

Quality of life in patients with meningiomas: the true meaning of "benign"

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1. ABSTRACT

Health-related quality of life (QOL) is a complex subject that requires assessment of patients' perceptions about their lives after surgery or illness in addition to the perceptions of surgeons about outcomes and radiographic findings. Patients should be asked about the effect of the disease on their work life, relationships, emotional and physical well being, and level of independence. Even the limited available literature makes it clear that the course of treatment of patients with meningiomas can be anything but benign. Future research is required using global QOL scales and disease-specific scales. Because QOL is a multidimensional concept, researchers must select the appropriate QOL scale that best measures the appropriate dimension of health (physical function, emotional well being, and symptoms). This article provides a review of current research on QOL related to the surgical treatment of meningiomas to help increase clinicians' understanding of the complex nature of QOL assessment and how this assessment can be applied to neurosurgical patients.

2. INTRODUCTION

Meningiomas are the most common of all nonglial tumors, accounting for 14 percent to 18 percent of all intracranial tumors in adults (1). The Central Brain Tumor Registry of the United States (2) reports that meningiomas account for 24 percent of primary brain tumors, second only to combined glial tumors. Meningiomas are considered benign, potentially curable tumors. With treatment, survival rates are excellent. Nevertheless, the ability of surgical treatment to provide a cure without incurring morbidity is often closely related to the location of the tumor and its involvement with surrounding neurovascular structures (3). Other factors, such as the size of a tumor and unforeseen surgical complications (e.g., stroke), can cause this histologically benign disease to have a course that is anything but benign.

Malignant variants of these tumors behave aggressively. Malignant meningiomas account for fewer than 10 percent of all meningiomas (4). As with benign

Table 1. Summary of studies on quality of life of patients with meningiomas

Number of Patients	Mean Age (years)	Male:Female Ratio	Mean Follow-up	30-day Perioperative Mortality Rate (%)	Anaplastic or Malignant Meningiomas (%)	Scale Used	Ref
257	53.1	3: 5	9.0 years	4	7	KPS	1
46	72	1: 2	1-5 years	11.7	3.7	KPS	9
119	not included	1: 4.5	33.8 months	not included	15 (grade III)	KPS	10
200	57	1: 2.3	33 months	not included	2	Modified FACT-BR	11
155	60.8 ± 14.7	1: 1.83	not included	not included	not indicated	IHD (NS) NHP	6
269	50 ± 13.6	1: 3.3	49 ± 26 months	1	excluded	KPS	12
89	62.6 surgery alone	1: 7	3.0 years surgery alone	not included	not included	KPS SF-36 Barthel Index BCM-20 Neuropsychological Testing	13
	63.3 surgery and radiation		7.6 years surgery and radiation				

BCM: Brain Cancer Module-20, FACT-BR: Functional Assessment of Cancer Therapy-Brain, IHD(NS): Innsbruck Health Dimensions Questionnaire for Neurosurgical Patients, KPS: Karnofsky Performance Scale, NHP: Nottingham Health Profile, SF: Short form

meningiomas, treatment consists of tumor debulking, but treatment for malignant meningiomas is followed by radiation. Even with treatment, patients with these lesions only expect to survive 2 to 9 years (4). QOL then becomes an important factor, one with widespread implications for patients and their family. QOL indicates “an overall sense of well being, including aspects of happiness and satisfaction, with life as a whole” (5).

Perceptions of a successful outcome may differ between the medical community and patients and their families. Historically, large surgical series have focused on the pathological characteristics of tumors, their location, and the extent of their resection. Occasionally, patient outcomes have been described using a follow-up neurological examination and/or a level of physical functioning, (i.e. Karnofsky Performance Scale [KPS] score). Patients and their families/caregivers are likely to base their perceptions of success on criteria, including freedom from symptoms and improved QOL. Mohsenipour and colleagues (6) define QOL as “coming to terms with an individual’s experience of the functional consequences of disease and illness.” They note that QOL after tumor resection can be defined by examining at least four categories: physical complaints, psychosocial distress, social interactions, and functional status.

Patients’ perceptions of life alterations related to their disease could provide a valuable perspective on what constitutes optimum neurosurgical treatment, thereby improving our understanding of patient outcomes. Patients need to be educated so that they may make informed decisions about their care, the burdens of disease they are willing to accept, and acceptable treatment risks. Studies that contrast surgical and nonsurgical outcomes highlight differences in QOL outcomes associated with treatment compared with the natural history of the disease. Self-reported patient assessments may provide a very different account of outcomes than the outcomes identified by the medical team (3). QOL scales can provide a useful measure of patient satisfaction, their subjective experiences, and healthcare preferences (3).

3. QUALITY OF LIFE MEASUREMENTS IN PATIENTS WITH MENINGIOMA

Though QOL measurements have been applied to many types of intracranial tumors, few studies have involved patients with meningiomas (Table 1). Furthermore, the available studies on patients with meningiomas are retrospective. Few incorporate patients’ perceptions of health-related QOL outcomes, specifically the impact of disease and treatment on their physical, psychological, and social function and well being (7).

The KPS is often used as a measure of outcomes. This scale measures patients’ ability to perform normal activities or their dependence on help and nursing care (8). KPS scores range from 0 to 100 percent. For example, a KPS score of 30 indicates that patients are severely disabled, a score of 50 indicates that patients require considerable assistance and frequent medical care, and a score of 100 indicates that patients are normal with “no complaints.” The KPS is scored by the care provider, rather than by the patient, and it does not address psychological, social, or disease-specific symptoms. Though often used in neurosurgical series, KPS scores poorly correlate with health-related QOL (see Discussion).

Chan and Thompson (1) retrospectively analyzed 257 patients who underwent neurosurgical treatment of an intracranial meningioma between 1960 and 1981. Most patients were between 40 and 70 years old (mean age, 53.1 years). The most common presenting symptoms were headache (49 percent), seizures (39 percent), hemiparesis or hemiplegia (30 percent), and vision impairment or loss (16 percent). Of the patients who presented with seizures, 40 percent continued to have seizures after surgery. Postoperatively, an additional 19 percent of the patients developed new seizures.

Chan and Thompson used KPS scores to determine “acceptable quality of life” or “quality of survival” after tumor resection (1). The authors defined a KPS score of 70 or above as acceptable (i.e., persons able to care for themselves but unable to perform normal activities). Their 30-day postoperative mortality rate was 4

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percent. The overall mean length of survival was 9 years. For those with an acceptable KPS score of 70 or higher, the mean length of survival was 8.3 years. Eighteen patients had a malignant meningioma, and their mean length of survival was 3.6 years. Of these 18 patients, 12 underwent radiation therapy. Their mean survival was 5.1 years, but this group was socially independent for only 4.6 years. The six patients who did not receive radiation treatment survived only a mean of 7.2 months, and their KPS scores were acceptable for only 3.5 months. Patients with a KPS score of less than 70 at admission had a higher rate of perioperative mortality and poorer QOL after surgery compared to those with higher scores at admission.

Arienta and colleagues (9) evaluated the outcomes of surgical treatment on QOL and morbidity and mortality rates of 46 elderly patients (older than 70 years) with an intracranial meningioma. To determine the natural history of the disease, 34 patients who underwent surgical resection were compared to 12 age-matched patients who were not treated surgically for a variety of reasons. Peritumoral edema visible on computed tomography (CT Scan) was associated with poor outcomes in patients regardless of whether they were treated surgically or nonsurgically. Patients with diabetes who underwent surgery had a higher postoperative mortality rate than patients without diabetes. Cardiovascular disease was considered a contraindication to surgery. The overall surgical mortality rate for this elderly group was 11.7 percent at 30 days and 20.5 percent at 3 months—higher rates than reported in other studies. Long-term follow-up of the patients treated surgically revealed one recurrent malignant meningioma from which the patient died and four patients who died from comorbid medical conditions. At the 2-year follow-up examination, the mortality rate attributable to meningioma-related disabilities in the patients treated nonsurgically was 50 percent.

Arienta and colleagues (9) found that the KPS scores of the surgical patients improved immediately after surgery and over long-term follow-up (range, 1–5 years) compared with the nonsurgical group. KPS scores decreased in nonsurgical patients who survived 2 years without surgical treatment, presumably due to tumor progression. These researchers used no subjective indices to evaluate patients' perceived health-related QOL.

De Jesus and colleagues (10) retrospectively analyzed recurrence, progression, and QOL in 119 patients treated for cavernous sinus meningiomas between 1983 and 1993. Tumor recurrence was defined as "the radiological appearance of the tumor after radiographically confirmed gross total resection" (10). After gross total resection, the recurrence rate was 10 percent. Tumors progressed in 10 percent of patients with an incomplete resection. Four patients (3 percent) died from tumor progression. Ten deaths (12 percent) were attributed to other causes.

De Jesus and colleagues (10) evaluated only KPS scores. The median preoperative KPS score was 90, and the median postoperative KPS score was 80. Both pre- and postoperative KPS scores ranged from 40 to 100. The

authors reported that many patients continued to improve postoperatively, but KPS scores at 3 months, 12 months, and more than 1 year after surgery failed to show a statistically significant change over time.

Kalkanis and colleagues (11) retrospectively analyzed QOL after surgical treatment of meningiomas by a single surgeon. They devised a telephone survey using 26 of 53 questions on the FACT-BR that they believed to be the "most relevant." All respondents had undergone a craniotomy for resection of meningioma between 1987 and April 1996.

Of the 200 patients listed in the database as having undergone a craniotomy for a meningioma, 164 patients were still living at the time of the study. Of these, 155 participated and 9 declined to be interviewed. Of the 36 deceased patients, 18 patients died within 5 years, and 8 patients died after 5 years, all attributed to their meningioma or surgical resection (11). Within 5 years of surgery, 10 patients died of uncertain causes, including tumor and comorbid medical condition diagnosed prior to tumor surgery.

The mean age of respondents was 59.3 years, and they underwent surgery a mean of 4.26 years before the study. Twenty percent underwent stereotactic radiosurgery, 22.6 percent of patients who died from causes related to surgery received adjunctive radiotherapy, and 1.3 percent received adjunctive chemotherapy. Interestingly, of the patients that died, their mean age at the time of their surgery was 63.6 years compared to 55.1 years for survey respondents ($P = 0.004$). This finding suggests that older patients who underwent a craniotomy had worse outcomes and a higher mortality rate than younger patients.

Based on the survey, 80 percent of respondents were able to work "quite a bit" or "very much," and 78 percent found their work fulfilling. Seventy-seven percent of the patients were "quite a bit" or "very much" content with their QOL, and 87 percent reported feeling "quite a bit" or "very much" independent. More than 80 percent reported being able to read and write "quite a bit" or "very much" like they used to, and 89 percent reported being able to drive a vehicle "quite a bit" or "very much" like they used to. Only 3 percent reported fear of having a seizure, and 95.5 percent reported never having had a seizure.

Mohsenipour and colleagues (6) conducted a mail survey of 155 patients who had undergone craniotomy for resection of an intracranial meningioma using the Nottingham Health Profile (NHP) and the Innsbruck Health Dimensions Questionnaire for Neurosurgical Patients (IHD [NS]). The NHP is described by authors as "relatively short" and asks patients questions about pain, energy, emotions, sleep, social isolation, and physical mobility. The IHD (NS) addresses the patients' economic situation, physical complaints, difficulties with activities of daily living (ADL), and social/family situations. Overall, QOL in most patients after surgery was good or mildly impaired. Of the 82 respondents, 25 required long-term medication to prevent seizures. Compared with other respondents, this

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group reported more difficulties with ADLs and the ability to work and perceived their condition as more of a disability. Postoperatively, 63 percent of patients had no complaint or a mild loss of energy. Seventy-five percent of patients had mild complaints or denied complaints of pain or emotional impairment after surgery. Emotional impairment decreased significantly with increasing time after surgery. Thirty-five percent of patients reported fear of tumor recurrence. Sixty percent of patients had no or mild sleep difficulties. Few patients reported social isolation as a problem.

Twenty percent of the patients reported strong impairments related to energy level and mobility. Physical impairment seemed to increase as the size of the tumor increased. Most people that reported physical impairment were older than 70 years, and it is unclear if their impairments were related to age or other diseases because there was no control group. This study is an excellent example of the detailed information that can be obtained from patients when subjective scales are used to assess QOL. The results indicate the long-lasting nature of impairments after treatment of a seemingly benign tumor.

Akagami and colleagues (12) developed the Meningioma Follow-up Questionnaire to evaluate the perceptions of 269 patients treated for basal meningiomas between 1993 and 2000. This 1-page questionnaire was described by its authors as "easy to complete" and addresses symptoms, activity, employment status, need for assistance, type of residence, perceived complications, and satisfaction with treatment received. It contains the elements needed to determine KPS scores and further addresses satisfaction with treatment and perceived complications.

The mean age of this population was 50 ± 13.6 years. The perioperative mortality rate was 1.1 percent. Of the 225 patients available for follow-up, 30 percent had documented postoperative complications, 15 percent of which were described as major (i.e., death, hematoma, cerebral edema, infection, unplanned reoperation, or heart attack). Minor complications included hydrocephalus, mild neurological deficits, easily repaired cerebrospinal fluid leaks, cellulitis, pneumonia, urinary tract infections, and deep vein thrombosis (12). In contrast, 48 percent of the patients reported complications. The questionnaire did not ask patients to specify their complications.

These patients' mean preoperative KPS score was 79 ± 10 , and their mean postoperative KPS score was 83 ± 10 . Though some patients chose to retire, 83 percent were reported to be employable while 17 percent were unable to work after surgery. Postoperatively, 43 percent returned to their original employment and 4 percent required modification. Ninety-five percent of patients felt that they had made a good treatment choice and would recommend it to a family member. Ninety percent of patients reported that their expectations of treatment were met. Sixty-four percent of patients were very satisfied, 33 percent were satisfied, and 3 percent were not satisfied with their treatment.

In a retrospective analysis of 89 patients with a World Health Organization grade I meningioma treated at one of two centers in The Netherlands between 1999 and 2005, van Nieuwenhuizen and colleagues (13) compared 18 patients who had undergone craniotomy for meningioma, 18 patients who had both surgery and adjunctive conformal external-beam radiation, and 18 healthy controls. They conducted neuropsychological tests, based physical functioning on KPS scores, and assessed ADLs with the Barthel Activities of Daily Living Index. A neurological functioning scale and Medical Outcomes Study Short Form-36 Health Survey were used to assess self-reported health-related QOL. The Brain Cancer Module-20 questionnaire then assessed additional health problems specific to patients with a meningioma.

The researchers found no significant difference in neurocognitive function between the patients who had undergone surgery alone and those treated with both surgery and radiation (13). Cognitive functioning, especially memory tasks, was lower in treated patients who had undergone surgery compared with the healthy controls. Health-related QOL decreased in patients undergoing surgery and radiation compared to those treated with surgery alone and the healthy controls. However, after post hoc analysis with correction for time since primary diagnosis, no significant difference in outcomes between the two treatment groups was found. Increased length of time with the disease appeared to decrease health-related QOL. Health-related QOL of patients who underwent craniotomy alone was reported to be similar to that of healthy controls.

4. DISCUSSION

Neurosurgical treatment teams must understand the burden of disease and the effect of its treatment on health-related QOL. Aggressive surgical treatment of meningiomas, with its attendant risks for morbidity and mortality, must be carefully weighed against the natural progression of the disease, which could be slow and relatively benign. This point is especially relevant when tumors occur in elderly patients. Though Arienta and colleagues (9) found favorable, physical, functional outcomes for older patients, those with comorbid conditions and less physical function at presentation had more surgical complications, a shorter life expectancy, and lower postoperative KPS scores than patients in other series.

The Centers for Disease Control and Prevention (CDC) stresses that individuals' health-related QOL includes "physical and mental perceptions and their correlates, including health risks and conditions, functional status, social support and socioeconomic status" (5). The mission of the CDC is to promote "health and QOL by preventing and controlling disease, injury and disability" (5). Though the KPS was a good general indicator of functional health status, measuring physical performance and dependence, Grieco and Long (14) found that KPS scores correlated poorly with health-related QOL (7). The KPS is not a reliable measure of

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Table 2. Examples of health-related quality of life scales

Quality of Life Scale	Description	What It Measures
EORTC-30-QLQ-C30 (Current version for use)	Cancer-specific HRQOL scale 30 items Patient-reported	Physical, role, cognitive, emotional, social functioning General QOL Fatigue, nausea, vomiting, and pain scales
FLIC Also known as Manitoba Cancer Treatment and Research Foundation Functional Living Index	Cancer-specific HRQOL scale 22 items Patient-reported	Physical and occupational functioning Psychological state Sociability and somatic comfort
FACT-BR subscale for brain cancer	Cancer-specific HRQOL scale 44 items Patient-reported	Physical well being Relationship with doctor Emotional well being Functional well being Additional symptoms/concerns
Medical Outcomes Study Short-Form Health Survey (SF-36)	General HRQOL scale 36 items Patient-reported	Physical functioning Role limitations caused by physical or emotional health problems Pain General health perceptions Vitality Social functioning General mental health
Barthel Activities of Daily Living Index	Physical functioning Observer rated	Continenence of bowel and bladder Grooming Toilet use Feeding Transfer and mobility Dressing Climbing stairs Bathing
Brain Cancer Module (BCM-20)	Brain tumor-specific HRQOL 10 items Patient-reported	Future uncertainty Visual disorder Motor dysfunction Communication deficit Emotional distress Signs and symptoms (headaches, seizures, drowsiness, hair loss, itching, weakness in legs, difficulties with bladder control)

BCM: Brain Cancer Module-20, EORTC-30-QLQ-C30: European Organization for Research on Treatment of Cancer Quality of Life Scale, FACT-BR: Functional Assessment of Cancer Therapy-Brain, FLIC: Functional Living Index-Cancer, HRQOL: Health-related quality of life, QOL: Quality of life, SF: Short form

QOL and, if used, needs to be supplemented with psychosocial and symptom-specific scales (7).

Patient-perceived health-related QOL scales were used in only three of the seven series reviewed. Akagami and colleagues (12) devised their own questionnaire using elements of the KPS and general questions about satisfaction with surgical outcomes. They reported that 90 percent of patients felt their treatment expectations were met, and 97 percent were very satisfied or satisfied with treatment. However, their use of a nonstandardized scale and the lack of validity testing of their survey calls into question the ability to generalize the results. Indeed, their findings appear to have no relationship to patient-perceived QOL. The patient-reported complication rate of 48 percent conflicts with their patients' self-reports of how satisfied they were with their outcomes. The authors appear to have been seeking a quick way to answer broad questions about postoperative health and QOL, and they acknowledged the need to do so in a subjective, patient-focused manner. Their study is an improvement over the historical neurosurgical mindset claiming that KPS scores sufficiently address issues concerning health-related QOL. Nonetheless, other general or disease-specific QOL scales can be used to evaluate such neurosurgical patients (Table 2).

Finally, Kalkanis and colleagues (11), Mohsenipour and colleagues (6), and van Nieuwenhuizen and colleagues (13) used appropriate health-related QOL assessment tools to measure patient-perceived outcomes

after craniotomy for meningioma. Therefore, the results of their studies warrant further attention. Kalkanis and colleagues (11) found that, overall, self-reported health-related QOL scores in their surgical group were high. They investigated the 23 percent of their patients who reported low contentment with their current QOL and found no correlation between neuropathological classification and tumor location. Mohsenipour and colleagues (6) found that about 60 percent of patients reported only mild to moderate impairment of their postoperative QOL. The 20 percent who reported moderate to severe physical handicaps were thought to be older patients, those with large tumors, and those taking antiepileptic medications. In the study by van Nieuwenhuizen and colleagues (13), postoperative memory impairments in patients treated for a meningioma were not worsened by the addition of radiotherapy to their therapeutic regimen compared with healthy controls.

Measures of health outcomes need to consider the signs and symptoms of a disease and the patient's perspective (7). Patient-based, self-reported questionnaires are the ideal to strive for. If patients are too frail to respond, indirect QOL measures can be used (7). Generic QOL scales (i.e., SF-36) allow investigators to compare their results with those from patients with other conditions or diseases (7). Disease-specific scales are most sensitive for assessing condition-related attributes (7). For instance, a brain tumor-specific scale should capture changes related to the presence of a tumor and the effects of related treatment.

5. CONCLUSION

Health-related QOL is a complicated, multifaceted subject that requires assessment of patients' perception of their life after surgery or illness. Factors that must be considered include the financial impact of the disease process, the ability to continue working, interpersonal relationships with family and friends, and possible fears about further illness, death, or both. The limited available literature makes it clear that the course of treatment of patients with benign meningiomas may be complicated. A complex constellation of factors must be considered when treatment recommendations are made. Carefully performed prospective studies using tools that target patients' perceived health-related QOL are needed to clarify these important issues.

6. REFERENCES

1. RC Chan, GB Thompson: Morbidity, mortality, and quality of life following surgery for intracranial meningiomas: a retrospective study in 257 cases. *J Neurosurg* 60, 52-60 (1984)
2. Central brain tumor registry of the United States: statistical report: primary brain tumors in the United States 1992-1997. CBTRUS. (2000)
3. J Bampoe, V Siomin, M Bernstein: Quality-of-life assessment in neurosurgical patients. *Neurosurgery Quarterly* 12, 132-141 (2002)
4. MW McDermott, A Quinones-Hinojosa, FW Bollen, DA Larson, M Prados. Meningiomas. In: *Brain cancer*. Ed: Prados M. BC Decker, London, England. (2002)
5. Centers for Disease Control and Prevention. *Measuring Healthy Days*. Atlanta, Georgia. (2000)
6. I Mohsenipour, E Deusch, M Gabl, M Hofer, K Twerdy: Quality of life in patients after meningioma resection. *Acta Neurochir (Wien)* 143, 547-553 (2001)
7. A Bowling. *Measuring disease*. Open University Press, United Kingdom. (2001)
8. DA Karnofsky, WH Abelmann, LF Craver, JH Burchenal: The use of nitrogen mustards in the palliative treatment of carcinoma. *Cancer* 1, 634-666 (1948)
9. C Arienta, M Caroli, S Balbi: Intracranial meningiomas in patients over 70 years old: follow-up in operated and unoperated cases. *Aging (Milano)* 4, 29-33 (1992)
10. O de Jesus, LN Sekhar, HK Parikh, DC Wright, DP Wagner: Long-term follow-up of patients with meningiomas involving the cavernous sinus: recurrence, progression, and quality of life. *Neurosurgery* 39, 915-919 (1996)
11. SN Kalkanis, A Quinones-Hinojosa, E Buzney, HJ Ribaud, PM Black: Quality of life following surgery for intracranial meningiomas at Brigham and Women's Hospital: a study of 164 patients using a modification of the functional assessment of cancer therapy-brain questionnaire. *J Neurooncol* 48, 233-241 (2000)
12. R Akagami, M Napolitano, LN Sekhar: Patient-evaluated outcome after surgery for basal meningiomas. *Neurosurgery* 50, 941-948 (2002)
13. D van Nieuwenhuizen, M Klein, LJ Stalpers, S Leenstra, JJ Heimans, JC Reijneveld: Differential effect of surgery and radiotherapy on neurocognitive functioning and health-related quality of life in WHO grade I meningioma patients. *J Neurooncol* 84, 271-278 (2007)
14. A Grieco, CJ Long: Investigation of the Karnofsky Performance Status as a measure of quality of life. *Health Psychol* 3, 129-142 (1984)

Abbreviations: ADL, activities of daily living; CDC, Centers for Disease Control and Prevention; FACT-BR, Functional Assessment of Cancer Therapy-Brain; FLIC, Functional Living Index-Cancer; IHD, Innsbruck Health Dimensions; Neurosurgical Patients; KPS, Karnofsky Performance Scale; NHP, Nottingham Health Profile; QOL, quality of life; SF, short form

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