Seminar 11 expectations

**Diagnosis:**

1. **What is** the most common feature that makes a mandibular [advancement] surgery case 2 jaws [maxilla also] instead of 1 jaw?
   
   In mandibular advancement and setback, the **transverse dimension** (width upper vs. lower) must be considered. Since orthognathic surgery is done only on non-growing patients, maxillary expansion is not reliably done with orthodontic tooth movement, and any relapse of the expansion after the surgery is done can cause bite opening.
   
   For this reason, surgeons usually want control of the transverse dimension, the orthodontist is instructed NOT to expand the upper arch with archwires, and even the tipping associated with Rapid palatal expansion is not good form before mandibular surgery. In some countries, the surgeon requests SARPE, surgical assisted rapid expansion to be done FIRST, and then the mandibular advancement or setback being done as a second surgical episode after the first has healed (and relapsed). Segmental osteotomy, or cutting the maxilla into 3 pieces to widen the upper jaw surgically is preferred in many practices in America, including that of Grant McGann. The surgeon can then control the width AND the tipping of the buccal segments.
   
   The other common feature is the **VERTICAL**, with the maxilla needing to be impacted to correct vertical maxillary excess and/or change the occlusal plane. By intruding the maxilla, the mandible can be rotated vertically, making for a more prominent chin.

2. **What is** the most common feature that makes a surgery case 3 jaws instead of 2 jaws?
   
   The “3rd jaw” is the chin button. In cases with severe mandibular retrognathism, the mandible sometimes cannot be advanced far enough due to dental limitations The problem cannot be fully corrected and the chin procedure is used to compensate. A genioplasty or chin procedure is then used to make the chin more prominent. IN other cases, where the chin button is too prominent, short, or asymmetric, the surgeon will tip the chin button down or to the side. Advancement of the chin may also be done to improve the airway in sleep apnea patients, since the tongue is attached to the lingual of the chin and when advanced, increases the size of the airway.

3. **What are** the most common complications of orthognathic surgery
   
   Temporary or Permanent paraesthesia of the lower lip (Infra-alveolar nerve) and infections. Swelling is the biggest problem after surgery, NOT pain.

4. **When do** third molars need to be extracted prior to orthognathic surgery and how long do you have to wait after the extractions for the orthognathic surgery?
   
   If the third molar breaks through the tissue, then full closure of the flap after surgery is not possible and there is increased risk of infection. After extracting the third molars, you must wait for 6 months for healing before the orthognathic surgery.

5. **Describe a genioplasty** for a prominent chin.
A saw is used to make a cut on the chin, below the mental nerve. The bone is freed and moved to the planned position and held in place with plates or screws. The freed bone of the chin is tipped down vertically. A bone plate can be used to stabilize the free piece. In this case, a bone implant (proplast) was inserted into the ‘wedge’ and a ligature was used to stabilize the free piece. Proplast is not used anymore, the reasons I do not know. According to Grant, the procedure on the x-ray would not give a very good result due to the short cut, causing a ‘witches chin’ appearance, and sometimes a noticeable ‘step’ on the inferior border.

Note: surgeons do NOT grind off the chin button, as this results in the soft tissue not reattaching. The best is to leave the cortical bone layer and move the section.

6. **What is the main limitation** to mandibular setback surgery? How is that quantified?

Constricting the airway as the tongue is pushed back is the main limitation of mandibular setback surgery. In a severe case, ‘apnea’ can result with the associated negative health issues. The airway volume and minimum dimension can be measured with 3D conebeam CT scans and software. The surgeon must balance the amount of airway constriction by setting back the mandible with the other possibility of maxillary advancement, which is favorable for the airway, in class III surgical treatment.

**Grant McGann, maxillofacial surgeon answer:** Basically look at the face and determine where you want the lower jaw to be. The facial appearance guides treatment. The basic rule is put the patient into Natural head position and draw a vertical line from subnasale also called the TVL or true vertical line. In men you want pogonion to be at or 2 mm in front of that line. In women you want the chin to be at or 2mm behind the line. The airway is also a consideration when doing mandibular setbacks as you can impinge on the airway. Look at the history for signs of sleep apnea (Epworth Sleep scale daytime sleepiness, snoring and witnessed apneas, morning headaches, nocturnal urination, sleep fragmentation, high blood pressure, depression, stroke, sleep study AHI > 5 ) and exam neck size greater than 17, mandibular retrusion, large tongue (scalloped), difficulty breathing through nose collapsed nasal valve, Swollen turbinates, overweight BMI >30, Short neck throat length, High palatal arch, large tonsils, long palate, brachyfacial, short face, Mallenpatti score greater than 2, narrow airway on CT scan, collapsed airway on nasal endoscopy during Mueller manuver. Generally people look better with advancements as it stretches the skin and makes people look younger. Most class 3's are maxillary deficient and almost always need advancement of the maxilla. I haven't done a straight setback EVER in my career and it is an old way of thinking about the problem. –Grant
7. **What happens** with the gingival tissue when you ‘intrude’ teeth with skeletal anchorage.

   *It generally follows the tooth intrusion. On the first skeletal anchorage intrusions, we were not sure if the tooth would intrude into the bone, the tissue covering the crown. That proved to be incorrect, fortunately. Palatal tissue can “bunch up” and reduce the amount of tooth showing.*

8. **What happens** with the alveolar bone when you intrude teeth with skeletal anchorage.

   *The bone also follows the tooth intrusion. There is remodeling that leaves the attachment level on the tooth at the same location.*

9. **What happens** with the cortical bone when you retract or advance teeth into the cortical bone layer.

   *If the force is HIGH, the exact amount is not fully defined, the cortical bone will resist tooth movement. In the upper arch, which has thinner cortical bone than the lower, the cortical bone may ‘bend’ or adapt to the ‘pressure’ from the tooth.*

   *If the force is LOW, the exact amount is not fully defined, the cortical bone will ‘remodel’, changing with the tooth movement. The exact mechanism is also uncertain since pressure is supposed to activate osteoclasts to resorb the bone in front of the pressure. But for some reason, the body also provides a mechanism for adding bone in front of the advancing pressure!*  
   Thank you!

10. **How is cortical bone** different than cancellous bone? How does this affect tooth movement?

    *Cortical bone is avascular. Well, there is vascularity, but it is very much less than in the cancellous bone. Less vascularity, and more density of the bone, makes for less exchange of cells and therefore less tooth movement, a biological process.*

    *In the past, we thought that cortical bone was the limitation to orthodontic tooth movement. With that in mind, McGann invented segmental corticotomy to extend the range of tooth movement. Then, in 2010, McGann stumbled onto bone remodeling on overlays of patients that were treated with nitie closed coils and even elastics. Since these nitie closed coil forces were previously standardized, with known force activations and reactivations, a system to utilize bone remodeling to extend tooth movement was possible.*

    *Three ‘exploratory flaps’ were done on patients with known bone remodeling, two on the lower labial and one on the upper lingual. Bone was present over the roots of the teeth and the*
cases were healthy with no gingival stripping 2 years after active treatment. A new era was borne, reducing the need for corticotomy.

11. **How much negative overjet** do you need in the pre-surgical orthodontic setup of a class III case with wits -17?

   A class I Wits is approximately “zero”, so a Wits of -17, which is a millimeter representation of the upper jaw vs. lower jaw antero-posterior position, would mean that the jaws are 17mm from normal. If you fully decompensate the teeth, expect approximately a 17mm negative overjet.

12. **What is the** dental ‘compensation” in class III cases? Class II?

   In class II cases, the teeth ‘compensate’ for the class II skeletal relationship by the upper incisor retroclining and the lower incisor proclining.

   In class III cases, the lower incisor retroclines, “reaching back” for the upper jaw and teeth and the upper incisor proclines, reaching forward for the lower jaw and teeth.

13. **Strain to close** the lips at rest will do what to the appearance of the chin?

   There will be a “peach pit” look from strain of the mentalis muscle pushing ‘up’ and thinning of the soft tissue at pogonion.

   **Note:** The measurement of stomion to incision, the vertical reference to the ‘resting upper lip’ is likely in error (less than reality) when the lips are closed for the lateral cephalometric x-ray. In cases with vertical control (skeletal anchorage intrusion of the anterior teeth) in the treatment plan, a lateral cephalometric x-ray with the lips at rest should also be taken as part of the starting records.

14. **What is a** “you owe me band”?

   A single band that is left on the teeth (at deband) to signify to all other orthodontists that the patient did not fully pay.

15. **When do you need** to use anterior bone plates for minimum anchorage instead of anterior cortical anchorage? How can the anterior cortical anchorage be broken down?

   In theory, anterior anchorage should work 100%, for as far as you want to advance the posterior teeth. But in reality, we know that patients do not always return on time, so the reactivation schedule can be changed, and at chairside we do not always remember to reactivate. PLUS, the mandibular symphysis may change shape even at heavier force than the arbitrary step 2 vs. 3.

   When making the treatment decision of using anterior cortical anchorage for the minimum anchorage needs of the patient, you need to consider all factors of the patient. What consequences there are if the anterior anchorage ‘breaks down’ and the incisors retract, need to be considered along with the thickness of the lingual cortical plate and the number of posterior teeth that need to be advanced. The ‘dots’ will quantify the amount the molars need to be advanced to help you make that decision. I hesitate to put a number on the value of anterior cortical anchorage, but let’s say that you can move 1 molar (extract lower 5s) nearly 100% forward using lower anterior cortical anchorage and the proper forces (step 3 or 4), but if you
are closing a lower 4 space with 7-6-5 moving forward, you might not want to count on more than 4mm without disturbing the anterior tooth position. It is SAFER to use a bone plate and forget it when the anchorage requirements of the anterior teeth are too much.

Dental and Surgical VTO

16. Explain how to get a LINE drawing of both the surgical vto and skeletal anchorage vto to compare side by side. (copy of dental vto, delete start teeth, or Ceph vto, turn off xray)

   Copy the dental vto, which will turn into a ceph with lines for start and final. Put your cursor on the incisors and lips to find the start teeth and then delete with the delete key. Change colors if you want, turn off the x-ray and print or screenshot the remaining line drawing to compare.

   The other method is to make a “ceph vto” by making a copy of the start ceph, moving the incisors to the approximate position you see on the dental vto as you correct for expected final incisor inclination, and then turn off x-ray and print or screenshot.

17. What value is there to making a “ceph vto”?

   The main advantage of a CEPH VTO, is in the ability to correct for the expected final incisor inclinations, which cannot be done on a dental vto nor a copy of the dental vto. After the final incisor inclination has been established, the skeletal resistance is then better represented, and bone remodeling is better represented.

   Section 4 note: There is ALSO better planning for the zygoma line of force on a ceph vto, since there is not an arbitrary intrusion of the incisors and then when making the dental vto, the incisor extrudes again. The line of force can be calculated using the visible incisor on the ceph vs. the final incisor position of the ceph vto.

Mechanics:

18. What happens when vertical elastics are applied to arches with ‘intrusion coils” (or no suspension)?

   Depending on the activation of the coils when the elastics are applied, AND the force applied by the elastic (dependent on the stretch and size of the elastic), the NET force will either extrude or intrude the upper teeth. In the picture below, the net force is likely near zero on the upper arch, possibly favoring the heavy elastics. The lower teeth may extrude to help close the bite.

   **using vertical elastics (to close an open bite from intrusion) withOUT first suspending with 012 ligature, will routinely result in EXTRUSION of the previously intruded upper teeth. If the picture below was without coils, then the upper teeth definitely would extrude. This can be disappointing when there is so much effort to gain the desired intrusion, just to lose it later.
19. **What happens** when you retract previously intruded [upper] incisors without first suspending? (intrusion coils may remain to maintain the intrusion)?

*The incisors will predictably EXTRUDE, the coils NOT maintaining the incisor vertical position. The tendency for an incisor to extrude as it is retracted is significant and requires suspension from the bone plate to maintain the vertical.*

20. **Explain the features** of a fantastic pre-surgical ortho setup for surgery:

   a) marginal ridges of all the posterior teeth upper and lower are LEVEL, all molars banded.
   b) Incisors are decompensated (range of bracket torque “dotted lines”)
   c) No rotations on the cuspids
   d) No expansion of the dental arches in pre-surgical ortho
   e) Cuspid width wider on the upper than the lower
   f) Level curve of spee (or average curve ONLY if requested by the surgeon)
   g) headgear/lip bumper tubes on the 6s, Keyhole loops 3-2 upper and lower, kobyashi hooks on all incisors, molar hooks bent down, ball hooks on all cuspid and bicuspid brackets. This is for intermaxillary fixation [at surgery only]
   h) If brackets interfere your ability to hold the progress models together, then reposition lower 3-3 brackets by 2mm to get them out of the way, and step down the archwire the same to compensate
   i) Dental arch symmetry upper and lower (molar, bicuspid, cuspid right vs. left)
   j) 8s removed 6 months before surgery (if they have broken or may break through the gingival tissue).
   k) Hand articulate the progress study models together and they fit perfect.

21. **What is** the worst thing that can happen to you with indirect bonding?

*The “transfer tray” does not fully seat, and therefore the brackets are at different heights. You have to remove the brackets, clean off the adhesive, take a new impression, recondition the bracket pads and start over!! This is why the indirect bonding impression is SO CRITICAL, and thus should be taken with the most accurate impression materials. NO tooth movement (eg separators) between that impression and seating the transfer tray.*

22. **Why not use** a light cure adhesive for indirect bonding (eg. Transbond xt) to increase bond strength?
The main issues are Incomplete curing of the bonding adhesive (through the transfer tray) and cleanup of excess bonding adhesive after the tray is removed. The cleanup can be a massive job, especially if the teeth have been bonded together!!

23. **What is a custom pad**, used in indirect bonding?
   Transbond xt is used in the lab to bond the brackets to the study model, and then this adhesive is cured and is a perfect fit, “custom pad” that will be bonded with sondhi rapid set to the etched tooth. Transbond to etched surface instead of metal mesh pad or ceramic to etched tooth surface.

24. **What should** you do before using Sondhi rapid set adhesive for indirect bonding to custom pads?
   Shake the bottle on a lab vibrator to mix the A and B solutions thoroughly. Settling of the materials can make for poor bond strength. Also be sure to paint EQUAL amounts of sondhi to the tooth and custom bracket pad.

25. **Why is 18x25N NOT** a good archwire for distalizing cuspids?
   As cuspids retract, there is a natural distal crown tipping. The archwire is then tipped down in the incisors, extruding the incisors. Bite opening is also common from the distortion of the archwire without sufficient stiffness to support the forces and tooth movement. The interbracket distance from 3-5 makes for more wire flexibility.

26. **Why is 18x25N NOT** a good archwire for closing extraction space?
   The archwire is too flexible, especially with the large inter-bracket distance 3-5 to support the forces and tooth movement. This leads to arch distortion, seen as bite opening in the bicuspids, tipping of the adjacent teeth into the extraction spaces, and molar extrusion. The archwire is also too flexible to control incisor torque.

27. **What are** the possible problems when you cut distal ends during cuspid retraction?
   The incisors are detorquing (friction on the archwire is the force) or the molars may be advancing, which is usually not wanted in 2-step retraction.

28. **What does** an archwire stop mesial to the 5s (or 6s) do during cuspid retraction?
   Prevents the incisors from detorquing, but if the molar is moving forward, the incisors advance. Stops are dangerous since they can be ‘forgotten’, inhibiting future tooth movements.

29. **What are** the dental and skeletal changes possible with a Reverse headgear?
   Maxillary advancement and molar/incisor dento-alveolar advancement. There can also be a vertical change with RHG, which is dependent on the location the elastic is attached, and the line of force from the dental attachment to the facemask.

30. **Explain the possible** uses of a piggyback archwire.
a) Multiple purposes of the two archwires in each arch, one needing flexibility, the other needing rigidity

b) To make progress in the case while waiting for a long stage of treatment to happen (eg. Correct class II with elastics while waiting for the cuspid to be retrieved...alignment).

c) Stabilize anchorage with one wire, wire flexibility for low retrieval force on the other.

d) OR could be aligning with a flexible wire in the bracket slot and a heavy wire is piggybacked to provide rigidity to the arch (skeletal anchorage intrusion)

e) To engage an additional (molar) tooth that was previously not bonded (19x25ss 6-6, decide to bond 7s).

** piggyback wire refers to an archwire that is secured to the bracket bases (double overtie), the end may or may not be in the auxiliary tube of the PIG molar. Overlayed archwire refers to a wire that is tied ‘on top’ of the archwire in the bracket slot. That is two archwires, one on top of the other, secured by one ligature.

31. Why use a PIG (triple) buccal tube when you could simply use a 5-5 sectional archwire?

   It is difficult to tie the double overtie on the 5s when the wire ends on these teeth. It is faster and easier to secure the end of the archwire in the auxiliary tube. The piggyback wire does NOT need to be secured to EVERY bracket base...only as needed to stabilize the archwire.

32. How do you secure a piggyback wire to the brackets?

   Either put 2 wires in the archwire slot secured by one steel ligature tie or tie the piggyback to the bracket bases (as needed) with double overties to secure the piggyback wire.

33. Discuss the activation of a nitie archwire for retrieving an impacted tooth.

   The LARGER the interbracket distance (eg. 2 tooth span), the heavier gauge archwire and more deflection. The smaller the span, the lighter gauge archwire and less deflection. This is why I typically use 016N, since I know what the deflection should LOOK like. The force for extrusion should be light and continuous. 012N can also work well. 18x25N is too stiff unless there is a large interbracket distance to make the wire more flexible. Less activation, the more frequent you need to reactivate, and the slower the retrieval.

34. If the palatal cusps of the upper bicuspids are “hanging down” what does this usually mean?

   The archwire is Expanded, applying a lateral force at the level of the crown, tipping up the buccal cusp, making the palatal cusp ‘look’ like it is hanging down. OR there may be a vertical force on these teeth, which looks the same. The most common is an expanded archwire, since these are commonly used in ortho.

   Note: the basic reason is that the tooth TIPPED buccal. It could be from a RPE or quad helix or anything that applies a force lateral or vertical.

35. How long can it take to retrieve adult impacted teeth?

   3 years, as was shown on a case in this seminar.
36. **Describe a ‘squeeze’ with elastics.**
   
   I give credit for this to the late Robert “Rick” Ricketts. To close an open bite quickly, Multiple elastics, much heavier than the patient can normally tolerate, are used for intermaxillary fixation, closing the bite. Usually the patient does not change the elastics, but returns to the practice to do this every 2-3 days. The process usually only lasts for 1 week, 2 weeks maximum. It is a way to get the patient out of brackets quickly.

37. **Do the ACE bone plates and anchors osseointegrate?**
   
   Yes, to some degree, and occasionally a screw will be unable to be removed (cut off head) or the bone plate is covered with bone (chip off with blade and remove with elevator). Retention is not from osseointegration, but from mechanical retention of the cortical bone. For skeletal anchorage purposes, we really do NOT want the screws and bone plates to osseointegrate since we usually remove them after their use (temporary).

38. **To avoid bite opening** from upper anterior skeletal anchorage intrusion, what should you do?
   
   Bond all teeth in the arch, especially the 7s. Use a stiff archwire (19x25) to avoid arch distortion, and if there is not enough deep bite for the planned intrusion, then intrude anterior PLUS posterior (section 4). Molar intrusion closes the bite.

39. **What happens** to the mandibular symphysis if the lower incisors are significantly extruded?
   
   It changes shape, the alveolus elongates.

40. **What happens** if you place a reverse curve archwire in an open bite case (to keep the incisors together)?
   
   The bicuspsids intrude, molars intrude, the archwire slides from side to side, the open bite is now everywhere, especially posterior, incisors extrude to elongate symphysis.

41. **Is distal to the cuspids** skeletal anchorage position efficient in closing extraction spaces and retracting the upper incisors?
There is more intrusion than retraction with this line of force, which gets more vertical as the anterior teeth retract. Therefore it is NOT considered efficient for retracting the upper anterior teeth. For this, the zygoma buttress is the best choice, and from this location the incisors can be intruded and retracted, the amounts varying by adjustment of the line of force.

42. **When should** stainless steel closed coils be used in the extraction spaces.

All cases where the dots show moderate-maximum anchorage or maximum anchorage, plus skeletal open bite cases where the dots may be moderate anchorage, but you wish to delay the placement of a TPA.

43. **If there** is anterior bite opening from anterior intrusion, what are your choices to make the correction?

a) Release the intrusion coils and let it relapse
b) Continue intrusion until the desired final position, then Suspend and use vertical elastics
c) Intrude the molars (zygoma bone plates and tpa)

**Growth and Growth Management**

44. **How do growing** patients develop a concave profile with retroclined lower incisors (eg. Class II div. 2)

The upper incisors ‘trap’ the lower incisors from moving forward with the {extra DH growth} of the mandible, resulting in a change in shape of the symphysis. And for some reason that I have not yet identified, the upper teeth do NOT want to follow this extra growth. The symphysis remodels to accommodate the dento-alveolar ‘retraction’ of the lower teeth, as the mandible moves forward to make a big chin button. I saw this in the Burlington sample when I was doing mandibular overlays, and did not know what it was.

45. **What growth management** technique could be used to avoid the concave profile, retroclined incisor, assuming you can predict this is coming?

18x25N alignment arch from 6-2-2-6 (or 6-3-3-6) with SLi incisor torque. 18x25 SLi retraction limit is near the Roth ideal inclination. In addition, OPEN coil could be used to push the incisors forward, encouraging the full expression of the bracket torque. Open coil 3-2 or C-2 or D-2 or 4-2? Establish enough anterior overjet to correct the class II posterior.

46. **How do we determine** how MUCH treatment effect there is with RHG in a growing patient?

We first must establish what happens without treatment, with an individual growth prediction. Then the Difference between what ACTUALLY happened to the maxilla and upper teeth is compared to what would happen without treatment. This difference is the treatment effect of the [RHg] appliance.

47. **What are the features** of the McGann individual growth system that are not in the estimated system? Why can it be called individual?
You must first establish that

a) Girls grow different than boys
b) Class I, II, III cases grow different

dividing the total population into these 6 sub-categories is a crude individual system, that pinpoints an individual better than if you had only the entire population. The challenge then is to chart how each of these 6 types of patients grow.

The next step is to establish that the A Point overlay defines DHG, and data is gathered to predict DHG. Predictors are identified based on the ‘individual patient’ characteristics. The significant predictors in order of most significant to least were: McGann growth factor, McGann Angle, Wits.

Then, the sample is divided into the 6 types of patient (gender and bite class) and a prediction model is made according to the stage of growth 0-6, using the predictors to determine the DHG and for the following features

a) Differential horizontal growth
b) Maxillary growth forward
c) Mandibular growth forward
d) Upper molar drift forward
e) Upper incisor drift forward
f) Lower molar drift forward
g) Lower incisor drift forward

This can be called an ‘individual’ system growth prediction system since the distinct individual features are used to create the prediction model (bite class, gender, McGann growth factor, McGann angle, wits). A prediction can then be made from the start of treatment (T1) to the anticipated finish of treatment (T2), with a prediction of the stage of growth at T2. This is done using ONE lateral cephalometric data for the stage of growth (wrist and growth interview preferred to only CVM) to better identify the stage of growth. Then, there can also be a prediction made of the growth remaining AFTER active treatment is finished (T2 to stage 6), with adjustments made to the time of treatment made for the best overall treatment result.

48. What is the McGann angle and why did McGann think that had anything to do with DHG?

The McGann angle is the angle between the Maxillary length and Mandibular length lines. On the diagram below, A-GN and the triangle were found to be NOT significant.
The original idea of the McGann angle had to do with the concept of ZERO McGann angle and 90 degree McGann angle. Both of course are not possible in the population. The diagram below represents ZERO McGann angle, a place where the DHG is the absolute difference between the maxillary length and mandibular length. The more the mandible grows in LENGTH than the maxilla, the more the DHG.

**PURE growth potential**

Maxillary Length (Co-A)

Mandibular length (Co-Gn)

If the McGann angle was 90 degrees, with the mandibular length (Co-Gn) being perpendicular to the Maxillary plane, then the DHG would be NEGATIVE, the amount of maxillary enlargement, the mandible enlargement being insignificant.

It turns out that the McGann angle was most often 30 degrees with plus or minus of about 5 degrees. This was a strong predictor of the ACTUAL DHG identified by the A point overlay.

49. **What is the McGann growth factor** and why did McGann think this had anything to do with predicting growth?

\[
\text{McGann Growth Factor} = \frac{\text{Maxillary length}}{\text{Mandibular length}} \times \text{McGann Angle}
\]
The growth factor came from my preliminary work with a PhD statistician named Jim Baxter, found on an internet search. Through our conversations and calculations, I learned that they can use multiple predictors to make the final model. Maxillary length and mandibular length were NOT significant predictors, but because of the McGann angle concept, I felt that these represented the “recorded history” of the individual patient, and therefore the three should be related in some way together.

Maxillary length divided by Mandibular length was just a hunch that was tested, with the McGann growth factor being MOST significant in predicting DHG. This was later confirmed by the 2nd research company, who had another PhD statistician, using another sample, the Burlington non-treated sample of 220 cases.

50. **What is the other predictor** of DHG found in the McGann growth study?

   Wits was the only other significant predictor found of DHG. It should be noted that the wits measurement is NOT influenced by differences in vertical dimension. At the preliminary statistical analysis, Ricketts facial axis had a slight significance when tested on 248 TREATED cases, but later was found to have NO significance when the sample size became 249 non-treated (plus treated) and larger (686 total cases).

51. **What about** the concept of vertical and horizontal growers?

   Those cephalometric measurements that were tested and were NOT significant were,
   
   a)  FMA (defined vertical and horizontal growers)
   b)  Y-axis (also defined vertical and horizontal growers)
   c)  Facial axis of Ricketts (also defined vertical and horizontal growers)
   d)  ANB
   e)  N perp A and N perp Po (McNamara)
   f)  McGann difference: McNamara Nasion Perp to A minus Nasion perp. At Pog. This was used to overcome errors in finding the Frankfurt horizontal (porion and orbitale).
   g)  Maxillary length
   h)  Mandibular length
   i)  A-Gn (vertical)
   j)  Dental age (lower 5 development until full eruption)

52. **How can DHG** be a negative number?

   The Maxilla grows or is moved forward faster than the mandible is growing forward.

53. **At what age** would you consider taking a hand-wrist x-ray in class III cases to look for late DHG?

   Same for boys and girls? Where would you look on the x-ray?

   The current standard for the ‘estimated’ system was for girls age 10-13 and boys age 12-15 starting age, to take a wrist x-ray. The purpose of this was to “better define stage 2-3-4”. The estimated system did not factor in growth after the pubertal growth spurt.

   With class III cases, and the documentation of the individual system to complete end of growth (Burlington sample ended typically at age 18-20 and had wrist x-rays on many of the cases), it
would be recommended to take hand-wrist x-rays on class III cases up to a “starting age 17” on males and “up to age 16” on girls, looking for incomplete fusion of the radius and ulna bones, a sign of remaining “late growth”.

54. **What is McGann’s stage 6? Stage 0?**

**Stage 0:** is ‘up to age 8’, which is considered impractical for any phase I mechanical intervention. But this could be practical for use by pediatric dentists, who are accustomed to treating patients earlier than age 8.

**Stage 6:** is when you have full fusion of the growth plates of the radius and ulna bones. Stage 5 is defined using wrist x-rays as full calcification of the fingers, but incomplete fusion of the ulna and radius.

55. **How can you identify** a 2nd standard deviation class III grower?

The starting lateral cephalometric x-ray is a “History of previous growth”. If Wits, one of the predictors, is in the 2nd standard deviation, then you can assume that this is a “extreme grower”. The growth management program also gives you the percentile of the population that grew less.

56. **What features** do you want to ‘growth manage’ in a class III growing case to minimize the problem? What appliances can you use for each of these?

Advance the maxilla (RHG), advance the upper teeth and alveolar bone (RHG, class III elastics), and stop the lower dental drifting (lower molar skeletal anchorage ligation).

57. **What features** do you want to “growth manage’ in a class II growing case to help correct the problem? What appliances can you use for each of these?

Stop or slow the growth forward of the maxilla ONLY in those cases with a normal or protruded maxilla (Cervical headgear), stop the upper dental and alveolar bone drifting forward (zygoma ligation, CHG, utility arch), allow lower molar drifting, allow or enhance mandible forward growth (functional appliance?)
58. **Why is a lower utility arch** not a good appliance in class II growth management? How can it help growth management? What about a Lower advancing arch?

   If you want to allow (or even encourage) lower molar drifting forward, then the utility arch is working against you in correcting the class II by growth management. Same with a lower advancing arch, since you do not want a force distal on the lower molar.

   A lower utility arch could help you with growth management by uncoupling the incisors, reducing the upper dental arch drifting forward with the extra growth of the mandible.

59. **Explain how** growth management can be cumulative.

   Each one of the “McGann elements” in the growth management diagram is moving independently. The upper teeth and bone were measured ‘relative to’ the maxilla with the maxillary overlay. The lower teeth and bone were measured “relative to” the mandible with the mandibular overlay. DHG was the growth of the mandible ‘relative to’ the maxilla position. So if you can stop one of these, for example zygoma ligation tying together the upper teeth to the maxillary bone...then the upper teeth will stop RELATIVE TO the maxilla, but both are still moving forward at the same pace as the maxilla.

   If there is differential horizontal growth of say 4mm and you stop the upper teeth from moving forward another 3mm and you allowed the lower teeth to move forward relative to the mandible 1mm, then you just corrected a NET 8mm of dental class II. The effect is cumulative.

**Patient Management:**

60. What may be happening when a patient does not show up for an orthodontic adjustment for 1 year?

   They could be,
   1. Shopping for an orthodontist since they are not satisfied with the progress
   2. Out of money and afraid to come for the appointment since they cannot pay (good patient)
   3. Having a life crisis, where their teeth are of secondary importance
   4. Moved from the area and forgot to tell you
   5. Thinking that the braces work by themselves, that there is no need for adjustments (yes, do not assume they know this).
One thing for sure, I do not think they forgot they had braces when they brush their teeth, eat food, and look in the mirror.