IMPACT OF A GUIDE DOG ON GLYCEMIA REGULATION IN BLIND/VISUALLY IMPAIRED PERSONS DUE TO DIABETES MELLITUS

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SUMMARY – The aim was to assess glycemia regulation in a blind diabetic patient after getting a guide dog. Glycosylated hemoglobin (HbA_{1c}) results of a blind patient before and after getting the guide dog were retrospectively collected. The paired t-test results yielded a two-tailed *P* value of 0.0925, a difference considered not statistically significant; the 95% confidence interval of this difference varied from -0.2494 to 1.889. An improvement of glycemia regulation was observed with the guide dog compared to previous glycemia regulation, however, the difference was not statistically significant. The moderate improvement could probably be attributed to the mobility of the blind person having a guide dog. Standard quality of life tests should be included in the evaluation of diabetic blind persons, especially the impact of a guide dog on glycemic control or other chronic complications of diabetes.

Key words: *Diabetes mellitus; Diabetic retinopathy; Hemoglobin A, glycosylated; Blindness – rehabilitation; Dogs*

Introduction

Visual impairment is a major cause of morbidity in patients with diabetes mellitus. Chronic hyperglycemia is thought to be the primary cause of diabetic retinopathy, resulting in abnormalities of retinal small blood vessels. Diabetic retinopathy is an important cause of visual loss and blindness in diabetic patients[1-6].

According to the World Health Organization (WHO) data, in 2002 more than 161 million people were visually impaired, of whom 124 million people had poor vision and 37 million were blind. The WHO has estimated that diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness throughout the world[3-6].

The latest Croatian studies indicate that blind individuals account for 0.13% of the 4.5 million population of Croatia, in total 5800 persons[7,8]. They are registered at the Croatian Association of the Blind. The leading causes of blindness in Croatia are myopia, diabetic retinopathy and glaucoma. In 212 individuals, blindness developed before age 16; in 84 of these, retinopathy was due to prematurity[7].

Mobility of a blind person is important from the psychological, physical and economic aspects and is an important tool of the person's independence in everyday life[9-13]. The blind require mobility training to get around safely with a white cane, a guide dog, and/or electronic mobility aid[3-5,9].

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Guide dogs are assistance dogs trained to lead blind or visually impaired people around obstacles. Before coupling a blind person and guide dog, evaluation of their matching capabilities should be done. An instructor performs training of the dog and the user (blind/visually impaired person) during 4-5 weeks, and during this period the matching should be completed.

Searching through all available databases (Medline, PubMed) for data on the impact of a guide dog on glycemia regulation in a blind/visually impaired person did not yield any associated or similar paper.

Case Report

We present a 34-year-old male having diabetes mellitus type 1 since his age of 3 years and using insulin as therapy for diabetes. During the last ten years, the patient presented with progression of diabetic retinopathy and maculopathy on both eyes because of which he had undergone laser retinal photocoagulation on several occasions. In 1999, pars plana vitrectomy (PPV) and endolaser therapy were consecutively done on his both eyes due to vitreous hemorrhage. In the next year, blindness of the right eye and severe visual impairment on the left eye were established. At that time, his blood glucose regulation measured by hemoglobin A_{1c} (HbA_{1c}) level was 8.09% (normal range, 4.8%-5.7%). Because of blindness, our patient requested a guide dog from the Croatian Guide Dog and Mobility Association. After checking all medical records and after psychological evaluation tests, matching of the blind person and the guide dog was done. The patient took the paired guide dog in February 2004. Insulin therapy included ultra-short acting insulin analogue 3 times a day and NPH insulin as basal component. Other medications were ramipril and furosemide. In that period, laboratory findings were as follows: HbA_{1c} 7.63%, creatinine 125 μmol/L, creatinine clearance 1.19 mL/s, albumin excretion rate in 24-h urine 453 mg/24 h, and protein extraction in 24-h urine 0.8 mg/24 h.

Eight months after getting the guide dog, the patient's HbA_{1c} level was 7.15%. Other laboratory findings were as follows: creatinine 131 μmol/L, creatinine clearance 1.24 mL/s, albumin excretion rate in 24-h urine 393 mg/24 h, and protein extraction in 24-h urine 0.516 mg/24 h.

We strongly believe that the glycemia control improvement was due to the increased physical activity. Using a self-made questionnaire, the patient reported an improved quality of life.

Conclusion

Blindness as a disability represents a major socioeconomic issue. Diabetic blind persons usually are young or middle aged and become socially incompetent for independent living. Decreased or lost independent physical activity leads to deterioration of their quality of life. Insufficient self-monitoring of blood glucose because of blindness manifests in worsening of their glycemic control.

Results of the Diabetes Control and Complications Trial (DCCT) and the U.K. Prospective Diabetes Study (UKPDS) have demonstrated that improved

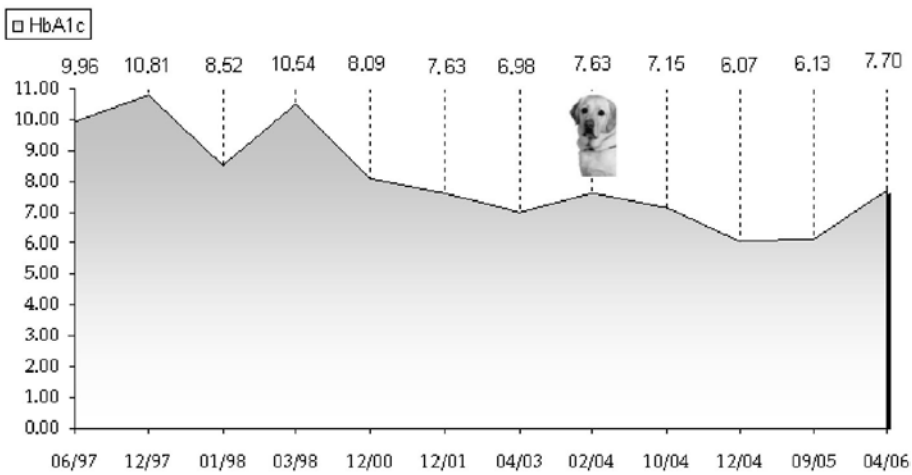

Fig. 1. HbA_{1c} values before and after guide dog assistance.

blood glucose control reduces the risk of developing retinopathy and slows down the progression of chronic diabetes complications[14,15].

Training for appropriate everyday life activities, social integration in the family and occupational environment, orientation ability and mobility of a blind person are very important therapeutic components[9-11]. Guide dogs are already known to be a very effective therapeutic tool for blind or hearing impaired persons, for mentally ill patients, etc. Their efficiency is due to the positive impact on social integration and on personal positive behavior.

Physical activity, as well as self-monitoring of blood glucose levels, are beneficial in diabetes mellitus prevention and management, and represent basic nonpharmacological management of diabetes mellitus. Vision loss or visual impairment diminishes the person's mobility and independence. Rehabilitation of a blind/visually impaired diabetic person is additionally more difficult due to other chronic complications (tactile disorders in diabetic patients, constant pains due to diabetic neuropathy, etc.).

In conclusion, from the results reported here, but not in previous literature, we strongly suggest guide dog as the treatment of choice for enhancing blind person's mobility and eventually for glycemic control improvement.

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Sažetak

UTJECAJ PSA VODIČA NA REGULACIJU GLIKEMIJE U SLIJEPIH/SLABOVIDNIH OSOBA SA ŠEĆERNOM BOLEŠĆU

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Cilj je bio procijeniti regulaciju glikemije kod slijepe osobe sa šećernom bolešću nakon što je ta osoba dobila psa vodiča. Retrospektivno su se prikupljali rezultati HbA_{1c} u slijepe osobe prije i nakon dobivanja psa vodiča. Primjenom rezultata parnog t-testa dobivena je dvosmjerna vrijednost *P* od 0,0925. Razlika nije bila statistički značajna, dok se 95% interval pouzdanosti te razlike kretao od -0,2494 do 1,889. Zabilježeno je poboljšanje regulacije glikemije uz psa vodiča u usporedbi s vrijednostima prije dobivanja psa vodiča, ali razlika nije bila statistički značajna. Smatramo da bi to umjereno poboljšanje moglo biti povezano s pokretljivošću slijepe osobe uz psa vodiča. U procjenu slijepe osobe sa šećernom bolešću treba uključiti standardne testove za kvalitetu života, osobito utjecaj psa na regulaciju glikemije ili na druge kronične komplikacije šećerne bolesti.

Ključne riječi: *Dijabetes melitus; Dijabetična retinopatija; Hemoglobin A, glikozilirani; Sljepoća – rehabilitacija; Psi*