Keratoconus is a bilateral but often asymmetric, corneal disorder that results in progressive thinning, steepening, irregular astigmatism, and potential scarring. Treatment modalities can be conservative (spectacle correction, contact lenses) or surgical (intracorneal rings, corneal collagen cross-linking or keratoplasty). The types of lenses used in this disease vary from soft spherical lenses, soft toric lenses, rigid gas permeable (RGP) lenses, piggy back lenses, hybrid lenses, and semi-scleral/scleral lenses.

Mainak Bhattacharyya - Q. What tools do you use before fitting contact lens in a keratoconus patient (Orbscan/Pentacam/ Keratometry)? Have you been using anterior segment OCT in your contact lens practice? If keratometry is not possible and corneal topography is not available, are there any guidelines for lens fitting?

Kirti Singh: While keratometry (manual as well as automated) can be used in fitting rigid lenses in most patients, in cases of keratoconus they are often not able to give appropriate readings due to irregular mires or extremely skewed readings. Corneal topography (Orbscan/Pentacam) derived radii of curvature is preferred as a guide in the selection of an initial back optic zone radius (BOZR) for rigid lens fitting. New tools available are Tangential maps, acquired using Placido disc-based systems, which are used to analyse to quantify size and location of the cone, and aids in the selection of an appropriate BOZD and total lens diameter in rigid lens fitting.

Anterior segment OCT can be used to evaluate influence of the soft lens mid-peripheral shape profile and edge design on apparent epithelial thickness and indentation of ocular surface with lens movement. It can also be used to measure central and peripheral tear film clearance in RGP lenses; quantification of corneal vault, across diameter of a contact lens has been effectively used for fitting mini-scleral and hybrid lenses. However it is not a pre –requisite requirement at all, it only adds to our understanding of fit, so its role in day to day fitting is very limited.

Newer technologies for quantifying anterior ocular surface morphology are emerging. A topographic device that measures up to a 20 millimetre diameter of anterior segment (Eye Surface Profiler, Eaglet-Eye, Houten, The Netherlands) has been marketed as having high potential clinical utility for contact lens fitting. Another recent topographic system uses a multi-coloured light emitting diode (LED) spot pattern, consisting of up to 700 spots, projected onto corneal surface (Cassini, i-Optics, The Hague, The Netherlands) detected by an image-processing software.
Since keratometry is not possible it would indicate that the cone is advanced. Guidelines for fitting in this situation would be one - check the other eye, and use that as a baseline BC for first trial lens. Secondly a large diameter >9.6 mm lens with steepest BC in your inventory could be taken as the first trial lens and then based on dynamic and static fit , modifications can be done. Many of these cases require specialized lens fit like Rose K IC or even miniscerals.

**Monica Chaudhry:** All (Keratometry/Pentacam/Orbscan) three tools have to be deployed for lens fitting in a keratoconus patient. No, I don’t use AS-OCT routinely in my practice. When keratometry is not possible/topography not available, then I use corneal profile method for lens trial.

**Rajeswari Mahadevan:** Yes, we do use keratometry, topography and Pentacam. Contact lens fitting in keratoconus can be made simpler and easier with these tools. But an experienced practitioner can fit lens without any such tool by assessing the steepening of the cornea with a torch light and with the help of fluorescein pattern formed by an RGP corneal lens. The fluorescein pattern becomes a guide to know the apex of the cone and accordingly modify fitting.

Topography and Pentacam provide simulated K reading which helps to fit a contact lens of any design by selecting a base curve flat or steep according to the severity of the cone. As the irregularity of the cornea is not the same at all the points in Keratoconus, the fitting with central K reading might lead to steep lens fit hence a simulated K reading is useful. Also the position of the cone will help to choose the design of the lens and the diameter.

**Rajesh Sinha:** Before fitting contact lens in a Keratoconus patient, apart from the routine investigations, a thorough topographic evaluation is must. Keratometry, Orbscan and Pentacam are all very useful tool to initiate the trial. The average K value in Keratometry or slightly steeper than that may be a starting point of fitting a rigid gas permeable (RGP) contact lens. On Orbscan the K value at 5 mm zone may again be useful in selecting the first lens for trial. Further the fit can be modified on the basis of centration, movement, coverage and fluorescein pattern.

Anterior segment OCT is useful in fitting a minisceral or scleral contact lens. The shape of the cornea, limbus and the anterior sclera as detected by ASOCT helps in guiding the parameters of these lenses. Although the fit can be assessed by slit lamp biomicroscopy, ASOCT provides useful information regarding vault and landing zone. Vault can be accurately assessed and more importantly the landing zone can be assessed accurately which is very important as too tight or loose landing zone can have problems of tear film entrapment and hypoxia as well as bubble in post-lens tear film.

If Keratometry is not possible and none of the topographic system is available then one can place a lens of a base curve by assessment on slit lamp. It is essential to know the reason for not getting the keratometric value e.g. whether there is scar or grossly irregular cornea etc. One can place a base curve of say, 43D and evaluate the fluorescein pattern. If the cornea is appearing steep or flat one can select the initial base curve based on rough assessment on slit lamp which may be steeper or flatter than 43D. Once the lens is placed and fluorescein pattern is seen the base curve can be modified based on the same and following the principles of centration, movement, coverage and fluorescein pattern.

**Umang Mathur:** For most patients keratometry readings obtained from a keratometer are adequate. Corneal topography, either Placido based or Pentacam is used when keratometry readings are beyond the range of the keratometer.

For corneal lens fitting, there is very little role of the anterior segment OCT. It can be used for scleral lens fitting to look for impingement/compression.

Manual keratometry is inexpensive and is adequate for most contact lens practice. In an unlikely situation when it is not available, then a ‘hit and trial’ method is used.

**Varsha Rathi:** I do use Orbscan/Pentacam for contact lens fitting to know the k values. If the investigations are not possible – then it indicates the severity of the condition and I will start with high minus power lens with steeper base curve.

Summary (Mainak Bhattacharyya): Keratometry, Orbscan and Pentacam are almost indispensable tools to initiate lens trial in keratoconus. In case of non-availability of all three, one can start with high minus power lens with steeper base curve and modify further trials based on fluorescein pattern. Anterior segment OCT has been effectively used in fitting minisceral/scleral/hybrid lenses but can also be used to measure central and peripheral tear film clearance in RGP lenses.

**Mainak Bhattacharyya - Q. How does morphology and size of cone influence the choice of contact lens to be prescribed?**

Kirti Singh: Three major subtypes of keratoconus defined based upon morphological criteria are nipple, oval and globus cones; centred (nipple) cones characterised by a cone diameter of five millimetres or less, round and positioned centrally or slightly inferior to the visual axis constitute about half of all cases and fitted with relative ease.

Oval (sagging) cones are larger in diameter and demonstrate either inferonasal or infero-temporal displacement of the corneal apex; achieving adequate lens centration and pupil coverage for oval cones can pose a relative challenge. The initial trial lens diameter should be kept small, a suitable starting point being 8.70 mm.

Round nipple cones require diameters of 8.5 to 9.0 mm, whereas oval cones require larger diameter lenses, ranging from 9.2 – 9.7 mm. Least prevalent is globus cone where conical area involves at least 75 per cent of the cornea. These cases are most difficult to fit and typically warrant designs with larger diameter 9.6 – 10.0mm (i.e., corneo-scleral, minisceral or sclera lenses) to achieve a desired fitting. The Rose K series has a guide which tells which type of lens to use depending on cone morphology and severity eg Rose
K2NC is designed for nipple cones, Rose K IC for large oval/globus cones.

**Monica Chaudhry:** Morphology and size of cone does influence the choice of lens to be prescribed to a great extent.

**Rajeswari Mahadevan:** A knowledge about the cone pattern helps in choosing a better design of the lens. In an early cone where the cone position is usually paracentral and may be inferior the astigmatism might be shown in the refraction and this cone can be fitted like any astigmatic fit. If the cone is central and a nipple cone, the lens of usual diameter like 9.2-9.4 mm may show an edge lift due to the transition zone from steep central to flat periphery. Hence a small diameter lens or a special tricurve lens design with a smaller optic zone is useful.

Once the cone is completely inferior the lens decentration is more and hence an oval cone is seen. In a small oval cone a normal diameter or small diameter lens will fit well. In Global cone the lens diameter can be very small or very large than normal fitting to cover the cone and stabilize the lens on the eye. A diameter of even 10mm is chosen. A poorly fitted conventional RGP lens with greater than 3mm feather touch zone is absolutely contraindicated in Keratoconus.

**Rajesh Sinha:** Morphology and size of cone do influence the choice of contact lens. If the cone is a small nipple cone then a Rose K2 contact lens is a very useful design. The conventional Soper design (bicurve) also fit well in these cases. However if the cone is small but pronounced nipple cone, specially designed Nipple cone lenses i.e. Rose K2 NC lenses have a better fitting. In large cones and the oval sagging cones with pronounced corneal irregularity, Rose K IC (Irregular Cornea) designs are required. In eyes with co-existing Keratoconus and Pellucid marginal degeneration, Rose K IC design, or Rose K2XL (Mini-scleral) or Hybrid lenses are required depending upon the severity.

**Umang Mathur:** Large cones fit better with large diameter lenses. Example: Rose-k2 Post Graft (10.4mm diameter) rather than 8.7-9.0mm diameter lenses. The mini-scleral contact lens is another good option for large cones that takes care of stability and comfort of the lens as well.

**Varsha Rathi:** A nipple cone will allow you to select a lens which is small diameter and steeper compared to oval or generalized cone where one may have to select a lens with larger diameter for trial.

**Summary (Mainak Bhattacharyya):** Small nipple cones can be fitted well with small diameter lens (8.5-9.0 mm) while oval cones require larger diameter (9.2-9.7 mm). Global cones are most difficult to fit and best fitted with larger diameter (i.e., corneo-scleral, mini-scleral or sclera lenses) lenses to achieve a desired fitting. While using customised lenses Rose K2 for smaller and Rose K2NC for more pronounced nipple cones, Rose K IC for oval cones and Rose K XL for global cones can be prescribed. (Figure 1)

**Mainak Bhattacharyya - Q.** Is there any role of soft/soft toric lenses in patients with keratoconus? What has been your experience with available soft contact lenses designed especially for keratoconus patients (Kerasoft IC/Soft K/Soflex/NovaKone)?

**Kirti Singh:** Traditional soft contact lenses are only regarded as an option for forme-fruste and early forms of keratoconus, intolerance or inadequate fit with RGP lenses and as the base in piggy back lenses. Of the hydrogels thicker lenses with low water content should be used to neutralize the irregular astigmatism. The major shortcoming of soft contact lens is their limited capacity to mask irregular astigmatism and inability to reduce higher-order optical aberrations, in particular vertical coma, unlike rigid lenses.

Advancements in manufacturing technologies, in particular ability to lathe quadrant-specific curve designs, have led to development of soft contact lenses specifically for keratoconus (KeraSoft IC, Rose K2 soft lens, Soft K, NovaKone), but there is a paucity of published data regarding their clinical efficacy. Besides, the costs involved and availability limits their use in my patients. The comfort and ease of wear is better with soft lenses. Toric siloxane hydrogel lenses and reverse geometry lenses maybe tried in RGP intolerant patients. Wavefront guided, aberration-controlled soft contact lens designs are under preliminary investigation and may give more satisfactory results in future.15,16

**Monica Chaudhry:** I don’t think the soft/soft toric lenses have much of a role in keratoconus patients. Except Novakone, have used others all other customised soft contact lenses. (Figure 2)
Rajeswari Mahadevan: Soft toric lenses can be dispensed for patients with very early cone or form fruste stage. Some of the special toric lenses mentioned above are useful in some patients with a stable cone but due to unavailability of easy trials and slightly lesser quality of vision, patients prefer scleral or semi-scleral lenses now-a days as they are available commonly.

Rajesh Sinha: There is a definite role of soft toric contact lens in early Keratoconus. In early Keratoconus wherein the astigmatism is not irregular, soft toric contact lens may provide good visual acuity while wearing the contact lens. But as the Keratoconus progresses the patients start developing ghosting of images and suboptimal visual improvement with soft toric contact lens.

Kerasoft IC contact lens is a front surface aspheric toric soft contact lens custom made for each keratoconic eye. It is a custom-lathed soft silicone hydrogel lens with quadrant specific design capability. The design allows for the customized selection of the central and peripheral regions in order to properly fit both corneal regions. We have performed a study using Kerasoft IC contact lens in Keratoconus and found out that it provides optimal visual outcome with good comfort to the patients of Keratoconus. The visual outcome and comfort was compared with Rose K2 lenses and we found that in mild and moderate Keratoconus, it was comparable; however in advanced and severe Keratoconus, the visual outcome was slightly better with Rose K2 lenses. The comfort of Kerasoft IC lens was better than Rose K2 lenses. The comfort of these lenses is such that these patients cannot be shifted to any RGP lens once they are used to these lenses. The fit of a Kerasoft IC contact lens is assessed on the basis of Movement, Rotation, Centration, Comfort and Visual Acuity (MoRoCCoVA).

Umang Mathur: Only very early Keratoconus can be fitted with the Soft/Soft toric lenses. The available soft contact lenses are helpful in mild-moderate keratoconus with clear cornea. It improves the visual acuity by quantity not the quality. With scarred corneas it may not help much. The contrast, brightness and sharpness is much better with RGP/Rose-k & Scleral lenses. (GP lenses)

The available soft lenses for keratoconus are not durable and more expensive than Rose-k & Scleral. The GP lenses have minimal risk of infection while the soft lenses do have high risk of infections.

Varsha Rathi: Yes, one can try soft toric lenses; however, as patients will have to use RGP if cone increases, one should try RGP before soft toric lenses. In my experience, kerasoft could be fitted well in patients with mild to moderate keratoconus and pellucid marginal degeneration.

Summary (Mainak Bhattacharyya): Soft toric lenses can be prescribed in patients with form fruste/early keratoconus. They have similar visual outcome comparable to Rose K2 lenses but offer better comfort in mild and moderate Keratoconus. Major limitation being cost, availability, inability to effectively overcome higher order aberrations as well as paucity of data regarding their clinical efficacy.

Mainak Bhattacharyya - Q. When do you use miniscleral/scleral lenses? What are the characteristics of a well fitted mini-scleral lens?

Kirti Singh: Although we have limited experience with use of miniscleral/sclera lenses, one needs to use these lenses in advanced cases, highly decentred cones and for patients intolerant to conventional RGP lenses. Mini-scleral lenses when fitted appropriately should vault the cornea and limbus, while resting evenly on the sclera. They are generally fitted to achieve a semi-sealed state with partial tear exchange.

The lens vault should be more than 400 -600 μm with 50 to 100 microns of clearance at the limbus as reduced oxygen supply at corneal periphery can lead to serious complications including limbal stem cell deficiency. Recent studies seem to indicate a beneficial role on corneal topography after use of these lenses with a negligible occlusive effect on corneal respiration.

The scleral lens should comfortably clear the corneal apex; must not rest on the limbus and the scleral fit should not be so tight that it causes blanching of the conjunctival vessels. (Figure 3) In both miniscleral/scleral lenses use of a highly oxygen-permeable material is critical and careful attention must be paid to the maximum central lens thickness and the clearance under the lens, to avoid corneal hypoxia. Eg Rose K XL uses Menicon Z, Lagado Tyro 97 or Boston XO.

Monica Chaudhry: I use miniscleral/sclera lenses either when corneal lenses fail or in patients with dry eye. Characteristics of a well fitted mini-scleral lens: (Figure 4 & 5)

• essential required vault
• sufficient limbal clearance
• scleral alignment

Rajeswari Mahadevan: Semi-scleral or scleral lens can be used at any stage of keratoconus. I have fitted them in patients with early nipple cone to patients not tolerant to RGP to highly global cone which shows a curvature reading of 80D. A well fitted scleral lens should have a good vault where the lens does not touch cornea at any point. The haptic should not have any lift with leakage of saline or tight edge with impingement staining. The lens must not cause any undue pressure on the limbal zone.

Figure 3: Scleral lens. Courtesy Prof Kirti Singh
Rajesh Sinha: Miniscleral contact lenses are useful in very advanced Keratoconus especially when the cone is large and eccentric. These are also useful in eyes with co-existing Keratoconus and Pellucid marginal degeneration. A decent vault and optimal landing zone are key features that should be assessed while fitting a mini-scleral contact lens.

Umang Mathur: When comfort, stability and adaptation are the prime issues, mini-scleral contact lenses score over RGP lenses. The well fitted mini-scleral lens should have at least 400-500 microns of apical clearance. There should be adequate mid peripheral clearance and should not cause lens compression / impingement over the sclera. There should also not be any debris collection or loose peripheral edges.

Varsha Rathi: These lenses are fitted when all other options fail or if the patient has keratoconus with ocular surface disease or allergic or vernal keratoconjunctivitis. The other indications are patients where the vision does not improve with the other modalities of lenses.

Summary (Mainak Bhattacharyya): Miniscleral/scleral lenses are best reserved for advanced keratoconus, especially when the cone is large and eccentric. The scleral lens should comfortably clear the corneal apex; must not rest on the limbus and should not cause blanching of the conjunctival vessels while a well fitted mini-scleral lens should have at least 400-500 microns of apical clearance with adequate mid peripheral clearance. Both miniscleral/scleral lenses must use a high oxygen-permeable material.

Mainak Bhattacharyya - Q. When do you use piggyback and hybrid lenses?

Kirti Singh: Piggyback contact lens systems are generally adopted when fitting with RGP lens use causes persistent discomfort, dislocation, recurrent abrasions or scarring. Placing a soft lens (carrier lens) under the rigid lens protects the cornea from excessive lens bearing, provides support to overliving RGP and enhances comfort. Prominent nebular-like scarring at the corneal apex and chronic 3 and 9 o’clock staining, likely to result in peripheral corneal pannus and scarring are cases where the use of a piggyback contact lens system may be indicated.

It has been suggested that using a soft lens with a relatively high positive power (greater than +4.00 D) in a piggyback system will help to improve the centration of a rigid lens on a keratoconic corneal apex with a markedly inferior sagging cone. When using a piggyback lens system, both the lenses should have a high Dk value (at least greater than 60 Barrer). I do not have experience with use of Hybrid lenses but corneal hypoxia, lens adherence, handling difficulties, edge pucker, a tendency to tear or split at soft-rigid junction leads to frequent replacements and expense.

Monica Chaudhry: I use piggyback and hybrid lens in case of poor corneal lens tolerance, allergic eyes and very irregular shaped cornea (but prefer scleral lens to this methodology).

Rajeswari Mahadevan: Piggyback lens is used when patient is either intolerant to RGP corneal lens and also when the RGP corneal lens does not stabilize well on the cornea. Currently with the advent of hybrid and scleral lens, piggy back is seldom dispensed except the patient is not able to afford other type of lenses. Hybrid lenses are a good option provided we are able to get good care products to maintain them.

Rajesh Sinha: Piggyback contact lens is useful in patients who are intolerant to rigid gas permeable contact lens. Hybrid lens is also useful in eyes with intolerance to RGP lens. Further the hybrid lens is also useful in eyes with large cones and Keratoconus and co-existing Pellucid marginal degeneration (PMD).

Umang Mathur: The patient with keratoconus who has high tendency for corneal erosions and scarred corneal patients who cannot afford Rose K & mini-scleral lenses are fitted with piggyback lenses. We do not use hybrid lenses as they are more expensive and less durable. The skirt of soft lens surrounded by GP lens has high tendency of spoilage/tear and loosing.

Varsha Rathi: Piggy back lenses are used when patients have RGP intolerance. If the fitting of RGP is good and patient feels a little discomfort, one can try PBCLs. Hybrid
is another option if available; however, the fitting should be optimized in these patients as corneal edema is reported in literature.

Summary (Mainak Bhattacharyya): Piggyback contact lens systems are generally adopted when fitting with RGP lens use causes persistent discomfort, dislocation, recurrent abrasions or scarring, allergic eyes and patients with co-existing keratoconus and PMD. Hybrid lenses are reported to cause corneal hypoxia, lens adherence, handling difficulties, edge pucker, a tendency to tear or split at soft-rigid junction which may warrant frequent replacements.

Mainak Bhattacharyya - Q. In advanced cones lenses remain the most commonly adopted visual rehabilitation means. For these patients dependent on lenses for their daily activities what in your experience are the problem areas and what solutions do you offer to your patient? How frequently do you encounter lens induced infection in your patients?

Kirti Singh: In advanced cones dependency on lenses is very high. The RGP lenses have a much lesser risk of lens induced infection than soft lenses but may cause lens intolerance in patients. The common problem areas are related to lens care, lens overuse and tear resurfacing. These patients are monitored for lens hygiene and case hygiene on a strict follow up regimen. Lens spoilage and scratches need to be managed by frequent edging and polishing of the RGP lens. In addition frequent use of preservative free lubricating eye drops as per convenience and need is required for these patients. Besides, they are always advised to keep a spare pair of lenses or back up spectacles handy for use in situations of lens drop-outs/intolerance. Thankfully in our cohort of patients, mostly young adults dependent yet comfortable with lens usage and concerned about their safety, we have not had any episode of keratitis. The few cases I have seen have been myopes using soft lenses, but never in conus cases.

Monica Chaudhry: My patients are always prescribed stand by glasses. Lens induced infection is encountered very rarely in my patients.

Rajeswari Mahadevan: Infections are seldom seen in Keratoconus patients wearing lens; usually they take care of the lens well. The care and maintenance depend on the initial dispensing and education. The only problem is over wear. Hence we always give optional spectacles which can be managed within in house when not wearing lens so that they can reduce lens wearing hours. I usually advise all patients to remove the lens once in the day time for an hour so that they can wear the lens again comfortably. By this they can avoid complications due to over wear and hypoxia. It improves the comfort also. Some patients do remove one lens at a time and give break so that they can still see well.

Rajesh Sinha: It is true that in advanced Keratoconus, patients are heavily dependent on contact lens. Most of these patients don’t find it difficult to handle as well. However, we always prescribe glasses as well so that occasionally if the lens is lost or chipped or damaged, they can use the glasses to have some useful vision. Further, we advise to have an extra pair of lenses if the patient has a lot of travelling or too much of outdoor activities.

Lens induced infection is extremely rare in my practice. Most of the time, corneal infection occurs only when the user sleeps wearing contact lens or swims wearing contact lens or if the hygiene is not good or there is grossly bad fit. Infection with a well fitted RGP contact lens with good care and maintenance is very uncommon.

Umang Mathur: In advanced keratoconus the dependency on lenses is very high, so the wearing hours often go beyond the recommended hours. The advantage of the GP lenses is that they do not increase the risk of infections in longer wearing hour. They may cause pain and redness, which do not cause any vision related complication. Restricting the wearing hours/giving breaks in between for ½ hour; limiting wearing hours during weekly off, helps to overcome the exhaust/intolerance issues.

Non preservative lubricating eye drops over the lenses also do help in maintain the comfort level with the lenses in longer wearing hours.

Varsha Rathi: A good question; the main problem is wearing lenses for longer hours. As these patients are dependent on their lenses for daily work, they are not comfortable without lens wear. Most important is a well fitted lens on the eye, a good care regimen to be followed, not to sleep with the lenses. If the corneal lenses are ill fitted, one should wear scleral lenses.

It is rare to have infections with RGP lenses or scleral lenses, though sometimes one may see those. The prevention is more important here and stress is given on proper cleaning of lenses, handling of the lenses and the frequent replacement of both lenses and the lens cases.

Summary (Mainak Bhattacharyya): Dependency on lenses in keratoconus patients is very high leading to lens wear beyond recommended hours. Restricting the wearing hours/giving breaks in between for ½ hour; limiting wearing hours during weekly off, helps to overcome intolerance issues. It is recommended to prescribe standby glasses or an extra pair of lenses especially when the patient is involved in frequent travelling/outdoor activities. Preservative free lubricating eye drops over the lenses also help in maintaining the comfort level. It is quite rare to have infections with RGP lenses or scleral lenses unless user sleeps wearing contact lens or if the hygiene is not good or there is grossly bad fit.

Mainak Bhattacharyya - Q. For children diagnosed with Keratoconus what visual rehabilitation would you prescribe and why? How would presence of active/intermittent VKC alter your prescription practices?

Kirti Singh: The approach for visual rehabilitation in children with keratoconus is similar to that adopted for adults; the primary aim is to improve vision and to provide a form of correction that is suitable, practical, comfortable and physiologically acceptable. I prefer spectacles wherever
they give reasonable vision. If vision with spectacles can lead to amblyopia then only do I use contact lenses.
Children successfully adapt to rigid lenses; however, as children routinely participate in sporting activities, lens stability may be a significant factor. Children with keratoconus mostly need to undergo CXL and the definite fitting should done post cross linking.
Keratoconus per se is known to be associated with allergy and VCK is frequently encountered in our setting in children with keratoconus. One must control the active allergy with medications before proceeding with CXL/lens fitting. The medications used are low potency steroids, 2% cyclosporine, tacrolimus and lubricants. The child is instructed to put the drops before lens insertion and after lens removal. If the condition flares up, lens withdrawal may be warranted.

Monica Chaudhry: For children ideal is corneal RGP / Rose K; if poor acceptance I start with soft lenses for keratoconus and later shift to corneal and finally with bad allergic eyes it may be scleral lens.
In presence of active/intermittent VKC, scleral / piggyback / early kc silicone hydrogel soft lens is preferred.

Rajeswari Mahadevan: Lenses have been successful improving vision in VKC children also, but they might be very intolerant than others. They wear the lens intermittently for few hours. Scleral lenses have shown good results and tolerance in these kids. The trial measurements must be performed when the condition is not active. Lubricants play a major role in giving comfortable wear.

Rajesh Sinha: Most of the children having Keratoconus have some form of ocular allergy. These children should be treated aggressively for the same. Since these allergies result in formation of papillae, it becomes difficult for these children to use contact lens. Aggressive and full treatment with fluorometholone, olopatidine, tacrolimus and lubricants depending upon the severity is needed for making these children fit for using contact lens. They should also be prescribed glasses for the period when they cannot use contact lens.

Umang Mathur: We have a choice of fitting them with RGP or Rose k or scleral lenses. The choice is entirely dependent on the severity of keratoconus. It is preferred to fit contact lens after collagen crosslinking (CXL). After CXL the changes in the contact lens parameters are unlikely to change. Many a times it has been observed that the scleral lenses also help in control allergies by acting as a barrier to allergic pathogens and the water pocket cushioning effect act as a nutrition to the cornea. However, it is recommended to fit contact lenses in controlled inflammation, not in the active allergy.

Varsha Rathi: RGP lens again is the lens of choice!
In presence of inflammation, sometimes the patients may have to stop wearing lenses. The symptoms may worsen with ill fitting lenses, associated keratopathy in the patients of allergic conjunctivitis. Adding topical antiallergic agents and lubricating agent will definitely improve their symptoms. Sometimes, it may be necessary to switch these patients to scleral lenses which will improve both comfort and vision.

Summary (Mainak Bhattacharyya): Children with keratoconus mostly need to undergo CXL and have some form of ocular allergy. One must control the active allergy with medications before proceeding with CXL/lens fitting. They should also be prescribed glasses for the period when they cannot use contact lens. In presence of active/intermittent VKC, scleral / piggyback / early kc silicone hydrogel soft lens maybe preferred.

Mainak Bhattacharyya - Q. How does cross linkage alter lens fitting in your patients?
Kirti Singh: A study conducted at our centre showed that despite no statistically significant change in objective parameters of lens fit, a tendency for flatter lens fit attributed to corneal compactness post cross linkage (CXL) was observed. This along with contact lens induced further flattening of the ectatic cornea resulted in a marked improvement in both objective and subjective contact lens fit in all keratoconus patients post CXL. (Figure 6) Duration of comfortable lens wear was the parameter which was most significantly altered positively after cross linkage.

Figure 6: RGP lens in a patient post cross linking. Courtesy Dr Mainak Bhattacharyya

Monica Chaudhry: Not exactly! Very minimal fitting and power changes are observed. Exceptional changes were seen in 1-2 odd cases. However most of the fits are done post CXR. Wait for at least 2-3 months.

Rajeswari Mahadevan: Contact lens fitting can be performed after 2-3 months of cross linking, though a recheck of measurements is required after 3 months of fitting. Conventional RGP and special design lenses have shown slight changes in fitting pre and post CXL and hence need a new fitting.

Rajesh Sinha: Cross linking is a useful method that helps to bring corneal stability as well as reduction in astigmatism in eyes with Keratoconus. Hence the stability of contact lens improves after cross linking. CXL helps in bringing a better fluorescein pattern and fit and more comfort with contact
Contact Lens Fitting in Keratoconus

Bhattacharyya M, Singh K, Chaudhry M, Mahadevan R, Sinha R, Mathur U, Rathi V. Contact Lens Fitting in Keratoconus. Delhi J Ophthalmol 2016; 27; 66-73.

Acknowledgements: Dr Umang Mathur would like to acknowledge Mr. Abhilekh Arneja, (Optometrist) in giving this experience in answering these queries.

Date of Submission: 20/05/2016       Date of Acceptance: 26/05/2016

Conflict of interest: None declared

Source of Funding: Nil

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