Health-Related Quality of Life and Posttraumatic Growth in Low-Grade Gliomas in China: A Prospective Study

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■ OBJECTIVE: **The present study aimed to describe the quality of life (QoL) changes of survivors of low-grade gliomas (LGGs) 1 year after surgery and to identify determinants of QoL with an emphasis on the role of perceived posttraumatic growth (PTG). We also tried to examine the linear and quadratic relationship between QoL and PTG.**

■ METHODS: **Two hundred sixty participants were included in the final data analysis. The Chinese version of posttraumatic growth inventory and the Functional Assessment of Cancer Therapy—Brain scale were used to measure PTG and QoL. Hierarchical linear models were fitted to explore the individual time trajectories in change of QoL and examine the relationship between demographics, clinical features, PTG, and QoL.**

■ RESULTS: **All dimensions of QoL and PTG increased over time except physical well-being, social well-being in QoL, and new possibilities in PTG. Time, PTG score, insurance, socioeconomic status, and right hemisphere tumor position were positive predictors of QoL. Seizure and depression negatively predicted QoL. The quadratic of PTG predicted QoL; however, the coefficient of quadratic PTG approached zero.**

■ CONCLUSIONS: **In general, PTG and QoL increased over time. Perceived PTG could significantly predict QoL of LGGs survivors 1 year after surgery. A quadratic relation between PTG and QoL was not found. Although our data suggested that the growth of QoL may vary across different patients, there were only 2 time points in this study. Future studies should set more time points to examine this relationship.**

INTRODUCTION

Low-grade gliomas (LGGs) arise from the glial matter in the brain, which include all World Health Organization grade I and II gliomas. Every year, approximately 15,000 individuals are diagnosed with LGGs in China.[1,2] In most cases, LGGs will recur and progress to high-grade gliomas. Moreover, approximately 80% of patients have seizures as well as other neurologic symptoms.[3,4] Thus, LGGs negatively affect the quality of life (QoL) of these patients. QoL is a multidimensional concept that covers not only physical well-being but also mental well-being. Cheng et al.[5] investigated QoL in patients with glioma in China, and they found that gliomas had a dramatic impact on the patients' lives both physically and psychologically. The negative consequences of LGGs have been well documented.[6,7] However, few studies have focused on the positive psychological part of LGGs.

As we know, individuals who are exposed to traumatic life events also may perceive at least some positive changes, such as posttraumatic growth (PTG).[8] PTG refers to the positive psychological change that can occur as a result of a struggle

Key words
- Chinese
- Low-grade gliomas
- Posttraumatic growth
- Quality of life

Abbreviations and Acronyms
CES-D: Center for Epidemiologic Studies Depression Scale
KPS: Karnofsky Performance Scale
LGG: Low-grade glioma
MMSE: Mini-Mental State Examination
PTG: Posttraumatic growth
PTGI: Posttraumatic growth inventory
QoL: Quality of life
SES: Socioeconomic status
T1: Time 1
T2: Time 2

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with highly challenging adverse life events.[9,10] To our knowledge, although PTG resulting from LGGs frequently is reported by survivors, few studies have examined the impact of perceived PTG on the QoL of patients with LGG. It is important to identify this relationship, as it may provide potential interventions for maintaining the QoL of patients with LGGs over time.

Previous studies have explored the relationship between QoL and PTG after cancer, but the results are contradictory.[10–12] Some studies found a positive relationship between PTG and QoL,[13] which makes sense. However, a few studies also suggested a null or negative relationship between them.[11,14] In addition, Tomich and Helgeson[12] found a curvilinear relation between PTG and QoL in patients with cancer. Specifically, patients with high and low levels of PTG had better QoL than those with moderate levels, which suggested the relationship between PTG and QoL may be complex and dynamic. However, the sample size in their study was too small to acquire enough statistical power; it would be necessary to verify this finding by using a relatively large sample in a prospective study. Moreover, a previous study found that minorities were more likely to report greater levels of PTG than white participants[15]; therefore, it is intriguing to investigate the PTG level of Chinese patients.

Based on the aforementioned reasons, we conducted a prospective study with the following objectives: 1) to describe the PTG and QoL changes during the first year after surgery in a Chinese sample; 2) to identify determinants of QoL with an emphasis on the roles of perceived PTG; and 3) to examine the linear and quadratic relationship between QoL and PTG.

METHODS

Power Analysis

Before we selected participants of the present study, a power analysis was conducted to make sure that enough statistical power and sample size could be achieved. Figure 1 presents the results of power analysis for the linear model. According to previous studies,[12,16] the effect sizes for PTG and many health outcomes ranged from null to medium; therefore, to acquire 90% statistical power under the conditions of small or medium effect size (e.g., 0.15 ~ 0.20) and 0.05 confidence level, at least 200 ~ 300 participants would be needed.

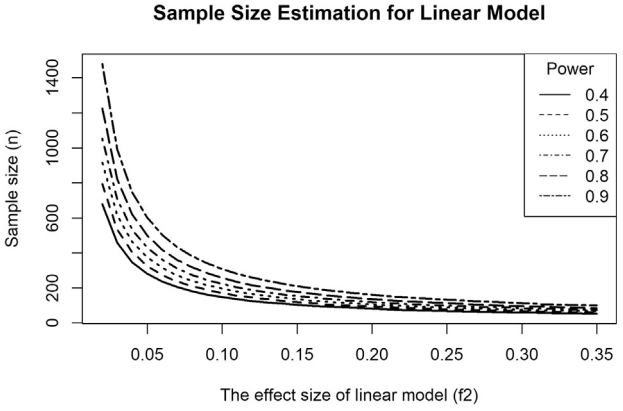

Figure 1. Results of power analysis for the linear model.

Participants and Procedures

Considering the results of power analysis and our capabilities, we aimed to select more than 300 participants. A prospective study design was conducted; specifically, participants filled out the questionnaires at 2 different time points: time 1 (T1), which was approximately 1 month after the operation, and at time 2 (T2), approximately 1 year after surgery. Ethics approval was granted by the West China hospital Sichuan University Institutional Human Research Ethics Committees. All participants signed consent forms before study inclusion.

Patients with histologically proven supratentorial LGG were enrolled at the West China Hospital Sichuan University from February 2011 to July 2016. The inclusive criteria were as follows: 1) histologically confirmed diagnoses of World Health Organization grade I or II glioma; 2) 18 years of age or older; 3) Karnofsky Performance Scale (KPS) $>$ 60. The exclusion criteria were: 1) abnormal cognition Mini-Mental State Examination (MMSE) $\leq$24; and 2) unable to read or understand the questionnaire.

Three hundred thirty-five patients enrolled and completed the questionnaires at T1. Five of them did not fully understand the questionnaires and were excluded. Of the remaining 330 patients, 36 patients were too sick to complete the T2 questionnaires, 3 patients died, 5 patients were lost to follow-up, and 5 patients declined participation. Therefore, 282 patients remained in our study (155 men, 127 women).

Demographic and Medical Features

Information of demographic and medical variables were directly obtained from hospital records, including sex, age, marital status, occupation, education, social insurance, tumor grade, tumor position, excision, therapy method, and complications. We also calculated the score of socioeconomic status (SES) for each participant according to their occupation and education level.[17]

Mini-Mental State Examination

MMSE was used to screen the participants in our study, which is the one of the most widely used screening tests in epidemiologic studies. The MMSE consists of a variety of items and has a maximum score of 30 points. The items have been grouped into 7 categories, each rationally representing a different cognitive domain or function: orientation to time; orientation to place; registration of 3 words; attention and calculation; recall of 3 words; and language and visual construction.[18] MMSE scores are frequently used to classify the severity of cognitive impairment into 3 levels: severe cognitive impairment (0–17), mild cognitive impairment (18–23), and no cognitive impairment (24–30).

Center for Epidemiologic Studies Depression Scale (CES-D)

The symptoms of depression were assessed by the 10-item version of CES-D over the past week on 4-point scales (0 = rarely; 3 = most of the time). The possible range of the 10-item scale is 0 to 30, and a total score of 10 or greater on this modified scale indicates significant depressive symptoms. The Cronbach α of CES-D in the present study was 0.74 and 0.81, respectively.