Abiochemical evaluation of lenses on cataract patients.

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الملخص

تضمنت الدراسة (46)مريض يعانون من الاصابة بالساد الأبيض ادخلوا الى قسم العيون في مستشفى الجمهوري التعليمي في محافظة بابل ضمن الفترة الزمنية مابين حزيران -اب 2008 تراوحت اعمارهم من (79-30)سنة كان (13)من المرضى يعانون من داء السكر (10) ,يعانون من ارتفاع في ضغط الدم (11) ,يعانون من الداء السكري مع ارتفاع ضغط الدم (12) ,يعانون من الاصابة بالساد الابيض فقط استخدموا كمجموعة سيطرة للمقارنة.

تم فحص هؤلاء المرضى سريريا ثم اجريت لهم عملية استئصال عدسة العين التي استخدمت لقياس تركيز البروتين الكلي ,الالبومين ,الكولسترول ,والتريكليسيرايدات ,اظهرت النتائج زيادة معنوية في تركيز البروتين الكلي ,مع انخفاض معنوي في تركيز الالبومين لدى المصابين بداء السكر عند مقارنتهم بمجموعة السيطرة ,بالاضافة إلى ذلك لم يلاحظ اي اختلاف معنوي في تركيز كل من الكولسترول و الترايكليسيريدات بين مجاميع المرضى.

Abstract

A study of (46) patients, suffering from cataract disease was done in the Ophthalmology Department of Al-Jamhori Teaching Hospital, Babylon Governorate for the period from May - August 2008. Their ages FROM ranged from (30 -79) years old.(13) suffering from diabetes, (10) hypertension, (11) diabetes with hypertension, and (12) suffering from cataract only used as a control group.

This study included measuring some biochemical parameters (total protein, albumin, cholesterol, and triacylglycerides), in lens homogenates.The results revealed highly significant increase in the total protein concentrations, while albumin concentration decreased significantly, on diabetes cataract and no changes in cholesterol and triacylglycerides concentration happened when compared with control groups.

Introduction

Cataract mean opacity of the lens or loss of transparency of the lens that causes impaired of vision[1]. Clinically, cataract may be classified dependent on the morphological characteristics of the cataract such as location, size, and appearance, while based on the etiology(classified into four broad) age-related cataract, congenital and developmental cataract, acquired cataract and secondary (complicated) cataract [2-4].

The most common symptoms of cataract are, cloudy or blurry vision, colors seem faded, poor night vision, frequent prescription changes in eye glasses or contact lenses and double vision or multiple images in eye [5]. The risk factors for cataract formation,were aging, diabetes, smoking, eye surgery, poor nutrition, alcohol and others [6-9]. Oxidative stress is a large increase in the cellular reduction potential (becoming less negative), or a large decreases in the reducing capacity of the cellular redox couples [10]. The protein aggregation and other gradual molecular changes that occur with aging almost cause widespread reduction in transparency and vision impaired[13]. In addition to altered membrane physiology and protein biochemistry, cataract development is accompanied by changes in lipid biochemistry, decreased enzyme activity, reduced glutathione levels, and diminished ATP production [12, 13].

Aim of Study
To evaluation the some biochemical parameters (total protein, albumin, cholesterol, and triacylglycerides) in lenses of cataract patients ,and
Study the differences between patients in different diseases.

Materials and Methods
Fourty-six patients with cataract (males and females) enrolled in this study The patients were subdivided into 4 groups; the first group consisted of diabetes patients (n=13), the second patients with hypertension (n=10), the third consisted of patients with diabetes with hypertension (n=11), and the fourth contained cataract patients only (n=12). Those patients admitted to Department of ophthalmology of Al-Jomhori Teaching Hospital in Hilla city, over the period of (3) months from May-August 2008. Surgery was done and lens was taken for analysis, the extracted lenses were soaked in 0.9 Nacl solution, and frozen to -20 C° until the time of the analysis. Lenses were homogenized in 2 volume of phosphate buffer pH 7.0 (stock solutions A :0.2 M solution of monobasic sodium phosphate (27.8 g in 100ml), B: 0.2 M solution of dibasic sodium phosphate (53.65g in 1000ml), 39.0mlof A + 61.0ml of B diluted to a total of 200ml. Then supernatant was taken to be analyzed. Total proteins concentration estimated by colometric test using a Cromatest linear chemical kit [14] , albumin was measured by using a kit of Biomaghreb [15], while cholesterol, and triacylglycerides were estimated by Biolabo kit[16].

Results and Statistical Analysis

Total proteins, albumin, cholesterol, and triacylglycerides concentrations that were estimated on lenses of cataract patients are listed in table (1). As shown in this table there was a significant difference (p<0.05) for total protein and albumin concentration in the diabetes, and diabetes hypertension cataract patients when compared with the control group. While cholesterol and triacylglycerides did not show any significant differences between cataratous groups.The linear regression analysis figure (1) revealed significant (r=0.905 , p<0.001)positive correlation cataract incidence with ages while sex failed to indicated a certain correlation with disease.The data of this study subjected to statistical analysis were expressed as mean± standard deviation (SD). Statistical comparisons were performed on student's *t* test and differences and were considered significant when the probability was (p< 0.05) [17].

Table -1: Some biochemical parameters on lenses of cataract patients

parameters	Diabetes cataract (n=13)	Hypertension cataract (n=10)	Diabetes and Hypertension Cataract (n=11)	Cataract (c0trol) (n=12)
Total protein mg/dl	0.171±0.114 *	0.134±0.112	0.172±0.098 *	0.076±0.07
Albumin g/l	0.143±0.161*	0.326±0.195	0.406±0.464*	0.414±0.397
Cholesterol g/l	9.085±2.6	9.105±5.272	21.912±16.543	17.005±17.087
triacylglycerides mg/dl	9.16±7.102	11.646±5.697	8.625±5.014	9.454±5.640

Notes: *   p<0.05
n = (number of patients)
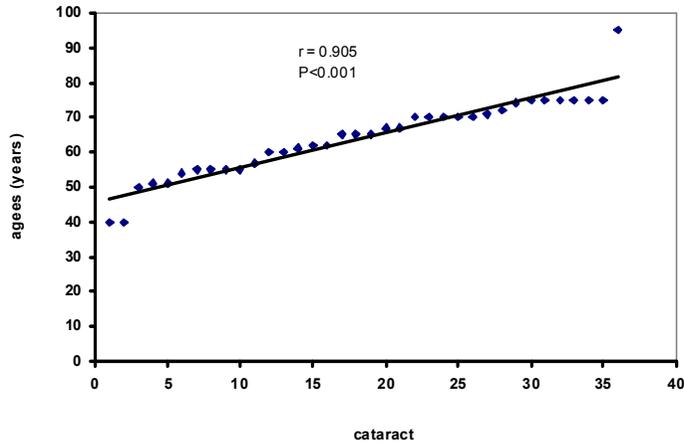
Figer 1: Corelation between age and cataract

Discussion

Measurement of total protein concentration provides general information reflecting disease states in many organ systems. The concentration depends on the relative amount of protein and water in the compartments [18]. Lens of the eye is made of mostly water and protein, the last is arranged in a way that keeps the lens clear and lets light pass through it[19].In the present study, total proteins concentration determined in lenses of cataract patients, the significant differences show in diabetes and diabetes hypertension cataract patients when compared with cataract patients(control group). Increase glucose levels in diabetes lead to shifted of glucose to the eye then increased extracellular osmolarity in responds with an excessive flux of glucose to sorbitol by the polyol pathway, that leads to swelling, fiber breakdown, and opacification [20] . Glucose also glycosylated proteins (protein with glucose attached) [21], then increase protein concentration lead to some of the proteins clumps together and start to cloud an area of the lens[19]. This result was in agreement with[22] that shows protein aggregation results in developments of high molecular weight aggregates causing changes in reflecting index and increase light scattering. The increases of total protein concentrations in this study refer to increase some types of proteins, not all types , because the present data revealed to significant lowering of albumin concentration on diabetes cataract than control group. These are consider acceptable results because the risk of cataract increased by about 50% in the lowest quantities of albumin in plasma [23].
Total cholesterol and triacylglycerides also evaluated on lenses of all

patients that enrolled in this study. The results did not show any significant differences between all group patients .High cholesterol and triacylglycerides are considered risk factors of cataracts , because lipid oxidation in responsible for development of human lens opacity that resulting from lens membranes damage[24]. In addition to that the changes that observed in the phospholipid composition in human lenses of cataract greater than that reported for any organ or diseases [25]; moreover decreasing glutathione levels and vitamin C help to increase lipid and protein oxidation and then cataract development[26].

The present data also indicated increasing cataract incidence with progress age, and it is suggested that the increase incidence is due to harmful effect of levels of oxidized lipids that reported to increase in the human lens with age, and lens membrane oxidation exists, above which membrane disruption and lens opacity results [27]. Linear regression analysis failed to exhibited any relationships between sex and cataract disease.

References

1. Pradhan AK, Shukla AK, and Reddy MV. :Assessment of oxidative and antioxidant status in age related cataract in rural population. Ind, J. of clin. Bioch. 2004; 19(1):83.
2. Bulasubramanian D., Bansal AK., and Bastil S: The biology of cataract. Ind, J, opth 1993, Vol 41(4) :153-171.
3. Jack JK. Clinical ophthalmology. 6th ed 2007: 337.
4. Manuel BD., and Benjamin VM. Disease of the lenses: cataract: clinical types. In:Duanes clinical ophthalmology. 2003; vol 1.
5. Bruce J., Chris C., and Anothony B. Lecture notes on ophthalmology. 9th ed. 2003: 82.
6. Dolin P. Assessment of the epidemiological evidence that exposure to solar ultraviolet radiation causes cataract. Doc ophthalmol 1995; 88:327-337.
7. Harding JJ. Recent studies of risk factors and protection factors for cataract. Curr opin ophthalmol. 1997; 8:46.
8. West SK.Editorial: who develops cataracts? Arch ophthalmol. 1991; 109:196.
9. McCarty CA., and Taylor HR. The genetics of cataract. Invest ophthalmol Vis Sci. 2001; 42:1677.
10. Schafer FQ., and Buettner GR. Redox environment of the cell as viewed through the redox state of the glutathione disulfide/glutathione couple. Free Radic Biol Med. 2001; (11):1191-212.
11. Nicholas AD. Physiology of the eye and visual system. The lenses. In: Duanes clinical ophthalmology. 2003; Vol 2.
12. Cloudy WO. The lens and the vitreous. In: the human eye structure and function. 1999; 494-495.
13. Beaulieu CF., and Clark JI. Nuclear magnetic resonance and laser

spectroscopic analysis of lens transparency during calcium induced opacification. Invest ophthalmol Vis Sci. 1990; 31:1339.

14. Falkiner WR., and Meites S. Selected methods of clinical chemistry AACC, Washington,D C. 1982. 9,319.

15. Doumas B., and et al.Clin Chem Acta.1971, 31,78.

16. FossatiP., Principle L. clinic. Chem. 1982. 82, p2077-2080.

17. Paul Y. Cemical calculations at a glance. 2nd ed. Blackwell publishing company. 2005.

18. Murray RK., Granner DK., Mayes PA., and Rodwell VW. Harpers biochemistry. 4th ed. Stawford, Aplleton and Lange 1996.

19. National Institutes of Health. Ophthalmic Genetics Newsletter. 200;1(2).

20. Datta V., Peter GF., Geoffrey HA., Roy F. Metabolic cataracs in newly diagnosed diabetes. Archives of Disease in childhood. 1997; 76:118-120.

21. Johnson AM., Schmid K., and Alper CA. Inheritance of human – acid glycoprotein variants. J Clin Invest. 1969; 48:2293.

22. Paunksnis A., Kuzmienel L., Kurapkiene S., Jurkonis R., Ivanov L., and Sadauskiene I. Ultrasonic and biochemical characteristics of human nuclear cataract. Ultragarsas. 2001; 40(3):11-5.

23. Delcourt C., Dupuy AM., Carriere I., Lacrous A., Cristol JP. Albumin and transthyretin as risk factors for cataract. Archives of ophthalmology. 2005;123:225-232.

24. Babizhayev MD., Deyev AL., and Linberg LF. Lipid peroxidation as apossible causes of cataract.Mech Aging Dev. 1988;44(1):69-89.

25. Nigel F., Catharine RG., Suddall H., Cristopher N., and Daived I. Relation between size at birth and age related cataract. Investigative Ophthalmology and Visual Science. 2001; 4:614-619.

26. Sihota R., Mohan M., Angra SK., and Mathur RL. Clinico-biochemical study of experimental complicated cataracts. Original articale.Vol 39.1991;4:184-150.

27. Lyle BJ., Mares-Perlman JA., and Klein BEK. Antioxidant intake and risk of incident age-related nuclear cataracts in the Beaver Dam eye study. Am J Epidimiol. 1999; 801-809.