) UP: 5 degrees, crown tips Distal, root mesial
b) TipD: 5 degrees, crown tips Distal, root mesial
c) TipM: 5 degrees, crown tips mesial (and root distal)
d) CIIE: 3 degrees, crown tips distal, root mesial

68. Explain the ‘generations’ in the diagnosis of tooth rotations and why one is better or worse than the previous.

**Generation 1:** hold the study model in your hands, viewing the occlusal surface, indicate the rotations. Only the most obvious, severe rotations were classified by this method. When we would find out is at the start of finishing, when we were checking for under-correction of rotations, finding many, now that the obvious rotations were corrected. This then involved a bracket Rx change or wire bending to finish.


**Generation 2:** Clear acetate with the archwire shapes is put over the top of the study model (occlusal surface) when the rotation is being made. This gave us a reference to decide if the tooth was rotated or not, and the concept of whether a tooth was rotated or not may be dependent on the shape of the archwire chosen. We still missed the rotation diagnosis on many teeth and there was no record of what we saw when making the diagnosis.

**Generation 3:** the archwire in model measuring is used as the reference if a tooth is rotated or not, but NOW the red line between mesial and distal dots was first edited to “represent the rotation of each tooth” before the diagnosis was made. Now we got nearly full diagnosis of rotations and there was a record of what we were looking at when we missed.

69. What are the features (relative to Roth) of the 37/47Li2c molar buccal tube and when is it used? How do you get this variation in the IP appliance for your patient?

Li, as in other nomenclature in IP stands for Lingual root torque (or buccal crown torque in this case) relative to the Roth type torque on the same tooth. The slot is cut so that the crown will be uprighted to the buccal (applied to the common lingual inclined lower 7s) when rectangular wire engages the bracket slot. It is available ONLY welded to a band, since a bonded bracket on such a tooth would likely fail due to the occlusion from the upper opposing molar. Lingual cleats are standard on this band, enabling the placement of posterior cross elastics (6oz ¼” would be standard) from the buccal of the upper molar to the lingual cleats of the lower molar. A special elastic holding instrument (plastic holder with a hook) is used for the patient to place the elastic on the lingual cleats.

You get this variation by checking “posterior teeth tipped lingual” in question 5 of the IP appliance tab.

70. When is 31/41Tie brackets (single tie wing) used and how to you get this variation in the IP appliance for your patient?

These are brackets with only one tie wing, instead of the standard “twin” tie-wing bracket. These are used when there is very little room for the standard bracket, and to
increase the inter-bracket distance. They are only temporary, being replaced with the normal bracket after access is gained. They can be applied to:
a) A blocked out incisor
b) Two lower mesial rotated incisors where the facial surface is facing each other, making the interbracket distance very small, if anything.
c) Indirect bonding it is standard to use one of these brackets when the regular bracket cannot be placed in the correct location on the tooth.

These brackets are placed into the prescription in the “ordering tab”, before the single patient order is sent to the supply via internet. OR, you should have 2 of each tooth, interchangeable for 31 and 41, in the inventory wheels.

71. Why are large bonding pads standard on IP bicuspid brackets? When are ‘regular’ size pads used?

The large pads, in a study several years ago, reduced the bond failure from 35% with a standard pad to 3% with the ‘offset’ pad. They are ONLY used to reduce bond failure, but is a standard in the IP appliance for that reason. We work without much extra inventory, so we need every advantage we can get to reduce the need for extra brackets beyond the single patient order.

The regular size pads are only used when the bicuspid are too small to accept the larger pad. IN the IP appliance tab, question 5, you get the small pad when you check any of the UPPER bicuspids have short clinical crowns. If you check lower bicuspids are short, then you get bands on these teeth.

72. Describe the 16/26D variation and when /why it is used? How do you get this variation in the IP appliance for your patient?

16/26D variation is often confused with ‘tipD’, but they are not at all the same. 16/26D simply means that there is NO distal offset (mesial rotation) on the upper molar tube.
This is really a ‘standard edgewise” tube that was used before straight wire...the orthodontist would bend ‘bayonette’ bends into the archwire to place the mesial-buccal rotation to the upper molar (“distal offset” it is called). By having NO distal offset, the molar will rotate mesial-palatal, taking up more archlength, pushing the teeth anterior to the molar further forward. This is desirable in non extraction class III cases. For extraction upper arches in class III cases, the Roth variation is probably the best.

This variation is automatically added to the IP appliance when you check “class III” in classification 1 tab. If you do NOT want it, you either change this to class I, or custom select the bracket you want instead.

73. Describe how to get upper lateral incisor brackets on the upper 3s in the initial appliance for your patient, when closing the spaces of a case with missing upper 2s (3s in 2 position on finish)

“X” out as missing or extracted the upper 3s (the 2s are ACTUALLY missing), then you will get lateral incisor brackets that can be placed on the cuspids.

74. The computer program for IPsoft gives you an La bracket on upper incisors when upper 1 to SN is greater than 110 degrees (proclined)....when is this good and when is it bad? How do you over-ride this programming if you do not want La torque on the upper incisors?

This is good when you are treating the case non extraction. BUT if you are treating the case with extraction, retracting the incisors a significant amount, then you want an incisor torque bracket that controls the retraction limit (eg. Li) not the advancing limit (eg. La).

You can over-ride the programming by either changing the degrees in the ceph tab to 104 (normal, not proclined) or custom selecting the bracket you really want.
75. Explain the problems encountered when the upper incisors are at the 19x25 Roth retraction limit and the lower incisors are at the 19x25 Roth advancing limit in class II treatment.

*The anterior overjet is gone BEFORE the posterior teeth reach a class I occlusion. So if you continue class II elastics, for instance, the lower arch will go into edge-to-edge incisors and eventually anterior crossbite before the posterior occlusion reaches class I.* It is very common in the specialty to see finished cases with class II posterior and no anterior overjet. This is one of the problems that makes this.

76. In an extraction case, if BOTH upper and lower incisors are at the Roth 19x25 retraction limit, what problems might you expect?

*No anterior overjet and the posterior teeth are still class II. Most cases will look too retruded (really incisor inclination) and deep bite would be common.*

77. If in a non extraction case, BOTH upper and lower incisors are at the Roth 19x25 advancing limit, what problems might you expect?

*The Roth advancing limit is very proclined, especially on the upper. The case will look too protruded (really excess proclination) and the upper incisal edge will be felt as too much overjet by the patient.*

78. In a class II case, what problems might you have with the upper incisor at the Li 19x25 retraction limit, and the lower incisor at the Roth 19x25 advancing limit?

*The anterior overjet may go away before the posterior reach class I occlusion, but it will be close!*

79. Explain when you might choose a Roth bracket instead of an Li bracket for the upper incisor when there is significant upper incisor retraction predicted on the dental vto.

*To avoid doing an upper lingual corticotomy, the Li 19x25 retraction limit has more skeletal resistance than the Roth retraction limit, accepting some posterior class II and a more retroclined upper incisor look.*

80. When a retroclined upper incisor starting position is ‘outside’ the retraction limit of the bracket and archwire combination, what tooth movement do you expect when that rectangular wire is engaged? How can you know this will happen when placing the archwire in the clinic?

*One of the following will happen,*

a) *The crown of the incisors will move forward (causing spaces upper 2-2)*
b) The root of the incisors will move back (limited by the palatal cortical bone)
c) Both the crown will move forward and the root will move back.

When placing the archwire, you will have to ‘twist’ the rectangular wire with a plier to push it into the bottom of the bracket slot. When you release the wire, the tooth will feel that twist. One of the three movements will happen depending upon
1) The skeletal resistance of the palatal cortical bone
2) Whether you let the incisor crowns move forward or not.

81. On a progress ceph, you check the 19x25 range of bracket torque on an upper incisor with a Roth bracket and find the tooth is on the dotted line. What does this mean now and for the future tooth movement?
The dotted line, the Roth ideal inclination, is in the round wire range. The bracket (tooth) is free to rotate around the archwire in either direction, the rectangular archwire having no influence. The tooth will ‘tip’ at the apex if it moves forward or back from this location.

Mechanics

82. When a nitie open coil is placed between an E and 6, what tooth movement happens (anchorage)
Assuming the E roots have not yet resorbed, the 6 will move back since the E has more anchorage value than the recently erupted 6.

83. What happens if the line of force from cervical headgear is too low, and how is this corrected?
The [first molar] crown will tip distal. Correction (to get more bodily tooth movement) is to bend the outer bow of the facebow “up” with a 3 prong headgear plier.

84. Explain how to determine the best line of force for cervical headgear.
Make a mark with a white marking pencil or sharpe marker on the outer bow, the same distance as the U loop (representing the mesial of the molar). Insert the facebow into the headgear tubes of the molar (on your patient) and then measure from this mark 10mm up and 1mm back...make a dot on the face.
The line of force from the module, represented by the extension of the string, should pass through the dot you made on the face.

85. Explain how upper arch distalization is done with headgear and open coil (the steps in treatment). Is this effective and efficient?
Use TipM weld on the upper 6s, engage 19x25ss archwire, Compress nitie open coil between upper 4-6 (letting the 5s drift distal), activated 150 grams per side (+2mm compression of a 10mm PDS nitie open coil) and reactivate every 8 weeks with a (2mm) splint hook. Headgear is 12 oz per side, normal line of force through the center of rotation of the upper molar. Wear 14 hours per day.

After the molar is class 1-2mm class III, then place TPA 6-6 to stabilize the molar, expanded into the buccal cortical bone. Nitie closed coil 6-4, activated step 2 (ONLY) to retract the bicuspids.

(note: some clever students even change the molar band from tipM for distalization to TipD to increase the anchorage of the molar before trying to pull back the cuspids and bicuspids).

Next, nitie closed coil 6-3, activated step 2 to retract the cuspid (19x25ss only, no 18x25N for this step). HOPEFULLY you have class I at this point, if not, then add class II elastic lower 6 to upper 3.

Next, 19x25ss T loops, activated 1mm at the vertical legs with cinchback to retract the incisors (2nd step in 2-step retraction).

86. If the headgear facebow contacts the incisors at an adjustment visit, what tooth movement do you suspect and how do you adjust the facebow?

Molar distalization (but could be incisor advancement?). Expand the U loop in front of the molar on the inner bow with a light wire plier, the flat side on the inside of the loop.

87. Explain what a lower utility arch is, what the design is and why.

Anterior segment is 16x16ss archwire (because Ricketts said so) from 2-2

Anterior step, made 1mm distal to the lateral incisor, angled slightly ‘out’ to avoid gingival tissue. Made with the how plier ‘paddle’ for consistency

Buccal segment: wire between the anterior step and posterior step

Posterior step: smaller step that contacts the mesial of the molar buccal tube.

Tipback bend: 30 degrees from the horizontal plane, posterior to the posterior step

Toe-in (not needed): posterior to the posterior step

Utility arch, invented by Robert “Rick” Ricketts (palos verdes, CA, died 2006?), is designed to intrude the lower incisors to level the occlusal plane (instead of bicuspid extrusion with a straight archwire). In addition, the molar [crown] tips-back, increasing archlength in the mixed dentition [retained with LLA]. The toe-in was to prepare the molar for the future use of class II elastics (rotate mesial buccal to compensate for the unwanted mesial-lingual rotation resulting from the class II elastic force acting at the
buccal ball hook). Ricketts did not talk about the molar extrusion, equal and opposite action to incisor intrusion, that can explain some of the bite opening you see in the anterior.

88. Explain how to make a lower lingual arch, what the design is and why.
Fit bands on the lower 6s or Es, usually with the buccal attachment intended for the 2nd phase of treatment. Take an alginate impression of the lower arch, over the top of the bands. Remove the bands (careful not to distort) and place in the alginate impression in the proper position. Wrap in wet paper towel, put in zip lock bag, send to the lab for soldering (and hopefully they add a weld). Draw on the lab slip the lingual bar which should have these features.

a) 036 lingual bar with U loop mesial to the molar band
b) Anterior curve in contact with the cingulums of the lower incisors
c) Offset bend distal to the cuspid to prevent impacting erupting bicuspids
d) If you lost a primary C on one side, then a soldered ‘finger rest’ distal to the 2 on the side where the C was lost to prevent shifting of the midline to that side.

89. What happens if the LLA does not touch the cingulum of the lower incisors?
The lower incisors can drift lingual

90. What can happen if no offset is made distal to the cuspids in LLA design
The lower bicuspids can get stuck under the lingual bar, stopping eruption.

91. What problems can you have if the lab does not bend a U loop in the LLA design?
If the lingual bar does not touch the cingulum, then you have a ‘remake’...if you have a Loop, then you can adjust the lingual bar to touch the cingulum and cement the LLA that day.

92. What should you do if a band keeps coming loose?
Acid etch buccal and lingual surface and cement with composite.

93. Explain the intra-oral activation of open coil with a split hook or split stop. Why use a split hook vs. split stop?
Select the proper size of split stop or hook (PDS only sells for rectangular wire), either for round wire or rectangular wire. Place the split hook or stop in the beaks of a light wire or weingardt plier (has serrations) careful not to squeeze too hard, distorting the ‘split’.
Compress the open coil to be reactivated with a ligature director, slide the ‘split’ or open part of the stop over the archwire and squeeze it to place. Release the open coil.
A split hook has a hook on the ‘stop’, which makes it more stable in the plier jaws, not turning and slipping. Split stop has no hook and is cleaner after in the mouth, but many of these get distorted or dropped with frustration.

94. If an archwire extends over a long distance (eg. several teeth missing), what can you do to reduce soft tissue (lips and cheeks) irritation? 
*Place a piece of stainless steel closed coil on the archwire in the exposed part of the archwire to prevent tissue irritation.* (note: some use elastomeric tubing for this, but the tubing discolors, swells with water retention, and gets generally stinky).

95. When distalizing an upper arch using 16/26tipM bands, how much over-correction should you add to the molar distalization? 
*In the days before tipM welds, we used to over-correct 2-3mm and sometimes that was not enough. The root of the molar will be more to the distal with this weld, so technically you could not over-correct at all...but to be safe 1mm class III would be nice.* (note: some clever students even change the molar band from tipM for distalization to TipD to increase the anchorage of the molar before trying to pull back the cuspids and bicuspsids).

96. When retracting cuspids on round wire, why is a stop placed mesial to the 5 bracket? 
What happens if the molars move forward [stop on archwire] as the cuspid is retracted? 
*The stop mesial to the 5 bracket when cuspids are retracted on 020ss, was introduced to prevent excess detorquing of the incisors as the cuspid is retracted (friction of the cuspid on the archwire moves the archwire back).*  
If the molars move forward as the force is applied from the molar to the cuspid, then the stop will serve to move the incisors FORWARD, more proclined. Stops are not considered a good technique by McGann, so you do not see them in our system...they can also be forgotten and months later you are wondering why the space won’t close.

97. When preformed 19x25ss T loops are activated 1/2mm, how much force is applied and what is the significance of this force until the vertical legs come together? 
*150 grams of force, and less as the vertical legs of the loop come together. This is the same as ‘step 2’ type force, where the molars are stable and the incisors will retract (with cortical bone remodeling)*

98. When preformed 19x25ss T loops are activated 1mm, how much force is applied and what is the expected tooth movement, and why? What happens when there is 1/2mm of tooth movement?
At 1mm activation of the vertical legs of the machine made T loop, the force will be 250 grams (and less as the teeth move, the loop closes). At this initial force, similar to step 3 nitie coil force, the molars and incisors will be advancing/retracting 50:50, but fortunately this is a short time because T loops are used to retract incisors while the molars stay stable. After 1/2mm of loop activation, the force is where the molars remain stable.

99. When preformed 19x25ss T loops are activated 2mm, how much force is applied and what is the expected tooth movement.
   More than 300 grams. Molars will move forward same as incisors move back, for at least 1-1.5mm of loop activation.

100. How do you curve in the T loops to avoid lip irritation?
   Place hollow chop pliers on the vertical legs of the loop and squeeze to curve in the loop.
   Check that the torque has not been changed on the archwire.

101. What is the difference in activating T loops with cinchback versus a tie-back?
   Either can give the same activation. Tie back allows the archwire to be removed and be adjusted or to rebond a lost bracket. Tie-back, however, can be frustrating to bend since it is usually place in the “small” interbracket distance between 5-6. Then, when the omega loop contacts the mesial of the molar, the ability to activate the closing loop is lost.
   Cinchback, bending the archwire distal to the molar tube, makes for more difficult removal (have to cut the wire mesial to the molar, sometimes debonding the 5 bracket), and you are unable to alter the archwire and sometimes you cannot get a bracket rebonded or band recemented without removing the archwire and getting a new one. (yes you want extra T looped archwires in inventory).

102. How can you derotate a severely rotated bicuspid?
   You can deflect a round nitie alignment archwire into the bracket slot and reposition as the tooth rotates and the archwire becomes inactive....OR
   You can use chain to the lingual cleats or buttons, OR
   Some will use 4 chains from the adjacent teeth to the rotated bicuspid, NOT placing a bracket on the bicuspid until the bicuspid is fully rotated, or over-rotated.
After 3 months
103. Explain what to do if [extraction] spaces are resistant to closing.

   Do one or more of the following:
   
   a) Check the archwire for binding as it slides through the slot(s)
   b) Check the molar tubes (7s) to be sure they are not crimped by a distal end cutter.
   c) Check that the tongue has not formed a habit of pushing into the space and therefore has stopped tooth movement
   d) Check the opposing occlusion (usually cuspids) to be sure there is not an interference stopping tooth movement
   e) Check that there is enough anterior overjet for the teeth to move
   f) Check forces to be sure they are activated correctly or elastics being worn (maybe modify the force, usually LESS is the answer).
   g) Check cortical bone to see if there was a traumatic extraction (loss of cortical plate) with constricted space to move teeth into (still can be done, just slower and use less force...I only gave up on ONE, but it could be your situation. My fingers could almost touch each other when placed in the space buccal and lingual.
   h) If all else fails, consider closing with a segmental T loop archwire, removing the friction.

104. What are the causes of an occlusal plane cant and how can this be corrected?

   a) The most common cause is inconsistent bracket height right vs left. This is corrected by repositioning the brackets to the correct heights.
b) If the brackets appear to be in the correct location, then you can bend “down” the archwire in the areas where the teeth are too high and bend “up” the archwire in areas where the teeth are too low (usually a ‘sweep’ with your fingers, not a bend with pliers,

c) but if the cant is say 2-2, then you may make a “big” second order bend starting on one side 2-3 step up and the other side 2-3 step down.

d) If the entire maxilla is canted, showing more gum on one side than the other, skeletal anchorage is the method to correct that problem. Check your frontal ceph for [occlusal] plane cant

105. What is the problem, signs and consequences of too frequent adjustment visits? The problem is over-activation of the appliance. Teeth are not moving and the patient complaining of constant pain. The problem is that the forces are too high and never are given time to be released by ‘frontal’ resorption. The periodontal ligament is excessively squeezed, cutting vascularity and stopping cellular activity needed to move the teeth.

106. Explain the treatment effects of class II elastics applied from lower molars to upper KH loops. How is this different if the elastic is placed on the lower 6 vs. lower 7?

a) Upper anterior feels a force directed ‘back and down’

b) Lower molars and all the teeth in front of them feel a force directed “forward and up”

c) Canting of the occlusal plane (posterior up, anterior down...clockwise rotation) with the mandible ‘swinging open’ (down and back) is a common consequence. This is a negative treatment effect that can work against class II correction, especially in growing patients that may have differential horizontal growth that is being now directed vertically instead of horizontally. The lower arch moving forward is the general treatment result. Some might say an increase in gingival display, but this is not usually enough to be noticed.

If the elastic is placed on the 7 instead of the 6, then

a. The force is more horizontal than if placed on the 6

b. The force is greater since there is a longer stretch of the elastic

c. Otherwise the same treatment effects listed above are still happening, just at a slightly different magnitude

107. Explain how ‘short’ class II elastics are different than applying the elastic to the lower molars.

a. The force is more vertical, closing the bite more
b. There is not the change in occlusal plane and mandible swinging open.
c. The class II correction may be more than you expect, although only use when you have 1-2mm class II, usually on a finishing 18x25N archwire.

108. Explain the treatment effects of class III (3) elastics applied from upper molars to lower KH loops. What elastics should be used for this job?
   a) Upper molar feels a force directed forward and down. This advances the upper arch of teeth (effective), opens the bite which also creates more class II (less class III).
   b) The lower anterior feels a force directed back and up. It is possible that the lower arch of teeth will distalize slightly, as amazing as that may seem, but don’t count on much. The lower anterior will also extrude.
   c) The occlusal plane may change counterclockwise, which is favorable for DHG (bad in a class III case).
   d) Treatment changes with class III elastics is more rapid than class II elastics since there is less cortical bone resistance to the upper moving forward (than the lower moving forward)
      Use a 4 oz ¼” elastic for class III elastics to see if the TM joint tolerates this force, and if successful, you may change to 6oz ¼” or stay the same...

109. When should anterior cross elastics be used and describe the treatment effect. What elastic should be used for this? What happens if you use too much force (heavy elastic)?
   Anterior cross elastics are used to change the midlines upper vs. lower. You should see excess horizontal overjet on one side vs. the other side when viewing upper cuspid to lower cuspid. Also, be sure that you want to move the upper midline, as this will happen (both sides of the elastic will move). You would think that this elastic placement would also result in occlusal plane cants upper and lower from the vertical force of the elastics, but this is not usually enough to be noticed.
   Anterior cross elastics are also very helpful in centering a mandible that has a functional shift to one side. The elastic works “very fast”...too fast for tooth movement as the mandible is what is moving.
   Use 4oz ¼” elastic. If too much force is applied (eg 6oz ¼”), the patient will not wear it.

110. When should you use posterior cross elastics and describe the treatment effect. What elastic should you use?
   Posterior cross elastics are best used to constrict the lower, not expand the upper (molars). The elastic to use is 6oz ¼”, and it is attached from cleats lingual to the UPPER
molar(s) or bicuspsids to the buccal attachment(s) on the LOWER bands or brackets. The treatment effect will be to gain horizontal overjet of the upper wider than the lower, but if used unilateral, you can expand/constrict the opposite side since it is also connected to the same archwire.

Posterior cross elastics to the lingual cleats of LOWER molars and buccal attachments of UPPER molars are often used to ‘upright’ the crown of the lower molar. This happens quickly, same 6oz ¼”

111. Explain the treatment effects of saif springs applied in the class II direction (lower molars to upper KH loop) and what the problems may be.

Force generated by saif springs is VERY HEAVY...like about 5 elastics. The molar that the spring is attached to will get mobile as it is extruded into the occlusion with the upper. The bite will open with the mandible swinging down and back. The lower arch will advance and the class II will get better, IF THE PATIENT does not wreck all the appliances it is attached to when trying to remove it. The main advantage, aside from all the negatives, is that this is one of the only class II correcting appliances that are not dependent upon patient compliance (Herbst is the other).

112. Explain the treatment effects of saif springs applied in the class III direction (upper molar to lower KH Loop) and what the problems may be.

This is a very favorable direction and quick acting. Aside from the TM joint crying for help from the heavy force and the mandible being forced back into the fossa, the upper arch of teeth will advance quickly, the bite will open quickly, and thus the class III will correct quickly. The usual other negatives of appliances breaking, loose bands and molar teeth, etc are the same as in the class II direction.

113. How do you attach saif springs to the brackets/KH loops and molar bands?

Twist 2-3 strands of .012 ligature (koby hooks or from the spool of wire used for skeletal anchorage) into a ‘rope’. Loop this “rope” between the bracket bases of the upper 3-4 brackets or 3-KH loops, with the end of the saif spring attached in this loop (giving some flexibility for the spring to move forward and back. Attach the other end to the molar ball hook, bending this hook ‘in’ with a band pusher or light wire plier so the end of the spring cannot be removed.

114. When an archwire ‘breaks’ in the middle of the arch, what is the most likely problem? What do you do if the problem continues after replacing the archwire?
There is likely movement of the archwire in that area, up and down. Maybe a tooth is in hyper-oclusion and is excessively mobile. Instead of the bracket(s) failing, the archwire breaks. If the problem continues, then either
a) Use a lighter archwire that is more flexible and can take the movement in one location
b) Bend a loop in the stainless steel archwire where the breakage is happening to add flexibility.

115. What is the treatment effect of a gable bend distal to the loop in the upper arch? (torque, vertical, incisor angulation)
   a) Adds lingual root torque
   b) Adds intrusion of the incisors (and extrusion of the posterior segment)
   c) Increases [palatal cortical bone] skeletal resistance (therefore should only be used with Roth type bracket torque, not Li)
   d) Tips the roots of the incisors distal, making incisal edges uneven.

116. How much gable bend do you add to an La upper incisor bracket to make it effectively an Li bracket? How much gable to go from Roth to Li?

In a 19x25 archwire in a 22 slot, which is the only archwire size we have loops bent and the usual slot you will be using on the upper with a gable bend (not SLi!), the round wire range is 20 degrees. The gable is usually used when retracting incisors, so the Li retraction limit is the dotted line, the Roth ideal inclination. Referring to the diagrams below, the La retraction limit to the dotted line is then 20 degrees. The Roth retraction limit to the dotted line is 10 degrees.
117. How can you tell if there is a gable bend added to a KH loop archwire? T loop archwire?

When the archwire is already ligated into the brackets,

a) the vertical legs of the KH loop will be angled to the distal (instead of vertical) to the occlusal plane of the archwire in the slots.

b) The horizontal (superior) section of the T loop will be angled from the horizontal (see diagram above)

c) The archwire passing through the incisors is at an angle to the plane of the archwire passing through the molars and bicusps (see diagram above). This is only seen after the gable has been in the mouth for awhile, the treatment effect realized.

118. Why do you NOT want to add a gable bend when the upper incisor torque is Li?

Most of the time, the cortical bone skeletal resistance is ‘plenty’ when Li torque brackets are used. Adding to this skeletal resistance does NOT help in your efforts to retract the incisors and in fact may change the anchorage in favor of the incisors, the molars now moving forward (more class II).

Finishing

119. How do you tie a 018N to the brackets 6-6 to engage recently bonded lower 7s?

Double overties to the bracket bases (not every bracket, just enough to stabilize the wire, and pass the archwire usually inferior to the first molar bracket (under the tie wings...this creates about a 1mm ‘step down’ from the first molar to second molar, extruding the 6 or intruding the 7 by that much.

120. When lower 7 bands are added at the start of finishing, the bite may open in the anterior. Does this mean you seated the bands too occlusal? What should you do about this open bite?

The bands should be placed on the teeth to position the bracket in the correct position, regardless if the patient bites on the attachment (opening the bite) or not. Nothing to do but wait for the occlusion to settle down again. If severe or the patient has weak muscles of mastication, you could add vertical elastics to speed the process.
Note: Lower 7 bands in PDS have the attachment welded 1/2mm more occlusal to make the best occlusions.

121. Explain when you might want to make a finishing wire bend instead of repositioning the bracket
   a) When the difference is so small that you may not be able to reposition the bracket within that level of accuracy.
   b) When you are proficient at making bends (especially intra-oral steps) and the time to do this is much less than repositioning the bracket.
   c) When you just feel like bending wire that day.

122. Explain when you would want to reposition the bracket instead of making a finishing wire bend.
   When making 2nd order adjustments (tip the root or rotation correction), as this is ineffective when bending wire.

123. Why should you ‘lace’ the teeth in the arch together during the finishing stage?
   So spaces do not open or ‘re-open’ that need to be closed later. Finishing wires are NOT good archwires to support the mechanics of closing spaces. Spaces can open by making changes in the angulation (tip) of the teeth, sometimes unintentionally as you reposition a bracket. Principle: crowns move before roots.

124. Is cinching back the archwire the same as lacing?
   NO, since if you cinchback the archwire, you cannot remove it again to make adjustments. Also, the cinchback can “slip” allowing spaces to reopen. Occasionally the lacing is also not tight enough or the ligature wire stretches, allowing spacing to occur even in a laced arch.

125. Explain what to do if spaces [re]open during finishing in a bicuspid extraction case.
   Replace the (keyhole loop) archwire you used to close the spaces the first time (hope you saved it), and close the spaces with closed coils...later restarting finishing with lacing.

126. Why might extraction spaces re-open during treatment or in retention and how do you prevent this?
   During treatment:
a) compression of the gingival tissue fibers that are elastic and want to push the extraction space open again

b) Occlusion settles, a cusp tip riding on an inclined ridge to cause a space to open

c) Roots are not parallel and the crowns move on top of their roots as a general principle.

d) Changing root tip of a tooth, the crown moving before the root, opening a space.

Prevent all the above by lacing and not allowing the spaces to open. Also you can do an extraction space fiberotomy, removing the interproximal (compressed) tissue.

In retention:

a) same as above a,b,c.

b) a retainer clasp pushes into the contact, opening the space as the retainer settles.

**prevent by getting the best occlusion possible in finishing before debanding, getting the roots parallel adjacent to the extraction spaces, and doing fiberotomy where indicated. For the retainers, use clear overlay retainers, and if you must use a Hawley with clasping, use ‘rests’ and make grooves in the teeth for the crossover wires to fit into.

127. What are you to do when you notice an under-correction of a tooth rotation in the finishing stage.

Check for:

a) The correct bracket Rx (rotation bracket and in the correct direction): change if wrong

b) Calculus or adhesive in the slot that prevents the archwire from fully seating

c) Position of the bracket on the tooth (not off-center): reposition as needed.

d) If you cannot find the problem, change the bracket to a new one with the correct rotation feature.

128. How long after removing the bands and brackets should you wait to prepare the teeth for fixed bridge replacement?

*AT LEAST 1 month to let the periodontal structures mature. If you do it too early, then the fixed bridge (or crown or implant crown, etc) will “not fit” as the teeth moved after the impression. It may be a good policy to first prep and temporize, no impression.*

*Return a few weeks or month later to take the impression. Now you know the temporary fits within the occlusal scheme and does not move the teeth.*

129. Explain the process of placing an implant tooth replacement following orthodontic treatment.
AFTER you are confident that the adjacent natural teeth are not moving any further (finishing wire is passive, etc), then you can place the fixture, using this waiting time to finish for integration. After removing the brackets, either place a temporary crown on the fixture if enough time has lapsed or make a clear overlay retainer over the top of the fixture to secure the [mobile] orthodontic moved teeth. Wait for at LEAST one month, prefer longer, or until enough time has lapsed on the fixture, and then make the crown as usual. Be sure to have a retainer in place during the lab time to make the crown. After seating, a new clear retainer is made to fit the arch with the new crown.

130. Explain the treatment effect of using vertical elastics and/or chain on 018ss finishing wire. How is 18x25N different?

Chain applies a force ‘back’ at the level of the crown, resulting in TIPPING of the crown back as the spaces close, and even if there are no spaces to close. Round wire has NO retraction limit, so the teeth can freely tip and continue tipping (detorquing) until the chain force is stopped and lacing used. With 18x25N, there is a retraction limit, just a little more retroclined than the 19x25 retraction limits, so noticeable detorquing is not seen with that archwire.

Vertical elastics apply an extrusive force away from the center of the tooth (pulp chamber) and therefore detorque the crowns (crowns move lingual), as far as the occlusion with the opposing arch allows. With 018ss archwire, there is no retraction limit to stop this from happening and continuing as long as the forces are used, so it is only the cortical bone on the buccal and lingual that resist the tipping lingual. With 18x25N, there is a retraction limit, although exactly where is unknown, there is a limit to how much detorquing or lingual inclination can result from the use of vertical elastics.

131. Describe “progressive deband” and how it is done in adult patients. What problems can you have with this procedure?

Remove as many bands as possible, especially at least one band in spaces where there are two bands. Use chain activated “passive + 1 module” to close the space over a 2-week period before debanding the entire arch. (Active) Ligature wire lacing can also be used to close the spaces with those feeling more competent with this skill. Sometimes the spacing is so critical (crowns would be need to be replaced if there is a residual space in retention), that you may want to change to bonded brackets to close this band space before removing the brackets.

The problem can be rotation of the molar or even total arch distortion from the use of the chain, since the [finishing] archwire is not stiff enough to support the force, especially when you increase the interbracket distance by removing bands.
132. What should you do when the patient is aware of the dental midlines (not being coincident)?
   a) Take a frontal cephalometric to “check for skeletal asymmetry”
   b) Give them an anterior cross elastic to fix it. (responsibility shifted to the patient)
   c) Do whatever you can to correct the midline (skew the archwires, etc)
   d) If desperate and everything has been tried and you have an unhappy patient, then use skeletal anchorage to move the midline (section 3 training)

133. How do you fix (reduce) a ‘window’ on upper incisors?
   a) Tip the roots to the mesial
   b) Strip the incisors (heavily) on the mesial, flattening the mesial contours (do not do this on the distal of incisors) and then close the space with chain or active ligature wire lacing.

134. How do you fix (reduce) a “window” on lower incisors?
   Same as on the upper except now you have the option of stripping on the distal contours of the incisors as well as the mesial.