



## Management of Color Blindness with Contact Lens: A Case Study

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### Abstract

Color vision deficiency is mostly inherited and occurs due to mutation of the X chromosome. It is the reason why men are most commonly affected. A case of color vision deficiency was for a 21-year-old male who had come for a routine eye evaluation.

Colour vision was managed with X chrome contact lens. Subject was fitted with X chrome contact lens in non-dominant eye and color vision test was reevaluated after adaptation of 15 min, 1 hour, and 2 hours. The improvement in color vision on Ishihara color plates was noticed on follow-up.

It was concluded that X-chrome lenses help to improve the color vision deficiency and it is one of the management for color vision deficiency. Thus, early diagnosis is indicated for timely intervention and better results, especially in children.

**Keywords:** Color Vision (CV); Contact Lens (CL); X Chrome Lens and Ishihara Plates

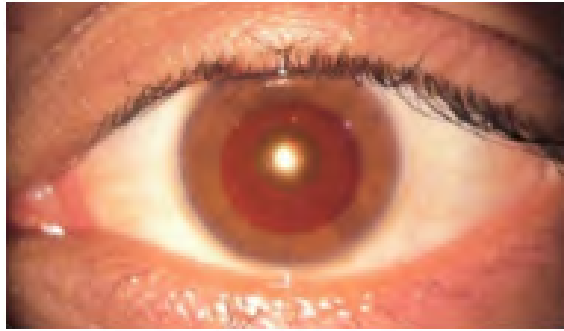
### Introduction

Visible light is part of the electromagnetic spectrum that the human eye can detect, and also helps us see different colors. Visible light has a range of wavelengths from 400nm violet to 700nm red. The X chromosome mutation is the reason for an inherited color vision deficiency, which is more commonly seen than acquired [1]. The 3 cone receptors present in the retina are sensitive to different wavelengths of light, and the brain will interpret them as red, green, and blue. The 3 types of cones are L type (long) 560 nm, M type (middle) 530 nm, and S type (small) 430 nm [2].

The X-chrome lens is a contact lens with a red filter that corrects the red-green deficiency. It will transmit light at wavelengths from 580 nm to 700 nm. The X chrome is ideal for wear in the non-dominant eye [3] and it mostly works in congenital color vision deficiency cases for those who have protan and deuteran defects [4].

### Case Report

A 21-year-old male came to an eye hospital for a routine eye examination. The unaided visual acuity in both eyes was 6/6 and N-6 for distance and near respectively with no ocular and systemic history. The anterior and posterior segments were within normal limits. The contrast sensitivity, visual field were also within normal limits. But on colour vision on Ishihara plates showed colour vision defects. And managed to read 2 plates out of 24. The patient was asked to wear X-chrome contact lenses (Figure 1) and was evaluated at the intervals of 15 minutes, 60 minutes, and 120 minutes. The colour vision improvement was noticed after some period of adaptation. The colour vision at the interval of 15 minutes 10/24 plates, after 1 hour 13/24, and after 2 hours of lens wear was 13/24. His vision and contrast sensitivity was normal after wearing the X chrome lenses, and there was no other discomfort.



**Figure 1:** Left Eye Slit-lamp picture showing X-chrome contact lens.

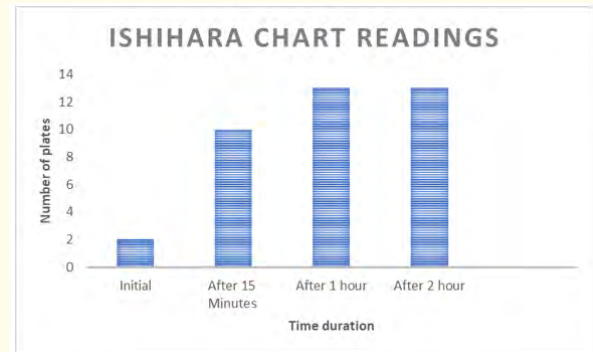
### Discussion

Colour vision deficiency is usually inherited and rarely seen as acquired. And it is inherited from mutations on the X chromosome. It is more common in males than females. Whereas acquired colour blindness can be caused by diseases, drugs, and chemicals, The X-chrome contact lenses will help with the inherited colour vision deficiency.

Basically, the X-chrome contact lens allows new shades of colour, which a colour vision patient appreciates and shows improvement on test. The dominant eye is also important, which will send certain colours correctly. There will be colour compensation from one eye to the other eye. There will be a proper interpretation that can happen by retinal rivalry [5].

The X-chrome lenses are advised to be worn in the non-dominant eye. The colour confusions have a variation of lightness. If the red-green colour deficient wears a red lens and views the object of red-green color, the green portion will look darker than the red, so that the previously blended two colours will be visible separate.

There were no changes in the visual acuity, contrast sensitivity, or stereopsis after wearing the X-chrome contact lens. But there was an improvement in the colour vision after wearing the x-chrome contact lens [6].



**Graph 1:** It shows the number of plates read after a certain interval of time.

### Conclusion

A X-chrome contact lens can be given to red and green deficient patients, which will improve their colour vision deficiency. In this study also, there was an improvement in colour vision after wearing the X-chrome contact lens. It will be better to prescribe in children rather than the elderly group, as the patient will be easily adapted to the lens.

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