Building Confidence in Orthokeratology

Researchers exploring the science behind orthokeratology are creating a body of knowledge to help clinicians achieve optimal outcomes.

Orthokeratology is finally getting some respect. What was a poorly understood, unpredictable phenomenon 15 years ago has become well established in the mainstream of eye care, thanks in no small part to scientists like Professor Helen Swarbrick and the Research in Orthokeratology (ROK) Group at the University of New South Wales (UNSW) in Sydney. On the eve of the annual meeting of the Association for Research in Vision and Ophthalmology (ARVO), we spoke with Prof. Swarbrick about the ROK Group’s work and its impact on clinical practice.

Linkage 1: 3-pronged effort

The ROK Group, which currently includes Prof. Swarbrick, research fellow Dr. Paul Gifford, research optometrist Dr. Ahmed Alharbi, and PhD students Pauline Kang, Vinod Maseedupally and Edward Lum, obtained its first grant in 2004 through the Australian Research Council’s Linkage scheme, whereby the government matches funds provided by private industry. Bausch + Lomb Boston (previously the Boston Products Group and Polymer Technology Corporation) has been a major industry partner with the ROK Group since its inception. Australian industry collaborators include Capricornia Contact Lens and BE Enterprises.

“Linkage 1 originally had three main aspects,” Prof. Swarbrick said. “First, we wanted to understand more clearly just what we were doing to the cornea when we caused reshaping. Second, we wanted to determine if we could steepen the cornea to correct hyperopia in a planned and predictable way. Paul Gifford conducted most of that work as a PhD student. The third aspect was to determine if there was an optimal Dk/t for an orthokeratology lens.”

Further work by the ROK Group, specifically research optometrist Kathleen Watt, was pivotal in determining the underlying causes for corneal infections. “Dr. Watt’s work demonstrated that the infections resulted from poor control of the orthokeratology procedure and the use of inappropriate lenses, materials and, in particular, lens care procedures,” Prof. Swarbrick said. “As a result of that work, we made some strong recommendations about how to make orthokeratology a safe procedure, in particular avoiding the use of tap water for lens care. I am particularly proud of that work because it really has had an impact internationally. I believe we saved a lot of eyes.”

Confirming myopia control

The ROK Group’s second Linkage grant was a natural extension of the work done in the first. “There was growing excitement about the idea of myopia control,” Prof. Swarbrick said. “For some reason, orthokeratology in children appeared to slow or stop the progression of myopia. At that stage, there was no real scientific evidence, although some pilot studies looked promising. So with our Linkage 2 funding, we ran a prospective, randomized clinical trial to study this further.”

The researchers designed a study unlike any that had been done before in orthokeratology. As Prof. Swarbrick explained: “Rather than compare a group of patients wearing orthokeratology lenses with a control group wearing spectacles or conventional daily wear GP lenses, we decided to be brave and fit children with an overnight ortho-k lens on one eye and a daily-wear conventional GP lens on the other eye. After 6 months, they swapped the lenses, and we observed them for another 6 months.”

This was an unusual study and challenging to run but quite powerful, Dr. Swarbrick noted, because within the same individual, researchers could directly compare the rate of growth of the eye wearing the

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orthokeratology lens with that of the eye wearing the control lens. At 12 months, 24 patients had completed the study. Final data from this study will be presented at the 2011 ARVO meeting.

“The results are highly statistically significant,” Prof. Swarbrick said. “Our study provides compelling evidence that orthokeratology does have an effect on the growth of the eye in myopia.”

Looking toward the future

A new grant will enable the ROK Group to delve into the complexities and subtleties of the optical effects of orthokeratology. “We want to understand better how to deal with other refractive errors through corneal reshaping,” Prof. Swarbrick said. “In theory, once we know what we are doing to the corneal tissue, we should be able to design and modulate where we do it, so that we can correct myopia and hyperopia at higher levels, presbyopia and astigmatism.”

PhD student Vinod Maseedupally expects to present his preliminary work toward the goal of orthokeratology for astigmatism at this year’s ARVO meeting. PhD student Pauline Kang has been studying peripheral refraction of the eye in relation to orthokeratology and has presented her findings at various meetings worldwide.

Another orthokeratology project is under way at the UNSW School of Biotechnology and Biomolecular Sciences. “One question we have not yet answered is what is the effect of orthokeratology on the cells of the corneal epithelium,” Prof. Swarbrick said. “We know we compress them, but we do not know if that affects their physiology. Rakish Kumar, an MPhil student, has developed a system to expose cultured human corneal epithelial cells to different environments that mimic overnight orthokeratology lens wear. He will study the cellular response in terms of the proteins and metabolites expressed by the cells.”

Confidence through science

Among the major advances in orthokeratology over the last two decades, Prof. Swarbrick lists her top three as: the development and refinement of reverse geometry lens designs, the use of corneal topography in clinical practice and the development of oxygen permeable lens materials.

“I would add a fourth advance,” she said, “and that is the growth of research activity in this area. The work of the ROK Group and many others around the world doing research in orthokeratology has confirmed a scientific basis and credibility for the modality. We have tackled problems and answered important questions about how to make orthokeratology more efficacious and safer for patients. I believe clinicians have become more confident about using orthokeratology in their practices because research has shown it does have a scientific basis.”

Helen Swarbrick, DipOpt, MSc, PhD, FAAO, is head of the ROK Group and a Professor in the School of Optometry and Vision Science at the University of New South Wales in Sydney. You can contact her at h.swarbrick@unsw.edu.au.
Research Confirms Impact of Lens Material on Corneal Reshaping

The ROK Group recently completed a series of studies on the effect of lens materials on orthokeratology for myopia. The objective was to determine if there was an advantage or disadvantage in using higher Dk lens materials.

“What we found was that the higher the oxygen permeability of the material, the more rapid the onset of the reshaping effect,” Prof. Swarbrick said. “This adds further support to the recommendation that high Dk materials should be used for overnight orthokeratology, not only to provide physiological advantages but also to optimize clinical outcomes.”

New Scleral Lens Fitting Guide Available

Bausch + Lomb Boston is pleased to make available a new guide to scleral lenses by Eef van der Worp, BOptom, PhD. Based on an exhaustive literature search, A Guide to Scleral Lens Fitting brings together the latest knowledge and understanding of this increasingly popular vision correction option.

A Guide to Scleral Lens Fitting provides an introduction to scleral shape, topography and lens design, as well as a generic fitting guide to help practitioners become more comfortable with the concept of scleral lenses. It gives a general overview, supported by experienced scleral lens fitters worldwide. Its goal is to give practitioners a framework to oversee and integrate scleral lens fitting into their practices. Modern scleral lens fitting is still in its infancy, which makes it a modality with great potential. Fitting scleral lenses is not black-and-white, however, and many differences exist among fitters, cultures, manufacturers and countries. This clinical guide finds common ground among various philosophies.

To request a complimentary copy of A Guide to Scleral Lens Fitting, contact your authorized Boston laboratory or send an e-mail request to boston@bausch.com. For requests originating outside the United States, please remember to include a telephone number. A PDF version may be downloaded from Pacific University’s website at http://commons.pacificu.edu/mono/4/.

B+L to Market KeraSoft® Lenses Worldwide

KeraSoft® soft contact lenses will soon be available through Bausch + Lomb’s network of lab channel partners through a global licensing agreement with UK-based Ultra Vision CLPL. KeraSoft lenses are a patented combination of the latest technologies in soft and silicone hydrogel materials. They are custom made using geometries from complex mathematics to offer comfortable wear and excellent vision to patients with irregular corneas caused by disease, trauma or corneal surgery.

“Extending the KeraSoft technology allows the labs to expand the ability of practitioners to offer life-changing vision correction to a wider range of patients who have a variety of irregular cornea conditions resulting from keratoconus and pellucid marginal degeneration,” said Jerry Warner, vice president, Marketing and general manager, Bausch + Lomb, Global Contact Lens.
Spotlight on Charles Di Natale
For this issue’s Spotlight, we spoke with Charles Di Natale, OD, Regional Manager of Boston GP Business in China, South Asia, Australia and New Zealand.

Please tell us about your background and your experiences before joining Bausch + Lomb?

I was born in a small town in Sicily and moved with my mum and dad to Sydney in 1956. We lived in a predominantly Italian area, where I continue to live with my wife and four children. Growing up in this Italian area, I often accompanied my parents or an uncle or aunty to the local optometrist to interpret for them. As a result, I became well known to the optometrist who would often take me aside and explain why he performed certain tests. This experience was the main impetus for my deciding to study optometry.

I was fortunate to have Brien Holden as a lecturer in my final year at the University of New South Wales. He encouraged me to stay on at University, and the following year, I became his first Masters student. With Prof. Holden’s motivating influence, I never strayed far from the contact lens field. I worked for a while in one of the leading contact lens laboratories at the time and later started my own private practice. Around 1980, three colleagues and I founded Eycon Lens Labs, which we sold in 1989.

What is your current role with the Boston Products Group?

As the Regional Manager of Boston GP Business in China, South Asia, Australia and New Zealand, I cover a large geographical area with a wide range of cultural and social diversity. My goal is to support our products in a professional and responsible manner and to provide my customers, the laboratory owners, with educational opportunities by arranging specialized GP fitting workshops for their doctors and facilitating international speakers to present lectures and seminars.

My approach has always been to stay close to my customers via personal visits, phone calls and e-mails. It then becomes easier to acknowledge and understand their needs and, wherever possible, provide an answer or solution.

In your opinion, what has been the most significant advance in the GP industry?

I believe the most important development in the GP sector has been the development of oxygen permeable materials that provide a safe physiological environment for lens wear. I remember so well my first year as a graduate optometrist working in a contact lens-only practice in Sydney. The only material available was PMMA. Soft lenses were still 15 months away. On most of the patients’ record cards were the letters CCC for central corneal clouding. As a result of those early clinical experiences, I now have the greatest respect for oxygen permeable GP materials.

What are the most interesting changes that we should anticipate in the future?

The use of computers and modern lathes will allow for some exciting lens designs. We are just starting to see the emergence of some sophisticated designs for keratoconus, orthokeratology and multifocals.

With the introduction of larger-diameter high-Dk lenses, we will see an increasing use of these designs. The main beneficiaries of this technology in the short term will be patients with irregular corneas.

The “holy grail” with respect to GP lenses is, of course, increased comfort for the new wearer. Experienced GP practitioners recognize that comfort is not a great issue for established GP wearers, but we need to improve the initial comfort experience for newer wearers.

Please tell us about your life outside the office. What are your hobbies and interests?

With four children and work commitments, it is often difficult to find that elusive “leisure time,” however, time with the family is certainly quality time for me. I enjoy going to restaurants with friends on a Friday evening and sharing a good “red.” Sydney has no shortage of very good, inexpensive restaurants! I have developed a passion for red wine and enjoy going to wine tastings with friends who have a similar passion.

Golf is another passion, and when time permits, I truly enjoy those few hours on the golf course. In winter, we enjoy family ski holidays in the Australian Alps. My other favorite passion in winter is to have a weekend at home, coffee brewing and the weekend paper sprawled in front of me.

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