Investigating the anti-inflammatory effects of curcumin on Endotoxin-induced uveitis in rabbits' eyes

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Abstract

Corticosteroids are used in the treatment of inflammatory diseases of the eye such as uveitis, but these drugs have many side effects such as cataract and primary open angle glaucoma (POAG) and aggravation of keratitis caused by herpes simplex, fungal keratitis, etc. Therefore, the efforts to find new medicines that control ocular inflammation while lacking any steroid side effects continue. Curcumin is a yellow substance found in turmeric and in traditional medicine it is used as an antiseptic, analgesic, anti-inflammatory and antioxidant. In this study, the anti-inflammatory effect of this substance was investigated. For this purpose, six adult rabbits of the same breed were used. To create the inflammation, 100mg of polysaccharide of Escherichia coli bacteria endotoxin was injected into the vitreous of the rabbits' both eyes. Then 0.1cc curcumin pure extract was injected into the vitreous of their right eye. After three days, the eyes were removed and placed in a formalin for 2 weeks to fixate them, and then using microscopic studies, the degrees of inflammation of both eyes, with and without the injection of the drug, were compared. The results show no inflammation or inflammatory cells in the eyes injected with curcumin. From the present study, it is concluded that curcumin can be considered in treatment of ocular inflammations as a complementary substance or drug.

Introduction

Uveitis refers to the inflammation of choroid (choroiditis), ciliary body (intermediate uveitis, cyclitis, peripheral uveitis or Pars planitis), or iris (Iritis, iridocyclitis) and commonly includes inflammation of the retina (retinitis), retinal vessels (retinal vasculitis) and optic nerve (papillitis, optic neuritis).

Uveitis may be secondary to inflammation of the cornea (keratitis), sclera (scleritis), or both (Sclerokeratitis) and usually affects people from 20 to 50 years of age and is responsible for 10 to 20% cases of blindness in developed countries. Corticosteroids and cycloplegics form the basis of uveitis treatment but cataracts and glaucoma are the most common side-effects of treatment with corticosteroids. Given the serious side-effects of steroid drugs for the treatment of inflammatory diseases of the eye, it is important to find some medications that can treat inflammatory diseases but do not have any unwanted steroid side-effects.
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Turmeric is taken from the rootstock of a plant called Curcuma longa that is part of the Zingiberaceae family and is one of the evergreen plants family. Curcumin (C_{21}H_{20}O_{6}) which is the most active part of turmeric, is responsible for its yellow color, constitutes 2 to 5% of it and was extracted for the first time in 1815 and introduced as Diferuloylmethane in 1910 by Lamp and Mylobedska (figure 1). Curcumin not only has been used as a spice but also as a treatment for a variety of disorders. This substance is used as a traditional medicine in both Chinese and Indian medicine and has been used as antiseptic, analgesic (1 and 2), anti-inflammatory (3, 4, 5, 6, 7 and 8), antioxidant (9 and 10) and preventer of Cardiovascular Diseases (11, 12). Turmeric has healed infected and non-infected wounds in rats and rabbits. In this regard, since curcumin has shown anti-inflammatory effects in past studies, we decided to evaluate its effect on the inflammation induced in the rabbits eye and if this substance proves to be useful in several experiments, it may be introduces as a substitute for ocular steroids.

MATERIALS AND METHODS

This study was conducted on six adult rabbits of the same breed (12 eyes). In this research, the right eyes were considered as the experiment group and the left eyes were considered as the control group.

At the beginning, 100ngr of polysaccharide of Escherichia coli bacteria endotoxin was injected into the vitreous of the rabbits' both eyes and then 0.1cc of curcumin was injected into their right eyes' vitreous using TB syringes. The rabbits were kept in equal conditions for 72 hours and after the 72 hours, 1CC of KCL was injected into their hearts to kill them and their eyes were removed for microscopic observations and fixated in 37% formalin for 2 weeks. After two weeks, in order to perform microscopic observations on different anatomical structures and to investigate the presence or absence of inflammatory cells, the eyes were cut and stained for preparing slides, then they were observed by using a light microscope.

RESULTS

The results showed that curcumin has an anti-inflammatory effect on polysaccharide (endotonine) induced inflammatory reactions in rabbit eye. In control group, in which we had no curcurmin injection, the inflammatory cells like PMNs, macrophages, monocytes etc, are seen in different layers of the eye, including Cornea, Iris, Vitreous body, Retina, choroid, denoting severe inflammatory changes, due to endotoxin stimuli (figure 2). However, in curcurmin injected group, we noted no significant inflammatory cells in different parts of the eye (figure 3).

CONCLUSION

Given the results of the microscopic studies on both groups, ie with and without curcurmin injection, it was concluded that in the former group there was no inflammatory reaction in different anatomical ocular structures, including the Cornea, Iris, Vitreous etc. whereas in control group are seen many inflammatory cells in previous mentioned layers.

Based on on the current management protocols, corticosteroids are the mainstay of inflammatory disease of the eye. Unfortunately unwanted side effects of these medications like cataract, glaucoma and aggravation of existing herpes keratitis, are a major concern. So, it seems necessary to use an alternative medication that has beneficial effect of corticosteroids, but lack their harmful effects.

Regarding different usage of curcurmin, especially its anti-inflammatory effects and by considering the result of this study, we suggest that curcurmin may be considered as an alternative or complementary medication for the treatment of inflammatory disease of the eye. However, this needs additional studies to confirm the result of our study.
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Figure 1- chemical structure of curcumin

Figure 2: inflammatory cells at the cornea

Figure 3: Iris and sclera after treatment with curcumin, lacking any inflammatory cells or hemorrhage.
REFERENCES