



# Rubeola keratitis emergence during a recent measles outbreak in New Zealand

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## ABSTRACT

**INTRODUCTION:** Measles is a highly contagious disease caused by the rubeola virus. It can result in ocular complications such as conjunctivitis and keratitis, which will be encountered in general practice. Cases usually resolve without sequelae, but may progress to corneal perforation if left untreated.

**AIM:** We present two cases of rubeola keratitis secondary to measles infection.

**METHODS:** This report is about a retrospective review of data from two patients who presented to the eye department with rubeola keratitis in the midst of the recent measles outbreak in New Zealand.

**RESULTS:** Both patients presented with decreased visual acuity approximately 2 weeks after being diagnosed with measles. One of them was unvaccinated, whereas the other had no documentation of previous vaccination. Both were healthy and immunocompetent individuals. There was no evidence of corneal perforation or retinopathy on examination. Both patients regained their baseline visual acuity after treatment with fluorometholone eye drops.

**DISCUSSION:** Despite the existence of a safe and effective vaccine, there were more than 2000 cases of measles in the recent outbreak in New Zealand. The lack of vaccination is one of the primary causes of rubeola keratitis. These cases highlight the effects of measles infection from an ophthalmology perspective and reinforce the paramount importance of getting vaccinated.

**KEYWORDS:** Measles, rubeola keratitis, conjunctivitis, vaccination, immunization

J PRIM HEALTH CARE

2020;12(3):289–292.

doi:10.1071/HC20013

Received 20 April 2020

Accepted 27 August 2020

Published 22 September 2020

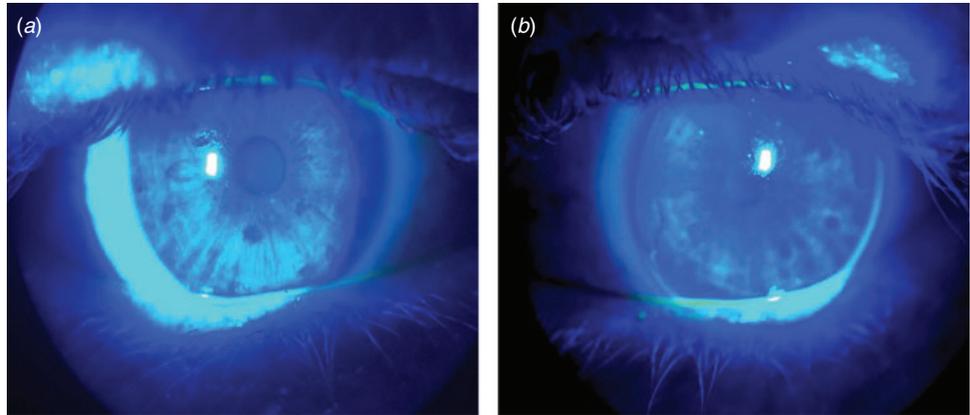
## Introduction

Measles is a highly contagious disease caused by the rubeola virus. There has been a significant decline in disease incidence, especially in developed countries, since the advent of the measles (MMR) vaccine.<sup>1</sup> Measles can result in severe complications such as pneumonia and encephalitis, whereas ocular manifestations include conjunctivitis and keratitis. Rubeola keratitis has been shown to progress to corneal perforation and phthisis bulbi in underdeveloped countries if left untreated.<sup>2</sup> We report two cases of rubeola keratitis during the recent measles outbreak in New Zealand.

## Case 1

The first case was a 49-year-old fit and well New Zealand European man with no documentation of previous measles vaccination. He presented to Middlemore Hospital emergency department with a 1-week history of high fever and rash on his face and torso. Measles IgG was found to be non-reactive. Five days after his discharge from Middlemore Hospital with a diagnosis of measles, he self-presented to the Eye Institute with a 2-day history of gritty sensation and blurred vision in both eyes. On examination, best corrected visual acuity (BCVA) was 6/15 in the right eye ('oculus dexter'

Figure 1. Rubeola keratitis. Small punctate epithelial lesions staining with fluorescein in the right (a) and left (b) eye.



[OD] or 'right eye'), pinholing (PH) to 6/6, and was 6/12 in the left eye ('oculus sinister' [OS] or 'left eye'), improving to 6/7.5 with PH. There was epitheliopathy in both eyes (Figure 1) with no stromal changes or intraocular involvement. There was no corneal perforation and posterior segment examination was unremarkable. Fluorometholone and systane preservative-free eye drops were started for bilateral rubeola keratitis and dry eyes. A follow-up review after 2 days showed an improvement in symptoms and ocular surface, with a BCVA of 6/4.5 (OD) and 6/6 (OS), improving to 6/4.5 with PH. The BCVA was back to his baseline of 6/4.5 in both eyes ('oculus uterque' [OU] or 'both eyes') after 3 weeks.

## Case 2

The second case was a 25-year-old unvaccinated New Zealand European man who was diagnosed with measles 2 weeks before seeing an eye specialist. Apart from having bilateral myopic laser assisted in-situ keratomileusis (LASIK) in February 2018, he was otherwise fit and well. He was referred by his general practitioner with a 2-day history of reduced vision in his right eye. Examination showed bilateral patchy keratitis affecting the epithelium and anterior stroma, which appeared to be related to his recent measles infection. Best uncorrected visual acuity (BUVA) was 6/7.5-1 (OD) and 6/7.5+2 (OS). He was started on fluorometholone eye drops and a follow-up 2

weeks later showed resolution of symptoms with clear corneas and a BUVA of 6/5 OU.

## Discussion

Measles is one of the most highly contagious viral diseases that is transmittable via airborne spread or direct droplet contact 5 days before and after the onset of a rash.<sup>3</sup> Patients often present with a prodromal fever, coryza, keratoconjunctivitis, Koplik's spots and a rash that may last up to a week. Serious complications from measles include pneumonia, encephalitis and corneal ulceration, which are rare in developed countries, but remain a common cause of blindness in developing countries. Risk factors for blindness include protein malnutrition and vitamin A deficiency, which increase the likelihood of corneal scarring.<sup>4</sup>

Rubeola keratitis typically presents bilaterally with red eyes, decreased vision and photophobia.<sup>5</sup> Small, punctate epithelial lesions of the cornea will manifest on staining with fluorescein or rose Bengal.<sup>6</sup> It has been reported in 57% of cases in a study of 61 Turkish military personnel with measles, and onset may be delayed up to 14 days after the appearance of a rash.<sup>7</sup> With good nutrition, these lesions usually improve without residual damage, but secondary bacterial or viral infections such as adenovirus and herpes simplex virus (HSV) may result in permanent scarring and blindness. Blindness may also occur from cortical

encephalitis secondary to measles.<sup>4,8</sup> The onset of keratitis is usually but not always preceded by conjunctivitis, where a radial spread of erosions occurs from the conjunctiva towards the corneal apex.<sup>7,9</sup>

Despite the availability of a highly effective and safe vaccine against measles, New Zealand has recently battled an unprecedented measles outbreak with more than 2190 confirmed cases; most cases are reported in Auckland.<sup>10</sup> Immunization remains the primary defence against measles and immunization rates of at least 90% are required to prevent the transmission of measles in the community.<sup>3</sup> New Zealand has been verified by the World Health Organization (WHO) as having eliminated measles in October 2017 with immunization rates of more than 90%.<sup>11</sup> There was poor immunization coverage historically due to an inadequate immunization programme and lower immunization rates in previous cohorts, notably in the 1990s, following proposition of a link between autism and the MMR vaccine.<sup>11</sup> Less than 60% of children were fully immunized in 1991 compared to 93% in 2012.<sup>11</sup> These figures suggest a large proportion of young to middle-aged adults with inadequate immunity still exist, as was likely the case for the two patients presented in this study. Due to a lack of vaccination documentation, it was unclear if Case 1, who was born in 1970, was vaccinated. Given the temporary suspension of the vaccine programme from late 1969 to early 1970 due to a high rate of vaccine adverse reactions and only a single vaccination dose being used in 1969 with a 5–10% seroconversion failure rate, Case 1 may not have been seroconverted or not immunized due to parental concern or programme suspension.

## Conclusion

Measles is an acute infection caused by the rubeola virus. Ophthalmic involvement in measles is well known and its manifestations include conjunctivitis and keratitis. Although ophthalmologic problems are commonly managed by general practitioners, it can be challenging to diagnose the nature and severity of keratitis without access to a slit-lamp. General practitioners can contact ophthalmology services to discuss and refer patients for further assessment. It is generally not recommended to start ocular steroids before ophthalmology review

due to potential side-effects such as corneal thinning and raised intraocular pressure. To prevent potential exposure of staff and other patients to measles, it is important to alert the ophthalmology teams of any isolation needs in the referrals. In light of decreasing measles immunization rates in recent years, it is essential to maintain efforts in catch-up immunizations, quarantine and contact tracing to prevent another measles epidemic outbreak.

## Competing interests

The authors declare no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

## Funding

This research did not receive any specific funding.

## Author contributions

Conception and design of the study was worked on by S. Subbiah and A.P.C. Ong. Acquisition of data was worked on by S. Subbiah and A.P.C. Ong. Analysis and interpretation of data was worked on by all authors. All authors critically revised the article and reviewed the submitted version of the manuscript.

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