DLK cause close to hand

Sean Henahan in Paris

THE CAUSE of mysterious diffuse lamellar keratitis outbreaks may be closer at hand than you think. After eliminating all the usual suspects, Richard S. Hoffman MD and colleagues traced an epidemic of DLK in their institution to a batch of bad surgical gloves.

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Dr Hoffman and colleagues were frustrated and perplexed after a persistent epidemic of diffuse lamellar keratitis at the Oregon Eye Institute, Eugene, Oregon. The incidence of DLK during the epidemic ranged from 16% to 85% per surgical day, he told a session of the XXII Congress of the ESCRS.

Previous outbreaks of DLK have been attributed by other investigators to everything from bacterial endotoxins lurking in sterilisers to epithelial defects, metallic debris and betadine exposure. Dr Hoffman was able to eliminate the better-known DLK agents from the list by switching sterilisers and altering antibiotic regimens, but still could not determine the cause of the problem. Eventually the clinicians evaluated a new, less likely suspect, the surgical gloves. In fact, as soon as they changed the brand of surgical gloves they had been using during surgery, the incidence of DLK dropped to zero. The clinic has had no cases of DLK since changing brands.

Silicone oil contamination

Subsequent microscopic analyses of the gloves revealed a possible explanation. The researchers performed optical microscopy, scanning electron microscopy-energy dispersive spectroscopy, Fourier transform infrared spectroscopy, and scanning electron microscopy-energy dispersive spectroscopy, as well as Fourier transform infrared spectroscopy on the suspect gloves and also on the replacement gloves.

The examinations revealed that the DLK-associated gloves had extensive silicone oil contamination on the internal and external surfaces. In contrast, the DLK-free gloves showed only trace amounts of silicone oil on the external surface.

Dr Hoffman was initially sceptical that gloves could be causing the DLK problem when a nurse first suggested the idea. He did not believe that the gloves were coming in contact with the interface or instruments in contact with the interface. After the switch to the new gloves eliminated the DLK problem, he reconsidered. He then realised that he did touch the microkeratome blades during insertion, and that he routinely squeezed out a sponge before wiping the keratectomy interface—either of which might introduce silicone into the interface.

“Our investigations suggested that silicone oil contamination of surgical gloves appears to be associated with epidemic DLK. If you are dealing with a DLK outbreak and have ruled out other potential aetiologies, it might be a good idea to analyse your surgical gloves for silicone oil contamination, and to consider switching to a different brand.”

Different surgical glove makers use greater or lesser amounts of silicone for various purposes during manufacture. In some cases, silicone is added to the coagulant/latex as a defoamer. In such cases silicone concentrations are typically very low, he noted. However, in other cases, methyl silicone is used as a part of a polymer-based coating process. This is a likely cause for silicone on glove surfaces, he said.

Silicone among a range of implicated factors

Dr Hoffman cited other cases in which silicone was implicated in post-operative keratitis following refractive surgery. In one study presented at the ASCRS conference in 1998, R. Maddox reported a case of ‘Sands of the Sahara’ syndrome associated with silicone exposure from a leaking keratome. In another study (J Cataract Refract Surg 1999; 25:603-604), SC Kaufman reported a similar problem associated with oil present on microkeratome blades.

Previous investigations into epidemics of diffuse lamellar keratitis (DLK) showed that bacterial endotoxins lurking in medical equipment could account for many outbreaks.

Canadian researcher Simon Holland MD FRCS investigated 11 recent outbreaks of DLK at ten laser refractive clinics in nine European countries. In several cases the outbreaks were linked to the sterilisation process used by the clinic—short-cycle steam sterilisation. Two outbreaks were linked to surgical sponges. A microkeratome blade was implicated in another outbreak.

He visited each clinic and conducted a retrospective chart review, along with a review of the surgical system in use and an analysis of the epidemiology of the outbreaks. When possible, he also examined the air quality and other elements of the surgical environment, observed surgery and sterilisation techniques, and conducted microbiologic sampling.

Microbiological investigations conducted at six of the clinics revealed the presence ofRalstonia, Burkholderia, Pseudomonas species in steriliser reservoirs and ultrasound baths.

The outbreaks resolved with changes in sterilisation and instrument cleaning protocols. Clinics changed from short cycle steam sterilisation to either the dry heat or long-cycle steam methods. Clinics also instituted improved instrument preparation and cleaning protocols.

“Most of these European outbreaks of DLK were resolved by changing the method of instrument sterilisation and by improved instrument cleaning. These measures are consistent with avoiding endotoxin or instrument contamination of the surgical field,” he reported.

Dr Holland is a recognised authority on the subject, having reported the first outbreak of DLK associated with refractive surgery in 1998, at a clinic in Vancouver, British Columbia, Canada. That outbreak was controlled by revising steriliser cleaning protocols and returning when those protocols were discontinued. It was at this time that he developed the theory that the problem could be traced to endotoxins released by steriliser reservoir Gram-negative biofilm.