

WWW 2 Panellists



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**1. What do you think about the interference of topical anaesthetic on the muscle strength at time of muscle adjustment?**

DM: If after adjustment the patient was fine, he remained fine. Thus, I think there is no interference if done with small incisions. If quite a lot of anaesthetic gets posterior to the insertion, there may be an interference.

EC: Never do adjustment immediately after surgery under local

DG: Not enough to be an issue for me, I use delayed adjustables so am adjusting 5 days later.

CD: None

YS: I don't do adjustable suture surgery. However, if by topical anaesthesia you mean topical tetracaine, I do not think that will have an effect on the muscle strength.

RK: I don't think so, it will interfere.

**2. Is it possible to use local anaesthesia in reoperation?**

DM: Yes, depending on the amount of scarring and the amount of muscle displacement, which should not be excessive. If possible, however, I suggest to perform total anaesthesia in repeat surgeries.

EC: For me, no

DG: Yes, but you must choose the correct patient, with the correct re-op circumstances and work well with your anaesthesiologist. Topical followed by a local infusion works. More typical is general anaesthesia.

CD: Maybe if horizontal and minimal scarring

YS: Is the question can you do reoperations under topical anaesthesia? This completely depends on the surgery involved. It is possible to do a central plication or central tenotomy on an awake patient under only topical anaesthesia, especially on muscles that have not been previously operated on i.e. prior strabismus surgery on the antagonist muscles, or on the horizontal muscles, and the reoperation is on the verticals. Depending on the extent of the previous surgeries, topical anaesthesia may be limited. If extensive exploration is required, or significant restriction, general anaesthesia is required. The painful part of topical surgery is pulling on the extraocular muscle, so if this is anticipated, plan for a general anaesthesia. Patient selection for topical cases is the key.

RK: Yes, it is possible, but not preferable. After injection for LA there could be chemosis and interpretation of FDT and tightness etc. becomes difficult. In simple case where you are not expecting much scarring it should be fine.

**3. Size of your opening in MISS if recession is more than 6 mm?**

DM: Personally, I avoid large recessions because of the risk of long-term overcorrections with need to advance the muscle again. If necessary, beginners should open twice 6 mm. If you are familiar with transconjunctival suturing techniques, you can do it with twice 4 mm.

**4. Which is your favourite incision in primary surgery, and in reoperations?**

DM: Both MISS. Even in complex surgeries like transpositions I use MISS. Exception large scars between superior rectus muscle and superior oblique muscle. Clearly, this depends on the experience. Less experience = use more frequently another technique like the limbal or fornix approach.

EC: Limbal incision for recti muscles; peripheral incision for oblique muscles

DG: Fornix for both.

CD: Fornix, limbal

YS: I prefer fornix surgery when possible over limbal surgery, especially in patients under 40. The conjunctiva needs to be assessed in each patient, and when it appears elastic enough to withstand fornix incision, that is my preference: patients are more comfortable, cosmetically it looks better, and risk of dellen and corneal irritation reduced. In older patients with more fragile conjunctiva, I prefer limbal incisions. If I am performing a technique that Dr. Ken Wright and I have developed using a modified hang-back recession with fibrin glue, we use a limbal incision. If I am performing a central plication, I use a modified Swan incision.

RK: Fornix for both. Rarely swan incision when there is severe scarring at the sight of fornix incision and patients over 50 years old.

**5. Have you experienced "soft" eye in patients who had brimonidine drops for reducing vascularity?**

DM: I tried it but had more bleeding after surgery. I prefer not to use it and gently cauterize vessels that bleed a lot.

EC: No

DG: No, I use dilute epinephrine topically.

YS: No.

RK: No. Please refer to our publication: *Gupta A, Kekunnaya R, Sachdeva V, Rao HL. Strabismus surgery hemostasis. Ophthalmology. 2012 Mar;119(3):649-50.*

**6. You do botox through intact conjunctiva or you open until muscle exposure?**

DM: I use it only during a surgical procedure. Then I open the conjunctiva. Before, but many years ago, I was using it also without doing surgery, then I was not opening the conjunctiva, but I was using electrodes to ensure that I was in the muscle belly.

EC. Adults, through conjunctiva; babies less than 6 months, narcosis with opening

DG: Intact in the office, open in the OR.

YS: I do not use Botox in strabismus surgery.

RK: Yes, through intact conjunctiva in the office and after opening the conjunctiva in the OR during surgery.

**7. Dr. Ramesh, do your measurements hang while doing topical?**

RK: Is your question 'Do your measurements **hang** while doing topical?'. If so; Yes, it can happen if the patient is moving his / her eye a lot during surgery and your temporary knot is loose. Once you place a permanent knot is it is not a problem.

If your question is 'Do your measurements **change** while doing topical?'; then the answer is No

**8. If we do hang back recession for large recessions, do you think we can reduce size of fornix incision?**

DG: Depends upon the muscle and its attachments.

YS: I rarely perform hang-back recessions, but if I do I use the limbal incision and use glue to secure the muscle to the sclera to prevent anterior creep of the muscle, or posterior sag, and the same fibrin glue is used to close the conjunctiva nicely.

RK: Yes, if you are doing or aiming at a large recession beyond 8-10 mm. Otherwise the incision size remains the same if you take all the precautions not to put undue traction on the conjunctiva. Having said the I rarely perform hang back recession. Barbie retractor really helps in limiting the size of conjunctiva.

**9. How do you move the muscle for pattern Strabismus in fornix incision?**

DG: Not a problem, I do it all the time.

YS: The type of incision does not influence how you move a muscle for pattern strabismus, same principles apply to both fornix and limbal incisions.

RK: It is possible to move the muscle through fornix incisions. For e.g. if you want to transpose the MR superiorly, your conjunctival incision should be at the superonasal fornix. Accordingly, you can move the MR up (half or full tendon width). These minor adjustments help even in transposition surgeries for Duane / Sixth nerve palsy, etc.

**10. Can we have a video on the double plication surgery?**

RK: Please send an email to [wspos@wspos.org](mailto:wspos@wspos.org); we will get back to you with the video.

**11. How do we do squint surgery under topical anaesthesia?**

DM: Always with an anaesthesiologist, in cases the patient feels pain, intravenous pain killer and sedation can be helpful, also because of the oculo-cardia reflex. Before advancing / plication of a muscle, bring the eye in primary position in order to avoid pain. I also use in addition to the drops anaesthetic (can be a gel) next to the muscle belly.

EC: Only one muscle, never re-ops; Icarbocaine drops and propofol i.v. during muscle traction

DG: Sedation (propofol), topical and then small infusion can do it.

YS: The most important thing is to not pull on the muscle, this is where the pain comes from. Topical anaesthesia like tetracaine will numb the conjunctiva and cornea, and the scleral passes are not painful, nor are the muscle passes. A traction suture is key to move the eye into the position required, not pulling on the muscle. I use a Wright grooved hook to safely pass the muscle sutures so that pulling on the muscle is avoided. Picking the appropriate patient who

can tolerate topical anaesthesia is very important; I do not recommend to do in children. When I perform topical anaesthesia cases, I perform in our surgical suite, no anaesthesiologist required, for minimally invasive surgeries like central tenotomies, central plications. If a larger procedure is required then I perform in the OR, still with just topical anaesthetic, but like to have the anaesthesiologist present in case of an intraoperative surprise requiring more sedation for the patient. I would recommend limbal or Swan incisions and not fornix incisions for topical anaesthesia surgery as fornix surgery requires more traction of the muscles.

RK: Prepare and discuss the procedure in the office along with advantages etc. Please do simple Q tip test. Instil one drop of topical anaesthesia drop and touch the eye ball with Q tip. Observe the patients and assess whether he / she is fit.

In the OR keep the IV line, monitors and again instil few drops anaesthetics few minutes before surgery. I perform in the presence of anaesthesiologist. Conjunctival incision or suture pass through the sclera are not painful. Only stretching the muscle causes a bit of pain. Hence please avoid any manoeuvres which stretches the muscle. One can ask the patient to sit up after the surgery in the OR and can Perform single stage adjustment if required. I avoid topical anaesthesia strabismus surgery in oblique muscle surgeries and re operations. [This is an article for the same.](#)

**12. Locking forceps can be used instead of traction suture to rotate the globe in strabismus surgery. What is the opinion of the speakers'?**

DM: No space if you perform MISS, I also do not have an assistant who can hold them. I never used them, even when performing a limbal / fornix approach.

EC: Do not use them

DG: I use modified curved locking moody's with a 3/2 flat teeth configuration.

CD: I prefer forceps. Reduced risk of trauma and bleeding

YS: I rarely use traction sutures, and use locking forceps to rotation the globe. I use a 0.5 curved locking forcep for this which is weighted enough that it almost obviates the need of an assistant.

RK: I use locking forceps in almost all cases except in cases of friable conjunctiva where I use cotton bud to stabilize the globe when I incise the conjunctiva. Locking forceps is a very useful instrument.

**13. Some people use superior rectus traction suture in order to expose the globe. What is your opinion on that? I see here most of Panellists are using traction sutures close to the limbus.**

DM: I think the question was about using a traction suture at 12' and 6' for horizontal rectus muscles. Exposure is limited, much better exposure with corneal or, in children, scleral traction sutures next to the rectus muscle you operate on.

EC: Always use traction sutures for recti and oblique muscles

DG: I have assistants so do not use.

YS: I do not use traction sutures routinely, and have not used it through the superior rectus – I think this is unnecessary.

RK: I do not use traction sutures at all.

**14. With limbus based surgery: particularly dellen formation is more with resection particularly with large resection. What precaution you take to avoid dellen formation?**

DM: Colling through the eyelids a couple of times a day. Use of steroid eye drops (I never give any drops after MISS). Consider inverting the sutures. If you have a strong swelling of Tenon's, consider to remove the swollen Tenon. Can also be done at the slit lamp. Use ointments or frequently artificial tears and do not forget that some people sleep with open eyes: ointment or gel before sleeping.

EC: Create flat surface and see in re-ops patients after 1 week.

DG: Steroids and ointment help me but I prefer fornix.

CD: Make sure the conjunctiva is not raised above the level of the limbus.

YS: Whenever you are advancing a muscle or performing a tightening procedure (plication, resection) the risk of a dellen is real with limbal-based surgery. I always ensure I have sutured my conjunctiva a few millimetres posterior to the initial attachment of the conjunctiva at the limbus to prevent the potential conjunctival overhang. Once attached, if it appears that there is still overhang, I will carefully trim a very small strip of conjunctiva. Again, patient selection is key! If I have concerns about post-op follow-up (patient from a far distance, or other social constraints) or if I think the patient will not tolerate a post-op procedure to remove conjunctiva (rarely needed) then I will be more prone to remove this small strip of conjunctiva intra-operatively. Usually not needed. Your suture knot ends need to be cut very short, so no rubbing against the cornea.

RK: I prefer fornix incision even in cases of large resections. Topical steroids and artificial tear eye drops might help if you have one. Additionally, trim the additional conj. / tenons, suture ends, etc.

#### **15. Is there any role for the use of short term systemic steroids post op?**

DM: I like to give them in thyroid cases, but I do not know if they really help to avoid a recurrence of a myositis. If I'm afraid I give orally steroids for 6 weeks in such cases. In MISS only steroid eye drops if after a couple of weeks, the redness around the small incisions is too pronounced.

EC: No

DG: I use them in adjustable sutures as I do DELAYED adjustables for about 5 days, and in Thyroid.

CD: I have not used

YS: I do not use systemic steroids post-op, and do not find it necessary, even for my re-operations.

RK: I do not use them in primary and reoperations. I don't think there is any role.

#### **16. Any real evidence that the type of incision affects the anterior segment circulation?**

DM: As stated during the webinar, I don't think.

EC: No

DG: No, but I prefer fornix and \*think\* it does preserve the circulation better.

YS: Relative to the effect of disinserting multiple rectus muscles, especially vertical muscles, the effect of the limbal incision is minimal, but theoretically contributes.

RK: It's a theoretical fact rather than evidence based.

**17. Are patients who have aniridia and ectodermal dysplasia prone to limbal stem cell deficiency? In which case, should limbal incisions be avoided?**

DM: Possibly, there are no studies supporting that a nice limbal opening may really worsen the condition (however do not use cautery in that region!)

RK: Yes, possibly a good idea.

**18. Does anyone close limbal incision with or without small recession so as to avoid restriction especially in re-ops?**

DG: I do recess the conjunctiva to augment recession or relieve a restriction.

CD: I frequently recess the conjunctiva if it is tight

YS: Only if there is conjunctival restriction, otherwise no (see answer to 14 to prevent dellen).

**19. Some people use limbal incision to make teaching residents easier, but I teach fornix based though cos this is what I was taught and it's comfortable for me.**

YS: I always have residents in the OR learning from me, and they have no problem learning fornix incision. Residents can learn both equally well.

RK: Yes, I do the same with our fellows. But we make sure that they learn limbal, swan incisions as well.

**20. Are there any tips to minimise incision size when performing transposition surgeries?**

DM: Incisions only where you work, thus where you disinsert and reinsert the muscle

EC: No

DG: GENTLE surgery.

YS: Transposition surgeries require direct visualization of the muscles to see the ciliary arteries (if doing split-tendon transposition, which I recommend doing to prevent anterior segment ischemia.) I also add a suture 5-6 mm posterior to the lateral rectus insertion through the lateral rectus muscle and the transposed vertical muscles, to increase the effect of the transposition, which requires posterior exposure. In these cases, I would perform limbal incisions.

AF: Microscope is very helpful for this procedure.

RK: Make the incision between the two muscles. For e.g.: if you are planning SRT, your incision should be between SR and LR. This way you can minimize the size of the conjunctival wound. Again, make sure that you do not put undue traction on the conjunctiva.

**21. How can I avoid ending up with an excessively stretched and widened fornix incision by the end of my surgery?**

DG: Understand the relationship to the insertion and start with small incisions.

YS: It is a fine balance between having a small incision that then may be forcibly ripped open or not allowing good exposure and too large an incision that requires time to close at the end of the case. The incision will enlarge, but tips to keep it smaller are to place your initial incision in close proximity to the muscle of interest. If I am doing a very large recession, I will plan to make a large incision, to allow more efficient and less traumatic to the conjunctiva access to the muscle. If the incision is planned in this way, it will stretch less and close more efficiently and with a better cosmetic effect.

RK: Plan well, understand the anatomy, see the muscle insertion and ciliary vessels by moving the globe (just before the incision) and avoid undue traction. Avoid fornix incision in older people. Please refer to Q 8 and Q 20.

**22. In MISS, the central part of muscle is not tagged; is there a risk of central sagging?**

DM: Not if you suture the muscle taking 1/3 and you avoid that when reanchoring that the distance between the 2 sutures is equal to the muscle.

**23. Don't recommend fornix if the patient has a glaucoma shunt or scleral buckle or severe symblepharon!**

DM: Which technique depends on many factors: size / location of filtering bleb, which muscle must be operated on, where are the scars from symblepharon.

YS: I personally wouldn't make such a generalization and for these cases look at each case individually. It may be that a fornix incision is more appropriate than a limbal, depending on the location of the glaucoma shunt. Practically, many of these patients are older and their conjunctiva will not tolerate a fornix incision.

RK: Depends on case to case basis. Many factors like age, extent and severity of scar, size / location of buckle / filtering bleb / symblepharon, which muscle to be operated, etc. matter in this decision. If fornix incision is not possible, I would go for swan / paralimbal incision.

**24. Daniel, perhaps your incision would be classified as Modified Swann Incision; that is incomplete as in a Swann, the two incisions near the polls or corners of the muscle are connected to improve visualization, but not in your technique. Is that fair?**

DM: Avoid any conjunctival opening over the muscle: severe bleeding, scarring that will make reoperations difficult. MISS openings are NEVER above a muscle or tendon.

**25. Paralimbal is a very good choice for reoperation!**

DM: Depends on which muscle has been operated before, where the scars are located.

YS: With reoperations there is often a lot of scarring of the conjunctiva to sclera anterior to the insertion and paralimbal is the only option (or trying a fornix incision to avoid that scarred area completely, and if possible).

RK: Paralimbal only in selected cases; fornix works very well for most cases.

**26. Dr. Ramesh, what type of retractor are you using?**

RK: One of the very useful instruments. It's called Barbie retractor.

**27. Any tips to choose the initial site for MISS?**

DM: Medial or rectus muscle, muscle displacements of 4 or less mm, age between 14 or 40. Too young: Tenon makes surgery harder, too old: tearing of conjunctiva if you are not used to operate through a small opening. Start with BIG small incision, e.g. 2 x 6 mm. Primary surgery, later with experience reoperations.

**28. Any special tips if we need to convert in case of complications or inability to proceed?**

DM: Do not open more than you need. In MISS usually enlarging radially is enough with no need to join the two cuts at the limbus.

DG: Proceed; I will convert to Limbal when needed.

YS: Is this referring to MISS? I have started re-operations with fornix incisions, and had to convert to a limbal-type incision, and vice-versa, depending on scarring and access to muscle. I think you should not be so worried about the size of the incision in reoperations, but knowing what you are operating on – i.e. is there a stretched scar, that you can only know by direct visualization, that needs to be removed, is there scarring in an area you were not anticipating, that will require a different approach and incision to access the muscle, has surgery other than anticipated been performed. You need to be open minded to changing your technique to be as safe for the patient, and making the surgery as efficient and accurate as possible to allow the best outcome.

RK: Depends upon whether it a conjunctiva related complication or muscle related like suture gets cut or muscle slips, etc. If the wound gets extended, one can suture it and proceed or convert to limbal incision if required.

**29. Would Dr. Mojon clarify which muscles he will / will not do MISS?**

DM: Beginner medial and lateral rectus, later all muscles, all techniques have been published with images.

**30. How do you recess using MISS?**

DM: 2 openings, then 2 sutures close to insertion, measure the distance and preanchor before cutting the muscle (because bleeding after cutting may make it harder to anchor the muscle). Look at publications with images.

**31. Dr. Mojon, are there situations that you don't do MISS? such as having a previous large horizontal muscle recession?**

DM: I did 30,000 muscles with MISS. Thus, I can handle (nearly) all situations. But this took me 17 years. Thus, you need to determine yourself what you feel able to do. You can start small and if it gets difficult open more.

**How does a MISS work if you have to advance a MR that was previously recessed?**

DM: That was the video that I showed. There are publications about that.

**Any situation that you had to change from MISS to limbal?**

DM: In the beginning in about 5%; now never.

**32. How large a recession can be done with the minimally invasive technique?**

DM: Same as with open surgery if you use transconjunctival suturing techniques (TRASU): technique has been published with images.

**33. Is it legal in your countries to operate without a helper?**

DM: Sure, I'm also operating about 1000 cataracts, what should an assistant do? Would be interesting to us to know which countries do not allow to do eye surgeries without assistant.

EC: Yes

DG: Yes

CD: Yes

YS: Yes (Canada)

AF: Yes (Colombia)

RK: Yes (India)

**34. Can MISS be used for oblique surgery?**

DM: Yes, but because there already radial openings have been described before MISS, I would only use the term MISS for oblique muscles for large recessions when you perform 2 openings: technique has been published with images.

**35. When you use microscope, what magnification do you use?**

DM: Depends on what I'm doing, usually between 7 and 10x

EC: Variable

CD: Lowest

RK: Very rarely do I use microscopes (like when I forget my surgical loupe or when I operate in one of our secondary rural eye centres). I use the lowest magnification available at such times.

**36. Does the muscle sometimes sag with this technique?**

DM: Answer for MISS - avoid that by taking 1/3 of the muscle with your suture.

RK: In fornix incision - this can be avoided by taking a central partial thickness bite and two locking full thickness side bites while suturing.

**37. Dr. Ramesh, when you are doing away with subconj dissection around the muscle and when recession is done, would u be worried with the actual recession happening since the muscle is still anchored with tissue around and it would actually undercorrect?**

RK: No, I am not worried about this and have not seen the above phenomenon in resurgeries either.

**38. Opinion regarding not closing the fornix incision?**

DM: No problem, as long as no fat is protruding (which obviously should not, but in repeat surgery may not be avoidable)

DG: I prefer to close.

CD: I always close it

YS: I would recommend closing all conjunctival incisions, other than the tiny incision through conjunctiva when performing a procedure like a central tenotomy. Even the MISS incisions in my opinion are too big to be left open. The risk of infection is real, although small, and the extra minute to close an incision is important to avoid infection. Why put the patient at additional risk by keeping incisions open? We use post-op antibiotics and precautions to not swim etc. after strabismus surgery, but patient compliance to those recommendations cannot be guaranteed. The surgeon can ensure closure of the incision and limit communication between the patient's tears and other sources of infection to the posterior structures of the eye.

RK: I leave the wound open in cases of partial tenotomy procedures and primary MR muscle surgeries. For all other conjunctival wounds during any other muscle surgeries, I close with suture or more recently with fibrin glue.

**39. Till what age you would do forniceal incision?**

DM: That was one of my problems with that technique: thyroid, repeat and over 50-60: difficult to use without inducing tears.

DG: Any, use careful technique in older pts.

CD: depends on the conjunctiva

YS: I always try to approach with a fornix incision if the conjunctiva appears to have the elasticity to handle the conjunctival manipulation. So I don't use an exact age cut-off, although we teach our residents the age of 40, there are 50 year-olds with very healthy and elastic conjunctiva, and conversely there can be patients younger than 40 who have very unhealthy and not elastic conjunctiva, often with other medical comorbidities, or prior ocular surgeries. I take a case by case approach. I use fornix incisions for all oblique surgeries.

RK: Any age, as long as the conjunctiva is strong. I avoid locking forceps in older patients and use cotton tipped buds to move the globe.

**40. How far do Panellists dissect the extra ocular muscle will it interfere with pulley?**

DM: Only minimally.

EC: At least 10 mm

DG: In routine recession, very little, just enough to sew the muscle.

CD: Usually posteriorly including the pulley

YS: I do not perform dissection routinely on my recessions. My approach is to perform the minimal amount of dissection required, and for recessions, involves removing the anterior tenon's so that the muscle at the insertion is clear of Tenon's for securing the muscle with the suture. I do not dissect posteriorly – this step is unnecessary, and increases the surgical time, increases risk of bleeding and scarring from fat adherence if Tenon's is violated.

RK: I do not. Only clear the tenon's at the muscle insertion. Additional clearing is unnecessary.

**41. When shifting muscles for a pattern, any difficulty in fornix incision?**

DG: No

YS: Not in my experience.

RK: NO. Please refer to Q 9.

**42. Does any panellist do interrupted suture on the muscle on each side?**

DM: Yes.

EC: I do it

DG: No

CD: No

YS: I use a double-armed suture.

RK: No, I use double armed; but interrupted sutures can be used on each side (I do it only in muscle transplantation cases)

**43. What is the age group in which brimonidine drops can be used?**

DM: I never found it helpful, I had more bleeding, if a vessel is really bleeding: gentle cauterization.

EC: do not use

YS: I avoid using brimonidine in kids under 2 years old. I never use in strabismus surgery.

RK: Just one drop in each eye and press the NLD to avoid systemic absorption just before surgery won't lead to any complication esp. sedations etc. Can be used in any age group (can avoid under 2 years). Please refer to our publication for more details: *Gupta A, Kekunnaya R, Sachdeva V, Rao HL. Strabismus surgery hemostasis. Ophthalmology. 2012 Mar;119(3):649-50.*

**44. Well, I don't cauterize ciliary arteries; is that a good thing? Crushing or using running saline is more than enough for haemostasis, right?**

DM: Under the microscope you see what you do, small incisions do not mean that you cauterize without looking at the tissue. In case of severe bleeding that is not visible you have to enlarge the cuts!

EC: I also use adrenaline on cotton for haemostasis

DG: I cauterize very little. I use epinephrine diluted on CTA with gentle pressure.

YS: Agreed, I rarely perform cautery and avoid when possible.

RK: I use cautery only in cases of SR and IR recession. It bleeds very much comparatively. You selectively cauterize the ciliary vessels at the insertion level only. In resection you anyways crush the muscle.

**45. It depends on the case; I usually prefer the fornix technique for the primary Sx in young people (including children), but in old people I prefer limbal technique. For reoperations I use a microscope**

DM: Agree, or try MISS!

RK: Most cases fornix incision very rarely swan incision. I use surgical loupe for magnification. But one can use microscope as well, but it slows down the surgery.

**46. What is your opinion on traction sutures to help exposing the muscles during surgery?**

DM: Use them in all cases.

CD: I don't use them. I find traction forceps are better

YS: I do not routinely need or use a traction suture as I get adequate exposure using a curved locking forcep.

RK: I don't use them. I used curved locking forceps.

**47. If the Tenon's incision is perpendicular to Conjunctiva, there is NO Tenon's prolapse and therefore closure is not needed.**

DM: You mean radial to the limbus: I agree, as long as no fat.

YS: I create my fornix incision in the same technique: one incision through conjunctiva, and a second perpendicular incision through Tenon's, for the same reason – minimizes Tenon's prolapse. However, I do close both Tenon's and conjunctiva to prevent Tenon's prolapse, in patients with a lot of Tenon's, typically kids, and close conjunctiva always with sutures as an extra precaution to prevent infection.

RK: I directly reach the bare sclera and hook the muscle. My incisions are closer to muscle pole. Hence no tenons prolapse. If there is any, excess tenon can be trimmed.

**48. Dr. Ramesh; what do you use in topical squint surgery, subtenon injection needs to be given**

RK: I do not give sub tenons injection, only topical anaesthetic. please refer to Q 11.

**49. Limbal incision can affect limbal stem cells, why not start 2-3 mm posterior to limbus for re-ops, etc.?**

DM: Visible scars, avoid any opening that is parallel to the limbus that is not performed at the limbus itself: exception superior and inferior rectus, you will not see the scar. However, I also avoid it then.

EC: never had problems with limbal incision

CD: Depends on the amount of scarring. It is not always possible

**50. When not closing fornix incision for medials, what if you see the muscle and sutures obvious from your wound?**

DM: If the opening is done correctly and no tear occurs, this should never be a problem.

DG: I close.

CD: I gather you mean after the surgery. I continue topical antibiotics until the suture has dissolved

YS: I close all my incisions!

RK: Probably in that case, your wound may be larger, you could suture in this scenario. When doubt, please do not take a chance, close it.

**51. More heaping or glue based closure will occur in fornix!**

DM: Tried glue, but had impression, people feel it more. But never did many cases, thus might be better to have the advice of Ramesh.

DG: Not my experience.

RK: Not really, it apposes very nicely. Fibrin is good alternative to suture, except that it is expensive.

**52. If I want to shift from a limbal to a fornix incision, how should I go about it?**

DG: Spend time with a surgeon; that does it.

YS: There are many online resources with videos and textbooks describing the fornix incision. However, in person instruction will always be better if possible. Dr. Granet made a plug for the WCPOS course where we teach different techniques on surgical models, and we also have a strabismus surgical hands-on course offered yearly at the AAO.

RK: Watch some videos and if possible observe surgeons for a week or two. And buy additional instruments.

**53. Tissue glue possibility of infection?**

DM: I don't think so.

YS: The risk of infection with tissue glue is almost nil. It is used routinely in many different ocular surgeries. If you are using a commercially available tissue glue, I would not be concerned about the risk of infection – the risk of an infection from the patient's own tears or blepharitis is much greater especially with incisions left open.

RK: No. There is no risk of infection just due to fibrin glue.

**54. In many cases of forniceal incision, conjunctiva tears occur. Any tips to avoid that??**

DM: Avoid thyroid cases, patients over 50-60 and reoperations.

DG: I use special forceps modified to handle the tissue.

CD: Avoid stretching the conjunctiva and be prepared to extend your wound if necessary.

YS: Create your incision large enough to not have to force it open to access the muscle. It is better to have a slightly larger incision that closes well than try to make a tiny incision that then is stretched and tears. You need to make sure however that you are placing the fornix incision in the correct place to limit the amount of stretch needed – I place mine approximately 8 mm posterior to the limbus and parallel to the lid speculum in the "white zone", away from the edges of the recti muscles.

RK: I use teaser hook and with gentle retraction of the conjunctiva chance of tear is very minimal. As described earlier, please avoid undue traction of the conjunctiva.

**55. Is it more like Swan incision but just lateral to muscle insertion?**

DM: What? None of the techniques shown opens the conj. over the muscle or tenon. Avoid that!

RK: There is not cut or opening of the conjunctiva over the muscle.

**56. Dr. Ramesh, we know that the conjunctiva will stretch but not the Tenon's. Do you make a separate Tenon's incision? Is it bigger than the Conjunctiva incision? Is it in the same direction or perpendicular to Conjunctival Incision?**

DG: I make separate incisions.

YS: See my answer to 47.

RK: I use teaser hook is specifically to lift the 'conjunctiva only' over the tenon's. I don't make separate incision for conjunctiva and tenon's as described for another question.

**57. When doing limbal incision for reoperation (especially advancing medial rectus) how do you manage the redundant conjunctiva at conjunctiva closure?**

DM: Never cut anything, dissect more before closing.

EC: Cut it off

DG: I irrigate with steroids and sometimes will trim the conj.

CD: I excise it

YS: See my answer to 14.

**58. With glue, in how many cases has the conj. re-opened?**

YS: I have not had conjunctiva re-open in using glue to close a limbal incision.

RK: Minimal opening in 2-3 cases in the early period probably due to faulty technique of application. Even one or two sutured would open up occasionally. All in all, no difference in suture vs glue group.

**59. The fornix-based incision is 8-10 mm behind the limbus but it is stretched to over the insertion with the hooks.**

RK: Varies from muscle to muscle. Don't have to follow 8 - 10 mm strictly. This way, one can minimize the size of fornix incision as described above.

**60. That technique will work when the conjunctiva is scarce in the limbus?**

DM: MISS is very nice for such cases. Patients who had many previous surgeries at one muscle will tell you after MISS about the difference: less pain, redness, often no need for pain killers or eye drops.

RK: Yes, fornix incision can work here.

**61. When suturing to sclera, was Ramesh using a Desmarres or Barbie retractor?**

RK: Barbie retractor

**62. Can you please explain forniceal incision in superior oblique surgery?**

DM: Radial cut temporal from the lateral border of the superior rectus muscle.

DG: Easy! Just be careful in what tissue you are holding.

YS: A fornix incision is made superior temporally to isolate the superior oblique tendon, and the incision made nasally. This protects and keeps the nasal intermuscular septum intact which is key in this type of surgery.

RK: I go with a superotemporal incision & hook the superior rectus muscle. I then insert a Barbie retractor through the conjunctival opening to explore the superior oblique muscle.

**63. Do you prefer topical anaesthesia in all squint cases?**

DM: I do 95% in total anesthesia, 5% in topical only.

EC: Use it only in one muscle surgery, not in re-ops

DG: No.

CD: No, I only use for patients with horizontal surgery and if they are systemically at risk of other types of anaesthesia

YS: No

RK: My preference is GA in 90 % of cases & in only 5 - 10 % of cases do I use topical or local anesthesia. TA is possible only in selected, co-operative patients.

**64. What about resection vs plications? Pros /cons?**

DM: I hardly know a surgeon who started with plication who did switch back

EC: Now use just plication, avoids risks to induce a vertical and reduces risks of scleral perforation

DG: Depends, I use both, shifting to plication more recently.

YS: I perform almost only plications, unless a very large tightening procedure required, which is rare, if larger than 5-6 mm I convert to a traditional resection. Pros of plications: limits anterior segment ischemia, quicker, reversible (within a few days), can be repeated, no risk of lost muscle, easy to teach. I do not see any cons to plications.

RK: I do both. In plication, my measurements are little bit more than resections. We can't do very large plication. Otherwise both techniques are similar. Plication is quicker than resection and we do not discard any tissue in plication.

**65. Have you done any suture less, glue less fornix conjunctival incision?**

DM: Yes, no problem.

CD: No

YS: No, do not recommend due to infection risk. Endophthalmitis although rare is devastating if it occurs and we should take every precaution to limit infection risk by closing conjunctiva.

RK: Yes, only for MR recession and partial tenotomy cases.

**66. Dr. Ramesh; could you please elaborate what precautions one has to take during topical squint surgery?**

RK: Please refer to Q 11 for the answers.

**67. What is the retractor used?**

DM: Bangerter

RK: Barbie retractor.

**68. Dr. Ramesh, which topical anesthesia and how you use for topical strabismus surgery? Do you use any sedatives during surgery?**

RK: Please refer to Q 11.

**69. Have you had problems of wound gaping in fornix incisions sutured with vicryl? / gaping in some part of incision?**

DG: No, I use a buried 8-0 vicryl.

YS: Especially when teaching, it is important to ensure the initial incision through conjunctiva is made with one decisive incision, not several small, jagged cuts – this will make approximation of the two conjunctival tissue edges appose

nically and reduce the risk of gaping. When closing the conjunctival incision, the two apices of the incisions should be retracted with fine forceps (I use 0.3) to put the incision on stretch, again allowing the two edges of the incision to align symmetrically, avoiding gaping.

RK: Yes, very rarely I see this; especially if the conjunctival suture knots are loose or the suture dissolves or breaks. However, with precautions this can be avoided.

**70. In case of repeat surgery, which incision would the panel prefer? I tried with traditional approach of limbal incision and many time found lots of scarring over the original muscle incision.**

DM: Clear what I prefer; I use MISS.

EC: In these cases, I open the muscle insertion

DG: Fornix.

CD: Limbal

YS: See answer 25.

RK: Fornix incision and see answers to Q 25.

**71. Do you use fibrin glue also in children?**

DM: I only tried it in adults, but never did many cases. In Pterygium surgery I switched back to Vicryl 8-0 (buried). A little bit longer surgery, but no displacements.

CD: No

YS: I have used a modified hang-back technique for recessions with fibrin glue in children successfully.

RK: Yes, I do.

**72. I find glue easier to close limbal incision; in fornix based chance of tenon's prolapse probably more, right?**

RK: I didn't see that issue when I closed the incision with glue.

**73. What power loupes do people use? I use 4.5X**

DG: 2.5X

YS: I do not use loupes, but my residents are required to use loupes.

RK: 4.5 X

**74. What is the best way to record video of Surgery if you are working with loops?**

DM: To have a camera between the loupes with a coaxial light. But: do not move your head too much.

DG: I got a second lens for my microscope that increases the focal length.

RK: We use an overhead camera which also provides a light source for the surgery.

**75. Some doctors operate with naked eye!**

DM: You can also drive a car without glasses being highly myopic. Once you start using the microscope, if possible for you, you will realize that seeing more than you need is never a disadvantage.

DG: I am too old for that!

YS: Yes, that's what I currently do. See 73.

RK: I did for the first 4 years. Best to have some form of magnification; esp. for reops.

**76. I have had a few children post squint surgery who were steroid responders with dexamethasone. All 3 children were aged between 12-14 yrs. started AGM for control. What is your experience on this?**

DM: I hardly ever give eye drops.

DG: N=1 and I stopped the steroids.

CD: This is well documented and a satisfactory alternative is diclofenac

YS: I use Tobradex post-op but only for a few days – max time a week. Steroid response with such a short course should not occur.

RK: I had few cases with prednisolone acetate eye drops, I have switched to Loteprednol Etabonate.

**77. Limbal for adults & fornix for children. What is your comment?**

DG: I use fornix as much as possible.

YS: Answered above.

RK: Fornix in majority of cases.

**78. Low magnification on microscope is helpful.**

DM: Depends on what you are doing. In repeat surgery, when you have to decide what is muscle or what is scar, high magnification. But you are right, use the minimal mag that allows you to do the surgery safely.

**79. I did 2 strab fellowships. One with a microscope. One with loops. If you are not presbyopic, I believe loops are better.**

DM: Cannot agree, especially for complex cases. The only advantage is, you can move more. But you can get used to moving your arms more.

YS: Agreed. I have used loupes, microscope (rarely) and currently use nothing. Once I become presbyopic I may go back to loupes. It is really important especially when teaching to have a wide field of view to allow visualization of the entire surgical field, arm positioning, instrument handling. Importantly ergonomics should be considered – loupes can be very heavy depending on the style and contribute to neck pain/strain depending on the surgeon's position. The microscope may be beneficial to limit this. However, there are significant additional costs involved with using an operating microscope – some surgeons may not have access, and there is additional sterile draping of the microscope handles etc. that may be needed. When I operate on the inferior oblique, or on tough reops I like to wear a head light and direct that light deep posteriorly, which I think is superior to using the microscope.

RK: I use loupes.

**80. Loupes can cause bad back posture.**

DM: I agree, unless the rest of the setting is perfect (chair, height of eyes of patient)

DG: Yes! I have a bad back worsened by this. Got a Dental chair with better ergonomics and it helps.

YS: It is not just the loupes, it is the type of loupes, whether you are standing or sitting and where you are relative to the patient positioning. However, anything on your head can cause extra neck strain if not designed ergonomically. Many loupes are designed so that the head and neck are straight and you are looking down through the loupes. Bad back and neck posture can occur just as much with incorrect positioning with a microscope and is well described.

RK: This risk is there. This can be avoided or minimized with proper surgical ergonomics.

**81. You do not use any suture on the sides of the incision; is there any specific reason?**

DM: MISS no need, after taking out the speculum they are closed.

**82. What is the postoperative regimen you would recommend for a routine strabismus surgery?**

DM: After MISS nothing

EC: Just eye drops, combination of steroids and antibiotics for 15 days

DG: Tobradex.

CD: Dexamethasone and Chloromyecetin drops 3x daily, weaned over 3 weeks

YS: There is minimal scientific evidence evaluating this, and it is difficult to do a study looking at risk of infection as infection rates are relatively low in strabismus surgery. Prolonged steroid use post-operatively, or some would argue any steroid use post-operatively may increase the risk of stretched scar formation and late overcorrection. I currently use Tobradex drops QID and ointment QHS for 1-week post-op. I see my post-op patients 3-4 days post-op. If everything is healing well and patient is comfortable, I stop the drops and ointment then. Most paediatric patients realistically are not getting much drops in as it is difficult for compliance. Post-op healing is probably the same without any steroids.

RK: Combination of antibiotics and low potent steroids. Antibiotics for one week and steroid tapered over 3 - 4 weeks.

**83. Dr. Campos, another advantage of limbal incision might be in elderly with friable conjunctivas, right?**

DM: Correct, or MISS because with enough expertise you will not displace the conj. Without expertise better to use limbal approach.

EC: Agree

**84. 3 comments: (1) I usually cauterize and do not see much scar on reoperations; (2) even on multiple surgeries usually I can carefully open the conjunctiva through the limbus; (3) on reoperations I like to have a wide field to see the muscle and membranes**

DM: Agree, but swelling will be strong after reopening and may lead to a permanent redness, especially if cortisone eye drops are not instilled as they should. That's also why I prefer MISS.

DG: You are a MASTER surgeon!

**85. for extremely scarred conjunctiva do you use a conjunctival graft when you cannot close the conjunctiva cannot be closed properly?**

DM: No need in MISS, apart if I have to excise a scar anteriorly to the muscle. Then MISS makes no sense, open wide and rotate or transplant conj.

EC: Prefer bare sclera

DG: I have along with amniotic membrane.

YS: In these cases, I plan in advance to have an amniotic membrane graft available to use with fibrin glue, this is a very effective way to replace scarred restrictive conjunctiva. I prefer this to taking a conjunctival graft to preserve the conjunctiva in the other eye for future surgery (glaucoma, strabismus) and limit creating another problem with the conjunctival autograft area. I do not like to leave bare sclera.

RK: Amniotic membrane is used in these type of cases.

**86. What about introp viscoelastic to reduce patient inflammation?**

DM: I tried to keep my small openings open, but never saw a difference of inflammation.

EC: No advantage

DG: I reported that! I do use it; it helps a lot for decreasing scarring and delayed adjustables!

CD: Well reported but I have not found it to be very helpful

YS: I have not used this, and do not think it is necessary nor will help with patient inflammation. Minimal dissection, and careful surgery, minimal cautery will help reduce inflammation.

RK: I do not have any experience with this.

**87. Is resurgery on a previous limbal scar easier to operate on or a previous fornix scar more difficult?**

DM: Between both, I would go for limbal.

DG: Fornix for me.

YS: Hard to generalize - both incisions if performed properly with routine strabismus surgery allow for reoperations with either incision. But many cases present to us with scarring, using both incisions.

RK: Depends on how the primary surgery was done. May be easier to reoperate in a case with previous fornix scar.

**88. Is there a mix-up with respect to the terminologies here? limbal-based incision versus limbal-approach incision?**

DG: Yes

YS: Yes. Limbal incision and fornix incision is the terminology for strabismus surgery incisions – these terms mean the incision is at the limbus, or at the fornix. Limbal-based means the hinge for the incision would be at the limbus and fornix-based would mean the hinge for the incision is in the fornix. These latter terms are used in glaucoma surgeries for the flap.

RK: As discussed during the webinar, better to say limbal incision or fornix incision.

**89. So what else can you do in reoperations, if you cannot get in through the limbus?**

RK: Fornix, Paralimbal or swan incision

**90. Do you recess the conj. in a recession procedure?**

DM: Never, even in open surgery.

EC: Yes, in case of mechanical problem

DG: If needed, but not routinely.

YS: Not in routine cases with full ductions. The only time I would recess the conjunctiva is if with serial forced ductions intraoperatively there was restriction. Then the conjunctiva would be recessed first to see if that releases the restriction. If it does that may be all required. If not, the restriction requires a muscle recession. If conjunctiva is recessed significantly I would use an amniotic membrane graft to replace the recessed conjunctiva to cover the bare sclera.

RK: Very rarely in restrictive strabismus.

**91. 2 comments: I usually cauterize and in my experience this doesn't bring more scar when I need to reoperate.**

DM: Correct as long as its gentle.

YS: I perform minimal cautery, usually there is minimal bleeding. The key is selective and careful cautery – every single blood vessel does not need to be cauterized, I selectively cauterize if needed for a bleeder that doesn't respond to initial pressure with a cotton-tip applicator.

RK: Agree. It has to be minimal and targeted cautery.

**92. In Resurgery with limbal route, would not fornix be better as it would be virgin?**

DM: Theoretically yes, but it hard to do reoperations through fornix approach, especially if complex.

YS: That has been my experience for certain cases, as we discussed.

RK: Agree

**93. What does the panel think of using non-absorbable suture for IR esp. restrictive strabismus?**

DM: I'm using resorbable sutures also for tendons (plications) and never had an issue like many colleagues I know. Thus, I'm not sure than apart from equatorial myopexia, where I never tried, there is a need for non-resorbable.

EC: May cause granulomas

DG: I do not use this - I mostly use adjustables.

YS: I often will use a non-absorbable suture (5-0 Merciline) for the IR, especially in thyroid cases, and I also will use in reop cases where I have found a stretched scar. There is some evidence that using a non-absorbable suture in these situations may limit a repeat stretched scar and late over correction, which is a concern in the IR in thyroid cases. For complex reops I like the Merciline as I know it will act as a tag if another surgery is required, and may help find the

muscle. I place the knot posteriorly (scleral passes aimed posteriorly) so that the suture knot is under the muscle to avoid conjunctival erosion. I have not had issues with granuloma or conjunctival erosion.

RK: I use absorbable suture with additional knots and I avoid hang back surgery for IR.

**94. The fast absorbing catgut is 6-0? Which type of needle?**

CD: Cutting

YS: I use a 6-0 plain gut with a spatulated micro-point needle.

**95. Why is it important to discuss one incision from each other, If the results (which is motor alignment) are the same few months down the line? It boils down to surgeon preference.**

DM: Do not agree, I want patients to open the eye immediately, have no pain, and have them back to work very quickly. Working disability (secondary health care costs) cannot be ignored.

DG: Does it?

YS: I think it boils down to surgeon preference and comfort with the technique – that will contribute to the efficacy of the overall procedure. However, there are merits to both procedures, and discussing this basic incision type has opened up discussion for many of the nuances of strabismus surgery and how we can all improve our techniques. Agreed that both incisions if performed well, will close eventually with good cosmesis and the hardest part of the surgery is determining what to do with the muscle.

RK: Surgeons training and preference is important. As we evolve, we need to find solutions to better the comfort of the patients, even immediately after surgery and on post op day 1. In this matter, type of incision is important along with a few other things. Motor alignment along with better comfort immediately after surgery is important. if we can provide both, why not?

**96. What is the preferred suturing technique for the muscle?**

DM: 2 sutures 1/3 of the muscle, full thickness, but only one passage. (however if you use the microscope and you see what you do). Exception in stretched scars (look for them, more frequent than you think, otherwise your muscle advancement will not work!): in this cases I'm paranoid to do many many sutures after taking out the thinned portion at the insertion.

DG: Locking whipstitch.

YS: I use a double armed 5-0 Vicryl suture, with a full thickness central security knot, and full-thickness locking bites at the poles of the muscle – I do this for my recessions, resections and plications. I soak this suture in povidone iodine 5% for all my cases to limit the risk of infection.

RK: I use double armed 6-0 Vicryl suture, with a partial thickness central security knot and locking full thickness bites on either sides.

**97. Is it better to use the arrow sponge for dissection or use scissors?**

DM: Never a sponge, the perimuscular tissue will be damaged.

EC: Scissors for young patients and sponges for elderly people.

DG: I will use both at times. I wet the sponge in those settings.

CD: If thick tissues and or if scarring then scissors.

RK: I use both. Rarely scissors, except in resurgeries.

**98. I prefer if we use limbal incision instead of limbal based to avoid mixing up.**

YS: Agreed, discussed above.

RK: Agreed as per Q 88.

**99. I use the 8/0 suture inside out, so the knot is buried and further reduces the irritation.**

DM: If I need to suture, I do the same.

DG: Me too!

YS: I have found that using the 6-0 plain gut is very comfortable for patients, and reduces the need for burying the suture knot. If using an 8-0 Vicryl, burying the knot will likely be more comfortable for the patient as the suture ends in Vicryl are pointier.

RK: Very good technique.

**100. Please discuss swan incision for lost / slipped medial rectus or huge resection of MR as for third nerve surgery**

DM: Never Swan, much better a large limbal opening, use the microscope which usually will allow you to see thin muscle fibres more anteriorly than the rest of the muscle, follow them and find the muscle!

YS: The Swan incision alone may be used but has the potential complication of scarring especially medially and should be used carefully and keep the incision away from the plica and semilunar folds. When needed for exposure, I use a modified Swan incision which is a fornix incision that is then extended approximately 4-5 mm over the area of the rectus muscle for better posterior exposure.

**101. What is modified swan's incision?**

DM: Combination of Swan and fornix.

YS: See answer to Q 100.

**102. For reoperations, if there is severe conjunctival scarring or we need more conj. recession, I prefer fornix based incision.**

DM: Never recess a conjunctiva, visible scars may result.

RK: Agree, but not with conjunctival recession.

**103. A patient with convergence excess who had a unilateral recess / resect as a child comes to you as a teenager for redo surgery for an esotropia. What is your preferred approach for the redo?**

DM: Recess / plicate on the other eye unless the other eye is much better. Then, again same eye.

EC: If he never fixates with the deviated eye, do a retro-equatorial myopexy on the Medial Rectus muscle on that eye

CD: Operate on the fellow eye

YS: Without knowing all the details, in a reoperation where one eye has been previously operated, I would tend to operate on the non-operated eye. However, if there are limited ductions of the previously operated eye, then that eye needs to be explored for restriction or stretched scar and the problem addressed. Other factors to consider are the vision in the eyes, and finally the patient's preference. If the patient is monocular, then I would operate only the poorer/non-seeing eye.

RK: Depends on the amount of deviation, duction limitation, vision, etc. Probably best to perform R and R procedure in the fellow eye.