SOLUTION TOXICITY IN SOFT CONTACT LENS DAILY WEAR IS ASSOCIATED WITH CORNEAL INFLAMMATION

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BACKGROUND
Second generation silicone hydrogel materials are now targeting the daily wear (DW) market. Certain combinations of multipurpose solutions and silicone hydrogel lenses are associated with solution-based corneal staining and toxic staining typically described as mild, transient, asymptomatic and not requiring cessation of lens wear.

PURPOSE
To determine the relationship between solution toxicity, corneal inflammatory events and ocular discomfort in soft contact lens (SCL) DW.

METHODS
• Retrospective analysis of 16 non-randomised interventional clinical trials
• 699 subjects (1218 eyes); 2,152 study visits
• Bilateral DW, monthly replacement
• Visit schedule: baseline, 1 week (questionnaire only), 2 weeks, 1 month, 3 months
• Regulatory (ethics) approval and Informed Consent obtained

RESULTS
• Age (Mean ± SD) 34 ± 11
• Male: Female (%) 29:71
• Previous lens wear history (%) (zero: existing lens wearer) 7:83
• Subjects completed the study (%) 87
• Smokers: Non-Smokers (%) 8:92
• Ethnicity (%) (Asian: Non-Asian) 20:80

Table 1: Number and Types of Corneal Infiltrative Events

<table>
<thead>
<tr>
<th>Lens Types</th>
<th>Lens Care Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balafilcon A</td>
<td>H2O2 (AOSept)</td>
</tr>
<tr>
<td>Etalon A</td>
<td>Polyquarternium-1 (Optifree Express)</td>
</tr>
<tr>
<td>Galafilcon A</td>
<td>PHMB (AQuify)</td>
</tr>
<tr>
<td>Lotrafilcon A</td>
<td>Alexidine (ReNu MoistureLoc)</td>
</tr>
<tr>
<td>Lotrafilcon B</td>
<td>SensiClean A</td>
</tr>
</tbody>
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Note: 16/24 possible permutations were trialed.

Solution toxicity = Diffuse punctate staining in at least 45 corneal areas.

Figure 1: Corneal Infiltrative Events classified according to Sweeney’s Guide to Corneal Infiltrative Condition

REFERENCES

SUMMARY AND DISCUSSION
• This study demonstrates that corneal infiltrative events are 3-times more likely to occur in eyes that experienced toxic staining than those that did not (Table 4). Possible aetiologies for the corneal infiltrates include:
  - A direct causal relationship with toxic staining stimulating corneal inflammation.
  - Weakening of the cornea’s natural defences against microbial, lens related and environmental challenges by the toxic staining damage.
• A dose-response relationship was evident for studies using multipurpose solutions and not for studies using the hydrogen peroxide solution, where toxic staining rates were generally low (Figure 4). X-ray photoelectron spectroscopy of pre-soaked lenses indicates that substances from multipurpose lens care solutions are adsorbed onto the surface of contact lenses. The release of antistaphylococcal components of multipurpose contact lens solutions such as polyquarternium-1, PHMB, and alexidine following insertion is the likely cause of damage to the superficial corneal epithelium.

CONCLUSION
Subjects that experience solution toxicity are more at risk of developing a corneal infiltrative event. Although these events were generally mild and asymptomatic, the potential for more serious sequelae means that if toxic corneal staining is detected, alternative solution/solution type combinations ought to be investigated to reduce the general level of staining, lower the risk of inflammation and at the same time increase the general level of comfort.

REFERENCES

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