Working Disability in Norwegian Patients with Vestibular Schwannoma: Vertigo Predicts Future Dependence

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Key words
- Acoustic neurinoma
- Disability pension
- Vestibular schwannoma

Abbreviations and Acronyms
CI: Confidence interval
GKRS: Gamma knife radiosurgery
OR: Odds ratio
QoL: Quality of life
VAS: Visual analog scale
VS: Vestibular schwannoma

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OBJECTIVE: **We examined whether reduced hearing, tinnitus, dizziness, and unsteadiness affected the patients' ability to maintain work within a time frame of 2–10 years after diagnosis.**

METHODS: **A total of 434 consecutive patients were followed at regular intervals. Data on symptoms were scored prospectively and dichotomized by visual analog scales for tinnitus and vertigo. Study design is retrospective. Hearing acuity was scored according to the Gardner-Robertson scale, and unsteadiness was measured on a balance platform. Patients were asked about working status, and scored as receiving governmental compensation for disability.**

RESULTS: **Two hundred six patients were eligible for study. Of these, one died and nine were lost to follow-up. Ninety-seven patients received conservative management, 49 patients recieved gamma knife radiosurgery, and 50 patients were treated by microsurgery. Mean follow-up time was 58.7 months (range, 20–132 months). There was a significant increase in the number of individuals receiving compensation during the study period ($P < 0.0001$). At baseline, the proportion of pension receivers was within same range as that of the age- and sex-matched Norwegian population (5.61% vs. 6.91%; case-control odds ratio, 0.82; 95% confidence interval 0.45–1.49; $P = 0.51$, not significant). At the final time point, the increase in the number of receivers deviated significantly from the reference population (case-control odds ratio, 3.80; 95% confidence interval 2.71–5.33; $P \leq 0.001$). Examining symptoms at first presentation as predictors of future dependence revealed that vertigo and higher mean age were associated with a higher risk ($P < 0.001$ and $P = 0.015$, respectively). No other symptoms were predictive of dependence.**

CONCLUSIONS: **In a prospectively followed cohort of Norwegian patients with vestibular schwannoma, vestibular complaints were significant predictors for becoming dependant of disability pension.**

INTRODUCTION

Vestibular schwannoma (VS) is a benign tumor with four cardinal symptoms: reduced hearing, tinnitus, dizziness, and unsteadiness, which relate to the affected cranial nerves. Several studies indicate that although the tumor is usually easy to control, the patient is left with complaints and quality of life (QoL) that may be similar to, or even worse, than those found before treatment (1, 4, 9, 12, 17). Therefore, the complaints, rather than the tumor per se often constitute the problem to the patient. This may pass unrecognized to the treating physician, whose focus is on tumor size, facial nerve function, and hearing acuity, rather than on "hidden" complaints such as tinnitus and vertigo. During the years 2000–2009, we examined 434 patients with VS at our center. In 2006 and 2012 we published two studies including 199/193 patients, respectively, and showed that patients presenting with an untreated tumor and vestibular symptoms scored significantly lower on QoL questionnaires than those without dizziness or unsteadiness (1, 10). Symptoms arising from the cochlear nerve, however, did not affect QoL to the same extent.

In the present study, we examined another important issue, namely the patients' dependence on governmental disability pension within a time frame of 2–10 years after diagnosis. In Norway disability pension is a governmental financial support to ensure subsistent income if wage-earning capacity has been permanently impaired due to illness or injury. The requirements to be entitled to disability pension are 1) Norwegian citizen, 2) aged 18–67 years, 3) wage-earning capacity must be permanently impaired due to illness or injury, 4) the individual must have undergone appropriate medical treatment and individualized employment schemes, and 5) wage-earning capacity must have been impaired by at least 50% (11).

We hypothesized that among patients, specific symptoms presenting at onset might be associated with an increase in need for such support. In particular, we investigated the occurrence of vestibular symptoms as predictors of disability pension.

PATIENTS AND METHODS

In the period 2001 to 2009 we investigated a total of 434 consecutive patients referred to the Otoneurosurgical group for VS. To reduce the influence of retirement because of advanced age as a confounder in the present study, we excluded all patients aged 56 years and older at first visit from the study group.

Patients were followed at our center for regular visits (1, 8-10). Data on symptoms (vertigo/dizziness, unsteadiness, and tinnitus) were scored prospectively in a dichotomized way each time. Hearing acuity was recorded by audiometry and scored according to the Gardner-Robertson scale as useful (grade A and B) or nonuseful (grade C and D) (2). Patients were asked about their working status, and scored as receiving governmental compensation for disability (full and partial grouped together). Information on temporary sick leave was also recorded, but was not used as an end point in this study. Data were recorded on a Case Report Form during the clinical interview and then transferred to a database.

All patients were followed regularly at our clinic. The study program on VS is approved by the National Data Inspectorate (NSD 13199) and all patients gave written consent at inclusion. The study period included the time from the inclusion of the first patient in 2000, until the finally included patient had been observed for at least 20 months.

Semiquantitative Analysis of Complaints and Vestibular Disability

The patients responded to a questionnaire where they were asked to quantify their experience of vertigo and tinnitus along a 100-mm visual analog scale (VAS). In addition, patients were tested on a stabilometry platform at repeated visits, as described previously (10). The area of sway obtained during a 1-minute recording of patient with closed eyes was used as an indicator of balance function.

Control Group

To investigate whether the patients were at higher risk of receiving disability pension than the general population at inclusion and at study end, the patient data were compared with those from the reference general Norwegian population data obtained from the Norwegian Bureau of Statistics. Means of disability pension for the years 2005–2007 and 2011 were used.

The individuals were grouped in 5-year cohorts and by sex.

Table 1. Demographics

Material		Data
Eligible for study	206	
Dead before 2 years	1	
Lost to follow-up	9 (3.1%)	
Study population	196	
	Age (years)	Mean 44.46 (min 15—max 55)
	Sex	Male/Female 104/92
	Observation time (months)	Mean 58.66 (range 20—132)
Treatment	Expectation	97
	Gamma knife radiosurgery	49
	Microsurgery	50
Status at inclusion	No compensation	139
	Disability pension	11
	Sick leave compensation	46
Symptoms at inclusion	Vertigo	89/196 (45.4%)
	Tinnitus	156/196 (79.6%)
	Nonserviceable hearing	64/177 (36.2%) 19 missing
	Unsteadiness	67/196 (34.2%)

Statistical Analysis

The primary end point was the patient's overall risk of converting from being independent to becoming dependent of permanent disability pension within the period of observation. To identify whether any particular risk factor could be identified at the patient's first presentation, we dichotomized patients who received disability compensation at final observation (termed receivers and nonreceivers). The distribution of mean age, type of treatment, and each of the dichotomized variables at presentation—vertigo, unsteadiness, tinnitus, serviceable hearing, and gender—was investigated as final receivers/nonreceivers using t-test and χ^2 tests, respectively. Kaplan Meier survival statistics was used to further analyze the shift from nonreceiver to receiver group across onset symptoms that were statistically associated with a higher risk of final dependence. We used the logistic regression model with adjustment for age and sex to analyze a possible correlation between disability pension and VS.

RESULTS

Patients

Of 434 patients, 206 patients were within the age group at inclusion and thus eligible for the study. Of these, one patient died within the study period and nine patients (3.1%) were lost to follow-up at

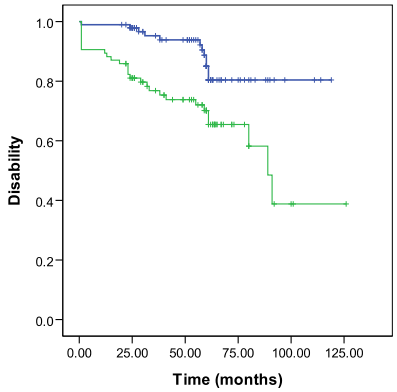

Figure 1. New receivers of disability pension in groups of patients with vestibular schwannoma without *(upper line)* and with *(lower line)* complaints of vertigo at first presentation. The differences are statistically different (log rank test, $P < 0.001$).