

## Investigation of ocular changes in children and young people with thyroid diseases before and after the treatment with 20 % honey solution eye drops

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The objective of the study was to investigate ocular changes in children and young patients with thyroid diseases before and after the treatment with 20 % honey solution eye drops.

In total, 33 patients with thyroid diseases and corneal, conjunctival changes were examined. There were 25 girls and 8 boys aged 6 to 29.5 years, mean age  $13.2 \pm 3.7$  years; 17 patients were treated with 20 % honey solution eye drops and 16 patients received artificial tears (three times a day, for 3 weeks). There was evaluated the state of eye conjunctiva and cornea, visual acuity, proptosis before and after the course of treatment. All patients underwent a complete ophthalmic examination including best-corrected Snellen visual acuity, slit-lamp, corneal sensitivity investigations and the Hertel exophthalmometry.

The treatment with 20 % honey eye drops reduced complaints of patients (photophobia, itching, foreign body sensation, tearing, and the eye ball pain), statistically significant by improved visual acuity, the status of the conjunctiva (redness, swelling) and cornea (fluorescein staining, corneal sensitivity and erosions) in comparison with those patients who used artificial tears. There was no change in proptosis measurements after the treatment. We have found a more positive effect of 20 % honey solution eye drops on the state of the conjunctiva and cornea in patients with thyroid diseases when the treatment had been started at the early period of thyroid diseases when there had been no corneal damages.

The 20 % honey solution eye drops reduced the complaints of patients, statistically significant by improved their visual acuity, the status of the conjunctiva (redness, swelling) and cornea. Honey eye drops may be used to prevent conjunctival and corneal complications in patients with thyroid diseases and corneal, conjunctival changes.

### Introduction

Thyroid diseases may lead to changes of the eye and orbit. When thyroid hormone levels are too high, usually eye symptoms appear, but they can occur when these levels are normal or below normal. The ocular manifestations of thyroid eye disease include eyelid retraction, proptosis, chemosis, periorbital edema, and altered ocular motility with significant functional, social, and cosmetic disturbances [1]. In patients, orbital muscles and fat become inflamed and swollen, therefore there may be a variety of eye signs: protrusion of one or both eyeballs, swollen eyelids, redness and swelling of the conjunctiva [2]. The most common eye sign in thyroid eye disease is proptosis and eyelid retraction. The immune system is involved in the development of the signs and symptoms [3]. The swelling that causes proptosis is due to accumulation of fluid, fat, and inflammatory cells [4]. In children with Graves' disease, the eye problems tend to be less severe [5]. The increased orbital extent may lead to

exposed cornea, difficulty in completely closing the eyelids, especially while sleeping, corneal drying and inflammation, which can progress to severe infections and ulcers of the cornea in extreme cases. Although most cases of thyroid diseases do not result in visual loss, ocular manifestations may result in a protruding appearance of the eyes, corneal damages (exposure keratopathy), decrease of the eye movements, troublesome double vision and compressive optic neuropathy [6].

Corneal damages in thyroid eye disease have been described in the context of tear film instability, lagophthalmos, vision-threatening exposure keratitis, and corneal astigmatism [7].

The upper eyelid has subcutaneous, suborbicular, and pretarsal fat components, and the orbital septum may be tighter [8]. In endocrine ophthalmopathy, the whole cornea may be swelling and buckling back upon itself, causing vertical folds or lines in the Descemet's membrane [9].

Until recent times, there have been studies about honey medical use because of its antibacterial activity. In

medical literature, there are reports on honey used for the treatment of burn wounds, bullous keratopathy [10, 11]. The healing, regeneration and stimulation of the immune system by honey, its antibacterial, debriding, antiinflammatory action allow to cure the ocular and palpebral burns and wounds, to reduce inflammation, swelling, and pain. Honey contains a wide range of amino acids, vitamins and sugars. Honey drops exhibit very good anti-inflammatory, regenerative and anti-toxic features, and we use them to treat such eye disorders as keratopathy, keratitis, corneal ulcers and conjunctivitis.

There are some reports about the role of honey drops in dry eye syndrome. Properties such as honey osmosis, enzymes with production of hydrogen peroxide reduce the growth of *Staphylococcus aureus* [12, 13]. Honey contains glucose and fructose, vitamins A, B, C, D, E, K and beta-carotene, minerals and enzymes. The antibacterial and cleansing properties of honey have been described [14]. The effect of bee honey on the proliferative activity of human B- and T-lymphocytes and the activity of phagocytes was noted [15]. Exposure keratitis may be complicated by sterile or infectious corneal ulceration. Thyroid keratopathy is usually treated with artificial tears or gels.

The effect of treatment with 20 % honey eye drops in children and young patients with thyroid diseases was not investigated.

The objective of the study was to investigate ocular changes in children and young patients with thyroid diseases before and after treatment with 20 % honey solution eye drops.

## Materials and methods

There were examined 33 patients with thyroid diseases and corneal, conjunctival changes. There were 25 girls and 8 boys aged 6 to 29.5 years, mean age  $13.2 \pm 3.7$  years; 17 patients were treated with 20 % honey solution eye drops and 16 with artificial tears (control group). Both eye drops were applied three times daily for three weeks. All subjects underwent a complete ophthalmic examination including best-corrected visual acuity, slit-lamp, corneal sensitivity investigations and the Hertel exophthalmometry. These investigations were carried out before and after the treatment. The data were assessed 5–10 days after the end of the treatment. Statistical analysis was conducted using SPSS 18.0 (Version 16.0) statistical software package. The following statistical characteristics were calculated for the continuous values: average  $\pm$  SD. For comparing continuous variables, the t-test was used. The *p* values less than 0.05 were considered as statistically significant. The values were statistically analyzed with the pretreatment values after a three-week course of treatment.

## Results and discussion

Treatment with 20 % honey eye drops reduced the complaints of patients (photophobia, itching, foreign body sensation, tearing and pain of the eye ball), statistically significant by improved their visual acuity, the status of the

conjunctiva (redness, swelling) and cornea (fluorescein staining, corneal sensitivity and erosions) in comparison with those patients who used artificial tears.

We estimated patients, complaints: photophobia before the treatment with honey solution eye drops had been present in 64.7 % of children and young patients with thyroid diseases. After treatment with honey eye drops, the sensation of photophobia was observed in 35.3 % of patients (the difference 29.4 %). Photophobia had been present in 62.5 % of patients treated with artificial tears before the treatment, and after the treatment it was observed in 56.3 % of patients (Tables 1 and 2). Itching in patients treated with honey eye drops was noted in 70.6 %. In patients treated with honey solution eye drops it reduced to 47.1 %. Itching before the treatment with artificial tears had been present in 56.3 % of patients and after the course of treatment had been noted in 43.8 %. Foreign body sensation before the treatment with honey eye drops had been noted in 47.1 % of patients and after the treatment in 17.7 % (the difference 29.4 %). Foreign body sensation in patients treated with artificial tears had been noted in 37.5 % of children and young patients with thyroid diseases and after treatment in 31.3 %. Tearing in patients treated with honey solution eye drops had been present in 70.6 % and after treatment in 35.3 % (the difference 35.3 %). Tearing before treatment with artificial tears had been noted in 68.8 % and after treatment in 56.3 % of patients. Pain of the eye before treatment with honey solution eye drops had been expressed in 58.8 % and after treatment in 29.4 % of patients, the difference being 29.4 %. Pain of the eye before treatment with artificial tears had been present in 50.0 % of patients and after treatment with artificial tears in 43.8 % of children and young patients with thyroid diseases.

After treatment, there were more difference in the complaints of children and young patients with thyroid diseases treated with 20 % honey solution eye drops than in patients treated with artificial tears. The greatest effect of the honey eye drops was noted on photophobia, foreign body sensation, tearing and pain of the eye (Tables 1 and 2).

**Table 1.** Complaints of patients treated with 20 % honey solution eye drops

Complaints	Before treatment, %	After treatment, %	Difference of data after treatment, %
Photophobia	64.7	35.3	29.4
Itching	70.6	47.1	23.5
Foreign body sensation	47.1	17.7	29.4
Tearing	70.6	35.3	35.3
Pain of the eye	58.8	29.4	29.4

**Table 2.** Complaints of patients treated with artificial tears

Complaints	Before treatment, %	After treatment, %	Difference of data after treatment, %
Photophobia	62.5	56.3	6.2
Itching	56.3	43.8	12.5
Foreign body sensation	37.5	31.3	6.2
Tearing	68.8	56.3	12.5
Pain of the eye	50.0	43.8	6.2

Visual acuity before treatment with honey eye drops was  $0.61 \pm 0.14$ , and after treatment it was  $0.78 \pm 0.16$  ( $p = 0.03$ ). Visual acuity before treatment with artificial tears was  $0.59 \pm 0.15$ , and after treatment it was  $0.61 \pm 0.18$  ( $p = 0.08$ ) (Tables 3 and 4).

**Table 3.** Ocular changes in patients with thyroid diseases treated with 20 % honey solution eye drops

Ocular changes	Before treatment, %	After treatment, %	Difference of data after treatment, %
Visual acuity	$0.61 \pm 0.14$	$0.78 \pm 0.16$	0.17
Proptosis (mm)	$17.18 \pm 2.74$	$17.07 \pm 2.68$	0.11
Redness of conjunctivae	47.1	29.4	17.7
Swelling of conjunctivae	52.9	35.3	17.6
Fluorescein staining	35.3	17.7	17.6
Corneal sensitivity	47.1	23.5	23.6
Erosion of the cornea	23.5	5.9	17.6

**Table 4.** Ocular changes in patients with thyroid diseases treated with artificial tears

Ocular changes	Before treatment, %	After treatment, %	Difference of data after treatment, %
Visual acuity	$0.59 \pm 0.15$	$0.61 \pm 0.18$	0.02
Proptosis	$17.16 \pm 2.07$	$17.12 \pm 2.26$	0.04
Redness of conjunctivae	62.5	43.8	18.7
Swelling of conjunctivae	68.8	56.3	12.5
Fluorescein staining	25.0	18.8	6.2
Corneal sensitivity	37.5	31.3	6.2
Erosion of the cornea	18.8	12.5	6.3

There was no change in proptosis measurements after treatment with 20 % honey solution eye drops and artificial tears. Hertel's exophthalmometry in children and young patients with thyroid diseases showed that proptosis was  $17.18 \pm 2.74$  mm and after treatment decreased, but not significantly (mean  $17.07 \pm 2.68$  mm,  $p = 0.07$ ). Proptosis

before artificial tears was  $17.16 \pm 2.07$  mm, and after treatment proptosis showed an insignificant decrease –  $17.12 \pm 2.26$  mm ( $p = 0.06$ ).

After treatment with 20 % honey solution eye drops, improvement of ocular changes (redness and swelling of conjunctivae, fluorescein staining, erosion of the cornea, corneal sensitivity) was observed in most of patients with thyroid diseases as compared with patients treated with artificial tears (Tables 3 and 4). Redness of conjunctivae before treatment with honey solution eye drops was noted in 47.1 % and after treatment in 29.4 % of patients (difference 17.7 %). Before treatment with artificial tears, redness of conjunctivae had been present in 62.5 % of children and young patients with thyroid diseases and after treatment in 43.8 %. Swelling of conjunctivae before the treatment with honey eye drops had been noted in 52.9 % and after treatment in 35.3 % of patients. Before the treatment with artificial tears, swelling of conjunctivae had been found in 68.8 % and after treatment in 56.3 % of patients. Fluorescein staining before the treatment with honey eye drops had been present in 35.3 % and after treatment in 17.7 % of patients. Before treatment with artificial tears, fluorescein staining had been diagnosed in 25.0 % of children and young patients with thyroid diseases and after treatment in 18.8 % of patients. Corneal sensitivity before the treatment with honey eye drops had been decreased in 47.1 % and after treatment in 23.5 % of patients (difference 23.6 %). In patients treated with artificial tears, corneal sensitivity before the treatment had been decreased in 37.5 % and after treatment in 31.3 % of patients. Erosion of the cornea before the treatment with honey eye drops had been noted in 23.5 % and after treatment with honey eye drops in 5.9 % of patients (the difference 17.6 %). Erosion of the cornea in patients treated with artificial tears before the treatment had been found in 18.8 % and after treatment in 12.5 % of patients.

We have found in patients with thyroid diseases treatment with 20 % honey solution eye drops improved inflammatory signs and increased corneal sensitivity, epithelization and lacrimal secretion as compared to treatment with artificial tears; therefore, we can recommend their use in patients with thyroid diseases to prevent corneal complications. The effect of 20 % honey solution eye drops on the state of the conjunctiva and cornea in patients was more positive when the treatment had been started in the early period of thyroid diseases when there had been no corneal damage.

As we know, thyroid eye disease may be complicated by sterile or infectious corneal ulcer. Eye redness photophobia, itching, sensation of foreign body, tearing are common in patients with thyroid diseases [1]. A mild corneal exposure in thyroid diseases may be treated with eye drop lubricants (tear supplements) and pressure dressings to cover the eye [2]. Infection and ulceration of the cornea may require a frequent use of antibiotics to prevent cornea perforation.

Honey is effective in the treatment of infectious wounds due to enzymes and the inhibition of bacterial growth [14]. Honey stimulates immune functions, lymphocytes, and phagocytes.

Some investigators have used honey to treat wounds, and it was effective against antibiotic-resistant strains of bacteria [12, 16].

There are no studies of treating thyroid disease patients with honey eye drops. The effect of honey was noted in patients with bullous keratopathy by Sethi and Rai (2005) [11]. Their studies have shown that honey drops have good anti-toxic and anti-inflammatory features, they regenerate of the tissues.

Postherpetic corneal opacities were treated with honey drops by Mozherenkov (1984), and he found a positive effect [17].

Jankauskiene et al. (2007) treated the dry eye syndrome with honey eye drops and found the greatest effect of the honey eye drops on tearing, corneal sensitivity, and itching [18].

Our study has shown that 20 % honey eye drops reduced complaints of patients (photophobia, foreign body sensation, itching, tearing and pain of the eyeball), statistically significant by improved visual acuity, the status of the conjunctiva (redness and swelling) and cornea (fluorescein staining, corneal sensitivity, erosion) in comparison with the patients who used artificial tears.

We recommend to use honey eye drops to reduce the swelling and redness of the conjunctiva, to treat the thyroid eye disease, dry eye syndrome, keratopathy.

## Conclusions

The study has shown that 20 % honey solution eye drops reduce the complaints of patients, improve visual acuity, conjunctival status. We recommend honey eye drops to use in patients with thyroid diseases, corneal and conjunctival disorders.

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VAIKŲ IR JAUNUOLIŲ, SERGANČIŲ  
SKYDLIAUKĖS LIGOMIS, AKIŲ POKYČIŲ  
TYRIMAS PRIEŠ GYDYMĄ 20 % MEDAUS TIRPALO  
AKIŲ LAŠAIS IR PO JO

## Santrauka

Tyrimo tikslas – ištirti vaikų ir jaunų pacientų, sergančių skydliaukės ligomis, akių pokyčius prieš gydymą 20 % medaus tirpalo akių lašais ir po jo.

Ištirti 33 pacientai, sergantys skydliaukės ligomis ir turintys ragenos, junginės pokyčių. Tyrime dalyvavo 25 mergaitės ir 8 berniukai. Jų amžius buvo 6–29,5 metų, pacientų amžiaus vidurkis – 13,2±3,7 metų. 17 pacientų buvo gydomi 20 % medaus tirpalo akių lašais, 16 – dirbtinėmis ašaromis (tris kartus per

dieną, 3 savaites). Prieš gydymo kursą ir po jo įvertinta akių junginių, ragenos, regėjimo aštrumo, išverstakumo būklė. Visi ligoniai ištirti oftalmologiškai. Įvertintas geriausiai koreguotas regėjimo aštrumas tiriant Sneleno lentele, atlikti ragenos jautrumo tyrimai, tyrimas plyšine lempa ir Hertelio egzoftalmometrija.

Gydymui taikyti 20 proc. medaus tirpalo akies lašai sumažino pacientų nusiskundimus (šviesos baimę, niežėjimą, svetimkūnio pojūtį, ašarojimą ir akies obuolio skausmą), statistiškai reikšmingai pagerėjo regėjimo aštrumas, junginės (paraudimas, patinimas) ir ragenos būklė (sumažėjo dažymasis fluoresceinu, ragenos jautrumas ir erozijos), palyginti su pacientais, kurie naudojo dirbtines ašaras. Po gydymo išverstakumo pokyčio nepastebėta. Nustatyta, kad 20 proc.

medaus tirpalo akių lašai skydliaukės ligomis sergančių pacientų junginės ir ragenos būklei didesnę teigiamą poveikį turėjo tada, kai gydymas buvo pradėtas ankstyvuojant skydliaukės ligos laikotarpiu. Tuo metu dar nebuvo ragenos pakenkimų.

20 proc. medaus tirpalo akių lašai sumažino pacientų nusiskundimus, statistiškai reikšmingai pagerino regėjimo aštrumą, junginės (paraudimas, patinimas) ir ragenos būklę. Medaus tirpalo akių lašai gali būti naudojami siekiant užkirsti kelią pacientų, sergančių skydliaukės ligomis, junginės ir ragenos komplikacijoms ir esant ragenos, junginės pokyčiams.