The Relationship Between Low Vision and Musculoskeletal Complaints. A Case Control Study Between Age-related Macular Degeneration Patients and Age-matched Controls with Normal Vision

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ABSTRACT

Introduction: Age-related Macular Degeneration (ARMD) patients often describe complaints from neck and scapula area muscles and a decreased postural control. In clinical assessment, these complaints are considered to be due to old age.

Purpose: This study focuses on low-vision patients with ARMD, comparing them to age-matched controls without any eye disease, in order to evaluate if the linkage between self-rated visual complaints and musculoskeletal complaints is more prominent when low vision is present.

Methods: In a cross-sectional study, 24 ARMD patients, aged 65 to 85, were compared to a group of 24 controls without visual problems having a similar age distribution. Visual acuity, the need for magnification plus other optical and visual parameters were assessed. Visual, musculoskeletal and balance/proprioceptive complaints were collected by means of a self-rating questionnaire. The Visual Functioning Questionnaire - Near Activities Subscale (VFQ–NAS) was used to evaluate visual function and related complaints.

Results: The correlation between visual complaints and musculoskeletal complaints yielded significant values of the correlation coefficient when performed separately within each group, as well as when calculated on the entire data set [ARMD, Spearman's rho $(\rho)=0.60$, $P=0.002$; control group $\rho=0.59$, $P=0.004$; both groups together $\rho=0.50$ $P<0.001$]. Stepwise multiple regression analysis supported the hypothesized effect of vision (Visual complaints + Minimum readable typefaces) on musculoskeletal complaints, $(r^2=0.42, P<0.05)$.

Conclusions: The results in this study support the hypothesis that a relationship exists between visual and musculoskeletal problems.
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Key Words: age; ARMD; low vision; balance/proprioception; musculoskeletal complaints; age-related maculopathy; perception.

RESUMEN

Introducción: Los pacientes con degeneración macular asociada a la edad (DMAE) a menudo refieren dolores musculares en el cuello y en la zona escapular, así como un menor control postural. En la evaluación clínica, se suele considerar que estas dolencias son debidas a la edad avanzada del paciente.

Objetivo: Este estudio se centra en los pacientes con DMAE y con baja visión, comparándolos con pacientes de referencia sin patologías oculares y de edades similares, con el fin de analizar si la conexión entre las afecciones visuales y las dolencias musculares (que refiere el paciente mismo) es más estrecha cuando el paciente padece baja visión.

Métodos: En un estudio transversal, se comparó un grupo de 24 pacientes con DMAE de edades comprendidas entre 65 y 85 años, con un grupo de 24 sujetos de referencia (controles) sin problemas visuales que presentaba una distribución de edades similar. Se obtuvieron datos relativos a la agudeza visual, a la necesidad o no de utilizar instrumentos con aumentos, así como a otros parámetros ópticos y visuales. Se recogieron datos sobre problemas visuales, dolencias osteomusculares y problemas de equilibrio/propiocepción, utilizando para ello un cuestionario que habían de contestar los pacientes mismos. Se utilizó la subsección sobre actividades de visión cercana del Cuestionario de la Función Visual (en inglés, Visual Functioning Questionnaire -Near Activities Subscale, o sus siglas VFQ–NAS) para evaluar la función visual y los problemas asociados.

Resultados: El coeficiente de correlación entre los problemas visuales y los problemas de tipo osteomuscular alcanzó valores significativos tanto cuando la correlación se realizó en cada grupo por separado, como cuando se llevó a cabo analizando juntos todos los sujetos participantes [DMAE, rho de Spearman $(\rho)=0,60$, $P=0,002$; grupo de referencia (controles) $\rho=0,59$, $P=0,004$; los dos grupos juntos $\rho=0,50$ $P<0,001$]. El análisis de regresión múltiple escalonada (paso a paso) respaldó la hipótesis de que la visión (problemas visuales + tamaño mínimo de letra legible) influye sobre las dolencias osteomusculares $(r^2=0,42, P<0,05)$.

Conclusiones: Los resultados de este estudio respaldan la hipótesis de que existe una relación entre problemas visuales y problemas de tipo osteomuscular.
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Palabras Clave: edad; DMAE; baja visión; equilibrio/propiocepción; dolencias osteomusculares; maculopatía asociada a la edad; percepción.

INTRODUCTION

Vision is one of the most important senses, functionally affecting other senses and motor control, thereby exercising vital effects on many bodily systems which, in turn, crucially affects everyday functioning and comfort. During the aging process, the body is subject to neural changes and other common complications, resulting in a decline in visual function and increasing disorders and impairments. In this respect, it is of interest to note that age-related macular degeneration (ARMD) is the most common disease leading to low vision in the western world, where the prevalence is so high that it is thought to involve one in three people at the age of seventy.[1-4]

Observations from low-vision clinics indicate that ARMD patients, besides their visual deficits (e.g., central field scotomas), also report musculoskeletal complaints, such as stiffness, fatigue and muscular pain in the neck/scapular

area along with nausea and dizziness.[5-7] Most of these complaints are considered to be due to normal aging; however, with diminishing eyesight and increasing demand on visual attention, a decreased near-work distance, higher levels of oculomotor load, the use of optical and technical magnification aids and the adoption of fatiguing postures, ARMD patients and other people with low vision may be at increased risk of developing musculoskeletal problems in the neck/scapular area, regardless of their age.[8-11]

Furthermore, musculoskeletal problems may also arise due to disturbed eye-hand coordination.

For example, skilled reach-to-grasp movements will likely not be appropriately calibrated when vision is impoverished.[12] In real-life tasks, the visuomotor consequences (feedback) about the outcome of a goal-directed arm and hand movement becomes less accurate in low vision. A constrained visuomotor control strategy, aggravated by muscle stiffness and co-contraction of muscles not directly involved in producing the desired reach-to-grasp movement, is likely to result as compensation.[13] The result may be prolonged static load leading to the development of fatigue, stiffness, muscular pain, as well as to disturbed proprioception, balance problems and dizziness.[14] Since the information from the muscle spindles (proprioception) is used by the central nervous system for direct feedback control of movement, a vicious cycle of chronic muscle pain could also be initiated this way in some low vision patients.[12-18]

The purpose of this study was, therefore, to explore the extent to which reduced vision is associated with neck/scapular area muscular dysfunction and/or discomfort. The relative impact of the different aspects of visual function on musculoskeletal functioning was of particular interest in this context. This objective was achieved by testing if subjects with low vision are more likely to suffer from musculoskeletal problems, as compared to age-matched controls. Although many different types of linkages between visual and musculoskeletal comfort and function (in the context of ARMD and low vision) seem plausible, to date they remain relatively unexplored. The hypothesis is that a reduced visual function is associated with neck/scapular area muscular complaints.

METHODS
Participants

Twenty-four ARMD patients (10 males and 14 females) aged 61-87 (Mean=76.5 years and SD=6.7) were compared with 24 age-matched controls with normal vision (13 males and 11 females) aged 65-83 (Mean=73.7 years and SD=6.0). Controls were included only if they had recently undergone an eye examination (less than two years before the study), confirming normal vision for their age and no known eye disease. Control subjects were relatives or companions of low vision patients visiting the clinic that happened to match our criteria.

The ARMD group consisted of patients who had first contacted the low-vision clinic between 1998 and 2007 and who had been seen at the low vision clinic at least twice, which meant that the patients to be included in the study were selected only among those who had adapted to their visual impairment.

The ARMD patients were consecutively selected from the queue system of patients who required a new appointment with the clinic. All ARMD patients who matched the inclusion criteria were asked to participate. Among those ARMD patients that were asked, all but two agreed to participate in the study: One of them had to cancel the set appointment due to illness and the other one due to problems with transportation. The enrolled ARMD patients had not to date been treated with surgery or injections to prevent further visual loss. Those individuals (from both groups) who had been diagnosed with a condition (such as Arthritis, Multiple Sclerosis or Parkinson's disease) that could be the cause of perceived muscular pain, were excluded. To test for age equivalence, a group (ARMD/controls) by gender (male/ female), factorial ANOVA was conducted, revealing no significant differences (all P's>0.10). Levene's test for equality of age variance was non-significant (*P*>0.96), as was the case for both groups when using the Kolgomorov-Smirnov test of normal age distribution (P's>0.40), thus indicating that the age distribution in the two groups was equal and normal.

The study was performed according to the tenets of the Declaration of Helsinki. The Regional Ethical Review Board in Uppsala (Sweden), gave its approval to the study.

Visual Assessments
Binocular Visual Acuity was assessed by measuring best-corrected distant acuity using the ETDRS logMAR by-letter chart, which is designed and recommended for use in clinical trials. The measurements are described here as decimal Visual Acuity.

Binocular Near Visual Acuity was estimated with ETDRS logMAR near charts placed at a distance of 40 cm, and described as one decimal measure. Normal or best distance correction was used plus the near addition of +2.5 D to neutralize the distance. Illumination was set to be approximately 1000 lx, as recommended during normal reading.

Need for magnification. Their need for enlargement when reading was estimated. The calculations were done considering the addition of diopters from all normally used assisting visual aids. In the calculation, each unit of magnification is equivalent to + 4.0 D. For example, if 12 D spectacle microscopes were used, the calculation yielded 12/4 = 3 X. If 8 D reading glasses were combined with a 20 D hand-held magnifying aid, the equivalent magnification was 8/4 +20/4 = 7X.

None of the ARMD patients were totally dependent on technical aids (i.e. closed circuit television - CCTV), which means that all measurements refer to optical aids such as reading glasses and hand-held magnifying aids. This is not the exact angular magnification, but it gives an approximate estimate of the magnification needed.

Aids. The types of visual aids were recorded. If the visit resulted in a new prescription, which they liked and which led to a better performance, this was from then on considered as their present aid(s). Aids could either consist of optical or technical