

# Management of Tyndall Effect

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#### Definition

The Tyndall effect is named after the Irish physicist, John Tyndall (1820–1893), who first described the feature.

“The phenomenon in which light is scattered by particles of matter in its path. It enables a beam of light to become visible by illuminating dust particles, etc.”<sup>1</sup>

Seriousness of complication		Frequency of complication	
Minor complication		Common	
Worrying complication		Occasional	X
Moderate complication	X	Infrequent	
Serious, but not major		Rare	
Major complication		Very rare	

#### Introduction

In aesthetics, the Tyndall effect is used to describe the bluish hue that is visible within the skin caused by too superficial placement of hyaluronic acid (HA) filler.<sup>2</sup> The Tyndall effect is more commonly referred to as Rayleigh scattering by physicists after Lord Rayleigh who studied the process in more detail. The principle of the Tyndall effect is that different wavelengths of light do or do not scatter depending on the size of the substance they encounter.<sup>3</sup> Blue light is scattered about 10 times more than red light when passing through very small particles. It is for this reason that the sky appears blue and that a pool of HA beneath the skin scatters more light of shorter wavelength and has a bluish discoloration. A greater amount of small particles within a substance, the greater the scattering and the more obvious discoloration. This is the reason the Tyndall effect is more common with more particulate dermal fillers.

#### Incidence

Some articles refer to this complication occurring commonly and others infrequently. No large studies have reported any data on the incidence of the Tyndall effect. However, it does seem to be dependent to a large degree on the skill of the injector, the injection technique, the area treated, and the product used so it is likely the incidence will vary quite widely between different practitioners.

#### Signs and Symptoms

The Tyndall effect can be caused if HA is placed too superficially or in large boluses and may be mistaken for a mild but deep bruise<sup>2</sup> (although it does not resolve over a few days unlike bruising). Often, the area is slightly raised or lumpy due to the superficial placement of the filler. The discoloration may be

very mild and difficult to see in poor lighting. The Tyndall effect can be distressing for patients and gives a poor aesthetic outcome leading to anxiety and dissatisfaction.<sup>4</sup> The Tyndall effect may be visible immediately after treatment although it may appear after a few days and, without corrective measures, may last for months or years.<sup>5</sup>

### Areas of Caution

The Tyndall effect is more likely to occur where there is thinning of the skin,<sup>6</sup> whether this is due to the area being treated, the general skin condition, or the age of the patient. The tear trough and perioral or smoker's lines<sup>7</sup> are more common sites to observe this complication; however, there are many instances that have been reported in the nasolabial folds, which is more likely due to incorrect product placement by an inexperienced practitioner.

### Minimizing the Risk

Specific discussion regarding the risk of developing a Tyndall effect following treatment should be part of the consent process when using HA fillers, particularly when injecting into an area of caution. Assess the patient's skin for thickness and develop a treatment plan accordingly. Avoid treating high-risk areas if the skin is already thin and compromised.

Correct technique is the fundamental way to prevent this complication from occurring.<sup>4</sup> Depth of injection is paramount to prevent Tyndall effect, for example, in the tear trough region, the filler should be placed at the periosteal level or at least in the sub-orbicularis plane.<sup>6</sup> Similarly, as we know that light refraction will be far more significant in a relatively large pool of HA compared to a small one, injecting only very small aliquots and avoiding larger bolus deposition in areas of caution and when injecting more superficially will help to alleviate the risk further.

Certain products claim to have company data to support the reduction of Tyndall effect due to molecular structure, the use of cross-linked with non-cross-linked HA in combination with the addition of amino acids and minerals. There is a general consensus within the evidence that particulate dermal fillers with larger particle size are more likely to result in the Tyndall effect when injected incorrectly<sup>5</sup> and particularly non-animal stabilized HA (NASHA) gel.<sup>8</sup>

### Treatment of Tyndall Effect

Firm massage may be sufficient to flatten and disperse excessive, superficial, or a poor aesthetic result of HA filler.<sup>4,9</sup> Massage is most likely to be successful as soon as the effect is

noticed and ideally at the time of treatment; the longer the delay, the less likely massage is to be successful and certainly after more than a few days, it is unlikely to resolve the problem.

A simple stab excision using an 18G needle and simply expressing the filler from the area may be successful.<sup>6</sup> Aspiration<sup>9</sup> using a needle and syringe may remove the filler material in some cases or more formal incision and drainage<sup>4</sup> may be required.

The mainstay of treatment for Tyndall effect is to dissolve the HA using hyaluronidase (see Aesthetic Complications Expert Group guidelines on The Use of Hyaluronidase in Aesthetic Practice).<sup>2,4-7,9,10</sup> This will often lead to complete resolution of the problem within 24 hours, although occasionally a second treatment with hyaluronidase may be required.<sup>10</sup> Dosage will vary according to the amount of HA present in the area and whether the patient requests the filler to be completely removed or just the area of concern. Typical dosages reported in the literature were between 30 and 75 units. Hyaluronidase may be used at any time and has even been shown to be effective 63 months after initial injection of HA.<sup>11</sup>

There is a limited amount of evidence to support the use of Q-switched neodymium-doped yttrium aluminium garnet (Nd:YAG) 1064nm to help reduce Tyndall effect.<sup>3,12</sup> The mechanism of action is unclear and no discrete chromophore has been identified using spectrophotometric analysis of the filler material. More evidence would be needed before this technique could be recommended by the expert group.

Finally, camouflage makeup can be used to cover the discoloration if the patient is not keen to undergo any other intervention.

### Follow-up

All patients presenting with Tyndall effect should be carefully followed-up and photographs should be taken to objectively assess over time. If the practitioner is unable or has been unsuccessful in dealing with the complication, it is recommended to make an onward referral to a practitioner who has more experience in this area. Good follow-up and support, a full explanation to the patient, and appropriate consent is the best approach to stop a complication turning into a medical malpractice claim.

### References

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An Aesthetic Complications Expert Group Consensus Paper

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