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He is a recipient of a B&L award for outstanding achievement, has presented at various conferences and has been a lecturer and examiner at a variety of optometry schools.

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Piggybacking high Dk Contact Lenses in Complex Cases

Firstly, my compliments to Eef for launching this clinically based (R)GP contact lens newsletter. I have published my own contact lens and eye care column In Contact since 1985, and it’s been online and archived since 1998 with many interesting cases, some on piggybacking. You can use a site specific search for items on piggybacking or any other term you may wish to investigate. One of my prior piggyback articles also coincidentally covers cases of corneal plana, which was featured in Eef’s inaugural (R)GP newsletter.

Introduction

Piggyback Contact Lens (PBCL) systems involve the use of two contact lenses: usually a soft lens directly on the cornea with a corneal (R)GP on top. The intent is to provide a platform for the (R)GP. This is often required due to (R)GP intolerance when (R)GP vision is needed because soft lenses or spectacles are unable to provide decent vision. Hybrid lenses have typically not provided the results we seek.

Many cases in need of piggybacking are related to corneal problems such as scarring from keratoplasty, radial keratotomy, keratoconus or irregular topography from laser Induced corneal ectasia in refractive surgery. Other cases such as tilted or proud grafts that cause centration problems or heavy bearing on such areas or old scars also benefit.
I rarely used PBCLs before 2000 due to the severe limitations of the then available low Dk soft lenses. Since the advent of high Dk silicone hydrogels - coupled with the high Dk (R)GPs we have had for the past decade or two - we now have decent levels of oxygen transmission available and thus piggybacking has a much wider potential and greater use these days. According to Tim Bowden in his book Contact Lenses: The Story, he ascribes the first mention of piggybacking to David Westerhout in Zimbabwe in the mid 1960s, before most of us had even heard of soft lenses. Of course the hard lenses were PMMA and they were coupled with the thick HEMA soft lenses of the day, one can imagine the oedema problems. Thus it never really caught on until this century.

**A Case in Point**

In 1999 I was referred a complex case for contact lens management. The gentleman concerned had undergone bilateral penetrating keratoplasty for keratoconus. To add to his uniqueness, he also has a prosthetic leg and continues to be a stunt driver and car tester. He also often works in dusty environments.

His refraction is in the order of:
R -4.75/-3.50x 162  6/12p
L -7.00/-0.75x 167  6/12p

K readings at the time were:
R 48.12/39.25@ 64
L 45.87/48.25

I fitted his new (R)GP lenses in 1999. On the first day of wear with a custom toric (R)GP on his right eye and a spherical (R)GP on his left, he ignored my instructions to wear them for only three to five hours. He promptly wore them - straight after our aftercare visit - for a full 19-hour day doing stunt driving in a dusty quarry for a Ford advertisement featuring the All Black rugby team! Fortunately he developed no complications.

He was very pleased with his new found ability to wear lenses comfortably with remarkable 6/7.5 acuity OU. He did amazingly well with his (R)GPs over long hours in extreme environments for a number of years.
The left lens, as you can see, had a rather unusual and atypical ‘three leaf clover’ fluorescein pattern, with fairly hard bearing on proud areas of the less-than-perfect graft and over nodular suture-scars.

Over time, contact between the posterior side of the lens and these high-spots and scars resulted in corneal staining and erosions. This was aggravated by seasonal allergies and atopic conditions as well as environmental irritants and long wearing times.

He was treated on and off by his co-managing ophthalmologist with methylprednisolone and other non-steroidal anti inflammatory drugs, steroid eye drops that included Patanol, and lens lubricants. He would develop symptoms, then with treatment things would quiet down and later flare up again. I attempted various (R)GP design and material changes, but none provided any long term solution.

In 2005 I trialed a piggyback system, using his existing left (R)GP and a high Dk silicone hydrogel as follows:
As you can see, the addition of the silicone hydrogel 'carrier' smoothed out the fit fantastically. Within days he emailed me to say that it was working so well he wanted to have the right eye fitted, too. We duly piggybacked the right eye utilising his original toric (R)GP design. It also worked a treat. In this case and in a number of others, my existing (R)GP designs worked perfectly well.

I used a +1.00D 8.3 Acuvue Advance disposable soft lens carrier in the right eye, as the 8.4 Acuvue Oasys was ‘too flat’ with edge fluting. An 8.4 Oasys worked fine for the left eye.
I’m looking forward to the addition of plus powers to the world’s first single-use silicone hydrogel lens, 1-Day Acuvue TruEye, as this should make the ultimate piggyback carrier by eliminating the hassles associated with disinfecting four lenses. Currently I recommend that patients store their (R)GP and soft lenses in AOSSept Plus or in a MPDS such as Opti-Free.

The above combination makes this patient rather unique with two corneal grafts, a prosthetic leg and four contact lenses!

**Carriers**

I generally prefer to use a standard lens such as Acuvue Oasys 8.4/14.0/+1.00 because a plus carrier has a slightly steeper anterior surface that is more likely to match the (R)GP steeper base curve and to aid centration. I have also used 8.4 Night & Day and 8.6 Purevision; however, I prefer the lower modulus and surface friction of the Oasys lens. One could, in extreme cases, use an AirOptix Custom (or other custom silicone hydrogel lens) if a smaller, steeper, larger or flatter carrier is needed. Some people suggest ‘tweaking’ any over-refraction with a change in the soft lens power, but this rarely works and complicates the fitting, which is clearly demonstrated in a paper by O’Donnell C and Maldonado-Codina C, *A Hyper Dk PiggyBack Contact Lens System for Keratoconus*, Eye and Contact Lens 2004; 30 44-48. Their related article on the siliconehydrogels.org website is also worth checking out.

In some cases one needs to refit the (R)GP, usually flatter and/or with a more open periphery. Paul Rose recommends fitting piggyback (R)GPs 0.3mm flatter, as a rule of thumb. Some practitioners like to have an (R)GP lens that moves independently of the soft carrier. On the other hand, I have a few...
cases in which there is minimal movement of the (R)GP, almost binding to the soft carrier, with no problems or complications.

Achieving Enhanced Outcomes With PBCLs

I’ve used PBCLs with great success for Terrien’s Marginal degeneration, pellucid marginal degeneration, (R)GP intolerance, severe keratoconus, grafts, scarring, invagination, post radial keratotomy and post PRK & LASIK ectasia.

More Recent History

- Now 6/7.5 OU
- Up to 19 hrs wear _ Improved Tolerance
- 1 Prosthetic Leg, 2 grafts & 4 lenses!
- Staining & nebulae reduced
- Reduced steroids
- Seasonal Patanol as required
- Graft-Host interface ‘quieter’
- Happy & confident
- Does stunts, drives, extreme environments …
- Use BEST DESIGN/COMBO for CONE/TYPE

My patient has now reverted to wearing just his (R)GP on the right eye because once the PBCLs settled things down, he feels the comfort now is about the same either way. He continues to piggyback his left eye. The benefit of having the same (R)GP design with or without the silicone hydrogel carrier gives him this flexibility, and he can always resume the piggyback system if the right eye flares up. He is now much less reliant on steroids. He occasionally uses Patanol or steroid drops when his seasonal allergies and atopia flare up, maybe once or twice a year.

The combined contact lens and medical management strategies help reduce his risk of graft rejection.

I hope these tips, images and details are of benefit and will aid practitioners in achieving enhanced outcomes and maintenance of long term corneal integrity.

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