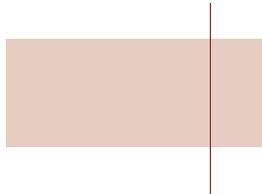


Population Screening for Primary Open-Angle Glaucoma

Summary

AGENCE D'ÉVALUATION DES TECHNOLOGIES
ET DES MODES D'INTERVENTION EN SANTÉ



Population Screening for Primary Open-Angle Glaucoma

Summary

Report prepared for AETMIS by

Brigitte Côté and Nieves Rodriguez

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PREFACE



Glaucoma is an irreversible eye disease that can lead to blindness. The most common form is primary open-angle glaucoma (POAG). It is estimated that its prevalence among people aged 40 years and older will reach 1.96% worldwide by 2010. According to the Canadian Ophthalmological Society, glaucoma affects one in 100 Canadians over the age of 40.

In 1995, the Conseil d'évaluation des technologies de la santé (CETS), the predecessor of the Agence d'évaluation des technologies et des modes d'intervention en santé (AETMIS), published a report assessing the advisability of population screening for POAG. The CETS report concluded that the uncertainty surrounding the estimated benefits of screening and its high cost did not support recommending the introduction of a systematic screening program for POAG in Québec.

In recent years, the emergence of new diagnostic techniques for detecting this disease has again raised the issue of the advisability of implementing a population screening program. In this context, the Agency considered it appropriate to produce an update on this issue.

Based on the public health criteria to justify introducing a population screening program, this report begins by documenting the natural history and prevalence of the disease. It then analyzes studies on the efficacy of available treatments and diagnostic tests, presents scientific evidence on screening efficacy and information about the situation in Québec, and finally addresses the advisability of population screening.

Juan Robert Iglesias, MD, MSc,
President and Chief Executive Officer

EXECUTIVE SUMMARY

Primary open-angle glaucoma (POAG) is a prevalent disease and the third leading cause of visual impairment and blindness in Canada, but its natural history and rate of progression to vision loss across a population are not actually known. Medical or surgical treatment for POAG may delay the progression of the disease in people with ocular-hypertensive glaucoma but not in those with normal-pressure glaucoma. It causes known adverse effects that affect visual function and quality of life, especially in the case of surgery.

New diagnostic techniques lead to earlier and more accurate detection of POAG-related structural and functional defects, but their sensitivity and specificity, taken in isolation, are insufficient for screening. Combinations of diagnostic tests could prove effective for target populations, but to date few studies have evaluated them. An economic assessment underway in the United Kingdom, which is expected to be published by the end of 2007, may shed new light on these aspects.

There is no evidence that screening asymptomatic people reduces the onset of severe complications or major visual impairment, and the criteria to support the introduction of a population screening program are not all met in the case of POAG.

As a result, AETMIS concludes that, for the time being, it is not justified to recommend introducing a population screening program for glaucoma in Québec.

From a broader public health perspective of reducing preventable blindness and of continually improving access to ophthalmology care and services, AETMIS finds that:

- *opportunistic screening activities are already in place, lead to referrals to ophthalmologists and absorb specialized resources;*
- *the extent, effectiveness and costs of opportunistic screening activities are not known;*
- *some patients are at greater risk of a rapidly progressive form of glaucoma, but these risk factors are not fully known;*
- *case-finding scenarios (opportunistic screening) targeting at-risk individuals and combining several diagnostic tests achieve a good performance for these groups.*

Some of these issues may be clarified once a better understanding of current opportunistic screening is achieved. Defining criteria for optometrists to refer suspected glaucoma cases to ophthalmologists would contribute to more effective follow-up and treatment for these patients; it is up to the two professional associations to determine those criteria. Moreover, a literature watch on the performance and cost-effectiveness of glaucoma screening (especially for studies assessing combinations of several glaucoma screening tests), along with analysis of the results of the assessment underway in the United Kingdom, should help identify promising avenues for screening at-risk groups. It would be appropriate to verify their applicability to the Québec context in order to formulate research priorities for Québec.

In submitting this report, AETMIS hopes to contribute to decision making on the policies and programs aimed at reducing preventable blindness and continually improving access to ophthalmology care and services in Québec.

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DISCLOSURE OF CONFLICTS OF INTEREST

None to be declared.

SUMMARY

Introduction

Glaucoma is an irreversible eye disease that can lead to blindness. The prevalence of primary open-angle glaucoma (POAG) among the population aged 40 years and older was 1.86% in the United States in 2000. The emergence of new diagnostic technologies in recent years has again raised the issue of the advisability of a population screening program for POAG. Eleven years after the initial report on this issue published by the Conseil d'évaluation des technologies de la santé (CETS), the predecessor of AETMIS, and following an ophthalmologist's preliminary evidence review, this report provides an update on this topic.

Methodology

This report is a systematic literature review on population screening for glaucoma, potentially promising diagnostic tools and available treatments. The review began by identifying published health-technology assessment reports on these topics. Various search strategies were then used in Medline and the Cochrane Library to locate primary studies on the same topics. Relevant articles were selected by the two authors according to pre-defined inclusion and exclusion criteria. Data were extracted by a researcher.

The disease and its diagnosis

Diagnostic criteria for glaucoma are optic disk damage and visual field loss. Ocular hypertension is a risk factor in nearly 50% of patients with glaucoma. Age, ethnicity, family history, myopia, diabetes and corneal thickness are other known risk factors. A Canadian study is underway to determine the risk factors for glaucoma progression in Canada. The disease has a long asymptomatic phase and its symptoms vary with the individual. The natural history of glaucoma and its rate of progression to blindness are not actually known. The great majority of people with glaucoma will not have major functional symptoms during their lifetimes.

The optic disk is observed through examination (by an eye care professional) of fundus photographs taken with a non-mydratic retinal camera or, more recently, with various laser devices or by tomography (retinal tomography, laser scanning polarimetry and ocular coherence tomography). Visual field function is examined by means of one of the many different perimetry methods developed over the years, including Humphrey perimetry and frequency doubling perimetry (FDP). Optic disk damage was detectable only through a specialist's clinical eye examination before the advent of new technologies allowing it to be expressed as numeric values. Definitions of the diagnostic parameters for glaucoma differ according to the studies reviewed. Given that there is no standard definition for glaucoma or for its progression, the different study outcomes are difficult to compare. The diagnostic performance (in terms of sensitivity and specificity) of the different perimetry and optic-disk examination techniques is variable. There is moderate diagnostic agreement among the different techniques. The effectiveness of most of the techniques depends on the competence of the specialists applying them or on patients' compliance, which produces non-negligible intra-observer and inter-observer variations. Very few studies permit assessment of the technologies in a population-screening situation rather than a case-finding situation.

Available treatments

Two types of glaucoma treatment are currently available: medical topical treatment and surgical treatment (conventional or laser). Treatment evaluation criteria are surrogate endpoints (progression of visual field deficit and optic disk damage). The evidence synthesis shows that treatment for ocular hypertension can delay the onset of POAG. A major study comparing treatment and observation showed that POAG had progressed in 5% of the patients in the treatment group and 10% in the observation group. However, given that the majority of patients do not develop POAG, the advisability of treating ocular hypertension is debatable. The literature differentiates between ocular-hypertensive and normal-pressure POAG. An evidence synthesis shows that neither medical nor surgical treatment offers any advantage for normal-pressure POAG. As for POAG with ocular hypertension, medical or surgical treatment delays the progression of visual field loss, but the exact long-term effects on vision-related quality of life are not known, since the rate of progression is slow in most patients. Treatments have various side effects, primarily a higher risk for cataracts leading to reduced visual acuity, especially after glaucoma surgery. Since the decision to treat is determined by the rate of POAG progression, it is critical to identify patients with rapidly progressing glaucoma.

Potentially useful screening tests

There are insufficient population-based studies on the performance of new diagnostic scanning techniques of the optic disk and nerve (retinal nerve fibre layer analysis – RNFLA) to conclude on the screening performance of these tests. Studies on frequency doubling perimetry (FDP) do not yield reasonably high sensitivity and specificity values when this technique is used alone to detect glaucoma. Modelling of different test combinations shows that some scenarios for screening target populations could prove to be cost-effective in some situations.

Screening

No study has assessed the effectiveness of population screening for glaucoma. The public health criteria for assessing the advisability of population screening are not fully met. The natural history of this disease and its progression to disabling symptomatology are not actually known. Treatment effectiveness is limited to patient subgroups with ocular hypertension and a demonstrable rate of progression. Diagnostic tools are not sufficiently capable of detecting patients who could truly benefit from treatment. These diagnostic tests are not sensitive or specific enough to be used for population screening. The use of screening test combinations could improve screening performance beyond the sensitivity and specificity of individually applied tests. The combination of screening tests that would offer the best cost-effectiveness ratio for Québec is not known. Targeting at-risk individuals (groups with a high prevalence of glaucoma) is a possible option to improve screening test performance, but the purpose of our review was not to determine the patients who would most benefit from screening. The effectiveness and costs of different possible targeted screening strategies still need to be evaluated in comparison with the screening activities already in place.

Situation in Québec

As part of the eye examinations performed by optometrists, detection of glaucoma cases, called opportunistic screening, affects roughly 335,000 people aged 65 years and older per year (about 33% of the elderly). It is not known what effect this activity has on preventing visual impairment in Québec. Suspected glaucoma patients are referred to ophthalmologists, but the pool of glaucoma specialists is not large enough to meet demand, especially in the regions. New diagnostic techniques are available in university and private clinics, but no data are available to determine the extent of their use owing to

the current reimbursement method for these diagnostic procedures. A pilot project on the co-management of glaucoma treatment by optometrists and ophthalmologists as well as research studies on glaucoma screening are currently underway in Québec.

Conclusion and recommendations

The major findings from this assessment are the following:

- 1) Primary open-angle glaucoma is a prevalent disease and the third leading cause of visual impairment and blindness in Canada.
- 2) The natural history of the disease and its rate of progression to visual loss across a population are not actually known.
- 3) Medical or surgical treatment for POAG may delay the progression of the disease in people with ocular-hypertensive glaucoma but not in those with normal-pressure glaucoma. It leads to known adverse effects that affect visual function and quality of life, especially in the case of surgery.
- 4) New diagnostic techniques lead to earlier and more accurate detection of structural and functional defects, but their sensitivity and specificity, taken individually, are insufficient for screening. The use of combined diagnostic tests could prove to be cost-effective for target populations. An economic assessment underway in the United Kingdom, which is expected to be published by the end of 2007, may shed new light on these aspects.
- 5) There is no evidence that screening asymptomatic people reduces the onset of severe complications or major visual impairment.
- 6) The public health criteria supporting population screening are not all met for POAG.

As a result, AETMIS concludes that, for the time being, it is not justified to recommend introducing a population screening program for glaucoma in Québec.

From a broader public health perspective of reducing preventable blindness and of continually improving access to ophthalmology care and services, AETMIS finds that:

- *opportunistic screening activities are already in place, lead to referrals to ophthalmologists and absorb specialized resources;*
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