Seminar 10 expectations

Diagnosis

1. **Explain** why the transverse dimensions are so important when doing mandibular advancement surgery? How do you determine if maxillary expansion is needed to accept the advancing mandible?

   When the mandible is advanced, the posterior is wider than the anterior, so more maxillary width is needed to accept the advancing mandible. The upper molar width may have been matching with the bicuspid, which are not as wide as the lower molar width. The upper cuspid width may be constricted RELATIVE to the lower cuspid width when the mandible is advanced, so in general we need to prepare the pre-orthodontic occlusion with some expansion in the upper cusps.

   In POS, we look at the ‘maxillary constriction’ calculation (black calculations tab in IPsoft) to see if the upper and lower molar widths need to be changed, or they will fit together well in the final occlusion. We also hold the study models together in the expected final Antero-posterior position, viewing the upper vs. lower width (transverse dimension).

   If there is maxillary expansion needed, then this may be done in two ways, neither is expansion with the upper archwire or other orthodontic tooth movements (tipping). The first way will be that the surgeon does a ‘segmental osteotomy’ of the upper jaw, positioning the 3-4 pieces of the maxilla to ‘set the teeth’ into the proper relationship. It is important that you do NOT EXPAND with the archwire when this is to be done, as archwire expansion is considered to be unstable in retention, in this case after the surgery.

   The 2nd method of pre-surgical maxillary expansion is to first do a surgical assisted rapid expansion (SARPE) before the [hospital] Le Forte osteotomy. When this is done, you first place a bonded or banded RPE, cemented, and then the surgeon will make the lateral and possibly release the pterygoid plates, followed by you monitoring the expansion of the appliance at the recommended activation schedule (and 25% over-correction).

2. **When should** you expand the upper teeth or upper jaw prior to mandibular advancement surgery and when should the surgeon do this (segmental osteotomy) at surgery?

   Only when the surgeon tells you to expand the upper jaw! He/she will be looking at the transverse dimension, along with others, so any information you can add will be appreciated. The surgeon is the boss on the pre-surgical orthodontic setup, YOU are the one that must deliver that setup to them.

3. **When a surgeon** says to ‘decompensate’ the teeth, what does this mean and how to you do it?

   Decompensate means to incline the teeth to the normal inclination, ‘OVER THE BONE’. If there is too much incisor advancement in the lower arch especially, then you will need to do an extraction pre-surgical ortho setup to decompensate the teeth. Start with the RBT templates
and see where the teeth would be at the ‘dotted lines” the Roth ideal inclination. With this tool, it is really quite easy, “dotted lines, send to the surgeon”.

Note: ‘compensation’ of the incisors to a class II skeletal malocclusion is the upper incisors ‘retroclined’ and the lower incisors ‘proclined’. IN a class III case, the upper incisors compensate to the underlying skeletal class III by being too proclined and the lower incisors too retroclined.

4. **Why should** you know how to make a surgical VTO? Does not the surgeon do this?

   You need to know how to make a surgical VTO for the most common surgical procedures. This not only shows that you seriously considered the surgical option (for legal reasons), but then you can explain to the patient this alternative. SOME patients will choose the orthognathic surgery approach to shorten their treatment time, even if the treatment results are the same.

   The surgeon will be the final decision maker on what surgical procedure will be done to reach the treatment goals, but your input of what YOU see can be a big help in determining the best treatment for your patient.

5. **What is “yaw” of the maxilla**, and how can you identify this? How can “yaw” be corrected?

   Yaw is a ‘twist’ or rotation of the maxilla in the coronal plane. This can be responsible for the upper midline being off to one side (when you have dental symmetry), and can be responsible for more class II/III on one side than the other.

   To find a ‘yaw’ problem of the maxilla, you first need to be thinking that this can exist. **In the past, I used a ‘submental vertex’ x-ray, the cone directing the x-ray ‘up’ from the bottom of the chin. A tracing was made of the condylar heads and fossa and a middle line was drawn on the midpalatal suture. Asymmetry was determined. This was actually quite common in patients suffering from TMD symptoms.**

   **Today, 3D CBCT (cone beam computerized tomography) ‘full face’ scans can be used to identify ‘yaw’. The only way to correct ‘yaw’ is through surgical correction.**

6. **Explain what** the main diagnostic criteria that determines if upper or lower [skeletal anchorage] intrusion is most appropriate for a given case. When do you need to intrude ‘both’ upper and lower?

   The upper resting lip to the UPPER incisor ‘incisal edge’ photograph or lateral cephalometric x-ray photograph with the lips at rest. On the lateral cephalogram, we measure ‘stomion to incision’, but this can be inaccurate if the technician asks the patient to close their lips before taking the x-ray. **This is also part of our initial clinical exam in the classification II tab of iPsoft.**

   **The upper lip demands support by the upper teeth, as evidenced by the look of a patient who removes their upper denture. You do not want any part of that look!! This means that the upper incisors can NOT be intruded, even if there is gingival display, if the upper incisor is at a normal vertical relation to the resting upper lip (1-3mm incisor showing). If the upper incisor can NOT be intruded in a [skeletal and] dental deep bite case, then the lower incisor is the focus. If the upper incisor can be intruded, but not enough to make the needed difference, then both upper and lower incisors (actually all the anterior teeth) need to be intruded.**
7. **What is the** “skeletal open bite” limit for skeletal anchorage distalization of an upper arch, or is it the same rule as with orthodontic distalization (don’t distalize in skeletal open bite cases)?

When using skeletal anchorage to distalize the upper arch of teeth, the line of force is “up and back”, making distalization successful in higher angle cases. In the treatment plans, I wrote FMA 35 degrees as the limit for zygoma buttress distalization, but it can be almost unlimited if you add posterior intrusion, multiple coils (section 4) from the zygoma.

Skeletal anchorage in g6 section 4 can be used to distalize (and intrude) the upper arch following extraction of upper 7s or 6s, or even distalizing the entire upper arch after (only) extracting the upper 8s.

Orthodontic only limitations of distalization will remain as “don’t distalize in skeletal open bite cases”, defined as FMA 28 degrees or more. Our experience in those types of cases is that the,

a) Bite opens in the anterior
b) The molar may not distalize, and if you think it did, it will likely relapse

c) Treatment times are generally [too] long and the results are often less then totally effective.

8. **When and how** do you determine to use piriform rim (between 2/3 roots) vs. distal to the cuspid location for intrusion?

The difference in the two locations is the line of force, with distal to the cuspid intruding the upper anterior ‘up and back’ and piriform rim intruding ‘straight up’. If you have a class I non extraction case with maxillary vertical excess, you will want to apply the force from the piriform rim. If you have a mild class II case, then distal to the cuspid is more favorable.

The quality of the bone (determined at surgery) can also be a determining factor of which location you can use. In many cases, distal to the cuspid has a more favorable line of force, but the bone is often thin (and maxillary sinus behind), which would lead to more frequent screw failure.

Screw retention can be improved by using multiple screw (T or Y) bone plates with multiple screws either from the distal to cuspid location or extending from the zygoma or lateral piriform rim. Attention should also be directed to the inferior orbital nerve as pressure from retraction can cause a temporary parasthesia (which always returns says Grant McGann) that can panic the patient and operator. This risk is not present with the piriform rim location until you get lateral and high.

9. **Explain how intrusion** of upper incisors can reduce the need for upper lingual corticotomy.

Due to the shape of the palate being ‘triangular’ at the top of the alveolus, intruding the upper incisor into that ‘wider’ space will enable more tooth retraction withOUT the root apex encroaching on the cortical bone layer, thus maintaining moderate skeletal resistance (no corticotomy) instead of severe skeletal resistance that needs a corticotomy since the apex is in the cortical bone layer.

10. **What skeletal anchorage location(s)** can be used when headgear and open coil does not work?

How much force should be applied?

There are two locations that can be used for applying force to an upper molar, the zygomatic buttress and the palate (TAD). Both locations are attached to the ‘basal bone’ of the maxilla, so the tooth movement resulting from the force will be dento-alveolar (distalization). Both have a line
of force of ‘up and back’ although the zygoma buttress location has more options for planning and changing the line of force. 150 grams per side (and less) have been shown to be efficient in distalizing the upper arch.

A third application can be used, an open coil to a 17x25 segmental wire in the PIG auxiliary tube. This would be supported by zygoma ligation to the 17x25 helix. The line of force is then ‘straight back’ on the upper molars. 150 grams or less (+2mm activation of a 10mm nitie open coil) would be the force applied.

These locations differ from headgear since there is not the distalization force on the MAXILLARY bone. All of these skeletal anchorage forces are supported by the maxillary bone and there is actually a forward force being applied.

11. **Explain how** cortical bone remodeling changes with the magnitude of force applied.

   Case 783, shown in this seminar, was the first case where McGann found the best force for distalization, and then later for bone remodeling. Another case, case 1018 was the first bone remodeling case found by McGann, a major remodeling of the mandibular symphysis. In case 783, a force of 250 grams was applied through nitie closed coils (important since the force is standardized) to the upper 3s, an attempt to distalize 3-5-6-7 in the upper arch. This did NOT result in visible tooth movement. The forces were then REDUCED to 150 grams per side and this resulted in visible tooth movement.

   200 grams and less force were applied in the same case to retract the upper incisors, and this resulted in bone remodeling. It was the skeletal anchorage and nitie closed coil standardized activations that allowed this discovery to be made.

12. **If you want** to distalize the upper arch, how much force should be applied? What happens if you apply 2x the force.

   150 grams per side attached to the KH loops works well. If you place 2x the force, tooth movement will ‘stop’.

13. **Describe how** to identify an occlusal plane cant on a frontal cephal, the smile photo, and the options for correction.

   The Frontal cephal should be considered the first source of identification, although a clever diagnostician will see occlusal plane cants at the first clinical exam. On the frontal cephal, the ‘occlusal plane’ drawn between the molars should be perpendicular to the sagittal plane, and when there is at least 2-3 degrees difference, a cant will start to be visually noticeable. At the clinical exam, the amount of gingival tissue right vs. left can be a tip that there is a plane cant.

   The additional photo record of a tongue blade inserted between the teeth, compared with the place passing through the pupils of the eyes, can be used as further documentation of the occlusal plane cant.

   The options for correction include:
   1. Maxillary surgery, Le Forte 1 osteotomy, impact one side more than the other.
   2. Skeletal anchorage intrusion of one side. This may also need vertical elastics “after suspension” of the intrusion to close the bite.
14. Explain how a frontal cephalometric (ceph) can be used to document dental midline asymmetry.

The sagittal plane, Nasion perpendicular to the zygoma plane and usually referenced to ANS, will give a nice representation of the dental midlines as well as the skeletal asymmetries. The dental midlines should be coincident with the sagittal plane of the skeleton as well as the ‘face’.

If a patient is complaining of a dental midline, one of your first defenses can be taking a frontal cephalometric to identify if there is a skeletal problem (yaw).

15. Explain how a crushing bone defect from traumatic loss of teeth can be restored with orthodontics.

A tooth can be moved into the defect, remodeling the cortical bone, in the process rebuilding the ridge. This amazingly can happen even with a ‘crush’ defect. Remodeling of cortical bone should be done with ‘low’ force (not heavy). 150 grams and less, and this may take a longer treatment time due to the cortical bone that needs to be remodeled.

16. Explain how a constricted ridge (traumatic extraction) can be closed by orthodontics with teeth that are wider than the [lower] ridge? What characteristics do you look for?

Cortical bone remodeling has to be the method as the tooth moves into an area of bone that would not support this width. Tooth movement can be expected to be slower and will be most efficient with ‘low’ force (150 grams or less) since it is cortical bone that is being remodeled to allow the tooth movement.

The archwires also must be the same shape and size as the dental arch to guide the teeth into the defect. Using expanded archwires will force the teeth laterally and space closure will be ineffective or impossible.

A “crease” in the gingival tissue will identify most extraction spaces that are closed as the peristeum and gingival tissue is ‘bunched together’ during space closure. In a constricted ridge, the crease will be even more noticeable.

17. Explain how a central incisor can be moved across the midline to the other side of the midpalatal suture.

With low force generated by a nitie open coil or closed coil [supported by skeletal anchorage], a central incisor CAN be moved across the midpalatal suture successfully. Exactly what happens to the fibers is still a subject of investigation, but it is possible and it happens.

18. What is the main risk of providing orthodontic treatment with a tooth that has been previously fractured or avulsed due to trauma.

Total and complete ‘external’ resorption of the root with loss of the tooth. NOT on all teeth, but on some, and if you have this happen to you, it is best to have it documented in the informed consent specific for this case.

The second problem, which can be just as much a problem, is ANKYLOSIS of the tooth. Then ALL the other teeth move to the ankylosed tooth, likely making your treatment goals impossible.
19. **Why is zygomatic buttress** skeletal anchorage considered a ‘section 4’ procedure?

   The line of force calculations are more complicated when applying force from the zygomatic buttress. The teeth are moving ‘up and back’ in variable amounts, so the planning is more complicated as some cases need more ‘up’ than ‘back’ and others need “back”, not “up”. Then it is more complicated surgery and application of the forces to get the intended tooth movements.

   Finally, if something goes wrong, like a bone plate fails, the consequences (upper midline shift, occlusal plane cant) can be more difficult to recover from.

   Zygoma ligation, simply ligating to an upper molar or cuspid for anchorage or growth management is considered “easy” section 3 procedures. The addition of the active force is where the line is drawn.

20. **Easy skeletal anchorage**: what is easy?

   Easy can be ‘easy’ surgery, but more importantly, it is a procedure that does not have severe consequences if something goes wrong. The complications are less severe and can be easily managed. The orthodontics associated with the skeletal anchorage position are not complicated.

21. **Why is a bone plate**, designed for oral surgery use, preferred over a “TAD” (temporary anchorage device) which usually refers to a product designed for orthodontic use?

   The bone plate is preferred since you can
   a) use multiple screws,
   b) apply more force,
   c) direct the line of force,
   d) place in areas where the bone is better
   e) fits closer to the anatomy of the bone
   f) is cheaper

22. **Where are TADs** or Ortho Anchors usually placed in the McGann system of skeletal anchorage?

   I have found good success placing an Ortho anchor in the following locations, since line of force is lot a major issue and there is good bone support. I do not follow the rule of only placing the tads in attached gingiva. When placing tads between teeth, expect a 50% failure rate, no matter which screw you use.

   a) Distal to the lower molars to stabilize these teeth
   b) Double cortical plate in the zygomatic buttress
   c) Palate
   d) Lower anterior
   e) Between teeth in attached gingiva
23. **Why and when** is a soft tissue [biopsy] punch needed when placing an ortho anchor?

When placing palatal skeletal anchors (TAD) in the palate or attached gingiva, a tissue punch is needed to open a ‘hole’ to make the pilot hole and to insert the head of the screw. It is best to insert the head of the screw all the way down to the bone, especially in the palate, to avoid ‘jiggling’ the screw with the tongue, food, or tooth brushing, resulting in more screw failure. A 2mm diameter tissue punch is what you need for the head of the ortho anchor.

24. **Explain the methods** to determine where the roots are located when placing a TAD between the roots of the teeth?

Aiming the ‘dart’ is NOT a reliable way to determine where the screw should be placed between roots. The risk is then high that you may put the screw into a tooth! The tooth will not be lost, but the screw will fall out. Using a perio probe to determine the ‘triangle’ where the crowns diverge, making a “dent” in the tissue with the probe, is a good method, although confirmation using some kind of metal marker is a good idea before drilling a pilot hole (into a tooth).

25. **Why are tads** recommended to be placed into the gingival tissue and not the mucosa? What modification in placing the screw do you use if there is a small band of attached gingiva?

Because the movement of the muscles will supposedly cause failure of the TAD and irritation to the tissue. If there is a small band of attached gingiva, then you must ‘angle’ the pilot hole and screw apically to reach the [crestal] bone. **note that the cortical bone is the least thickness at the crest, and the screw will likely fail. I also believe that there are two kinds of cortical bone…the cortical bone surrounding the teeth (that resorbs when you remove the teeth), which is less dense than the cortical bone of the skull (basal bone of the mandible and maxilla—zygomatic buttress). Note: soft tissue will NOT support orthodontic forces. Cancellous bone will NOT support orthodontic forces. ONLY cortical bone will, so the thickness and density of the cortical bone is critical to skeletal anchorage success.

26. **Why do you need** to reflect a soft tissue flap when placing bone plates or even TADs?

To determine the thickness and density of the cortical bone AND of course to SEE what you are doing. Small flap, small surgeon is the saying. No flap...not sure what that is....an orthodontist?

27. **Why should you** make a pilot hole before placing a screw in the cortical bone

   a) To reduce screw fracture
   b) To stabilize the screw when starting to thread
   c) For better accuracy finding the exact screw location
   d) To reduce crushing of the bone as the screw is inserted into the bone
   e) To determine how thick and dense the bone is. Minimum 1mm cortical bone or move to another location, when possible. If not possible, consider a different bone plate with multiple screws.
28. **What happens** when the pilot hole is not drilled DEEP ENOUGH and the bone is dense?

   *It becomes very difficult to advance the screw into the bone and the screw head may fracture from the screw. It is essentially impossible to remove the fractured part of the screw from the bone. This feels the same as screwing into a tooth (e.g. Impacted third molar), and adds a lot of uncertainty to the procedure.*

29. **When should** you use a 7.5mm screw instead of a 6mm screw?

   *When you are trying to engage double cortical plate in the zygomatic buttress should you use the 7.5mm screw as the FIRST screw (6mm on any others). The purpose of the longer screw is to engage the double cortical bone. In the palate, an 8mm screw may also be used, but is probably not needed since palatal bone is not as thick as you imagine.*

   *On all screws, remember that the last millimeter does NOT COUNT, as this is the self drilling feature of the screw, it is tapered and provides no retention.*

30. **When can** you use a 4.5mm screw?

   *In my way of thinking, the cancellous bone does NOT retain the screw, only the cortical bone layer does. The bone plates we use are called “compression” plates, the screws are holding the plate tightly against the bone. There is maybe 1/2mm of thickness of the screw that is consumed by the bone plate (it is beveled for the head of the screw), and the last 1-1.5mm of the screw is tapered for the self drilling. That leaves about 3mm of screw threads in a 4.5mm screw to secure to the cortical bone. These can be used in many places, since it is rare for us to have more than 3mm of cortical bone thickness. The minimum I like to have is 1mm thickness of cortical bone. But, the 6mm screw makes us feel better that there is nothing left for chance, so this is our ‘standard’.*

31. **What is the difference** between a ‘self drilling” and a “self tapping” screw? What do we use and why?

   *A self tapping screw needs to have a pilot hole drilled first, the screw then ‘treads’ as it is seated. A self drilling screw can be placed without a pilot hole, simply screwing the screw into the bone directly.*

   *We use self drilling screws, BUT with a pilot hole of smaller dimensions to get it started, and to prevent fracture of the screw during placement. Also, you will have more screws ‘fall off’ the screwdriver when you try to place the screw without a pilot hole.*

32. **What is** the diameter of screw we use and what size of pilot hole do we drill?

   *1.5mm. The pilot hole drill is 0.8mm diameter, which probably makes a larger hole than that. I also had a 1.1mm drill specially made by Ace for placement of screws in the lower buccal vestibule, where the bone is especially thick and dense. This may also be used in some zygoma locations where the bone is very dense and thick.*

33. **Explain HOW** to pick-up a screw from the block so that it will not fall off the driver as you pass from assistant to operator and when you place pressure to start the threads
Load screws from the block ONLY. NOT from the packaging. Holding the back of the driver handle in your palm, put pressure on the screw head with the driver as you twist...sometimes you will feel a click as the driver head locks into the screw head (feature of these screws made for McGann). Pull the screw out of the block and check for it being ‘straight’ and secure.

34. **If a screw is at an angle** on the screwdriver after “pickup”, what should the assistant do?
   Replace the screw into the block and pick it up again, putting pressure on the driver with the palm and turning the driver.

35. **What flap design(s) should be used to gain access for placing zygoma buttress plates and TADs?**
   There are two flap designs that we use for this location, an “L flap” or a “horizontal” flap. The L flap starts with a vertical incision just anterior to the zygoma, followed by a horizontal incision extending posterior at the mucogingival junction. The corner of the flap, which is about the first molar, is raised with a periosteal elevator, full thickness. This is easy and has excellent visibility with very little ‘stretch’ of the soft tissue. Closure is with 1-2 intermittent sutures (silk 4-0).

   The horizontal flap is simply an incision at the mucogingival junction (Grant leaves a little mucosa for easier closure), extending anterior to about the 2nd bicuspid and posterior to the tuberosity. The full thickness flap is then raised and retracted with elevators and retractors. There is usually more stretch and less visibility with this flap design. Closure is with 3-4 intermittent sutures, some will use a mattress continuous suture (like me).

36. **What flap design(s) should be used for placing piriform rim bone plates?** Where does the periosteal elevator or retractor rest to retract the tissue during screw placement?
   A vertical incision from the mucogingival junction to a location superior enough to give access to the piriform rim can be used...two periosteal elevators spread the vertical incision, BUT I do NOT like this access as you really do not know how far to extend the incision and a lot of muscle is cut (bleeding).

   A horizontal incision, at the mucogingival junction, extending from the central incisor to distal of the cuspid. Full thickness flap is raised with a periosteal elevator...do NOT be shy...get all the muscles off the bone to the rim and even a little onto ANS (anterior nasal spine) if you want to improve gingival display (after surgery they raise the lip less).

   The periosteal elevator strips the periosteum until it falls over the top of the piriform rim (nose), and then the tip of the elevator rests on the top of the rim and raises the tissue. If you pinch the nasal tubernates (soft tissue lining the nose), then they will feel pain, as this innervation is not on the inferior orbital nerve nor infiltration.

37. **What flap design(s) should be used to gain access to place ‘distal to the cuspid’ bone plates?**
   Horizontal incision at the mucogingival junction starting at the lateral incisor and extending to about the 2nd bicuspid...raise full thickness flap. There is NOT a good place to rest the elevator in this location, so be careful NOT to put pressure on the infra-orbital nerve or you will get a temporary parasthesia. It may be best to rest one elevator on the piriform rim and then a 2nd
elevator to extend posterior to gain access. Closure is with intermittent sutures at the mucogingival junction.

38. **What flap design(s)** should be used when placing lower anterior bone plates?

   You can use a horizontal incision at the mucogingival junction extending from cuspid to cuspid (distal to the cusps) when placing bilateral bone plates. This gives good access. Some feel that healing can create a pull on the attached gingiva, leading to recession, but I have not experienced this.

   A vertical incision is actually my favorite. Starting at the mucogingival junction, between the 2-3 teeth, make a vertical extending about 1 cm inferior, then take 2 periosteal elevators to ‘spread open’ the incision so you can access the bone below the tooth. There is nothing to ‘hit’ in this area except maybe a tooth root, so more access than this is not really needed. Closure can be NOTHING if you wish…the mucosa will simply heal over the top of the spring and wires. 1 silk suture could be placed to make sure the patient returns for post-operative visit in 1 week, but do not be surprised if the suture has fallen out by its own.

39. **What flap design** should be used when placing skeletal anchors in the buccal vestibule distal to lower molars.

   Similar to what you would use to extract a lower third molar. Start on the distal buccal line angle and make a small vertical incision, then extend the incision at the mucogingival junction forward to about the first molar. Reflect the full thickness flap laterally, staying under the periosteum (avoid buccal nerve). Closure can be one suture at the distal of the molar. Flap tension is usually very little in this area, so this surgery is generally quite easy.

40. **What safety measure** can you use to prevent a screw from falling off the screwdriver and into the mouth?

   Thread a 012 ligature through the ortho anchor screw head or bone plate (pass bone plate with the screw) and hold onto the end of this ligature (same hand as is holding the driver) when passing.

41. **What complications** can you have when using Ortho Anchors placed in the attached gingiva between the teeth?

   a) Root damage  
   b) screw fracture (screwing into a tooth results in fracture),  
   c) screw failure (frequent),  
   d) the screw extends past the cortical bone and gets in the way of tooth movement  
   e) line of force problems. The force is directed at the wrong angle, causing unwanted vertical changes such as canting of the occlusal plane

42. **What does it feel like** when you contact a tooth when placing a bone screw? What should you do when you feel this?
The screw becomes very difficult to advance, sometimes stripping the threads of the screw head. You should remove the screw, reevaluate the position, possibly redrill the pilot hole (or a new one in a different location, and try again. The patient may also feel pain.

43. **What happens** to the screw when it is placed adjacent to or into a tooth? What happens with the tooth?

The screw becomes loose, as the tooth is jiggling the screw during mastication and it fails (falls out). There is no consequence to the tooth, although in a severe case of root penetration, endodontic treatment may become necessary.

44. **Why do** screws fracture? What modification can you do to prevent fracture?

The force applied to the screw exceeds the specifications of the metallurgy of the screw. The best modification to reduce fracture is to use a pilot hole of sufficient size to match the density of the cortical bone. OR, buy a more expensive screw (eg. KLS).

45. **What is a ‘spinner’** and why must this be removed at surgery?

A screw that is ‘loose’ at surgery is called a spinner. The body will reject anything loose, so the screw must be removed and replaced with a ‘recovery screw’ of wider diameter or the bone plate moved to a new location. The most common reason for spinners is poor bone quality. The second is the operator continuing to turn the driver after the screw is fully seated, stripping the threads.

46. **Describe** the concept of “double cortical plate” in the zygoma buttress.

The intersection of the lateral zygomatic buttress meets with the floor of the sinus in an area that I call the double cortical bone. This is usually at the transition between vertical and horizontal on the infra-zygoma. Inferior of this junction is the alveolar process that houses the teeth. Lateral to this junction is the basal bone of the maxilla. The double cortical bone layers (or simply thick cortical bone) is found at this intersection.  
**Note:** when placing zygoma ligation for growth management, the screw must be in the basal bone of the maxilla...lateral to this junction, OR in double cortical bone.

47. **What methods** can we use to identify double cortical bone in the zygomatic buttress?

The Frontal ceph will show this double cortical bone intersection, and then you can reference the vertical vs. horizontal anatomy for your surgical reference. The frontal ceph is required in POS for placing zygoma bone screws for reason of referencing the anatomy and pre-surgical planning.

48. What is zygoma ligation, and what is it used for?

Zygoma ligation is a screw (ortho anchor or 2 hole bone plate) placed into the maxilla (basal bone), with a twisted steel ligature tie extended to the teeth (bicuspids, cuspid, or lateral incisor) during a period of growth to STOP the forward movement of the molars and upper teeth. This growth management method results in correction of class II dental.
Without zygoma ligation, the upper teeth drift forward, relative to the maxilla, following the extra differential horizontal growth of the mandible. This is why without treatment, “once a class II, always a class II”.

49. **Describe how** to place zygoma ligation. Flap design, screw length, anatomy location, type ligature and method. Why is this a section 3 skeletal anchorage procedure?

   *Study the frontal cephalometric view to locate the double cortical plate, if this exists, looking to see where this is relative to the vertical and horizontal portions of the alveolar bone and zygoma. After local anesthesia, palpate the anterior zygoma anatomy, using as a reference the first molar.*

   *Make a vertical incision from the mucogingival line on the mesial of the zygoma extending maybe 1cm, just above the ‘bridge’ of the infra-zygoma. Make a second incision at the mucogingival junction extending posterior from the vertical incision. Ride the 15 blade firmly on the bone to make a clean separation of the periosteum.*

   *With a periosteal elevator, insert into the incision to the bone and reflect a full thickness flap, exposing the infra-zygoma area. Identify the horizontal and vertical transition and referencing where you previously decided to make the pilot hole. Holding the drill at approximately a 45 degree angle to vertical, drill the 0.8mm pilot hole the full depth of the drill. The pilot drill is held with a slow speed with contra-angle latch type extension. As you are drilling the pilot hole, be aware of the thickness and density of the cortical bone and if you felt only 1 or 2 cortical plates during the drilling process. If there is thin plate, and only 1 layer, then move posterior (anterior usually has maxillary sinus) and try again.*

   *Confident that you have the best cortical plate to secure the screw, place the 7.5mm screw in a 2 hole bone plate, into the pilot hole, securing the screw, but not over-tightening. A curette may be helpful to keep the bone plate directed towards the tooth location you wish to ligate. Secure the twisted 012 ligature to the bracket base, lateral incisor, cuspid or first bicuspid.*

   *Close with a 1-3 intermittent 4-0 silk sutures and hold pressure with a wet gauze to secure the flap and stop any bleeding. Give normal post operative instructions for surgery.*
This is a section 3 skeletal anchorage (easy) because there is NOT an active coil applying force up and back at an angle to the occlusal plane, and without the complications of midline and occlusal plane cants if one side fails.

50. **Describe the anatomy** of the zygomatic process and where the screws and bone plates should be placed, including what structures you need to avoid more posterior or superior.

The zygomatic process is an extension of bone that forms the cheekbones of the face. Laterally, we place the “zygoma points” on the frontal cephalogram. About 2/3 on the lateral extension from the alveolar bone and teeth, is the zygomatic-maxillary suture, but it would be rare for us to reflect the tissue that far laterally, and it is not a problem screwing into the suture if you did. Posterior to the zygomatic process is the buccal fat pad, which is again not a problem if you happen to get into that. Staying under the periosteum avoids most of the problems in surgery, so just follow that rule. Superior and medial you will find the infra-orbital nerve, which can be traumatized to create temporary LIP paraesthesia from the central incisor to distal of the cuspid. This ‘always’ goes away and should be gone within a few days. Otherwise, there are no arteries, no nerves that can be damaged, and placing a screw into the maxillary sinus is not considered bad form.
51. **Describe the anatomy** of the piriform including where the good bone is located. What is happening if the patient has pain in this area?

*On the ‘rim’ of the nose is thicker bone that is favorable for skeletal anchorage. More inferior to this the bone is thinner and is alveolar bone that is less favorable to support skeletal anchors.*
floor of the nose has a soft tissue lining, the tubernates, that have different innervations than the bone, so the patient will feel pain if this tissue is ‘pinched’ with the elevator or penetrated with the pilot drill.

52. **What is the problem** with placing bone plates distal to the cuspids? How can this be solved?

The problem is thinner bone, but the line of force is favorable for many cases. This can be solved by using Bone plates with multiple screws or extend a bone plate from the zygoma or lateral piriform rim.

53. **When is 17x25ss tie-back** to the zygoma used to stabilize upper molars?

   a) **When the patient cannot tolerate the TPA**
   
   b) **When you cannot ligate to the 5 bracket base and you need to stabilize the molar (extracted 5s).** The position of the bone plate is vertical to the molar being stabilized, so you need an extension to “tie-back”.
   
   c) **Maximum anchorage planning.**

54. **How is zygoma 17x25 ligation different than using a TPA?**

   The molar can be stabilized 100% by this method, which is not really true of TPA. Some patients cannot tolerate the palatal bar, especially ‘gaggers’ or some adults that have a job where they speak for a living (eg. Attorneys, orthodontic lecturers!) so this is an alternative to the palatal bar.
17x25 ligation does NOT manage the width of the arch, nor does it control the torque of the molar, as in molar intrusion (skeletal anchorage) mechanics. 17x25 ligation is good for ‘anterior-posterior” anchorage management only.

55. How can an occlusal plane cant be corrected with skeletal anchorage?

Occlusal plane cants can result from:
1. Brackets at a different height right vs. left
2. Uprighting a tipped molar on one side
3. Unilateral mechanics, especially if skeletal anchorage (TADs) with a vertical vector of force
4. Failed bone plates where one side becomes inactive and the other side continues [intrusion].

Correction of the cant is usually done by,
   a) Repositioning brackets
   b) Unilateral intrusion with skeletal anchorage
   c) Disabling the coil (from skeletal anchorage) that is out-performing the opposite side.

56. How can you prevent and treat dental open bite from unilateral intrusion of the maxilla for occlusal plane cant correction?

Suspend the [unilateral] intrusion and then use vertical elastics to move the lower teeth to the upper, closing the dental open bite.

57. Explain the difference between “direct” and “indirect” application of forces to skeletal anchorage.

Direct skeletal anchorage is when the force is applied directly from the bone plate or TAD to the teeth. Indirect skeletal anchorage is when the bone plate or TAD is ligated to a tooth, which then supports the force. Indirect is used by many since they have had problems with (TADs) supporting direct forces and the compounding problems of incorrect line of force.

58. Explain how to plan the initial activation of the intrusion coil at surgery and then the reactivation schedule.

Turn the grid on the skeletal anchorage modified lateral ceph (or better the ceph vto), to quantify the mm of intrusion (or tooth movement). After determining the desired force (eg. 150 grams) the coil length to be used (6,9,12mm) is then the initial activation at surgery (eg. 2,3,5mm respectively for 150 grams). The reactivation of the coil is then +2mm every 8 weeks, assuming 1mm of tooth movement per month, until the desired tooth movement is reached. Then the coil is deactivated and suspended (if intrusion).
59. **Explain the difference in range of activation** and why it is so important to get ‘distance’ between the bone plate and the teeth where the coil attaches.

   *Shorter coils have shorter ranges of activation.* A 6mm nitie closed coil is activated +2mm for 150 grams of force, so after 1mm, the coil force is only 50 grams, which may not be enough to move the teeth (or at least will be very slow). So the range of tooth movement with a 6mm coil maybe said to be 1mm at 150 grams.

   *Longer coils have longer ranges of activation.* In the above 150 gram example, a 12mm coil is activated +5mm and can result in 4mm of tooth movement before it must be reactivated. We usually do not wait that long, but in an 8 week appointment interval, the 12mm coil may move the teeth 2x (2mm) the 6mm coil (1mm).

60. **What is the typical rate** of tooth movement with skeletal anchorage?

   1mm per month, and with skeletal anchorage, the FULL tooth movement is on the side of the coil you want to move. Coils (and elastics) pull from both sides, and with dental anchorage, we often only want 1 side to move, not the other side of the coil/elastic. In skeletal anchorage, one side (bone plate or tad) does NOT move, and the full tooth movement is from the desired side.

   1mm per month in dental movement, eg. Closed coil 6-KH, usually refers to BOTH sides moving, the molar half and the incisors half.

61. **If a zygoma** buttress coil fails (one side only), what problems can arise?

   *Since the force is pulling ‘up and back’, a horizontal and vertical vector, the occlusal plane will cant to the active side and the midline will shift to the active side.* Bite opening may also result since the inactive side stays in occlusion as the active side continues to intrude. This is one of the reasons why zygoma skeletal anchorage is considered section 4 type skeletal anchorage.
It should be noted that failed bone plates are NOT always immediately seen at chairside, and are not always obvious until unwanted tooth movement happens. Patients also do not always report a loose plate or screw, and do not always return at their appointed date.

62. **How can you “SEE” LOOSE bone plates and screws at chairside?**

   The best way is to look at the coils right and left to be sure they ‘look the same’. If one side looks like a ‘spring’ and the other side the coils are closed, then suspect a failed plate or screw on the ‘closed’ side. Take an x-ray and jiggle the coil to see if something moves. Even then, it is sometimes difficult to identify a loose plate or screw until the teeth have moved the wrong way. This is part of providing this service.

63. **Explain why** anchorage planning (eg. Maximum anchorage) in an upper 4 extraction case changes if you have Differential Horizontal growth (DHG) during treatment.

   LESS upper incisor retraction is needed since the DHG corrects some of the class II. There is less molar anchorage needed, being no longer maximum anchorage, by the amount of the DHG experienced during treatment.

64. **Explain how round wire finishing** can change the final incisor inclination from a 19x25 retraction limit to a more retroclined inclination.

   Round wire does not have a retraction limit, so chain or vertical forces (intermaxillary elastics) are free to retrocline the incisors (and really all the teeth in the arch). Even repositioning a bracket more gingival or stepping down a tooth on the archwire will result in a vertical force on that tooth, changing the inclination.

**IP appliance**

65. **When is La bracket torque used lower cuspids and why?**

   When the crown is positioned to the lingual, alignment can leave the root in the lingual as the crown moves to the dental arch. Labial root torque is then used (with rectangular archwires, of course) to move the root into the dental arch.

   The 2nd use of La bracket torque on lower 3s is when using an expanded archwire. The archwire expands the crown of the cuspid, with the tooth tipping around the crest of the labial cortical bone. In retention, expansion of lower cuspids is considered to be unstable, and is one reason why lower 3x3 retainers are used to maintain the intercanine width. Crowns move over roots is another concept in retention, so a labially tipped cuspid will likely relapse over time with the crown moving lingual [recrowding the incisors].

66. **Explain how to order** the Pig upper 6 band, the dimensions of the auxillary tube, and how to make the 17x25ss segment.

   The upper 6s “pig” variation, a “triple tube” is ordered by checking ‘piggyback (auxillary) archwires” in question 4 of IPsoft (or custom selecting). A 17x25ss ‘straight’
archwire (sold in a tube), is cut from the length of wire and a helix is bent with a light wire plier (very tip to make a tight helix). A stainless steel closed coil is cut a length that you would like to hold the helix away from the molar tube, usually about 10mm. The coil is placed onto the 17x25, against the helix and a ‘toe-in’ bend is made to keep the helix near the gingival tissue (not extending into the cheeks). The 17x25 wire is then inserted into the 18x25 auxillary tube and cinched back to secure the wire. A ligature wire from the zygoma skeletal anchorage is tied to the helix.

Mechanics (including with skeletal anchorage)

67. **How much force** do we want to distalize one molar? Why not more force? How much force does a cervical headgear apply to the molars?

To distalize one molar, 100-150 grams is the most we need for optimal tooth movement. More force will only slow the tooth movement if the PDL is compressed excessively, stopping the exchange of cells, and vascularity. Cervical headgear when applied to the molar is approximately 350 grams for a 12 oz module and 700 grams for a 24 oz module. This is likely too much force! Add to that an open coil + headgear and the molar may not move at all.

** in orthodontics, it is a general principle that LESS force is better! Remember that next time a tooth is not moving as you expect.

68. **What does the PDS nitie OPEN coil look like** when compressed 300 grams and more? Is this a force that you usually want to use when moving teeth? Why or why not. How much reactivation do you get when using a ‘slit stop’?

When the coil is compressed 300+grams it looks like a “snake”, curves within the coil. This is usually much more force than you want to move teeth, even a segment of teeth. 150-200 grams or less is what you usually want to move teeth efficiently. A split stop is 2mm, so 150 grams of activation is realized IF the coil starts passive. If the coil is still compressed to an unknown amount, then there would be at least 200 grams is the force after adding the split stop.
69. **How long ‘should’ it take for 8mm distalization of an upper molar by compressing nitie open coil?**

What might be wrong if it takes 3-4 times that time?

1mm per month or 8 months would be a typical rate of tooth movement. This could be longer due to occlusal resistance (interdigitation with the lower molar) and posterior crowding (7s or 8s in the way of the distalization).

If the distalization is taking too long (eg. 3-4 times as long), then

a) The force is too high (the coil is compressed too much).

b) The distalization is ‘relapsing’ as you are trying to distalize (this happens in skeletal open bite)

c) The force is intermittent (headgear, elastics) instead of continuous (coil).

70. **Does “step 2” nitie closed coils (6-KH, retracting 3-3) result in the same tooth movement as “2 step” retraction (nitie closed coil retraction of the cuspid followed by T loop retraction of the incisors)? why? Is the total time to retract the anterior teeth the same?**

The tooth movement could be considered ‘similar’, but with the “step 2” nitie closed coils to the KH loops, there is more bone remodeling, so more incisor retraction can result with this method. T loop activation is 250 grams at 1mm activation of the vertical legs and 150 grams for 1/2mm activation at the vertical legs. If a loop is activated 1mm, then the first 1/2mm of tooth movement will be 50:50 unless then retraction limit of the incisors is engaged (bodily movement), then the incisor does not retract, the molar moves forward. In the last ½ of tooth movement with the T loop, bone remodeling with incisor retraction will result.

**this is why over-activation of the loop, either by activating more than 1mm OR by reactivating more frequently than the time for the loop to return to its original ‘legs together’ position, will result in less incisor retraction and molar molar advancement.**

The total time of anterior retraction would be similar, depending on the amount of bone remodeling needed. Most would think it logical that the ONE STEP (step 2 6-KH) would be faster.
71. **Why should class II elastics** NOT be placed to T loops that are activated by cinchback?

   The force of the T loop is sufficient on the incisors, and adding MORE force with a class II elastic is only increasing the force on the incisors and slowing tooth movement. Also, the vertical force on the upper incisors as they are being retracted is usually considered unwanted...increasing deep bite and resistance to upper incisor retraction.

72. **How can the line of force** be adjusted when using TADs in the zygomatic buttress?

   By attaching the coil to a specific location on the ‘suspension’ wire. When twisting the 012 ligature, make a loop at the desired location (around a scaler tip) and attach the coil to this loop.

73. **Why is it recommended** that you use a gram gauge when applying closed coils to skeletal anchorage?

   The activation rulers do NOT work to determine nitie closed coil activation in skeletal anchorage, since there is no ‘molar’ to place the end of the activation ruler against. The activation ruler was specifically calibrated for use ONLY with the molar tubes. This leaves using known ‘millimeter’ activations, which is also ok, but in many surgical situations it is even difficult to measure the coil length. The gram gauge assures you that you have the desired coil activation AND THAT THE FORCE IS THE SAME ON BOTH SIDES!!

74. **What tooth movement** is realized by zygoma 17x25 ligation? Why? Is it a problem? What happens with the anterior teeth?
The molar root can be pushed to the distal as the molar crown does not move forward. The molar ligation is likely being used to prevent the molar crown from moving forward, so on the surface this is not a problem. The root tips back because there may be,

a. Flexibility of the 17x25 archwire, applying a force on the tooth as this ‘bend’ is maintained by the ligation

b. Growth in a downward direction that is resisted on the mesial by the ligation.

If the molar crown tips, then the straight archwire engaged in the molar tube also tips, resulting in an ‘intrusion’ force on the archwire and teeth anterior to the molar.

75. How do you upright a mesial inclined lower 7 (or 8)?

First bond a bracket to the tooth so a force can be applied. Preferably on the mesial, but if this is not possible, then the distal, and if not there, the occlusal. The best bonded bracket is the “pe” (partial erupted) bracket since it is small.

A force is then applied to the crown of the mesial inclined tooth, preferably “up and back” but if not ‘up’, then ‘back’ is the most important. Methods to apply this force include,

a) Piggyback nitie,

b) open coil from 6-7 (or 7-8) to push the crown distal

c) tad or bone plate located distal to the molar

Repositioning to a normal bracket position with a continuous archwire with the rest of the arch will eventually be used for the final tooth position.

76. How can you redirect the line of force when retrieving an impacted cuspid?

Use ligature wire lacing from one segment of teeth to the ‘attachment wire’, sliding it on the archwire to one side.
77. **When should an impacted** tooth be referred to a surgeon to bond a button

When the impacted tooth is ‘high’, at the level of the adjacent tooth apices, and is covered by (palatal) bone, and if there is a poor angle to the tooth (e.g., lingual to the central incisors)

78. **Explain why** the best [upper] cuspid bracket torque for a palatal placed cuspid is La torque.

*When the crown erupts into the arch, the root is likely still to the palatal. Therefore, the need for LABIAL ROOT movement (torque). For labial positioned impacted cuspids, the crown will incline lingual from the extrusive force, so an Li torque bracket is needed to move the root lingual.*

79. **How can a lower molar** move distal with a cervical headgear attached to the upper molar?

*Teeth do not move without a force being applied from somewhere. In this example, the only source of that force would be the occlusion with the upper molar that is being pushed ‘down and back’ from the cervical headgear appliance. It is the interdigitation with the molars that transfers the force from the upper molar to the lower molar.*

*In growth management, pushing the lower molar back is not desirable in class II cases. We want the lower molar to drift forward. To prevent the lower molar from distalizing, composite could be bonded to the lower molar (to the level of the cusp tips) to avoid the occlusion with the upper molar.*

80. **Which archwire** should be used for anterior skeletal anchorage intrusion? Why?

*The two things to consider is wire flexibility, amount of the planned intrusion, and the interaction of the archwire and bracket (torque) when selecting the archwire for intrusion.*
For wire flexibility, the minimum wire size that should be used is 18x25N. With this wire, distortion of the wire shape with the force of the coils can result in “unexpected” tooth movements, such as molar extrusion when the incisors are being intruded, or cants of the occlusal plane. Intruding on this wire should be limited to only 2-3mm. NO retracting of anterior teeth of course. 19x25ss is preferred as it does not distort and surprise tooth movements are rare. If the intrusion is more than 3mm, you definitely need to wait until 19x25ss.

For torque, the advancing limit of the bracket will limit the amount of incisor proclination resulting from the vertical force. If the intrusion is small, 2-4mm, then the proclination will likely not be that bad and you can recover this. But if the incisor is either starting in a proclined inclination or you are planning a big intrusion, 5mm or more, then it would be smart to use a bracket with an advancing limit to prevent excess proclination. 19x25 La torque brackets have a Roth ideal inclination for the advancing limit. In an extraction case, you may need to then change to Li bracket torque to retract the incisors AFTER the intrusion is completed.

At one time, I was recommending the use of 020ss archwire for intrusions, since we had one case where the root tip protruded through the labial cortical plate, seen when removing the plate. Another(181,792),(358,977) where ortho fooled us, it was later found out that it was NOT the rectangular wire, and it was NOT a root protruding through the cortical plate, but instead the coil scrapped the bone off of the root….the coil was tight against the bone and was jiggling.

81. **What should you do** if the occlusal plane cants during anterior intrusion?

Disable the closed coil that is performing the best and wait for the other side to catch up. PLUS check to be sure that the ‘lagging’ side does not have a bone plate failure. Take a periapical x-ray and see that the two coils ‘look to have the same’ amount of activation.

82. **During anterior intrusion**, the incisors procline to where? What does the Li advancing limit look like?

The advancing limit of the bracket/archwire combination is how far an incisor can procline as a result of the vertical force from a coil. The Li bracket has a very proclined advancing limit, since this bracket is designed for incisor retraction. The upper incisor in the picture below is at the Li advancing limit.

83. **Explain auto-rotation** of the mandible and how this happens during skeletal anchorage intrusion (but not in traditional ortho).
As the upper incisors and molars intrude, the mandible will move ‘up and forward’ as the lower teeth maintain occlusion with the upper teeth, the bite is closing, and the occlusal plane is changing in a counterclockwise direction. If you ONLY intrude the incisors, the archwire attached to the molars may also intrude the molars, but if you truly want auto-rotation, then the molars must be intruded also. (multiple coils = section 4).

As the mandible auto-rotates, the rotation creates more class III (less class II) and the chin button ‘gets larger’, gets more prominent is a better term since the chin button does not get any bigger, it simply is repositioned.

Auto-rotation is essentially impossible or improbable with traditional orthodontics. Tooth movements universally open bite bite, causing more class II, as the mandible ‘swings open’, and the occlusal plane rotates clockwise.

84. **What can happen** with asymmetric suspension and class II elastics?

The Vertical force from the elastic extrudes the side not suspended, but not the suspended side, resulting in an occlusal plane cant.

85. **What happens if** you use class II elastics or vertical elastics AFTER removing suspension that is retaining a previous intrusion?

Extrusion of the teeth previous intruded resulting in the return of gingival display or deep bite, and possibly canting of the occlusal plane with asymmetric gingival display. Moral, it is best to maintain the bone plates with suspension until the brackets are fully removed. You never know when you might add a vertical elastic or class II elastic during finishing.

86. **Explain how Lower lip** contours can be influenced by the upper incisor.

The upper incisor can be positioned BEHIND the lower incisor making the lower lip protrude more than if the lower incisor was supporting the lower lip. The upper incisor can also push down the lower lip, deepening the sublabial fold, a fairly common occurrence in class II cases with excess overjet.

87. **When should the Orthognathic surgery** be added to the diagnosis documentation in phase I+II cases?
AFTER phase I treatment is complete and new records are taken for a reevaluation of the phase I treatment results and phase II planning. Surgeons will NOT do surgery on a growing patient, so a phase I mixed dentition case is VERY MUCH too early to consider surgery.