

WWW 7 Panellists



Kimberley Tan (KT), Daniela-Eleonora Cioplean (DC), Manoj Parulekar (MP), Chong Bin Tsai (CBT), Dominique Thouvenin (DT), Meenakshi Swaminathan (MS), Anthony Vivian (AV), Jan Roelof Polling (JRP)
Special panellists: Richard Hertle (RH) & Ken Nischal (KKN)

1. What about bangerter filters?

KT: I use occasionally in older children.

DC: They can be successful used after age 3, especially after achieving a plateau VA. Careful in non-cooperative children. I don't recommend them in bilateral high Hyperopia. Risk of balance amblyopia,

MP: I am not sure there is any experience with that in IE

DT: Good in anisometric amblyopia with BV

JRP: PEDIG has shown good results for amblyopia therapy.

2. Does dicoptic therapy help in infantile surgery patients to get BSV.

KT: Typical use for amblyopia but not in 1st year of life.

DC: I don't have experience, but I think is not a realistic approach for babies.

MP: Not as far as I am aware

DT: No

AV: There is no evidence yet, but it is not a treatment that is applicable to infants

JRP: No dichoptic training will only treat amblyopia with limited angle (20 prism dioptres) Cannot cure BSV deficit

3. Does operating them makes them develop amblyopia due to fixation preference.

KT: Yes, we acknowledge an increase in amblyopia after successful surgery in infants.

DC: Possible if the follow-up is not appropriate. Look also to other risk factors: refraction, anizomeropia

MP: not usually, if they start off alternating, they continue to alternate, or achieve BSV and stereo in some cases. If they develop a consecutive exotropia early, they can develop amblyopia.

DT: No but it does not protect them

MS: No. not really. They need to be monitored for amblyopia regardless after surgery

AV: this is a risk so careful follow up of visual development is essential

JRP: More at risk of amblyopia because of loss of crossed fixation

4. How do you diagnose DVD, DHD with ocular movement recordings? What is the equipment you use and what signs do you look for?

KT: Don't use routinely, see WSPOS consensus statement Pompe 2019 IJO, for methods.

DC: I don't use special equipment except clinical observation, pictures, parent observations, eye fundus examination (torsion can be easily assessed).

MP: I think Rich Hertle can answer this best

JRP: I think Rich Hertle can answer this best, however R/L fixing cover test in R and L gaze is super easy!

RH: DVD and DHD are by definition "dissociated" meaning some monocular eye movements are non-yoked, dysconjugate, these is easily identified to <1 degree using eye movement recordings. Fixing eye will stay in primary while non fixing eye will show slow movement up and extorsion (DVD) or out and extorsion (DHD), usually with associated fusion maldevelopment nystagmus syndrome.

See excellent work by David Guyton [Dissociated vertical deviation: etiology, mechanism, and associated phenomena. Costenbader Lecture](#). Guyton DLJ AAOPOS. 2000 Jun;4(3):131-44.

5. Eye movement recordings will detect fMns, but how it will measure DHD?

KT: Refer Dr. Richard Hertle

DC: You can measure it by loose prisms

MP: I think Rich Hertle can answer this best

RH: See Q 4

6. How about superior rectus recession in DVD?

KT: Definitely useful, especially if little IOOA

DC: It can be used in cases without IOOA or as a second surgery for residual DVD following to IO Anterior Transposition.

MP: I think there is a risk of inducing hypotropia, I prefer IO anteriorisation

DT: Agree. I prefer Posterior fixation. But there is no perfect treatment of DVD

MS: Will work if DVD is greater in abduction or same in all gazes

AV: This is a recognised treatment for DVD but is less effective than inferior oblique anterior transposition, in my hands

JRP: Would be the first option in the absence of a real upshoot in adduction

7. Does torsion create an oblique overreaction later? Should we operate if we observe torsion only?

KT: Complex answer (ref: Guyton). Torsion only with no other primary misalignment in infants is not a common situation that you will be presented with.

DC: In My hands, the torsion can be appreciated by eye fundus pictures with a portable fundus camera. I do this before surgery in the surgery room. If torsion is present, if the child already has an up-shoot in ADD and the IO forced duction is positive I do IOOA in the same surgery with the BMRREC. On both obliques.

MP: I would not operate only for observed torsion

DT: No, if no head tilt

MS: not the current practice to operate if you see only torsion

JRP: Only inferior oblique surgery in case of the 3 components: Upshoot in adduction, V pattern and excyclotorsion

8. I have re-operated on MANY inferior obliques to anteriorize after myectomy or graded recession, and not a problem for an experienced strabismus surgeon.

KT: Agree, often not as bad as feared. Variance in predictability similar to any “re-operation”

DC: It can be done. But better do IOAT in front of recession if necessary.

MP: Agree

DT: Agree

MS: Thank you. Have done a few. Did not seem particularly difficult

AV: I don't know how you would know how much to anteriorize a myectomised inferior oblique and the risk of upgaze restriction is high

9. Dr. Meenakshi: Does it mean that we should first only correct the horizontal and not IO even if we see IO over action in adduction?

MP: That is my usual strategy

MS: As I said in my conclusion, many of my arguments were only if you are not sure. I personally operate on IO and Medial if I see IO overaction

10. WRT Occlusion therapy, how long do you use it before surgery?

KT: In very young, amblyopia uncommon, but use it if significant amblyopia whilst planning surgery (expect rapid response as very young infant).

DC: As long I'm for early surgery, when hyperopia is totally corrected and spontaneous alternance is achieved.

MP: As soon as amblyopia is detected, I start occlusion therapy.

DT: I perform surgery when amblyopia is cured. If no amblyopia, surgery is when angle is stable

MS: until free alternation.

JRP: Until the amblyopia has resolved, always consider bad compliance if it does not resolve within 12-18 months

11. Would you treat a 60 PD infantile esotropia at the same time and in the same way as an infantile ET of 20 PD?

KT: In general principles, you can. Does depend on age – obviously with the first 4 - 6 months of life, the 20 PD infant is much more likely to show improvement than the 60 PD – you may follow closely for a little longer to detect resolution or not.

DC: NO. I'm careful in small angles, re-check refraction. I propose Botulinum Toxin.

MP: I would try non surgical treatment i.e. glasses if suitable for 20 PD as it is unusual for IE to present with such small angles. If treatment needed, BT is a good option. For 60 PD, I would recess both MR 6 mm and inject Botox 5 units into both MR at the same time.

DT: Yes

MS: No. unusual to have 20 PD angles in Infantile ET. Would first rule out other causes too

AV: this is a good question. I would question whether the 20 ET child truly represents the Infantile Esotropia syndrome. They will not be cross fixating. Small deviations are more likely to resolve spontaneously so I think it is entirely reasonable to watch and monitor visual development (after careful refraction to make sure they are not hypermetropic).

JRP: Small angle have higher chance to resolve spontaneously, if still 20 PD stable at year one surgery can be considered to restore some BSV. Prognosis for BSV in large angle ET is low and therefore surgery can be postponed

12. Would you please mention the exact age of early and late surgeries?

KT: I won't operate younger than 4 months. So "early" surgery is 4-12 months of age. "Late" is after that.

DC: Earliest 6 - 7 months of age. According to the last research, under 12 months and accordingly to the literature before 24 months. Anyway, after 24 months - late surgery.

MP: Early is under 1 year, late is after 1 years.

DT: Late = past 3 years

AV: there is no exact age. Most studies define early as less than 2 years and late as over 2 years. Many aim for surgery between 1st and 2nd birthday. Ultra-early surgery could be assumed to be 6-12 months. There are not many people who operate less than 6/12

JRP: I would say <1 year early and >3 years is late

13. Compliance with patching in late surgery?

KT: All about the individual family – generally effective.

DC: Difficult, a good reason to not delay it so much.

MP: Can be variable.

DT: Very good if necessary

MS: compliance with patching is always an issue regardless of age

JRP: Never a problem, as DT said parents consider the large ET a problem and treat with patching, straight ocular alignment will give the impression that all is good and lower compliance in patching therapy

14. For early surgery I feel the biggest challenge is the perfection we are able to achieve in our clinical examination. If Prism bar cover test is not practically possible in babies, which method of estimating angle of deviation do you prefer and advocate?

KT: Agree difficult. Prism Krimsky and Hirschberg (and combination).

DC: Loose prism can be successful used, combined with pictures flash (Krimsky), appreciation of corneal reflex decentration. I always take many pictures during the preop follow-up.

MP: Hirschberg test (light reflex test). I often ask parents to take multiple photos with flash and send them to me, to determine the maximum angle.

DT: I think examination of the strabismus under anesthesia to differentiate the tonic part and the muscle retraction part is the most important. The retraction is evaluated with the persisting eso and the traction test, treated by recession. The tonic part is the one that vanishes under GA, treated with posterior fixation.

MS: many children will surprise you by cooperating for PBCT esp. at near and that is all you need really. However, studies do mention operating on Krimsky measurement. If I have to do that I attach an accommodative target to the flashlight

AV: single prisms are often easier because it is possible to see the eyes better and you can hold two prisms (one in front of each eye) with one hand if the deviation is big. If at all possible, you should try to get a distance and near angle approximation. As bimedial recession is my treatment of choice, even in large deviations (i.e. I do not do 3 or 4 muscle surgery in one go), most infants need my maximum recession (6 mm) so whether it is 50 PD or 60 PD is academic

JRP: Corneal light reflex: <https://www.aao.org/bcscsnippetdetail.aspx?id=703d090d-b6a0-45d5-a3da-e456c030caec>

15. If the squint is more than 60 prisms, what is the treatment: BMR and lateral in both eyes?

KT: Augmented BMRR (several ways to augment).

DC: NO. I used to do this mistake during my firsts years. Under 12 month of age, a bimedial MRRecession (11 mm from the limbus) has all the chances to fully correct this deviation. Use botulinum toxin for the residual angle.

MP: I do BiMR recession 6 mm and Botox 5 units to each MR at the same time.

DT: Cf 14

MS: two options. Either a third muscle or augmented recession with Botox

AV: Some do 3 or 4 muscle surgery but I prefer to do BMR first and see over 3-6/12 what the angle settles down to

JRP: because not potential for BSV: first maximum recess resect in 1 eye and for the second surgery the angle can be better measured and additional recess resect in other eye can be preformed

16. Is open sky Botox preferred to prevent complications like ptosis or vertical deviations?

KT: No real difference for me.

DC: Yes, I prefer it.

MP: You can get those complications even with open sky, but the risk is reduced. However, open sky creates scarring, and many of these children will need surgery later anyway.

CBT: no evidence showed open sky technique helps in the meta-analysis

DT: I tested both, and no more ptosis or VD if no opening

17. What age do you mean when you say late surgery?

KT: After 12 months.

DC: See Q 12.

MP: After 1 year

DT: After age 3 years

AV: more than 2 years

JRP: after 3 years of age

18. What about Botox before age 1 and later surgery if necessary?

KT: Definitely an option, but the downsides of surgery vs Botox at the first GA (post 3 - 4 months) are not large in a good anaesthetic environment. So my preference is surgery as I have a higher chance of getting where I want to be with one GA.

DC: Never tried it. I don't think it works in large angles.

MP: That is a reasonable approach, but Botox often does not fully correct the squint. If you don't restore alignment early, then results are not so good. If I was using Botox, I would use it within the first few months to reduce the angle, and surgery by 1 year.

CBT: we perform Botox when we cannot get a reliable measurement of the deviation, sometimes even after age 1

DT: No problem. Muscles are softer. Eyes more frequently straight under GA. In my series, 50% of surgery post Btx is for IOOA

JRP: Please consider neurological damage due to anaesthetics in so many operations at an early age

19. Should we undercorrect the angle of deviation esotropia in children with neuro developmental delay?

KT: There is so much variability, and less chance of effective stereopsis, that you should defer surgery. The angle changes are high (see Sardelic 2019).

DC: I prefer to delay the surgery or first try BOTOX in this category

MP: Results are very unpredictable in such cases. Probably equal rate of over and undercorrection.

DT: Not more than others

MS: mild undercorrection is recommended

AV: good question. IN infants with neuro-developmental issues (including prematurity and low birth weight) the incidence of over-correction is much greater, so we should be cautious with surgery numbers.

JRP: Always undercorrect, always do late surgery because of variable angle especially in children with developmental delay

20. Totally agree with early surgery

DC: Me to.

MP: Agree

DT: I don't!

JRP: Not me, the evidence is weak because the studies contain a lot of bias

21. What the maximum amount of MR recession do you do?

KT: Some variation – but just retro equatorial is your “max” - around 6 mm.

DC: 10.5 mm from the limbus under age 12 months. Maximum 11 mm between 12 - 24 months, maximum 11.5 later on.

MP: 6 mm

DT: 6 in children

MS: 6.5 mm (actually I measure from the limbus)

AV: 6 mm, but measurements carefully taken measuring from the limbus.

JRP: 7 mm

22. Early means how early? Please specify or define early and late surgery.

KT: See Q 12

DC: See Q 12

MP: See Q 12

JRP: See Q 12

23. How early do you operate?

KT: See Q 12

DC: 6 - 8 months if possible or soon as I get alternance and the baby were his glasses if hyperopia > +2

MP: Before 1 year

MS: when able to measure accurately, have treated amblyopia and prescribed any hyperopic correction

AV: as close to 1st birthday as possible

JRP: not before 10 months of age

24. Is it possible to correct all abnormalities associated with infantile esotropia?

KT: No

DC: I doubt but most of them can be controlled. Some of them can be avoided in term new-born babies.

MP: No, esotropia and DVD/IO overaction can be corrected.

DT: No. Because you cannot create BV that does not exist, and multiple reasons. But you can improve the situation

MS: some may persist despite best efforts like DVD

JRP: IE has the worst prognosis in concomitant strabismus surgery, most re-surgery rate. The earlier the more re-operations. Share this with the patient.

25. Is Botox not more effect if injected before the age of 1 years?

KT: It is.

DC: I think it has.

MP: Yes

CBT: Yes, we did inject Botox before age 1

DT: I think so. I star btx at age 6 month, and first injection never after age 18 months

26. Dr. Chong: When do you switch over to surgery?

CBT: when I can measure a reliable ET angle at distance and near, with and without refraction

27. Do you use EMG for Botox injection?

KT: Adults, older children yes. Not under GA for me.

DC: I use the open sky technique.

MP: No

CBT: No

DT: No

JRP: This is the golden standard

28. How many Botox injections are required?

KT: see Dr. Tsai presentation – varies - on average 1.5

MP: Typically, more than 1

CBT: it depends, we would switch to surgery if deviation recurred and we can measure a reliable deviation

DT: I don't perform more than 2. If it does not work, I switch to surgery

29. Won't the Ptosis following Botox cause amblyopia on its own?

KT: Yes, and this is a major concern in the very young infant.

MP: Yes

CBT: the ptosis was only temporally, patient may adopt a chin up position during that period, we did not encounter any occlusion amblyopia

DT: It is possible. I always ask for alternate patching during the first three months' post Btx

AV: yes. They need careful patching

JRP: You raise a good point, extra risk of visual delay

30. What is the indication for repeating a bilateral Botox injection? Is it ET of >10 PD in primary?

KT: Given you are aiming for an angle less than that - yes.

MP: more than 20. For 10-20, I try glasses first

CBT: patient at this age cannot cooperate well, we often repeat Botox when we notice ET 10-20 by near Krimsky test

DT: Yes

JRP: Keep in mind there is no dose response, risk of consecutive exo in small angle

31. Any studies looking at stereo / fusion and outcomes with surgery and Botox? Has any method given superior outcomes?

KT: See Dr. Tsai's and Dr. Parulekar's presentation. Outcomes relate to timing and success of alignment.

MP: We are about to publish this. Short answer is yes.

CBT: previous report (McNeer 2003) showed comparable result between Botox and surgery

DT: I don't think surgery or Btx cure BV in Infantile eso. It improves it. Surgery has more constant results.

JRP: This is a very good comment/question. I would be interested. To my knowledge no studies

32. In children with infantile ET & neurologic disease, do you do anything different? (smaller recession? Do you prefer Botox over BMR?)

KT: Wait longer until surgery or Botox.

DC: See Q 19

MP Difficult one, I tend to undercorrect slightly. Avoid BT as it might lead to overcorrection

CBT: in patients who had cerebral palsy, mental retardation. We might inject Botox first to see the response

DT: No. I examine under GA

AV: See question 19

JRP: Late surgery to minimize risk consec exo. Smaller recessions are always an option especially in smaller eyes!!! Do measure AL during surgery <20 mm is risk for overcorrecting

33. When doing Botox injections as primary treatment, what is a good postop result? Is it orthophoria or is a slight overcorrection desirable?

KT: A good result is achieving your intention – i.e. straight or a misalignment which is small enough to develop binocular function (<8 PD preferably).

MP: Overcorrection in the first 2-4 weeks is desirable

CBT: orthotropia or exotropia were both acceptable

DT: Exotropia during a few weeks, then microtropia

JRP: overcorrection in IE is never good because of lack of BSV

34. What is the maximum recession of MR that must be planned? 6 mm or more?

KT: Large angle ones

DC: Never do more than 6 in small children

MP: Maximum 6

DT: 6

AV: see Q 21

JRP: 7 mm max

35. Dr. Manoj: Are there any select indications when you would consider Botox as a primary treatment?

MP: Small angle, less than 30 PD that present early within first 6 months

36. The role of botulinum toxin is Congenital ET at 6 month of age where surgery is more controversial

MP see Q 35

JRP: I agree, for the given risks

37. What is the earliest age for surgery?

KT: For me, 4 months

DC: Advisable 6 -7 months. Idealistic, less than 60 days since onset.

MP: 7-8 months

AV: see Q 12

JRP: not before 10 months, because of possible reduction of the angle

38. Is there is a role for Botox in residual ET after surgery?

KT: Yes.

DC: Yes, it is a good indication in my hands.

MP: Yes, that is a good indication

CBT: if we can get reliable measurement of recurrent ET, we prefer surgery

DT: Yes

JRP: Might be an option, good point raised. But careful for residue after 3 months

39. With infantile esotropia that after treatment of amblyopia and refractive errors that's not significant +0.50 and vision now 6/6 and angle 25 prism dioptre, what should be next line of action? The child is presently 8 years old.

KT: If socially significant (cosmetically noticeable) - then BMRR for that angle. If not socially significant - nothing for now.

DC: For me surgery, of course.

MP: If angle same for near and distance fixation, I would aim for surgery to correct 20 PD. It is worth putting a prism bar to neutralise the deviation and checking if there is any binocular potential first.

DT: Surgery

AV: bimedial recessions is an option if parents are keen on surgery. Post-op diplopia is a real risk though, the older the child is and although the post-op diplopia test is notoriously unreliable, it is worth a careful examination and discussion.

JRP: If no convergence excess: rec resect in the non-dominant eye, otherwise bilateral recession medial rectus. 25 PD is approx. 12 degrees: 1.6 degree per millimetre is about 7.5 mm displacement in total 3.25 mm per eye / muscle

40. Do you have any experience of overcorrection after Botox injection for infantile esotropia?

KT: Uncommon, but I have experienced more disappointment with undercorrection.

DC: No

MP: Overcorrection is less common with BT alone, and also very rare with surgery + BT if MR is recessed no more than 6 mm

CBT: temporally overcorrection is acceptable, we had two patients of exophoria < 15 PD with good control

DT: Yes, about 5% have persistent exotropia. It may be some IE that would have spontaneously gone exo with time. I always warn parents of this eventuality

JRP: Would not recommend in case of IE because of lack of BSV

41. Dr. Chong: At what age would you start Botox treatment?

DC: Any age after 6 months if deviation is larger than 15 PD

CBT: after excluding the possibility of ocular instability of infancy, usually after 6 months of age

42. The dose of BOTOX is universally 5 IU?

KT: Different doses used, commonly 2.5-7.5 (see Issaho 2017).

DC: I use 2.5-4.00 UI in residual angles

MP: Botox 5 IU. Dysport 2.5 IU

CBT: we use the same dose of 5 U for bilateral MR each for all angles

JRP: There is no dose response effect, it remains a guess what is the best dose, more (dosing) studies are needed

43. How often is there a chance of ptosis after Botox? And in your experience is it severe enough to cause deprivation amblyopia?

KT: If aiming at very young - yes, it causes amblyopia.

DC: Never had but is not relevant, I don't use it so much

MP: I usually inject along with surgery, so injection is under direct visualisation, so rare. Can happen in 10% cases, usually very short lived 1 week. You can use Apraclonidine drops if ptosis develops. Apraclonidine can partially correct the ptosis, and minimise the risk of amblyopia

CBT: see Q 29

JRP: it is only 3 months, but still a slight risk if parents do not comply with patching

44. When do you consider surgery? after how many injections?

KT: My practice is primary surgery.

MP: After 1 injection if angle is back to pre BT size. If angle much reduced, second injection can be considered.

CBT: see Q 28

DT: 2

JRP: In my opinion, after the first. Some do not need a reoperation according to the studies

45. Do you consider the ptosis coming after BOTOX injection cause amblyopia?

KT: Yes.

MP: Yes

CBT: see Q 29

JRP: In a 1-year-old? Absolutely!!

46. It is necessary to make a large clinical trial

KT: Always need more trials!

MP: YES YES YES

AV: of course, but difficult to do as infantile esotropia is actually quite rare and possibly becoming rarer (may be related to decreased maternal smoking, and better perinatal care).

JRP: Good idea, with good methodology

47. Would you address the oblique muscle dysfunction at the same time?

KT: Depends - see webinar.

DC: See Q 7

MP: No

DT: yes, if really overactive

AV: No. A and V patterns get better with bimedial recession suggesting that the increased MR tone may be contributing. DVD is best treated with inferior oblique anterior transposition, so if the Inf. Oblique overaction is not causing any problems other than cosmetic, it is worth holding off if possible.

JRP: only if apparent and the three components are present. Also see Q 7

48. Dr. Manoj: When do you inject Botox when combined with surgery?

MP: Before I detach the muscle. It makes it easier than injecting after recessing.

49. What type of surgery do you do?

KT: BMRR as 1st line choice.

MP: <40 PD BiMR recession 6 mm >40 PD BiMR recession + BT

DT: Depending on examination under GA. Combination of MR recession and posterior fixation

JRP: I do not do surgery but Dutch orthoptist advice on strabismus surgery:
<https://pubmed.ncbi.nlm.nih.gov/18953557/>

50. By offering Botox or surgery early, how much stereo can we expect to achieve compared to delaying Botox / surgery say at the age of 5 yrs.?

KT: Unless strabismus shows spontaneous resolution (between 8 - 20% on CEOS and ELISSS), you should expect no decent stereopsis if any intervention is left until age 5

MP: Most studies show basic BSV in >50% cases, and high quality stereo in <1/3 cases with early surgery. Much less chance with late surgery

CBT: see Q 31

DT: none

AV: most of the evidence suggests that only crude binocularity is achievable whatever the age of intervention. However, the best outcome is a microtropia (< 8 PD) which gives the best chance of a stable alignment with limited amblyopia. This is best achieved with surgery before 2 years

JRP: Studies have different inclusion and bias for BSV occurs. Generally, 1/3 of late surgery develops Bagolini positive

51. During the Botox Injection do we ADDUCT the globe to expose the MR muscle or ABDUCT? The presenter mentioned ADDUCT.

KT: Abduct first, grab muscle, then adduct

MP: Abduct when inserting the needle, adduct to advance the needle and when injecting

CBT: ADDUCT to make the needle parallel to the belly of medial rectus

DT: You have to adduct the eye once the needle is in the muscle and then push the needle backward

52. How many Botox injections are needed up to the age of 5 yrs.?

KT: If I use Botox, I will only use again if it seemed to have a moderate effect. Otherwise prefer surgery

MP: Typically, 2

CBT: average 1.5 injections, however, we would switch to surgery if deviation recurred and we can measure a reliable deviation, most children will be cooperative at 2.5 to 3 years of age

JRP: Would not advice it at this age

53. What are the benefits of early surgery vs late (after age of 3 years)?

KT: Higher chance of normal binocular functions, if you operate well within first year of life.

DC: Better fusion, better of neuromotor development, normal appearance and in my hands, less surgeries

MP: See Q 50

DT: QOL for parents?

see Q 50

JRP: after 3 is late surgery

54. When we done the surgical...

DC: See Q 12 and 37

55. Diagnostic criteria

DC: ET over 15 PD with full correction on.

MP: widely published

56. What is infantile esotropia?

DC: ET persistent deviation appeared under age 6 months

57. What is the refractive status in infantile esotropia?

KT: Must be not relevant hypermetropia to the alignment (very young - first 4 months $< +3.0$ DS, as gets older $< +2.5$ DS - i.e. as infant ages every few months', smaller degrees of hypermetropia can affect angles of strabismus – especially in smaller, variable angles).

DC: I think it depends on the population. In our population, they are hyperopic in a percentage of 95% and hyperopia is higher than you will find in the books. I made a large retrospective study presented in ESA Meeting 2015: only 30% of them had low hyperopia, the rest more than +4 at age 9 months

MP: Can be low hyperopes. I try and correct even low errors to maximise alignment

DT: Usually few ametropias

MS: typically, low hypermetropia. But some of these patients may also have an accommodative component which can develop after surgery too

AV: normally there is no significant refractive error

JRP: Non-significant but early accommodative esotropia is common so always do retinoscopy

58. What can we do in COVID era?

KT: learn from each other and plan when we can gradually return more and more to routine practice

DC: Live, love, work, taking care of our patients

MP: I think you can reasonably justify early surgery, but not as an urgent/emergency case.

JRP: take good care of yourself and the patients, respect hygiene

59. When is the earliest time / best to operate a child with infantile esotropia?

KT: 4 months on.

DC: See Q 12 and 37

MP: 7-8 months

MS: by 16 months

JRP: After 3 to go for the best result in 1 operation

60. Please give us some trick to exam krimsky in infantile strabismus.

KT: no trick, just get interesting, lit age appropriate toys, and keep doing it a lot.

DC: Use loose prism, take flash photos, use toys or cartoons in your office to distract the child in order to look at distance

MP: I often ask parents to hold an iPad or cartoon on the phone to attract the child's attention and do the test as usual.

MS: see above. Answered

AV: see q 14

JRP: <https://www.aao.org/bcscsnippetdetail.aspx?id=703d090d-b6a0-45d5-a3da-e456c030caec> Or ask your orthoptist

61. How soon will you re-operate significant residual ET?

KT: Depends on your original indication. If you have not achieved your alignment in the first year of life for infantile ET, you should be considering further intervention at 6 weeks post op. If it's late surgery, then no rush at all.

DC: 2-3 months if larger than 25-30 PD but I would prefer to try toxin in smaller angles. Residual angles are always larger in children operated after 2-3 years

MP: Wait at least 3 months after 1st op

DT: I wait at least 6 months

MS: first we give a trial of full hypermetropic correction found on a cycloplegic refraction. Treat any amblyopia. If residual ET is not compatible with peripheral fusion, then can take up for resurgery

AV: good question. I wait at least 3/12 but monitor amblyopia carefully

JRP: until it is stable and until you can measure within a 5 PD range, also in left and right gaze (delay surgery if not possible!) Prognosis for BSV is already poor

62. 90 PD unilateral infantile esotropia - treatment approach please!

KT: Unilateral implies significant amblyopia? / 6th nerve palsy? / Duane's? / Unilateral globe abnormality – you need to address these issues first.

DC: Unilateral? Probably high amblyopia if doesn't alternate. Check refraction, possible anisometropia. Full correction. Patch depending on age, get alternance, check for up-shoots in add and operate. Bimedial MRREcession (see Q 21) +/- IO surgery (See Q 7)

MP: BiMR recession 6 mm plus BT 5 units into each MR. Warn parents second operation likely.

DT: Extremely rare in my experience. Probably decrease under general anesthesia, meaning a strong tonic part of the deviation. The I would do a combination of Posterior fixation and recession.

If the deviation remains unchanged under GA, I would consider 3 muscle surgery, and warn the parents for a second step.

JRP: Large recession resection in the squinting eye early. Measure again post op and wait for stability and then additional recess resect in the other eye. 4 x 7 mm muscle relocation = 18 mm relocation: 1,6 degrees per mm= 44,8 degree change of angle is perfect aligned for your patient. Always calculate your exact dose for the second surgery

63. For esotropia more than 2 years orthoptic treatment, but slowly progression, what should we do?

KT: >2 yrs., then surgical reasons are psychosocial development concerns when appropriate for the individual child (i.e. may not be well into school years). Continue to monitor and Rx amblyopia until well past risk group (age 7-8).

DC: I'll stop orthoptic treatment, huge chances for diplopia. Go for surgery or Botox.

MP: If infantile ET, unusual to progress slowly. Check for accommodative component and refraction. I think surgery needed.

AV: offer surgery (bimedial recession)

JRP: Question compliance, confront parents that they are delaying surgery

64. Botox treatment for post-operative residual squint (team A) VERSUS Botox as primary treatment for infantile ET (team B). I'd think team A are the favourites!...lol????????

DC: Surgery first, Botox for residual ET

MP: Agree!!

JRP: good point, I think so too

65. When is the earliest time / best to operate a child with infantile esotropia?

KT: 4 months.

DC: See Q 12 and Q 37

MP: 7-8 months

AV: see above

JRP: Not before age 10 months

66. Like to receive videos on interactions of following webinars of browed syndrome and Superior oblique palsy.

All our Webinars are archived on our [Facebook page](#) & [YouTube channel](#).

67. At what age do you recommend surgery in Primary Congenital Esotropia?

KT: 4 months

DC: See Q 12 and 37

MP: see Q 65 (Q no. changed taking into account 3 deleted Qs)

JRP: In convergence excess BMR without convergence excess unilateral recess resect

68. How do you measure the inferior oblique overaction in the presence of esotropia?

KT: Hard in young, can grade as older – not as important as you may think. More relevant as “significant” or not is 1) does the IOOA cause hypertropia near primary that will affect your chance of good paracentral consistent alignment for the young 2) is it part of the socially noticeable strabismus presentations – for the older child.

DC: There is no need to measure it, see Q 7. If there, preferable bilateral IO anteriortransposition, in most of cases, you will have less manifest DVD or at all.

MP: very tricky, I usually test uniocular movements in such cases.

DT: Grade in +
+ over elevation when eye goes in supra adduction
++ overelevation ... adduction
+++ overelevation starts as the eye leaves PP to add
++++ Hypertropia in PP increasing in add

MS: look for a V pattern, elevation in adduction, hypertropia in adduction and fundus torsion (maybe difficult in a child)

JRP: R/L fixing cover test in R and L gaze

69. How many times it is necessary to repeat, for example if the we used botulinum toxin at 1-year-old?

KT: Usually aim < 1 yr. on average 1.4 time, varies mostly 1-3.

MP: See Q 52

70. What is the best age to perform surgery in ce?

KT: see webinar. Aim 4 months if all else ok.

DC: See Q 12 and 37

MP: 7-8 months

AV: see above

JRP: I would say <1 year early and >3 years is late

71. How often you see ptosis following botulinum toxin injections?

KT: Majority don't have amblyopia inducing but is a big downside risk of injection in the very young (I don't do).

MP: 10% cases

CBT: see Q 29

72. Does the adduction restriction cause any problems in the child?

KT: not usually a prominent feature

MP: Small risk of amblyopia

JRP: More risk of consecutive exotropia, in convergence excess good for recurrence of residual ET

73. Ken: what forceps work best to bunch the rectus muscle for injection?

MP: I use St Martin's forceps

DT: Rosario Gomez de Llano Forceps

KKN : I use St Martins forceps

74. How many units of Botox do we inject in the mrm? Single or bilateral? Does the amount of ET determine amount of Botox?

KT: Varies, MR yes, usually bilat, dose can vary but many don't vary dose.

MP See Q 62 (Q no. changed taking into account 3 deleted Qs)

CBT: see Q 42

JRP: There is no dose response in Botox, more studies are needed

75. In case of infantile esotropia with IOOA or DVD, is it possible to do Botox injection?

KT: Yes.

DC: I think yes, solve later the vertical deviation

MP: Yes, but surgery generally works better

DT: Yes, but it seems less efficient

JRP: The more components present the worse the prognosis for good alignment after 1 procedure

76. Does Botox or early surgery prevent IOOA or DVD?

KT: No.

DC: No

MP: In my experience, it can reduce but not eliminate risk.

CBT: no evidence of this effect yet

DT: Not that I know

AV: very good question. Elevation in adduction is not only caused by inferior oblique o/a, so horizontal surgery can improve it. However, assuming that infantile ET is a neuro-developmental disorder which many consider is most likely, and that other Inf oblique o/a and DVD is caused by the neurological deficit, it is unlikely that surgery will alter the incidence.

JRP: Both are consequence of poor BSV so yes if there is a potential BSV development

77. What's the best time to do Botox? Is it earlier than what you would do surgery?

KT: For me NO.

DC: See Q 12 and Q 37

MP: Yes, ideally 5-6 months

CBT: see Q 41

DT: 9 months

JRP: No in my opinion

78. Dr. Ken: Would you still go for Botox first in case of IOOA / DVD with IET?

MP: I would go for surgery

KKN: No; in this case surgery of BMR recession and Bilateral inferior oblique recession or anteriorisation (if DVD)

79. How early is early surgery? Do you wait to have stable measurements before taking the patient to OR? Average?

KT: 4 months is my earliest. Stable measurements – one accepts a degree of testing variation, but if you feel the IET is small angle and truly variable, follow closely as these are the ones mostly likely to improve.

DC: See Q 12 and 37, I do the average. In most of cases they are large angles. Surprising, at young ages the surgery effectiveness is higher for large angles. Less contracture, more plasticity, less tight muscles

MP: 7-8 months. No. I usually try and assess the maximum angle of squint, often with photos parents have taken at home. It is rare to achieve stable measurements in these cases.

AV: age 1-2 years. See answers above

JRP: Yes, always wait for stable angle especially when you see reduction

80. And is there any change in the surgical dosage of a botoxed muscle?

KT: Once Botox shown to be ineffective – Sx for the angle you have then.

MP: No.

CBT: we use the same dose for botoxed and un-botoxed muscles

DT: Yes, muscles are smoother, with eyes more frequently straight under GA. More Posterior fixation, less recession.

JRP: Good question, but I don't think so, normal dose response as in a normal eye

81. How many Botox injections would you consider doing before moving onto surgery? Is it age dependant?

KT: I prefer primary surgery. Right now, I consider 1 Botox and will only repeat if I felt had a moderate but not quite enough effect.

MP: Rarely more than 1

CBT: see Q 52

DT: 2

82. Do you believe that an accurate visual assessment or improving amblyopia is necessary prior to surgery for infantile esotropia? This would delay surgery.

KT yes for vision, but good orthoptic assessment can assist in confirming ok vision for age. Dense pre-op amblyopia is uncommon in true IET, and regardless – if the child is only 3-4 months of age, it responds quickly to treatment. So, you can anticipate good response, review in weeks then plan surgery.

DC: With careful evaluation, accurate follow-up and patching, amblyopia can be prevented or treated if already installed. The follow-up should be done at 2-4 weeks, depending on age if patching is recommended, the tight follow up is necessary also after surgery.

MP: Not necessary, the two can happen concurrently

DT: Yes, yes. Amblyopia treatment is more important than BV and eye alignment

MS: if there is amblyopia, not much stereopsis will be obtained anyway. Also inadequately treated amblyopia can be a risk factor for consecutive XT

AV: this is a difficult dilemma. Of course, getting some idea about whether there is amblyopia and treating it before surgery is ideal. Luckily, amblyopia is not a common feature of true infantile esotropia. So you may not be absolutely sure there is not amblyopia, but if it is not obvious, I do not think that surgery should be delayed.

JRP: No an orthoptist can evaluate whether VA is equal in both eyes without proper measurement

83. What is the risk of developing consecutive XT after Botox treatment?

KT: Low

MP: Rare after BT alone. Temporarily seen after BT + surgery, recovers well.

CBT: see Q 40

DT: 5%

84. What do you mean early surgery? In congenital esotropia?

KT: Aim 4 months. Def < 12 months.

DC See Q 12 and Q 37

MP: 7-8 months.

JRP: <1 year is early and after 3 is late surgery

85. Do you use prismatic correction for these small children as a preoperative assistance?

KT: no

DC: Never

MP: No

DT: No

MS: difficult to make kids wear them

AV: no. Difficult to correct large angles effectively with prisms in an infant.

JRP: No prisms only in BSV presence and these children have no BSV

86. If you had a son / daughter born with congenital esotropia around 60 PD, bilateral IO overaction, limitation of abduction, no refractive error, how long do you wait to have a colleague to operate him / her?

KT: If the clinician is confident the problem is IET (i.e. "limitation of abduction" clarity is important) – then no reason to wait. If the child is already past 18 months, then still can do surgery then, but it's ok to wait till closer to socially significant school age.

DC: I would do it myself, after carefully evaluation probably at less than 60 days since the ET appeared.

MP: 7-8 months.

DT: I would recommend Botox before age 1, and if eso recurs, surgery between 2 and 3 years

MS: If able to get stable two sets of measurements (preferably cover test) then operate

AV: Excellent question, and one that we are frequently asked by parents. As the deviation is large, I know that no intervention is going to achieve high levels of BSV. I would want my colleague to produce a microtropia (<8 PD) and this is best achieved by aligning the eyes before 2 years of age. This will give the most stable alignment with the least chance of dense amblyopia. As it may take more than one operation, I will be bringing my child into the OR on their first birthday!

JRP: Till after 3 years

87. Is a cong. ET of 60 PD the same as a cong.ET 20 PD? Would you have treat the two in the same way? Time-wise and dose-wise?

KT: See Q 11. Dose different of course for surgery.

DC: See Q 11

MP: See Q 11

AV: see Q 11

JRP: Small angle have higher chance to resolve spontaneously, if still 20 PD stable at year one surgery can be considered to restore some BSV. Prognosis for BSV in large angle ET is low and therefore surgery can be postponed

88. Are there special doses surgery tables to operate at 7-8 months?

KT: Many.

DC: Yes, you can find them in the books

MP: I usually recess 6 mm and add BT at the same time for IE > 40 PD. If <40, 6 mm recessions alone. If <30, BiMR 5.5 mm

AV: no, not that I am aware. It would require a lot of early operations to create one.

JRP: there are not unfortunately

89. Dr Ken: Do you do Botox injection on both of medial rectus or just 1 medial rectus?

MP: Both MR

KKN: Both

90. Dear Ken, for twin infant and premature, what is the best age to perform surgery?

MP: Not sure, best is around 1 year in my opinion

JRP: Late, premature have no potential for BSV and surgery is only cosmetic

KKN: these cases must be assessed for periventricular leukomalacia; in such circumstances fusion potential is very low. I would do Botox but later. maybe by 2 yrs. If no PVL and no delay, do by 1 year corrected age.

91. What are the strategies for recurrent IOOA after IO recession?

KT: Resurgery – any option - find unoperated tendon head? Recess further? Myectomy? IOAT? Depends on other factors present.

DC: Reoperation on IO

MP: IO anteriorisation

DT: RE recession, antero transposition

JRP: SO tuck

92. So what is the verdict: When to Botox and when to surgery?

KT: Both acceptable

DC: Surgery in stable angles larger than 30 PD, Botox in smaller or variable angles

MP: Very early presentation, can have BT at 5-6 months. Surgery around 8 months

JRP: go for the safest option

93. I have used 5 u Botox in 0.1 ml. Do others feel that 0.05 ml is truly dependable to reach muscle through the needle? (concerns with ptosis understood)

KT: Yes. Lower dose probably better for less spread.

MP: No harm in using 0.1 ml but the risk of leakage is higher.

94. In treating DVD, when do we do SR recession or IO weakening?

KT: Both work well. IOAT if presence of IOOA as well, depends what else you have and surgeons comfort.

DC: If DVD accompanies IOOA, IO Anterior Transposition, if DVD alone or IO already operated without up-shoot in ADD -SRRRec

MP: I always do IO anteriorisation

DT: SR if real DV, with incyclo. IO if excyclo and seen in adduction

AV: in my hands, inferior oblique anterior transposition is the most reliable surgery for DVD. Superior rectus recessions have to be large (10 mm) to be effective and there is a risk of vertical deviation, especially if more is recessed on the eye with >DVD. Superior rectus posterior fixation sutures are another option (which don't work if the SR has been recessed 10 mm).

JRP: Treat asymmetrical DVD in combination with IOOA with IO weakening and additional DVD with SR recession

95. Anyone ever corrected the IOOA first and later the eso?

KT: That suggests you may not have IET; perhaps congenital SO palsies.

DC: No

MP: No

DT: Yes, in strabismus sursoadductorius

MS: No

JRP: Yes! With surprising good results, especially in large V pattern

96. Do you continue patching after surgery?

KT: If needed

DC: Usually yes

MP: Yes, for amblyopia if needed.

DT: If necessary

JRP: If required, yes always to treat the VA difference

97. What is the concentration of botulinum toxin used?

KT: see Q 42

MP: 5 units in 0.05 ml

CBT: 5 IU in 0.05 ml

JRP: Different dosages, but no consensus, no dose response

98. What is the site of botulinum toxin injection either muscle insertion or belly?

KT: not insertion as risk globe injury

MP: at least 6 mm behind insertion to be closest to neuromuscular junction

CBT: the target is the muscle belly

DT: Belly

99. Can we give botulinum toxin in iet with DVD? Does it delay the surgery for DVD?

KT: yes, separate

MP: Yes. I am not sure if it delays surgery for DVD though

CBT: we treat ET with Botox first for un-cooperative children, the DVD will be addressed later when the children can fixate well at distant target

JRP: No studies yet, not advised

101. Do we need to repeat the Botox or just one injection of 5 iu is sufficient? Also after 1 injection when should we decide that now surgery is needed, after how much time span?

KT: see Q 42

MP: It can be repeated, but if the squint has returned to preop angle, I would proceed with surgery. I wait 3 months after BT injection.

CBT: see Q 52

102. Should one change the age at which surgery is done if there is any history of prematurity?

KT: if significant prematurity, especially if co-existing morbidities (IVH, CP) then chance of binocular function restoration is decreased, so yes

DC: Yes, especially if they are some neurodevelopmental problems associated or ROP history

MP: Delay till 1 year

AV: good question. The risk of over-correction is definitely greater in premature infants so I would tend to do less surgery but still within 2 years corrected age if the deviation is significant.

JRP: Good question: absolutely YES! There is no normal development and no normal BSV development anyway. Surgery is only cosmetic

103. What does panel think of alternate patching before Sx?

KT: as I don't operate < 4 months, I don't use it

DC: Yes, but if they are amblyopia suspicions take care and adapt the hours in order to stimulate more the suspected eye. The patching will prevent abnormal connection in the brain between the two eyes.

MP: There is some suggestion that alternate patching prevents abnormal binocular interaction developing, and it might reduce the naso-temporal asymmetry of saccades, and improves range of abduction.

MS: By and large shown to not make a difference.

AV: not something that I often use, but I see the sense in it, so maybe I should!

JRP: There is no literature to support alternate patching, I would say no.