

# Use of Silver Nitrate in Superior Limbic Keratoconjunctivitis

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A 38 years old Pakistani female presented in outpatient department with a history of irritation and redness in both eyes for the last five months. It was associated with foreign body sensations and watering of both eyes. She had been using different eye drops but there was no recovery. There was no history of contact lens use. Slit lamp examination revealed superior limbal congestion in the form of inverted trapezoid, centered at 12 O'clock. Examination of the upper tarsal conjunctiva showed velvety congestion and papillae formation. Patient was prescribed topical lubricants and fluorometholone eye drops. Follow up after three weeks showed mild recovery. We applied 0.5% silver nitrate solution as a trial to the upper tarsal conjunctiva. The patient showed marked improvement in congestion after three weeks. During this period she used lubricant eye drops.

**S**uperior Limbic Keratoconjunctivitis (SLK) is a chronic inflammatory condition of the superior bulbar conjunctiva in a corridor, tunnel or inverted Trapezoid fashion, associated with the papillary hypertrophy of the upper tarsal conjunctiva. The first ever description of this condition dates back to the year 1963, when Theodore and Kimura presented it as a localized, chronic inflammation of the superior conjunctiva.<sup>1</sup> Most common associations of SLK are Thyroid abnormalities and Dry eye disease. The exact etiology is still unknown but the final common pathway in this condition is the mechanical soft tissue micro trauma.<sup>2</sup>

Since it is a multifactorial disease, there is no single consensus on the final treatment. One of the treatment options is topical application of 0.5% to 1% Silver nitrate. In this particular case report, remarkable results of a single application of Silver nitrate in SLK, its historical use, application protocol in SLK, possible mechanism of action, side effects and precautions are discussed.

## CASE REPORT

A 38 years old Pakistani female presented in outpatient department with a history of irritation and redness in both eyes for the last five months. It was

associated with foreign body sensation and watering of both eyes. She had been using different eye drops but there was no recovery. There was no history of contact lens use. She was hypertensive, which was not properly controlled. Systemic history negated any heat intolerance, insomnia and weight loss. However, she underwent Mastectomy two years back and had been using Tamoxifen since then. Family history was unremarkable.

On examination, she was orthophoric and extra ocular movements were of full range. Pupils were round, regular and normally reacting to light and accommodation. Visual acuity was 6/6 and intra ocular pressures with Applanation tonometry were 10 mm Hg in each eye. Slit lamp examination revealed superior limbal congestion in the form of inverted trapezoid, centered at 12 o'clock, (Fig. 1). Examination of the upper tarsal conjunctiva showed velvety congestion and Papillae formation (Fig. 2). Tear meniscus and tear film was normal. Tear film break up time was 17 seconds. Cornea and lens were clear and fluorescein staining of cornea was negative. Anterior chamber was quiet. Fundoscopy showed normal retina. On general physical examination, all vitals were normal except blood pressure, which was 150/85 mm of Hg. CBC and thyroid function tests were within the normal range.



**Fig. 1:** Superior tunnel shaped congestion in both eyes.



**Fig.2:** Velvety appearance of the upper tarsal conjunctiva due to papillary hypertrophy.



**Fig.3:** Showing instillation of a drop of 0.5% silver nitrate on the upper tarsal conjunctiva.

Patient was prescribed topical lubricants and fluorometholone eye drops. Follow up after three weeks showed mild recovery. We decided to apply 0.5% silver nitrate solution as a trial. Topical Proparacaine was used to anesthetize the conjunctiva.

Upper lid was everted. A drop of 0.5% Silver nitrate solution was applied to the upper tarsal conjunctiva and the lid was closed for one minute (Fig. 3). After one minute, the conjunctival sac and cornea were irrigated with normal saline solution. Slit lamp examination was normal and Fluorescein staining of the cornea was negative after the procedure.



**Fig. 4:** Marked improvement in superior bulbar congestion.

The patient was asked to use lubricant eye drops and called for follow up after three weeks. There was a marked improvement in congestion after three weeks as shown in (Fig. 4).

## DISCUSSION

Superior Limbic Keratoconjunctivitis (SLK) is a chronic inflammation of the superior bulbar conjunctiva, distributed in a corridor, tunnel or inverted Trapezoid fashion. It is associated with the papillary hypertrophy of the upper tarsal conjunctiva. Theodore coined the term Superior limbic keratoconjunctivitis for this condition in 1963.<sup>1</sup> The exact etiology of SLK is still unknown but most of the patients may have abnormal thyroid function<sup>3</sup>. Studies have also shown that almost 50% of patients with SLK have keratoconjunctivitis sicca.<sup>4</sup> In this particular patient, Thyroid function tests and the tear film were normal.

There are certain other risk factors associated with it. These include prolonged eyelid closure with associated hypoxia, conjunctivochalasis and tight conjunctival apposition to the globe following upper eyelid procedures.<sup>5</sup> How do all these factors contribute to the superior bulbar congestion, still remains unsettled. One of the possible mechanisms could be the upper lid tightness caused by chronic inflammation of the upper bulbar conjunctiva. This can disturb the normal turnover of the bulbar conjunctival epithelial cells, which further increases the inflammation.<sup>2</sup> Furthermore, the chronic

inflammation can lead to blepharospasm, which presses upon the bulbar conjunctiva aggravating the existing inflammation.<sup>6</sup> Our patient did not have tight lids but conjunctiva was a bit lax.

There are certain single case reports available in literature, which increase the confusion about the etiology of SLK. One case of hyperthyroidism with SLK is also reported which recovered after resection of the tumor.<sup>7</sup> Darrell described another case of SLK in identical twins proposing a possible genetic basis<sup>7</sup>. But the family history of our patient was unremarkable. Whatever be the cause, the final common pathway in all these conditions is soft tissue trauma.<sup>8</sup> It is hypothesized that there are frictional forces between (i) tarsal and bulbar surfaces; and (ii) between conjunctival stroma and sclera which may be responsible for this trauma.<sup>2</sup>

Due to a multifactorial pathogenesis of SLK, there has been no consensus on a single best treatment. Various treatment options including artificial tears and punctal occlusion in dry eyes, alternate patching of the eyes, topical mast cell stabilizers, vitamin A eye drops, cyclosporin A 0.5%, bandage contact lenses, cryotherapy and recession or resection of superior bulbar conjunctiva have all been described in literature with variable success. A case has been reported where unilateral bandage contact lens has improved the bilateral SLK.<sup>9</sup> Thermal and chemical cautery with silver nitrate has also been used by many clinicians. In one study, a success rate of 73% was seen with thermal cautery. It was seen that the number of goblet cells improved following cautery.<sup>10</sup> We decided to try silver nitrate solution in our patient after many different types of treatments failed in the previous five months.

Historically, silver had been mentioned in many literary and medical works since ancient times. In myths of Vampire stories it was believed that only those bullets would kill a vampire which contained silver in it. While medical use of silver salts dates back to 1881 when it was discovered that instillation of a drop of 1% silver nitrate in the eyes of neonates would prevent ocular infections. It was named Crede prophylaxis after the name of its discoverer.<sup>11,12</sup>

At that time it was also called lunar caustic because it was believed by ancient alchemists that, silver was associated with the moon. It was also used for water storage, as the water kept in silver containers did not get stale. Some people used to put silver coins in water utensils as well.

Dramatic relief of signs and symptoms in our case suggests that the possible mechanism of action of silver nitrate in SLK is its anti-inflammatory character. The earliest records of its anti-inflammatory action was observed in early 1900 when it was found that if silver nitrate was applied to the indolent wounds, the inflammation was reduced. In 1920, United States FDA approved silver for wound treatment.<sup>13</sup> Later it was found that Ag ions were released in water which might have the anti-inflammatory action. With the advent of antibiotics, the use of silver was abandoned and Crede's prophylaxis became a history due to corneal burns.

In this new era of modern medical science there is more research going on Silver nitrate and not very long ago, it was postulated that the nitrate ions in silver nitrate had pro-inflammatory effect<sup>13</sup>. This could be the reason that application of silver nitrate causes irritation and burning as an early effect. Later this is taken over by the anti-inflammatory effect of silver ions. Slight burning and irritation noticed in our patient immediately after application of Silver nitrate could be the result of this effect.

Another proposed mechanism of action of silver nitrate is its cauterizing effect. There is 75% silver nitrate with 25% potassium nitrate on a typical applicator of silver nitrate. As it is applied to a wet surface on the body, nitric acid is formed. This nitric acid has a chemical cauterizing effect, which is responsible for the resolution of superior bulbar congestion in SLK. Hence, Silver nitrate, when applied, will achieve its hemostatic effect by creating chemical cauterization or sealing of the vessels.

We could not find the results of large prospective studies on the use of silver nitrate in SLK. However, there are two cases of corneal burns associated with the use of silver nitrate in SLK where the practitioners had to settle the cases by large indemnity payments. In one case, Silver nitrate stick was applied to the tarsal conjunctiva after dipping in Dactriose. The cornea became hazy and final visual acuity was 20/200. In another case of a 35 yrs old patient, stick was directly applied to the limbus at 12 O'clock. A drop of solution dripped on to the cornea causing severe corneal burn at the spot. It is worth mentioning that in both cases silver nitrate stick was used.<sup>14</sup> These sticks are impregnated with concentrated silver nitrate and should be avoided in eyes. We took special precautions to avoid these corneal burns. Firstly, the concentration of silver nitrate was very low. Only 0.5% solution was used. It must be emphasized that if the

required effect is attained after such a low concentration, there is no need to risk the cornea by using concentrated solutions or sticks. Secondly, the eyelid was everted to apply the solution to the tarsal conjunctiva rather than directly applying to the bulbar conjunctiva. Thirdly, the cornea and conjunctiva were irrigated one minute after the application, to remove excess of silver nitrate.

So, we make following recommendations for the use of silver nitrate in SLK.

1. The surgeon should be vigilant in using silver nitrate. Solution should not be more concentrated than 1%.
2. Contact with the skin should be avoided.
3. The eye should be irrigated after application of the solution for least 5 to 10 minutes.
4. Direct contact of silver nitrate with the cornea should be avoided by everting the lid.
5. If one has to repeat the procedure, it should not be before 4 to 6 weeks after the first application.
6. It is also important that the solution must be kept in a dark and cool, dry location. If it is not, the medication will degrade and will be ineffective.

It is always better to use a freshly prepared solution.

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