QUALITY OF LIFE AFTER ACOUSTIC NEUROMA SURGERY

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A questionnaire was sent to 134 patients who had undergone surgery for a unilateral acoustic neuroma between 1980 and 1993, to obtain data on the consequences on their quality of life, physical condition, social life, employment, and use of medical facilities. Distinctions were made between the translabyrinthine-transotic approach, the suboccipital approach, the tumor size, and the number of operations per patient. We found that the patients' reported state of health after surgery was poorer than that in a group of comparable nonoperated patients. Recuperation after an operation took many months and did not always result in full recovery. Surgery had various effects on preoperative symptoms such as hearing loss, tinnitus, vertigo, and facial nerve dysfunction: improvement, no change, or deterioration. Surgery had severe consequences on social life and occupation, but far less effect on income. Almost one third of the patients required postoperative home help, and a proportion were declared unfit to work. The surgical approach, tumor size, and reoperations had a definite influence on the study parameters. After suboccipital surgery, there were more reports of pain, more declarations of incapacity to work, poorer facial nerve function, and more frequent visits to the general practitioner. The translabyrinthine-transotic approach was associated with more severe pain and more complaints of postoperative vertigo. A greater proportion of the patients with larger tumors were declared unfit to work. The general state of health after suboccipital reoperations was better than after the initial operation; there was no reasonable explanation for this. Facial nerve function deteriorated after reoperation(s).

KEY WORDS — acoustic neuroma, quality of life, suboccipital approach, translabyrinthine approach, tumor size.

INTRODUCTION

A patient's subjective assessment of the outcome of therapy is an important measure of therapeutic success. Whereas many reports have been published in the literature on the results of acoustic neuroma surgery after various approaches to various tumor diameters, the subjective opinion of the patient about the postoperative period has received far less attention. Parving et al and Wiegand and Fickel mentioned a decrease in the quality of life after acoustic neuroma surgery. Surgical intervention can strongly influence the daily life of the patient. The consequences of the intervention on tumors of the same diameter can vary depending on the choice of surgical approach. So far, no research has been conducted in which a comparison was made between the effects of tumor size, various approaches, and reoperations. At the University Hospital Nijmegen, patients with an acoustic neuroma can be operated on via the suboccipital approach or via the translabyrinthine-transotic approach. Although the suboccipital approach is used for the majority of large tumors and the translabyrinthine-transotic approach for the majority of small tumors, the overlap in tumor size means that a fairly reliable comparison can be made. Many different effects of tumor size, approach, and reoperations can be expected. Larger tumors may have more postoperative consequences on the quality of life than smaller ones. Surgical results have shown remarkable differences in facial nerve function in relation to the number of reoperations. Reoperations after subtotal removal may lead to greater morbidity. The results of our quality of life measurement were also compared to those of a group of nonoperated Dutch inhabitants. The outcome of the study may be used for patient education, to assist in the choice of approach, and to encourage further research.

PATIENTS AND METHODS

In the period from 1980 to the end of 1993, 176 patients were operated on for a unilateral acoustic neuroma at the University Hospital Nijmegen. The suboccipital approach was used in 108 patients, and the translabyrinthine or (modified) transotic approach in 66 patients. Two patients were operated on via the middle fossa approach and were excluded from the study.

In May 1994, the remaining 174 patients were sent a questionnaire with an instruction sheet about how to fill it in. The questionnaire comprised three sections: the consequences of the operation on 1) quality of life, 2) physical condition, and 3) the use of medical facilities. The results are discussed per section.

Quality of life was measured by means of generic and disease-specific measurement instruments and a number of questions about changes in relation to home help requirement, work (resuming work, being declared unfit to work), and income. The generic and

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PAIN

During the past 4 weeks...
How much bodily pain have you generally had?

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Fig 1. Example of COOP/WONCA pain chart.

disease-specific measures for quality of life are described briefly below.

The standard question of the CBS (Dutch Central Bureau of Statistics) was used to measure the state of health: "What is your general state of health?" We inquired about the patient's state of health at that time. Answers could be given on a 5-point scale (1 = very good, 5 = poor). The answers were compared to those obtained in 1991 and 1992 from a Dutch population of the same age. The COOP/WONCA (Dartmouth COOP Functional Status Assessment Charts ["COOP charts"]) from the World Organisation of Family Physicians/General Practitioners [WONCA]) was also used as a generic measure of quality of life. This instrument converts issues such as physical fitness, feelings, daily activities, social activities, pain, change in health, and general health. The state of health for these issues could be marked on a 5-point scale (one for each question). Figure 1 shows the COOP/WONCA pain chart. A total of 7 questions were used to gain an impression of the functional status of each patient over the preceding 2-week period. This was defined as the ability of a person to perform in and adapt to his or her environment.

The Cancer Rehabilitation Evaluation System—Short Form (CARES-SF) (Dutch translation) was used to develop our own disease-specific measurement instrument. The adapted version comprised 3 scales and a number of separate items; specific questions about breast cancer, prostate cancer, or intestinal cancer were omitted. The scales inquired about physical condition (8 items), psychosocial condition (13 questions), and several relational aspects. There were separate items about the adequacy of the information provided by the doctors, financial problems, insurance problems, and transportation difficulties. A total of 30 items were presented on the questionnaire. The question asked whether a specific problem had been applicable to the respondent during the preceding 4-week period. Answers could be given on a 5-point scale (0 = not at all, 4 = very much).

The physical condition of the patient as a result of cerebellopontine angle surgery was determined on the basis of the surgical effects on hearing (as experienced by the patient with both ears), tinnitus, vertigo, and facial nerve function. Hearing was measured by asking whether it had been adequate (good) or inadequate (poor) preoperatively and whether it had improved, remained the same, or deteriorated after the operation. Facial nerve function was measured as a percentage. There were 6 categories from 0% to and including 100%, in steps of 20%. This 6-step scale was in some degree similar to the House-Brackmann scale with 6 grades; 100% and 0% were equivalent to House grades I and VI, respectively.

The patients were also asked whether they had been using a hearing aid, or had ever received treatment to improve facial nerve function; in addition, they were asked to give their own opinion of whether recovery was complete (100%) or partial (at least 50%) and how long this had taken.

Use of medical facilities were measured by means of questions from the CBS about the number of visits to a general practitioner (GP), specialist, physiotherapist, or homeopathist and number of admissions to a hospital. The outcomes were compared to average values for the use of medical facilities in the Netherlands.

On each questionnaire that was returned to us, the treating physician recorded the operation date, surgical approach, tumor size, number of reoperations, and postoperative facial nerve function (if possible 1 year after the operation).

The questionnaires were analyzed anonymously. Not all the patients had answered all the questions. In the results we mention how many had answered a particular item. The outcomes were indexed to patient data such as age and sex.

Two surgical approaches were distinguished: translabyrinthine-transotic and suboccipital. Tumor size was defined as the maximum diameter, including the intrameatal part. Contrast was made between small tumors ($\leq 25 \text{ mm}$) and larger tumors.
The EPI-INFO computer program was used for data input. Statistical analyses were performed with SPSS/PC+ (Statistic Program for the Social Sciences/Personal Computer version), the χ² test, and an analysis of variance. As the maximum follow-up period of the patients was 14 years, the operation date was incorporated as a covariable.9 In this way, the effects were corrected for the length of the postoperative period, and we also compensated as much as possible for whether the operation had taken place many years ago or recently.

An important condition for such an analysis is to ensure that the so-called parallel assumption is not violated. We fulfilled this condition. The results are presented in a simple manner: the corrected means and the size of the covariable. P values are given for significant differences. In the analyses, the effects of the surgical approach and tumor size were evaluated especially. Distinction was made between patients who had undergone one operation and those who had undergone one or more reoperations.

**RESULTS**

The questionnaire was sent to 174 patients. A total of 40 questionnaires could not be used in the analyses because the patient had moved and was untraceable (n = 14), or the patient had refused to participate (n = 17) or had died (n = 9). The response rate in the total group was 89% (134/151): 88% (79/90) in the suboccipital approach group and 90% (55/61) in the translabyrinthine-transotic approach group. The study population comprised 68 men and 66 women, with an average age of 53.95 years (SD = 14.45) at the time the survey was conducted. The difference in age between the men and women was not significant. There was no significant difference between the sexes, ages, or approaches in relation to a certain tumor size and whether or not reoperations had been necessary. Table 1 shows the distribution of the patients according to the approach and tumor size.

| TABLE 1. APPROACH, TUMOR SIZE, AND REOPERATIONS IN 134 PATIENTS |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                 | Translabyrinthine- | Suboccipital     |                 |
|                                 | Transotic Approach| Approach         |                 |
| No. of Patients                 | Tumor ≤25 mm     | Tumor >25 mm    | Tumor ≤25 mm    | Tumor >25 mm    |
| With one operation              | 51/134 (38%)     | 2/134 (1%)      | 21/134 (16%)    | 43/134 (32%)    |
| With more than one operation    | 1/134 (1%)       | 1/134 (1%)      | 1/134 (1%)      | 14/134 (10%)    |
| Total                           | 52/134 (39%)     | 3/134 (2%)      | 22/134 (16%)    | 57/134 (43%)    |

Patients with a translabyrinthine-transotic approach and a tumor diameter of larger than 25 mm were excluded from the analyses incorporating approach and tumor size because of low numbers (n = 3). In 17 patients, reoperation had been necessary owing to recurrence after subtotal or near-total removal. These operations were mainly conducted after a suboccipital approach with a tumor diameter of larger than 25 mm. The reason for this was the large number of subtotal suboccipital operations performed at our clinic.4 Analyses on the effect of whether or not reoperations had been necessary were only performed on the group with a suboccipital approach and a large tumor because of the low number of patients with reoperations in the other groups. Table 1 also shows how many patients underwent reoperations per approach and tumor size.

**General State of Health.** In answer to the CBS question on the general state of health, the patients with reoperations (mean = 2.27) reported better health than those who had only undergone one operation (mean = 2.82, F(1,54) = 4.54, p < .04). It was not possible to explain this unexpected effect. There was no significant difference between the surgical approaches. All the data on the patients with acoustic neuroma surgery were compared to the CBS data for the general Dutch population: the state of health of the patients was considerably poorer than that of the general population (Fig 2). The answers given by the patients with and without reoperations for 3 of the 7 COOP/WONCA questions (pain, general health, and feelings) were significantly different. Patients with reoperations (mean = 1.80) reported significantly less severe pain than the patients without reoperations (mean = 2.75, F(1,50) = 5.07, p < .03). Patients with reoperations (mean = 2.05) reported better general health than the patients without reoperations (mean = 1.57, F(1,50) = 3.24, p < .08). It would be obvious to
ascribe this unexpected effect to the difference in the level of pain experienced by the patients with and without reoperations. As the level of pain decreased, the state of general health increased. The COOP/WONCA answers showed that the patients with a suboccipital approach, irrespective of the diameter of the tumor (mean = 2.3 small tumor; mean = 2.37 larger tumor), had more emotional problems than the patients with a translabyrinthine-transotic approach (mean = 1.80, F(2,98) = 2.37, p < .10). The disease-specific measure for the quality of life (the CARES-SF) comprised three scales. These scales were found to be reliable in this study. Cronbach’s α was 0.83 for the physical scale, 0.81 for the psychosocial scale, and 0.75 for the relational scale. The answers to the CARES-SF showed very little difference between patients with and without reoperations or between the surgical approaches and tumor diameters. Only the psychosocial scale revealed a difference between patients with and without reoperations (F(13,40) = 1.95, p < .06). The difference was mainly based on two items: “finding it difficult to sleep” (F(2,52) = 5.09, p < .03) and “worrying about becoming dependent on others in the future” (F(2,52) = 4.48, p < .01). When the patients with reoperations were compared to those without reoperations, the former had less difficulty with sleeping (mean = 1.15 versus mean = 0.35), but were more worried about the time that they would no longer be able to look after themselves (mean = 0.99 versus mean = 1.76). On an item level, one more effect could be seen. Irrespective of the tumor diameter (mean = 0.74 small tumor; mean = 0.72 larger tumor), more of the patients with a suboccipital approach complained of pain than the patients with a translabyrinthine-transotic approach (mean = 0.37, F(2,111) = 2.46, p < .10). It was concluded that there was more frequent pain after a suboccipital approach (CARES-SF), but that it was less severe (COOP/WONCA) than after a translabyrinthine-transotic approach. The CARES-SF items could be expressed as one collective quality of life measure. This measure comprised the sum of all the answers given. No significant differences were found between the patients with and without reoperations or between the two approaches for a certain tumor diameter. The quality of life of the patients was influenced to a limited extent (some questions on the CARES-SF) by the surgical approach and whether or not reoperation(s) had been necessary.

A high level of satisfaction (93%) was expressed about the preoperative information and counseling provided by the doctors and nurses.

**Influence of Operation(s) on Home Help.** A total of 41 of 130 patients (32%) required home help after the operation(s); 36 only required help with housekeeping tasks. Two patients also needed medical care and help with their personal care. All three forms of help were required by 1 patient. The help was provided for payment by third parties (45%), by members of the family (44%), or by a combination of the two, sometimes with other relatives or neighbors (11%). Receiving help was not related to the age of the patient.

**Employment.** A distinction was made between paid work and unpaid work. We asked about the situations 3 months before the operation and 1 year afterward. Preoperatively, 59 of 134 patients (44%) had paid employment; 75 of 134 patients (56%) had unpaid work. One year after the operation, 49 of 134 patients (37%) had paid work and 85 of 134 (63%) had unpaid work. At 1 year postoperation, paid or unpaid work had been resumed fully by 54% and partly by 15%; 31% were no longer able to work (n = 94). About 10% of the patients had found alternative employment (n = 94). In the Netherlands, it is possible for long-term patients to be given leave of absence from work during the evaluation period while retaining partial pay. Of the 119 patients who answered this question, 31 patients (26%) were declared unfit to work according to these norms. The number of patients with a large tumor in this group was significantly higher than the number with a small tumor ($\chi^2 = 9.15, p < .005$). Suboccipital surgery led significantly more often to being declared unfit to work than translabyrinthine-transotic surgery ($\chi^2 = 5.96, p < .05$). The main reasons were vertigo and hearing impairment.

**Income.** Only 67 of 134 patients (50%) provided information about their income. The income of 24 of 67 patients changed, and in 21 of 67 it decreased, as a result of the operations. Two patients who were self-employed encountered financial problems after the operation.

**Physical Health in Relation to Hearing, Tinnitus, Vertigo, and Facial Nerve Function.** The surgical approach, tumor size, and reoperations did not have
any influence on hearing (Table 2) and tinnitus (Table 3); in the further analyses we did not distinguish between them. A remarkably large proportion of the patients without vertigo preoperatively (Table 4, n = 44.3% according to the patients; 5.2% had 0% function) only slight correlation between them: r = .67, p < .001. Particularly answers of 0% and 100% (the extremes) were responsible for the difference: 56.7% had 100% function according to the physician versus 44.3% according to the patients; 5.2% had 0% function according to the physician versus 12.2% according to the patients. There was reasonable agreement on the other scales.

Recovery. We inquired about the level of recovery and the time that had elapsed. Partial recovery was mentioned by 92 of 97 patients within 1 year of the operation (at least 50% recovery); 56 of 97 had recovered fully in this time. Full recovery had taken longer than 1 year in 10 of 97 patients, while 31 of 97 patients had not yet recovered fully. Surgical approach for a particular tumor size and whether or not there had been reoperations did not have any significant effects on recovery (Fig 4). Adjuvant treatment was necessary in 45 of 134 patients (34%). It mainly comprised physiotherapy (60%), plastic surgery (7%), surgical reconstruction of the facial nerve (4%), or a combination of the three (20%).

Use of Medical Facilities. The use of medical facilities was higher in the patients with acoustic neuroma surgery than in the general Dutch population. During the previous year (May 1993 to May 1994), 85.3% of the patients had visited their GP, versus 75.5% of the general Dutch population in 1991 and 1992 (of comparable age). These percentages for specialist consultations were 82.6% and 39.8%, respectively; for admissions to hospital, 20.7% and 6.9%, respectively. Rates for physiotherapy and homeopathy reported by the patients were twice as high and one and a half times as high as those of the general Dutch population, respectively. No significant differences were found in the patient group for surgical approach for a particular tumor size or whether or not there had been reoperations.

| TABLE 3. PREOPERATIVE AND POSTOPERATIVE COMPLAINTS OF TINNITUS IN 106 PATIENTS |
|--------------------------------|--------------------------------|
| Tinnitus After Surgery | Preoperative (N = 81) | No Preoperative (N = 25) |
| Improved | 20/81 (25%) | 1/25 (4%) |
| Unchanged | 32/81 (40%) | 18/25 (72%) |
| Deteriorated | 29/81 (36%) | 6/25 (24%) |

Facial Nerve Function. We asked about the level of facial nerve function (patient's and treating physician's opinion), whether there were facial nerve problems before surgery, and whether adjuvant treatment was necessary after the operation. The patient's opinions about prospective facial nerve function (Table 6) were influenced significantly by reoperations (F(1,44) = 3.11, p < .09), but not by the surgical approach or the tumor size. Patients with reoperations (mean = 3.91) reported considerably poorer facial nerve function than the patients with only one operation (mean = 2.80). When the same evaluation was made by the treating physician, it was found to be influenced significantly by the surgical approach and tumor size (F(2,111) = 3.70, p < .03), but not by whether or not the patient had undergone reoperations. The most favorable facial nerve function was mentioned after a translabyrinthine-transotic approach for a small tumor, and the poorest function after suboccipital surgery for a larger tumor (mean = 2.38). Intermediate results were reported after suboccipital surgery for a small tumor (mean = 1.87). Figure 3 shows facial nerve function in House-Brackmann grades (1 year postoperatively, n = 123) against the percentages given by the patients (describing their present condition). The difference in evaluations between the physicians and the patients deviated in accordance with the correlation measure. There was only slight correlation between them: r = .67, p < .001. Particularly answers of 0% and 100% (the extremes) were responsible for the difference: 56.7% had 100% function according to the physician versus 44.3% according to the patients; 5.2% had 0% function according to the physician versus 12.2% according to the patients. There was reasonable agreement on the other scales.

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| TABLE 5. PREOPERATIVE VERSUS POSTOPERATIVE VERTIGO IN 63 PATIENTS |
|--------------------------------|--------------------------------|
| Tumor | Translabyrinthine-Transotic (N = 8) | Suboccipital (N = 25) |
| Postoperative Vertigo | ≤25 mm (N = 21) | ≤25 mm >25 mm (N = 10) (N = 32) |
| Improved, fewer complaints | 6/21 (29%) | 3/10 (30%) 15/32 (47%) |
| Unchanged or deteriorated, more complaints | 15/21 (71%) | 7/10 (70%) 17/32 (53%) |
there had been reoperations. There was a difference in the number of times the GP had been consulted in the previous 2 months. Irrespective of the tumor size, the GP had been visited significantly more often (F(2,111) = 4.79, p < .02) after a suboccipital approach (mean = 1.11 small tumor; mean = 1.24 larger tumor) than after a translabyrinthine-transotic approach (mean = 0.47).

**DISCUSSION**

Very little research has been performed on the quality of life of patients after surgery on the cerebellopontine angle for the treatment of an acoustic neuroma. The best-known study was published by the Acoustic Neuroma Association after the members of this patient association had been sent a questionnaire. The study group comprised patients who had encountered different treating physicians and had been operated on via various approaches at diverse centers. The study by Parving et al from Copenhagen was conducted exclusively on patients who had undergone translabyrinthine surgery; the tumor size and reoperations were not included in the analyses. Aspects such as the postoperative hearing level were described, although generally only the changes in hearing in the operated ear received consideration. In this study we evaluated the effects that the surgical approach, tumor size, and reoperations had had on the quality of life and on the views of the patients.

The quality of life was closely correlated with the general state of health. After cerebellopontine angle surgery, the state of health was poorer than that in comparable groups of patients, as was shown by both the generic and disease-specific measurement instruments. It was remarkable that the state of health of the patients with reoperations was better than expected. These patients reported less pain and slept better than average. Concerns about the future, on the contrary, increased if the patient had undergone reoperations. The surgical approach had an influence on pain; the translabyrinthine-transotic approach was associated with less frequent pain, but it was more severe than the pain after suboccipital surgery. We could not find a reasonable explanation for this. After discharge from the hospital, the operation affected the situation at home; one third of the patients required home help. The operation had less effect on a patient’s income, but over 25% of the patients were declared unfit to work. These mainly were patients who had under-
gone suboccipital surgery for a larger tumor.

Recovery after the operation was a long-term process, and full recovery was not always achieved. The long recovery period and problems with resuming work were also mentioned in the report on members of the Acoustic Neuroma Association.²

Our questions about hearing concerned bilateral hearing, with a good ear and a poor or deaf ear. According to the majority of patients, hearing (Table 3) was already poor before the operation (92%). This did not improve in the postoperative period, or it deteriorated further. Even adequate hearing was seldom spared by surgery. It was not always necessary or worthwhile to use a hearing aid for postoperative hearing impairment if only one ear was affected.

Preoperative tinnitus complaints did not often improve after surgery (25%), but they could develop (24%) or remain unchanged (40%). This is contrary to the findings of Berliner et al,¹⁰ who reported that surgery more often improved the complaints (37%) than caused them to deteriorate (15%) and that postoperative tinnitus developed in 34%.

Before the operation, 63 of 86 of our patients had vertigo. Surgery had various effects. With small tumors, the complaints sometimes improved, but they more often deteriorated. With large tumors (suboccipital approach) the complaints generally improved postoperatively. This may have been due to a reduction in cerebral pressure after the tumor was removed. It was remarkable that some of the patients who did not have vertigo preoperatively developed complaints after translabyrinthine-transotic surgery (Table 4). This might have been caused by the removal of an as-yet-unaffected labyrinth during the operation. However, the numbers were very small.

According to the treating physician, postoperative facial nerve function was poorer after surgery for large tumors and after reoperations. The answers the patients gave on the questionnaires showed that this was not significant. This is remarkable, because the classifications of the patients and physicians were in reasonable agreement, except at the extremes (Fig 3). The latter were responsible for the final outcome of surgical results and a decreasing number of complications, there is still considerable morbidity and prolonged recovery. It is important to realize this and to prepare new patients for these eventualities.

CONCLUSION

Cerebellopontine angle surgery had a great deal of influence on the quality of life of the patients. The postoperative recovery period was long, and recovery was not always full. Patients had a poorer general state of health and made more frequent use of medical facilities. A large proportion of the patients reported problems with their social life and work, but seldom with their income. Preoperative symptoms such as hearing loss, vertigo, and tinnitus were influenced by the operation. Facial nerve function often deteriorated postoperatively, and sometimes reconstructive surgery was necessary.

The surgical approach affected the postoperative quality of life. Facial nerve function was better in the patients with translabyrinthine-transotic surgery. This approach led to less frequent pain, but when present, pain was more severe. Fewer patients were declared unfit to work, and there were fewer visits to the GP than after suboccipital surgery. Reoperations after subtotal removal using the suboccipital approach had less influence than expected. The general state of health had even improved in some cases, but there were more emotional problems and concerns about the future. Facial nerve function deteriorated after reoperations. Larger tumors were more often associated with being declared unfit to work and reoperations than small tumors.

Adequate patient education should be based on surgical results and also consider patients' postoperative experience and opinions. For small tumors, the translabyrinthine-transotic approach seems to be preferable to the suboccipital approach. Despite good surgical results and a decreasing number of complications, there is still considerable morbidity and prolonged recovery. It is important to realize this and to prepare new patients for these eventualities.

REFERENCES


FOURTH INTERNATIONAL SYMPOSIUM ON CHILDHOOD DEAFNESS

The Fourth International Symposium on Childhood Deafness: Serving All Children With Hearing Loss will be held on Kiawah Island, South Carolina, October 9-13, 1996. For more information, contact Sheila Lewis, Bill Wilkerson Center, 1114 19th Avenue South, Nashville, TN 37212; telephone (615) 340-8292.