

# Contact Lens Update

CLINICAL INSIGHTS BASED IN CURRENT RESEARCH

## Myth 1: Daily Disposable Silicone Hydrogels – Necessary or Not?

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The annual fitting survey published each January by Morgan and colleagues in Contact Lens Spectrum has been conducted for 21 years and provides a very valuable resource on the trends in contact lens fitting around the globe. The latest survey,<sup>1</sup> which covered almost 20,000 fits in 30 countries, demonstrates that the most commonly chosen frequencies of replacement are either daily disposable (DD) or monthly reusable (RU) options, with an average of 37% of fits being DD and 43% being monthly RU. This edition also demonstrates the continued growth in the prescribing of silicone hydrogel (SiHy) materials compared with hydrogels, with 65% of all fits being into SiHy materials.

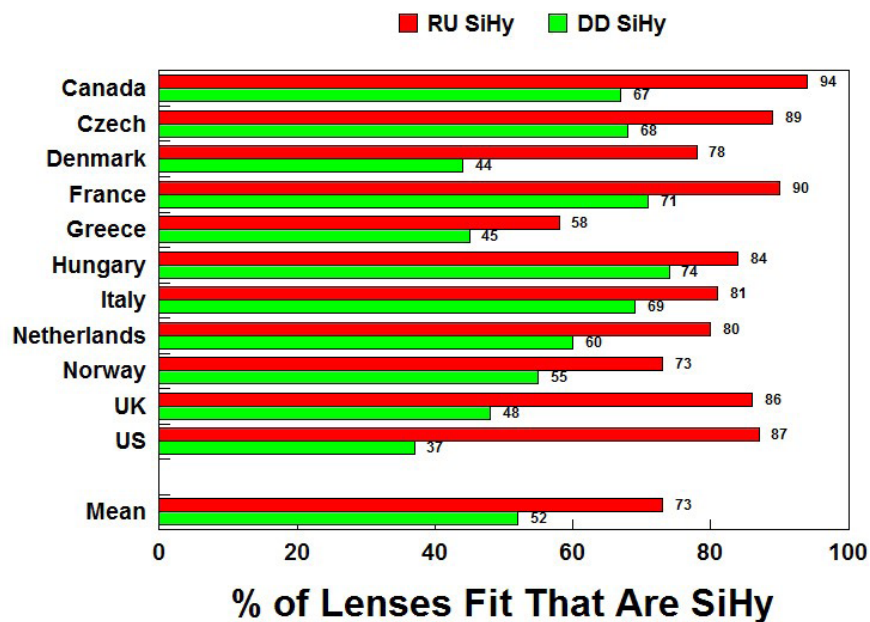


Figure 1: Percentage of lenses fit that are made from SiHy materials for various countries. Data taken from Morgan *et al.*<sup>1</sup>

Closer inspection of the data shows an interesting difference between the proportion of SiHy materials used for RU fit options versus those prescribed for DD usage. Fig 1 reports the percentage of RU and DD lenses fit that were SiHy materials from a variety of European markets, in comparison with data from the USA and Canada.<sup>1</sup> It clearly shows that while the majority of RU lenses prescribed were SiHy materials (ranging from 58 – 94% with an average of 73%), in every country the proportion of DD lenses prescribed that were manufactured from SiHy materials were under-indexed (ranging from 37 – 74% with an average of 52%). Thus, while three quarters of all RU lenses were SiHy, only half of the DD lenses were SiHy. This seems at odds with clinical intuition. SiHy

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materials have now been commercialised for 20 years and provide significant clinical benefits in terms of hypoxia, as evidenced by numerous publications and review papers.<sup>2-6</sup> Clearly practitioners feel that SiHy materials are necessary for their patients using their lenses on a RU basis, but they are not convinced they are needed for daily wear DD wearers. Why would practitioners seemingly opt to upgrade patients in terms of their frequency of replacement, but downgrade their material choice?

So, why are practitioners less likely to opt for a SiHy material for their DD wearers than for those using their lenses on a RU basis? Several potential reasons exist...

### 1. DD wearers do not need the oxygen afforded by SiHy materials

This concept is somewhat puzzling. If a patient needs the oxygen provided by a SiHy when they replace their lenses every month, why would that be different for those replaced every day? Indeed, the extra comfort often provided by a DD lens means that many DD wearers will get longer comfortable wearing times with their DD lenses than they achieved with their RU lenses, particularly at the end of the replacement period,<sup>7, 8</sup> thus providing less time each day in which their eyes are not wearing a lens.

A retrospective analysis of wearers of DD hydrogel and SiHy lenses demonstrated a statistically significant increase in limbal redness in those wearing the hydrogel lenses.<sup>9</sup> Previous studies have shown the association between oxygen transport and limbal redness, with subtle levels of hypoxia being indicated by an increase in limbal hyperemia and the wearing of SiHy materials resulting in a reduction in limbal redness.<sup>10-15</sup> Fig 2 (taken from a previous paper by Jones & Woods)<sup>16</sup> demonstrates the subtle limbal hyperemia that can occur after just eight hours when a DD hydrogel lens is worn compared with a DD SiHy. This visible difference demonstrates the relevance of DD SiHys for part-time as well as full-time wearers. Of course, the oxygen requirements of wearers differ<sup>17, 18</sup> and not every wearer of a DD hydrogel will show such a difference, but there are certainly some patients who would benefit from the oxygen transport afforded by a DD SiHy lens.

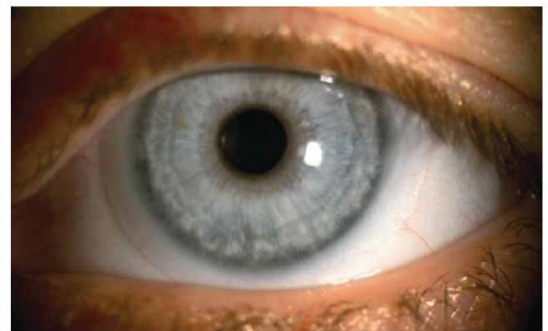
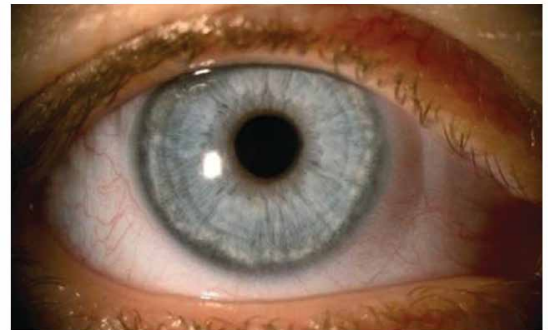


Figure 2: Same patient wearing a hydrogel DD lens in the right eye (top) and a SiHy DD lens in the left eye (bottom) for an eight-hour period, with a noticeable difference in limbal hyperaemia. (Images courtesy of Dr Shehzad Naroo). Taken from Jones & Woods.<sup>16</sup>

### 2. DD SiHy materials are not as comfortable as DD hydrogel materials

This concept likely dates back to the early, first generation SiHy materials. These materials had a high modulus due to their relatively high siloxane content which was incorporated to provide the very high oxygen transport required for 30 day continuous wear.<sup>19-24</sup> Initially, these materials were often available only in a single base curve and could induce reduced comfort, often due to poor fit, resulting in excessive edge stand-off.<sup>25-27</sup> These high modulus materials could also produce a variety of mechanical complications such as superior epithelial arcuate lesions (SEALS), corneal erosions, mechanical papillary conjunctivitis and mucin balls.<sup>28-30</sup>

Modern SiHys have lower moduli than the first generation materials,<sup>23, 24, 31</sup> are often designed with aspheric back surfaces, have improved edge design and are far closer in comfort to hydrogel lenses.<sup>32-35</sup> Three extensive

reviews showed no overall comfort preferences for hydrogels versus SiHy materials<sup>36-38</sup> and a recent comparison of DD hydrogel and DD SiHy lenses showed no comfort differences between these two material classes.<sup>9</sup>

### 3. Patients are allergic to silicone and I prefer to use hydrogel materials

It is biologically impossible to be allergic to the siloxane monomers that are within SiHy materials.<sup>39, 40</sup> This myth likely arose from the fact that practitioners believed they were seeing an eye which exhibited an allergic reaction to silicone, and it is understandable that some of the complications seen were thought to mimic allergic responses. Possible responses with SiHy materials that mimic allergy include:

- Mechanical complications such as papillary conjunctivitis, which can occur with SiHy materials.<sup>29, 30, 41-44</sup>
- Inflammatory reactions, such as corneal infiltrative events (CIEs) and contact lens-related acute red eye (CLARE) occur with SiHys. In fact, daily wear of RU SiHy CLs has an almost two-fold increase in the relative risk of infiltrative keratitis (IK).<sup>45-48</sup> A number of explanations have been postulated for this increase, including poorer wettability, different deposition patterns between hydrogel and SiHy materials, higher modulus, and varying interaction with both care systems<sup>49-58</sup> and CL cases.<sup>59-62</sup>

As pointed out in a recent review,<sup>31</sup> modern DD SiHy lenses are designed to overcome many of these complications and hopefully will lay to rest the myth of “silicone allergy”.

### 4. DD SiHy materials are simply too expensive

When DD SiHy materials were first introduced they were certainly introduced at a premium price, and in most cases the cost per wear of DD SiHy lenses is indeed higher than that of both DD hydrogels and RU SiHy CLs. However, many wearers do not use their lenses every day and the increased cost per month for part-time wearers may well be acceptable to patients, especially if they find a DD SiHy to be a comfortable option and the potential health benefits long-term are explained to them. In addition, some companies are now offering lower cost “entry-level” DD SiHy materials that are fairly close in cost to a DD hydrogel lens, and the cost of DD SiHy will likely continue to reduce as more options become available.

Rather than judging how much a patient will pay for a premium lens option, it would seem reasonable to offer patients an opportunity to try a DD SiHy lens and make the decision about what they find acceptable once they have tried them for a week or so. Practitioners should not judge the size of their patients’ wallet!

### 5. Wettability is better with DD hydrogel lenses

SiHy materials tend to exhibit higher contact angles during in vitro assessments than hydrogel materials,<sup>19, 63-67</sup> implying they are inferior in terms of wettability. However, the in-eye performance of SiHy materials demonstrates wettability very similar to that typically observed with hydrogel materials<sup>33, 67-70</sup> and an extensive review demonstrated that tear film break-up time over these materials was very similar.<sup>67</sup>

Occasionally, a patient appears unable to obtain good comfort and wetting with a SiHy material. Fig 3 is of a female with no apparent lid or tear film abnormalities who rapidly deposited her DD SiHy lens. Despite trying 3 different SiHy DD materials, after 3-4 hours the lens was heavily deposited with tear film debris. Refitting with a hydrogel solved the problem and the patient now wears these lenses all day with good comfort. The image shows that she had fairly heavy cosmetic use, but even with this being avoided the lens wettability issue was still present. The reason for this remains unknown, but such instances are very rare.

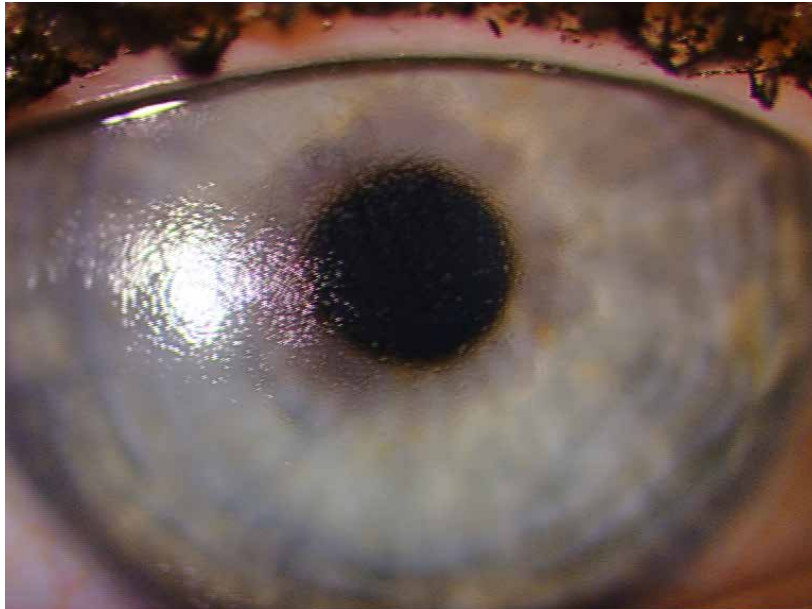


Figure 3: Poor wetting SiHy DD in a female patient. The lens has been worn for only 3 hours and shows marked deposition and poor wettability.

#### 6. SiHy DD are not available in as many parameters as I would like

To some extent this is true, and there is certainly greater parameter availability in DD hydrogel lenses than DD SiHy lenses. However, more and more companies are now offering expanded parameter availability in SiHy DD lenses, the spherical prescription range is fairly extensive (+8.00D to -12.00D) and several companies now have DD SiHy multifocals and torics available. These options will continue to grow, and the majority of patients can already be fit with SiHy DD lenses.

In conclusion, a review of the literature suggests that practitioner's reluctance to utilise SiHy materials for their DD wearers is generally unwarranted and that many wearers would benefit from being given the opportunity to try DD SiHy and to decide if the (potentially) extra cost is worth it for them.

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## Myth 1: Daily Disposable Silicone Hydrogels – Necessary or Not?

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