Superior Epithelial Arcuate Lesions (SEAL)

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Superior epithelial arcuate lesions (SEAL) are full epithelial thickness lesions of the superior cornea. Upon clinical exam, these erosions have irregular edges, raised epithelium at the margins, and are between 0.1mm to 0.3mm thick and between 1mm to 5mm in length. Found below the upper eyelid about 1 to 3mm from the limbus, they have positive fluorescein staining pattern.

SEALs are classified as either limbal or paralimbal, depending on the distance from the corneal edge. Limbal lesions are generally asymptomatic whereas paralimbal lesions are more likely to evoke mild foreign body sensations, more likely to scar and are associated with subepithelial infiltrates.

The risk factors of SEAL development can be divided into two major categories: patient characteristics and contact lens characteristics, as summarized in the tables below.

### PATIENT CHARACTERISTICS

<table>
<thead>
<tr>
<th>Gender</th>
<th>Males</th>
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<tbody>
<tr>
<td>Age</td>
<td>Presbyopes</td>
</tr>
<tr>
<td>Lid anatomy</td>
<td>Tight eyelids</td>
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<tr>
<td>Corneal curvature</td>
<td>Steep corneas</td>
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<tr>
<td>Ocular health</td>
<td>Lid disease and ocular surface disease</td>
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</tbody>
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### CONTACT LENS CHARACTERISTICS

<table>
<thead>
<tr>
<th>Lens fabrication</th>
<th>Lathe cut</th>
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</thead>
<tbody>
<tr>
<td>Lens material</td>
<td>Higher modulus</td>
</tr>
<tr>
<td>Lens design and curvatures</td>
<td>Tight fitting lenses</td>
</tr>
<tr>
<td>Lens thickness</td>
<td>Thicker lenses</td>
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</tbody>
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Mechanical irritation is the most common theory for the cause of SEALs. The edge and back surface design determine the alignment of the contact lens to the cornea. The misalignment between the contact lens and the superior cornea, combined with the force induced by the upper eyelid can result in chaffing of the cornea.

Poor tear quality and poor tear exchange under a lens can increase risk of SEAL regardless of the type of lens worn. Transition zones between curves on the back surface of a contact lens can create areas of friction between the cornea and lens. Additionally, deposits on the back surface of the lens and debris entrapment from tight lids can cause SEAL.

The incidence of SEALs is low because the symptoms are minimal, thus identifying and reporting is limited. There is a 0.9-4 percent incidence in both extended wear with silicone hydrogel lenses and conventional wear with hydrogel lenses despite the differences in dk/t. This suggests hypoxia is not a contributing factor.
The first step in proper management begins with identification. It is important to note that punctate staining in the same area can precede a SEAL by one to two weeks\(^4\). Treatment options include:

- Contact lens rest.
- Broad spectrum antibiotic.
- Preservative free artificial tears.
- Refit with a different design or material.
- There is a 63 percent initial recurrence rate with a 50 percent recurrence rate for a third episode. If three episodes occur, the patient should be refit into GP lenses.
- There is still a 13 percent recurrence rate regardless of contact lens material or solution\(^2\).

**References:**


**Dr. Pal received her Doctor of Optometry degree from the Southern California College of Optometry. She completed her contact lens and cornea residency at Northeastern State University Oklahoma College of Optometry, where she is certified in therapeutic pharmaceutical agents, glaucoma and anterior segment lasers. Dr. Pal has a contact lens specialty practice in Toronto, Canada. She is an adjunct faculty at the University of Waterloo and a facilitator and coordinator of industry contact lens workshops at optometry schools throughout North America.**

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