Occurrence and morphological characteristics of cataracts in patients treated with general steroid therapy at Cantonal Hospital Zenica

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ABSTRACT

Aim To determine the occurrence and morphological characteristics of cataracts and the impact of general steroid therapy on its occurrence.

Methods A retrospective/prospective study was conducted on 90 patients who had been treated at the Cantonal Hospital Zenica with general steroid therapy. There were 30 patients whose general steroid therapy lasted shorter than 4 years and 30 patients on steroid therapy for more than 4 years. The remaining 30 patients were the control group. An examination of lens transparency and morphological characteristics of cataract was made by slit lamp with previously achieved mydriasis.

Results A significant (p<0.05) occurrence of cataracts in patients taking general steroid therapy > 4 years and significantly more frequent occurrence of cataract in patients aged 60 years and over was found. Iatrogenic diabetes affects the occurrence of cataracts in addition to age and duration of therapy, especially in those who were on steroid therapy for more than 4 years. Steroid cataract was of subcapsular type according to its morphological characteristics.

Conclusion A possibility of cataract occurrence during or after the treatment with corticosteroids therapy should not be ignored. Subcapsular location of cataracts reduces work ability, normal daily activities and requires surgery. Ophthalmic examination should be an obligatory part of the preparation of patients for corticosteroids treatment. Control examinations should be repeated every six months during the therapy, and even more frequently if required.

Keywords: iatrogenic cataract, iatrogenic diabetes, subcapsular cataract.
INTRODUCTION

Cataract is any innate or acquired opacity of the lens which represents a significant public health and economic problem, and also the leading cause of blindness in the world (1, 2). Of approximately 37 million blind people in the world, 47.8% suffer from cataract. About 90% of the blind in this study come from developing countries (2). According to the WHO blindness due to cataract is visual acuity less than 3/60 in a better eye. It occurs at all age groups and its incidence is increasing exponentially over 50 years of age (3).

In addition to age, diabetes, myopia and UV radiation exposure, a steroid therapy is one of the risks for cataract development. Steroid induced cataract is an unwanted effect of the steroid therapy used for systemic diseases, inflammatory and allergy-related conditions and conditions after organ transplantations (2, 4). The most common complication is posterior subcapsular cataract (4, 5).

Until now it has not been possible to develop a reliable system of models on animal or isolated lenses suitable for the study of steroid-induced posterior subcapsular cataract. It is very difficult to produce opacity, similar to that seen in human lens even when the lenses are directly exposed to high concentrations of steroids (4, 5). The research relating to the mechanism of appearance of steroid cataract has intensified in recent years and has offered several explanations of the molecular origin of steroid cataract: metabolic disorder, osmotic failure, oxidation/conformational change, protein adduct formation, receptor mediated effects, aberrant cell behavior (6-14).

Corticosteroids therapy is used as topical, local or general therapy (1). Therapeutic approach (dosage and mode of application) is varied according to a kind and stage of a disease.

The aim of this study was to show the expediency of multidisciplinary approach to all patients treated with general steroid therapy for various reasons. It is already known that one of the complications of steroid therapy is cataracts occurrence especially when treated with steroids for more than 4 years (1). The purpose of the study was to alert about the needs and obligations of regular ophthalmologic examinations of all patients treated with general steroid therapy.

PATIENTS AND METHODS

This retrospective/prospective research was conducted at the Cantonal Hospital Zenica in the period 2010-2012 with the previous permission of the Cantonal Hospital Zenica Ethics Committee. The study involved neurological, dermatological and internal medicine patients who had been treated for various reasons and in various periods with peroral, intramuscular or intravenous steroid therapy and, as a part of the mandatory review, had had consultative ophthalmologic examinations in the Cantonal Hospital Zenica before the treatment with steroids.

The study involved a total of 90 patients older than 18, who had had no cataracts according earlier medical records. Sixty patients were treated with peroral, intramuscular or intravenous corticosteroid therapy because of various diseases (multiple sclerosis, sarcoidosis, lupus erythematosus systemicus, thrombocytopenia, hemolytic anemia, rheumatoid arthritis, pemphigus vulgaris); the group of 30 patients were treated with corticosteroid therapy for more than 4 years, and 30 patients for less than 4 years. The remaining 30 patients were randomly selected while having presbyopic spectacles administered during ordinary daily outpatient ophthalmic examinations.

The study excluded patients with previous eye and head trauma, radiation therapy, simultaneous steroid and cytostatic therapy, as well as the patients with secondary inflammation of the eye and the inner sheath, glaucoma and diabetes verified before the introduction of the steroid therapy.

All data obtained from medical history records were included in the retrospective investigation. The examination included visual acuity by Snellen visual acuity card (15), intraocular pressure measurement (Goldmann applanation tonometer, Haag Streit, USA), slit lamp examination (Haag Streit, USA) and ophthalmoscopy (Heine direct ophthalmoscope, Ohio, USA). Slit lamp examination and ophthalmoscopy were performed with previously achieved mydriasis.

The patients were classified according to sex and age, the existence or non-existence of lens opacification and according to morphological cataract characteristics. The results of an eye with pronounced opacity were analyzed. Decrease in visual acuity of at least two rows on Snellen’s (15) card were considered as cataracts.
As a part of prospective examination, cataracts occurrence was examined in patients treated with pulse intravenous corticosteroid therapy at least six months after the completion of the therapy. In addition, in the group of patients receiving general corticosteroid therapy for less than 4 years the occurrence of cataract was analyzed at least 6 months from the beginning of the therapy. Retrospective examination of cataracts occurrence was conducted in patients receiving corticosteroid therapy for more than 4 years.

The study used ANOVA Tukey’s F test for testing the variance between the groups, Pearson’s Chi-square χ² test to determine statistical significance between the characteristics of the samples given in nonparametric form (modification χ² test), and Fisher’s exact test.

RESULTS

The study involved 68 (75.6%) females and 22 (24.4%) males. In all three investigated groups (therapy >4 years, therapy <4 years and control group) women were more represented. The study involved adult patients, 31 (34.4%) patients were up to 49 years of age, 30 (33.3%) were aged between 50 and 59, and 29 (32.2%) were older than 60 years of age. All the patients who were on steroid therapy for over 4 years had iatrogenic diabetes.

Cataracts occurred in 24 (80%) patients who had received corticosteroid therapy for a period longer than 4 years, and in 12 (40%) patients who had received corticosteroid therapy for less than 4 years. Also, statistical significance of cataract occurrence was found (p<0.05) in patients on corticosteroid therapy for more than 4 years and the control group (Table 1).

### Table 1. Prevalence of lens transparency according to corticosteroid therapy usage

<table>
<thead>
<tr>
<th>Patient groups</th>
<th>Transparent lens</th>
<th>Opague lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy length &gt; 4 years</td>
<td>6 (20)</td>
<td>24 (80)</td>
</tr>
<tr>
<td>Therapy length &lt; 4 years</td>
<td>8 (60)</td>
<td>12 (40)</td>
</tr>
<tr>
<td>Control group</td>
<td>24 (80)</td>
<td>6 (20)</td>
</tr>
</tbody>
</table>

According morphological characteristics of cataract there was subcapsular cataract in 21 (70%) patients in the group of patients on therapy longer than 4 years, and in 7 (23.3%) patients in the group on therapy for a period less than 4 years. Corticonuclear cataracts occurred in 3 (10%) patients who received therapy for a period longer than 4 years and 5 (16.7%) who received therapy for less than 4 years. There was no patient with subcapsular cataract in the control group. Eight (20%) patients in the control group had corticonuclear cataract (p<0.05) (Table 2).

### Table 2. Morphological characteristics of cataracts according to corticosteroid therapy usage

<table>
<thead>
<tr>
<th>Patient groups</th>
<th>Subcapsular cataract</th>
<th>Corticonuclear cataract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy length &gt; 4 years</td>
<td>21 (70)</td>
<td>3 (10)</td>
</tr>
<tr>
<td>Therapy length &lt; 4 years</td>
<td>7 (23.3)</td>
<td>5 (16.7)</td>
</tr>
<tr>
<td>Control group</td>
<td>0</td>
<td>6 (20)</td>
</tr>
</tbody>
</table>

DISCUSSION

According to the available literature incidence of multiple sclerosis is twice higher in females than in males, 90% of patients with lupus erythematosus systemicus are women, sarcoidosis and mixed connective tissue disease are more common in women, and rheumatoid arthritis is three times more common in women (1). It is known that sarcoidosis, multiple sclerosis, SLE occur in the third decade of life, rheumatoid arthritis often in the fourth decade, systemic sclerosis usually in women under the age of 50 (1).

Eighty percent of patients on steroid therapy for over 4 years in this study had cataracts. In addition to steroids, the development of cataracts could be a consequence of the patient age and iatrogenic diabetes (1,2,4,5). Most patients involved in the study were elderly (over 60 years of age). It is known that the incidence of cataract grows exponentially after the age of 50 (5). Most of our patients on steroid therapy for a period over four years had iatrogenic diabetes. One of the risk factors for the development of cataracts is diabetes, as it has been described previously (1,2,5,16).

According to the WHO cataract is defined as opacification of the lens with a significant decrease in visual acuity (3). In this study, visual acuity was not analyzed because of the large number of patients, especially in the group of the patients on the steroid therapy >4 years with iatrogenic diabetes. In addition to diabetes as a cause of cataracts, daily fluctuation of blood sugar affects the refractive index of the lens and the amplitude of accommodation (1). Hyperglycemia is reflec-
A possibility of cataracts occurrence should not be ignored during or after the treatment with corticosteroids therapy. Subcapsular location of cataract reduces the work ability, normal daily activities and requires surgery. Ophthalmic examination is an obligatory part of the preparation of patients for the treatment with corticosteroids. Control examinations should be repeated every six months during the therapy.

**FUNDING**

No specific funding was received for this study.

**TRANSPARENCY DECLARATIONS**

Competing interest: none to declare.
Pojava katarakte i njene morfološke karakteristike kod pacijenata tretiranih općom steroidnom terapijom u Kantonalnoj bolnici Zenica

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SAŽETAK

Cilj Utvrditi učestalost steroidima indukovane katarakte, njene morfološke karakteristike i utvrditi utjecaj dužine terapije na njen nastanak.

Metode Retroprospektivno ispitivanje provedeno je na 90 pacijenata liječenih općom steroidnom terapijom u Kantonalnoj bolnici Zenica. Na općoj steroidnoj terapiji, u periodu dužem od 4 godine, bilo je 30 pacijenata, dok je 30 pacijenata primalo opću steroidnu terapiju kraće od 4 godine, a 30 ih je bilo u kontrolnoj grupi. Pregled prozirnosti leće i morfoloških karakteristika katarakte rađen je biomikroskopski uz prethodno postignutu midrijazu.

Rezultati Dokazana je značajno češća pojava katarakte kod pacijenata liječenih steroidima u periodu >4 godine, te značajno češća pojava katarakte kod pacijenata starosne dobi 60 i više godina. Pored starosne dobi i dužine steroidnog liječenja na pojavu katarakte utjecao je i jatrogeni dijabetes od kojeg su bili oboljeli pacijenti na steroidnom liječenju >4 godine. Steroidna katarakta je prema morfološkim karakteristikama bila subkapsularna.

Zaključak Mogućnost pojave katarakte tokom i nakon tretmana kortikosteroidnom terapijom ne treba biti zanemarena. Katarakta, locirana subkapsularno, umanjuje radnu sposobnost, obavljanje svakodnevnih i uobičajenih aktivnosti, te zahtijeva hirurško liječenje. Oftalmološki pregled treba da bude obavezno pripreme pacijenta za kortikosteroidnu terapiju. Kontrolne pregledove tokom terapije treba obavljati svakih šest mjeseci, a u slučaju potrebe i češće.

Ključne riječi: jatrogena katarakta, jatrogeni dijabetes, subkapsularna katarakta.