Contact Lens

Advances in corneal topography and lathing technology have expanded the indications for contact lens fitting in patients with irregular cornea such as keratoconus with sagging oval or globus cones, Keratoconus, pellucid marginal degeneration, post-intracorneal ring segments, post keratoplasty and post traumatic corneas although fitting of various contact lenses in these is still a challenge.

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VKS: What is your protocol for CL fitting in keratoconus and how do you decide the type of contact lens to be used?

PR: Look at the history, identify the condition and Rose K has rules as how you choose the design.

QBM: First do a manifest refraction, assess the extent of keratoconus by slit lamp, keratometry, and corneal topography.

Initially in the early stages where the keratoconus is mild, simple spectacle correction along with soft or soft toric CL may be adequate.

RGPs/Rose k piggy back/hybrid and Sclerals are reserved for moderate to severe KC.

OA: According to the curvature of the cornea and possibility to get the acceptable vision.

KS: It depends on grade of keratoconus, age of patient and status post cross linking.

• For mild conus and young children spectacle rehabilitation often suffices.

• For others it depends on topography pattern. For nipple cones a convention RGP lens with high DK values is tried first, failing which a specialized lens like Rose K2 or post aspheric lens is used. For oval and globus cones large diameter conventional RGP, Rose K 2/ Rose K NC/ Rose K2 IC lenses are tried in that sequence. If all these fail then semi-scleral lenses are tried as last option.

Post cross linkage only spectacles are prescribed for initial 3 months followed by contact lens protocol as for type of cone as mentioned above.
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JD: Each company has their own design and according to their design they draw up a protocol. Rose K lenses follow the guidelines given in detail in their fitting brochure for each design clearly stating the indication. For e.g. Rose K design does not believe in apical touch as it causes early scarring and hence their fitting philosophy is to have a minimum of 20 microns of tear layer between cornea and the lens.

VKS: What is the role of soft spherical/soft toric contact lenses in keratoconus?

PR: Useful in early keratoconics and post op corneas. Also some patients accept poorer vision than GP lenses for the sake of comfort or working conditions. However probably less than 15% of keratoconic patients would prefer soft lenses.

QBM: Soft lens will just drape over the cornea but will not give good vision in a K conus patient. It can be given as a soft spherical lens with astigmatic glasses on top.

Soft torics do help in the initial stages but the non-availability of the odd axis does not help in practice, it works very well when the astigmatism is low.

OA: Very limited at the early stage (grade 1).

KS: Limited but useful role.

- For mild conus with apical or slightly inferior ectasia soft lenses may suffice. Kerasoft lenses are an option, but soft torics are not very useful. The hydrogel however should be thicker than conventional lens.

Soft spherical can also be used as the base for piggy back lenses.

JD: For early KC if a good refraction achieves 6/12 + VA then it will work. David Thomas Contact Lenses (DTCL) can supply 54% & 74% Silicon Hydrogel material toric lenses upto -10.00D cyl correction in steps of one degree axis. This works for patients with one eye having an early cone and the other eye with advanced cone. A combination of DTCL SiHy soft toric with Rose K XL semi-scleral lens is most workable as with both the lid reaction is minimal.

Ideally the diameter is decided on the location of the cone, its sag and steepness.

Power is decided on the trial lens and then the visual acuity is evaluated by adding plus or minus spheres or cylinders.

OA: By topography and Sagittal Depth of the lens.

KS: Based on Sim K / flat K depending on corneal topography or keratometer reading with the former being preferred. This gives the base of BC of trial lens.

- Diameter varies from 9.4 to 9.8 depending on extent and type of cone.

- Power is as per available in trial set, usually -6 D. Final power is assessed by over-refraction through the trial lens incorporating the final back surface design.

JD: Each manufacturing company have their own method of working out the parameters of their lens design. There are several companies globally who market RGP lenses for Keratoconus.

VKS: How do you decide various parameters of RGP contact lenses in keratoconus patients?

PR: Rose K has a 5 step fitting system you follow.

QBM: The 3 important parameters are:

a) Base Curve
b) Diameter
c) Power

The base curve is decided by giving a trial on the basis of keratometry and topographical readings It is then evaluated on the basis of fluorescein patterns.

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VKS: Do you assess acceptable static and dynamic fit of RGP contact lenses in keratoconus?

PR: By observing a trial lens on the eye.

QBM: Dynamic fit is assessed when the lens is centered on the cornea during post-blink movements; good stability in different gazes and patient should be comfortable. The movement should not be more than 1mm with every blink and lens should not cross the limbus.

Static fit is assessed on the basis of fluorescein patterns observed with a slit-lamp.

KS: Dynamic fit is assessed first in primary gaze, post blink and for near reading gaze. Excessive bearing on apex of cone, peripheral lens adherence and excessive edge lift are avoided.

- A blink induced lens movement of >1 mm should be aimed. Steep and flat peripheral curves diagnosed by restricted lens movement with inadequate peripheral tear reservoir or excessive edge lift /excessive lens movement/ lens dislodgement respectively must be avoided.

- Static fit is assessed after adequate dynamic fit has been achieved which may involve change of 2-3 trial lenses. Central fit is assessed first and a pattern of apical clearance or three-point touch with feather clearance at centre is aimed for. Subsequently peripheral fit and edge lift are checked for. An ideal static fit pattern should demonstrate feather apical touch, mid-peripheral bearing with sufficient edge lift and clearance of 0.5 to 0.7 mm

- Contact lenses gravitate to steepest part or apex (usually inferior). Therefore accurate centring should not be aimed for.
Fit should be assessed only after all watering has subsided.

JD: In RGP fitting we concentrate on dynamic fitting as we need a continuous exchange of tears with regular blinking for supply of oxygen to the cornea and the flushing out of debris from the tear layer between the lens and the cornea. Static fit will cause no tear exchange leading to corneal staining and further complications of the corneal epithelium.

**VKS: What are guidelines to decide first trial lenses in various grades of keratoconus?**

**PR:** Each Rose K lens design has rules for choosing the first trial lens. This is based on tens of thousands of fits.

**QBM:** For initial lens it is ideal to start a lens fitting mid-point between the flat and steeper base curves

Try steeper and smaller diameter lenses with advanced cones

Change the base curve in 0.10 steps

Diameter equals to BOZR+0.2 mm bozd (6.0-7.0mm) starting point 8.7mm.

**OA:** By topography and Sagittal Depth of the lens.

**KS:** Same as Q 1.

**JD:** Each manufacturing company who make lenses for irregular cornea have their own design with their own fitting philosophy. It is best to follow the company fitting guideline to have the best results.

**VKS: What are the various options available in RGP intolerant keratoconus patients?**

**PR:** Piggybacking ,thicker soft lenses or semi sclerals.

**QBM:** In the last few years, several options have emerged, such as the piggy back lenses (soft lens with an RGP lens over it); the hybrid lens.. a single lens with a soft skirt and RGP back; and special Keratoconus lenses such as the Rose K designs with central and eccentric nipples depending on the type of cone. When all else fails, the large diameter scleral lenses, though expensive are usually very effective.

**OA:** T-ICL implantation.

**KS:** Rose K family, indigenous post aspheric , semisclerals, piggy back and even spectacles.

**JD:** If early KC and spectacle vision good then go for 74% Silicon Hydrogel toric lenses. Otherwise Semi-Scleral (Mini-scleral and Corneo-scleral) lenses serve the purpose successfully.

**VKS: What is your experience of use of piggyback contact lenses (PBCL) and hybrid lenses?**

**PR:** I prefer piggybacking to hybrids because a well fitted piggyback provides more corneal oxygen and the soft and hard lenses can be fitted more precisely.

**QBM:** This type of lens works well when patient finds RGP uncomfortable.

It is also used to improve comfort and minimise risk of epithelial abrasion by RGP.

The disadvantage of piggyback CL is that the patient has to use two lenses and two solutions. This requires more complicated care and maintenance.

Besides, there is reduced oxygen transmissibility. Due to this and handling problems, I do not use them as a long term solution.

**OA:** Negative.

**KS:** Used only PBCL in young adults. Not used hybrid lenses.

**JD:** Piggy backing with high oxygen permeable RGP lens in combination with 74% Silicon Hydrogel soft lens works excellently. However the maintenance of both lenses proves cumbersome and expensive. Secondly the cost of replacing the soft lens on a regular basis taken into account does not permit recommendation of this method to patients with low reserve of funds requiring this method of KC management.

**VKS: What procedure do you follow in fitting PBCL?**

**PR:** Sorry this is not a term I am familiar with.

**QBM:** I fit the soft lens first. Then keratometry is performed with the soft lens in situ and rgp or hard lens fitting is evaluated.

**OA:** I am not fitting PBCL.

**KS:** First fit the soft lens and then center a small diameter 9.0 – 9.2 mm RGP lens. Over refraction has to be done through the twin lenses in situ.

**JD:** The RGP lens first with good fitting of central and edge following the fitting philosophy of the company manufacturing the CL design. The soft lens can be a monthly disposable silicon hydrogel lens of +0.50 power. If the regular monthly disposable lens does not fit then a made to order 74% Silicon Hydrogel lathed lens is prescribed of the same power. For power calculation of the RGP lens, place the SiHy soft lens of +0.50 power on the cornea and then place the trial lens of the selected BC. A careful over-refraction will then help calculate and achieve the power of the RGP lens.
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**VKS: What procedure do you follow in fitting semiscleral contact lenses?**

**PR:** I prefer a corneo scleral design as binding is not an issue and oxygen to the cornea is much superior to a scleral design. Rose K2 XL has its own rules for fitting this semi scleral design based on the condition and k readings.

**QBM:** I start with the average of central k readings and progress steeper or flatter base curves until a good base curve to cornea relationship is achieved.

Then the lens is evaluated with fluorescein and depending on the fitting pattern the lens edge and optical zone is evaluated.

**OA:** Company recommended protocol.

**JD:** I follow the fitting guidelines of the company who manufactures the lenses. I am personally in favour of continuous tear exchange with semi-scleral lenses to achieve long wearing hours without compromising oxygen flux on the corneal surface.

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**VKS: What are indications and contraindications of use of scleral contact lenses in keratoconus patients and how do you select scleral CL parameters?**

**PR:** Intolerance to corneal lenses would be my primary reason to use a SS design. Also some dry eye conditions do better with SS’s. Because most SS designs do not deliver as much oxygen or tear exchange as a corneal lens one has to be careful in fitting post-operative eyes particularly old grafts where the endothelial count is low.

**QBM:** My indications are: a motivated patient requiring optical and vision improvement who is unhappy with the other contact lenses, including the Rose K. Those with co-existing dysfunctional tear syndrome, even those with Stevens Johnson syndrome can be fitted with scleral lenses.

Contra-indications: Very few, besides inability to afford the scleral lenses and acute Hydrops.

To decide CL parameters I follow a multi-step approach.

In pre-formed scleral lenses the total lens diameter and the optical zone are the first points to consider followed by the central and limbal clearance, the appropriate landing zone alignment, adequate edge lift, and finally rotational symmetrical design of the lens.

**OA:** Company recommended protocol.

**KS:** Have not used sclerals in my practice.

**JD:** I follow the fitting guidelines of the manufacturing company.

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**VKS: What are common complications of contact lenses that you encounter in your practice?**

**PR:** Lens intolerance and instability would be the two major factors.

**QBM:** 1. GPC, 2. Dryness, 3. corneal erosions, 4. corneal ulcer.

**OA:** Dry Eye

**KS:** Lens intolerance, dry eyes, lens induced papillary conjunctivitis and 3 / 9 o clock staining.

Lens deposits/ scratches, lens feel and allergy are also very common.

**JD:** Dryness, reduced wearing hours, debris falling in the eye causing watering and discomfort. Non-compliance is the biggest problem and often the patient returns with irreversible damage to the cornea.

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**VKS: How frequently do you encounter contact lens induced infection in your practice, what are common organisms involved and what are common risk factors?**

**PR:** Very rarely, infections are most uncommon with rigid lenses. However because SS designs do not provide the same tear exchange and oxygen to the cornea I believe long-term these may cause more infections.

**QBM:** The biggest problems associated with contact lens infection arise because of patients not following up and even if the eye is red patients still continue wearing lenses; lid hygiene is often poor, episodes of blepharitis are ignored. Many long term CL users become complacent—-not regularly cleaning lenses; not following instructions.
of taking care and not using proper solutions. With the advent of new lenses and new materials the complications have become less except of lens getting dry.

**OA:** Extremely Rare.

**KS:** Fortunately infectious keratitis is extremely rare and have not seen any case in last decade.

- The biggest risk factors is - an uniformed and poorly motivated user.

The best way to ensure that user is following cleaning and care instructions is to ask him/ her to bring the CL case every second visit or every quarter whichever is before. Case cleanliness allows the doctor to keep a tab on patients cleaning regimen and take remedial action when required.

**JD:** In my practice I have rarely encountered serious microbial keratitis infections by microbes such as Pseudomonas which causes ulceration and corneal melting within 48 hours if left untreated. This is because I have an excellent aftercare patient recall programme and very clear instructions issued in writing at the time of dispensing contact lenses for the use of correct method of disinfection of contact lenses and the lens case. I give clear instructions on personal hygiene and hand washing before lens handling. Bacteria species Ps. Aeruginosa, S. marcescens, S. aureus and fungi C. albicans, F. solani have known to cause infections by contaminating the contact lens and the lens storage case. Microbe Acanthaemoba which is prevalent in tap water has been reported to cause corneal opacities causing blindness.

**VKS:** What is your experience in change of fitting patterns of contact lenses before and after CXL in keratoconus patients?

**PR:** Very minor changes in parameters and often the same lens can be use pre and post operatively.

**QBM:** in most of cases we advise the patient to use their old lenses and then monitor till the corneal stabilises and then advise if necessary any changes.

**OA:** Lens shape has to be adapted to the flattening cornea.

**KS:** Corresponding to decrease in flat K, mean K and apical K the incidence of lens decentrations reduced, number of patients achieving near ideal fit of three point touch with feather clearance increased by 20-25% by 6 months post CXL in a study conducted at our center.

- The improvement in lens fit was less due to flattening of apex and more due to enhanced rigidity of the cross linked cornea as evident by the fact that although lens parameters of mean base curve, overall diameter were almost similar at pre and after 6 months of CXL, both number of lens drop out and lens tolerance increased.

An increase in duration of lens use by 8hrs/day from pre-operative value was observed in our study after cross linking.

**JD:** The corneal shape changes to the extent that complete new fitting parameters are required.

**VKS:** What advances do you anticipate in management of keratoconus patients with contact lenses in near future?

**PR:** Semi scleral lenses will be used more commonly. Graft procedures will continue to improve so may be performed earlier than they are now. Materials will continue to improve. Surgical procedures will be developed further but rigid lenses will still remain the mainstream treatment for keratoconus in the foreseeable future

**QBM:** The sky is the limit a far as better materials is concerned. I dream of a day when the contact lens will not only give the keratoconus patient better vision but will be able to prevent progression without compromising on comfort. Hopefully the need for CXL and surgical procedures like INTACS and even DALK and PK will drastically reduce and there will be no more contact lens intolerant patients with keratoconus!

**OA:** Hope we will have more possibilities not only to stabilize the corneas by CXL, but to re-shape them. With this the role of CL will be reduced. More people after “Refractive-CXL” will be “CL Free”.

**KS:** Availability of higher DK materials and refinements in peripheral curve design. More post aspheric designs and more indigenous manufacturers thereby leading to a reduction in coat of custom designed lenses.

**JD:** The further development of semi-scleral lens design made of higher oxygen permeable materials which cause less degradation of lens surface and the management of deposits build-up. Perhaps special plasma coatings to prevent deposit build-up? In my opinion semi-scleral lenses are here to stay.