RESEARCH COMMUNICATION

Study on the Health-related Quality of Life in Patients after Surgery for Malignant Bone Tumors

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Abstract

Aim: We conducted a study in China to assess the health-related quality of life (HRQoL) in patients treated on for malignant bone tumors after surgery, and investigate the possible determinants. Methods: The subjects were 120 patients surgically treated by amputation and limb-salvage for bone tumors during the period of June 2008 to June 2010. The Medical Outcomes Study Short Form 36 (SF-36) was employed to measure the HRQoL of all the patients before and after surgery. Results: With regard to the results of the general quality of life tool (SF-36), we observed a significant improvement of all the indexes of HRQoL after 6 months ($p<0.05$). PF, RP and BP scores showed significant increase between surgery after 6 and 12 months ($p<0.05$). The means of the HRQoL of bone tumor patients in our study were still much lower than those of general population in every domain, even 12 months after surgery. Logistic regression showed that female patients were found to have lower scores in physical component summary (PCS) than males (OR=0.64, 95% CI=0.35-0.89). Patients older than 15 years had lower scores in mental component summary (MCS) (OR=0.60, 95% CI=0.32-0.86). Ablative surgery was related to both lower MCS and PCS scores (For MCS, OR=0.54, 95% CI=0.31-0.83; for PCS, OR=0.43, 95% CI=0.25-0.73). Conclusion: Our study showed the treatment for bone tumor could greatly alter the HRQoL of patients. Age, sex and type of surgery were associated with physical or mental HRQoL after surgery.

Keywords: Health - related quality of life - malignant bone tumors - outcome assessment

Asian Pacific J Cancer Prev, **13**, 127-130

Introduction

Malignant bone tumors, including osteosarcoma and Eving sarcoma, shows a small percentage of cancers diagnosed and are typically occurring during the adolescent growth spurt, with a second smaller peak in the elderly. About 50% of the Ewing sarcoma and 40% of the osteosarcoma cases were found in young age people who aged 10-19 years, therefore, the bone tumors account for about 6% of all cancer diagnosed under the age of 20 years (Stelliarova et al., 2004; Stiller et al., 2006; Damron et al., 2007). Both bone malignancies have a preference for origination in the metaphysical region of long bones. Particularly the knee region and upper arm (Damron et al., 2007).

Survival rates for patients with bone cancer have steadily improved over the last decades of the last decades of the past century to an overall 5-year survival of approximately 60% for those younger than 30 years, 50% for those aged 30-49 years, and 30% for those aged 50 years or older (Stiller et al., 2006; Damron et al., 2007). Additionally, novel extremity-salving surgical procedures became available as alternatives to an amputation. In parallel with these improving life expectancy and surgical innovations, there has been a growing need to examine post-surgical quality of life (QoL) (Eiser and Grimer, 1999; Eiser, 2009).

In recent decades, there has been increasing concern about the importance of measuring health-related quality of life (HRQoL) for evaluation of outcomes after bone tumor surgery. After surgical treatment for bone tumor, the patients were reported to have significant mental improvement before surgery (Eiser and Grimer, 1999; Eiser, 2009). A number of factors, such as sex, age, clinic symptom, and severity of illness, may be associated with the HRQoL of bone tumor patients after surgery. However, such associations did not conducted in China. Due to lack of these outcome and its influencing factors of bone tumor patients after surgery, we conducted a study in China to assess the HRQoL in bone tumor patients after surgery, and investigated the possible determinants of the HRQoL of these patients. We performed a prospective follow-up study, and used a validated SF-36 questionnaire to investigate the QoL of bone tumor patients after surgery.

Materials and Methods

This study was performed in the General Hospital of PLA in China. 120 patients have been surgically treated by amputation and limb-salvage for bone tumor during the

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period of June 2008 to June 2010. A total of 120 patients were invited to participate on the day of hospitalized. This study was approved by the ethics committee of the hospital and all participants signed informed consents before participants.

On the day of participating, all the patients were asked to provide their and their next of kins' telephone numbers and mailing addresses to enable our follow-up. The assessment of HRQoL was performed via telephone interview before surgery, and every 6 months after surgery. The follow-up period was last for one year. The Medical Outcomes Study Short Form 36 (SF-36) was employed to measure the HRQOL (Ware et al., 1993). The SF-36 is a well validated HRQOL-measuring instrument and has been widely used among trauma survivors. The SF-36 evaluates eight health concepts or domains: physical functioning, role limitation due to physical problems (role–physical), bodily pain, general perception of health, vitality, social function, role limitation due to emotional problems (role—emotional), and mental health. Each scale score ranges from 0 (worst health state) to 100 (best health state). These eight health concept scales can be converted into a physical component summary (PCS) and a mental component summary scale (MCS), standardized to a score with a mean of 50 and a standard deviation of 10, with scores above and below 50 indicating above and below average functioning, respectively.

We used the Statistical Package for the Social Sciences (SPSS) version 12.0 (SPSS Inc., Chicago, IL, USA) for the data analysis. A P-value<0.05 was considered as statistically significant. Mann–Whitney U-tests and Wilcoxon's rank sum tests were employed to compare unpaired and paired quantitative variables, respectively. Chi-square tests. We also performed non-conditional logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) of potential affecting factors for low HRQoL after 12 months. Median values of dependent variables were chosen as cut points. Potential confounders were included in the multivariate model based on biological and statistical considerations. Potential confounders were entered into the multivariate models if they changed the effect estimates by 10% or more. Variables selected to appear in the final model include: sex, age at surgery, type of surgery, Morphology, annual income and TESS score.

Results

The baseline demographic and clinical characteristics of the bone tumor patients are shown in Table 1. Most of the bone tumor patients were males, and 55% of the patients had the economic status below 5000 RMB. Moreover, the length of stay in hospital was about 17±4.6 days. 57% of the patients chose ablative surgery, and the morphology of most patients was osteosarcoma. By the way, about 71% of the tumor localization was at distal femur.

The results of HRQoL assessment for clinic symptoms before surgery, after surgery for 6 and 12 months are listed in Table 2 by the eight domains. With regard to the results of the general quality of life tool (SF-36), we observed a significant improvement of Physical Function (PF), Role–Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Function (SF), Role-Emotional (RE) and Mental Health (MH) after 6 months

Table 1. The Baseline Demographic and Clinical Characteristics of the Bone Tumor Patients

Variables		All patients N=120
Gender, No(%)	Female	41 (34.2)
	Male	79 (65.8)
	Age at surgery	14.1±4.6
Annual income, No(%)	<5000 RMB	66 (55.0)
	≥5000 RMB	54 (45.0)
Type of surgery, No(%)	Limb-Salvage	52 (43.3)
	Ablative surgery	68 (56.7)
Morphology, No(%)	Osteosarcoma	94 (78.3)
	Ewing sarcoma	26 (21.7)
Localization, No(%)	Distal femur	85 (70.8)
	Proximal tibia	35 (29.2)

Table 2. Changes in Health Related Quality of Life (HRQoL) Over Time Among 120 Patients (Mean±Standard Deviation)

Variables	Before surgery		6 months after surgery		12 months after surgery	
SPF-36	Mean	95% CI	Mean	95% CI	Mea	95% CI
PF	32.6[a]	21.5-38.7	36.2[b]	22.7-54.3	46.2	28.6-65.2
RP	21.4[a]	16.7-28.3	32.1[b]	22.3-43.5	43.5	31.6-58.9
BP	24.5[a]	18.1-31.4	30.4[b]	25.3-47.5	40.5	30.4-55.5
GH	44.2	37.5-57.5	47.5	31.1-59.5	48.2	31.2-61.8
VT	41.5[a]	36.7-53.9	74.5	61.2-84.6	72.7	60.3-73.2
SF	51.6[a]	40.5-61.3	77.6	67.7-86.7	79.5	68.8-85.7
RE	53.2[a]	44.6-69.2	86.5	70.5-92.4	84.2	72.2-93.6
MH	61.5[a]	52.3-68.5	78.7	70.1-89.3	81.7	70.2-90.3
Physical component	29.8[a]	17.7-43.9	34.6	23.3-50.4	41.5	30.5-57.6
Mental component	52.9[a]	43.6-59.7	71.7	58.9-83.4	72.4	61.6-86.9

[a]Comparing the scores between before surgery and after surgery for 6 months, p<0.05; [b]Comparing the scores between surgery for 6 months and 12 months, p<0.05

Table 3. Logistic Regression for HRQoL 12 Months after Surgery among 120 Patients

Variables	Physical component summary Odds ratio (95% CI)	Mental component summary Odds ratio (95% CI)
Sex		
Male	1.0 (reference)	1.0 (reference)
Female	0.64(0.35-0.89)	0.87(0.52-1.23)
Age		
<15 years	1.0 (reference)	1.0 (reference)
≥15 years	0.60(0.32-0.86)	0.79(0.43-1.16)
Annual income		
<5000 RMB	1.0 (reference)	1.0 (reference)
≥5000 RMB	1.34(0.83-1.76)	1.45(0.88-1.85)
Type of surgery		
Limb-Salvage	1.0 (reference)	1.0 (reference)
Ablative surgery	0.54(0.31-0.83)	0.43(0.25-0.73)
Morphology		
Ewing sarcoma	1.0 (reference)	1.0 (reference)
Osteosarcoma	1.25(0.74-1.50)	1.18(0.78-1.40)
Localization		
Distal femur	1.0 (reference)	1.0 (reference)
Proximal tibia	0.79(0.54-1.32)	0.75(0.42-1.17)

(p<0.05). PF, RP and BP score showed significantly increased between surgery after 6 and 12 months (p<0.05). Although there was no reference group representing the general population included in this study, we were able to compare the HRQoL of bone tumor patients with previous published results from a Chinese general population (Li et al., 2003). The means of the HRQoL of bone tumor patients in our study were still much lower than those of general population in every domain, even 12 months after surgery.

Odds ratios with confidence intervals for HRQoL 12 months after surgery from logistic regression are shown by summary measurement in Table 3. Female patients were found to have lower scores in PCS than males (OR=0.64, 95% CI=0.35-0.89). Patients older than 15 years had lower scores in MCS (OR=0.60, 95% CI=0.32-0.86). Patients with economic status≤5000 RMB was associated with high score, but no significant difference was found (p>0.05). Ablative surgery was related to both lower MCS and PCS scores (for MCS, OR=0.54, 95% CI=0.31-0.83; for PCS, OR=0.43, 95% CI=0.25-0.73). No significant association was found between the morphology and localization and HRQoL in both MCS and PCS.

Discussion

Our study observed an improvement in the HRQoL of bone tumor patients from 6 months to 12 months after surgery. Such a change of HRQoL over time was consistent with previous studies (Eiser et al., 2001; Van et al., 2001; Ginsberg et al., 2007; Bekkering et al., 2010; Bekkering et al., 2011). However, in keeping with findings from previous studies, the HRQoL scores of patients with bone tumor were still lower than those of the general population in all domains, even in 12 months after surgery. Unfortunately, our study did not include a reference group to facilitate direct comparison as a few of the other studies did. Otherwise, our findings may be strengthened, so this should be considered in future studies.

With respect to the HRQoL in the early postoperative period, in both the limb-salvage and amputation groups, patients have to adapt to the new limb, and the physical component scores of HRQoL could not be greatly improved. After limb-salvage surgery full weight bearing will in general be limited for weeks after endoprosthetic reconstructions and for several months after allograft reconstructions. After amputation the prosthesis will usually be optimally fitted after approximately 2 months. The variations in early postoperative rehabilitation related to differences in surgical techniques may have had a considerable impact on observed HRQoL in the present study. Additionally, the localization of the tumor may have played a role. When limb-salvage surgery is performed in proximal tibia tumors, an extensor mechanism reconstruction almost always needs to be performed. The necessary protective actions and the recovery period are markedly different from limb-salvage surgery for distal femur tumors. Finally, in the later stages after surgery, complications and disease-related sequelae like metastases and the resulting surgery may also have had an important impact on function and HRQoL. Our logistic regression study also proved the above assumption. However, we did not find the difference of localization and morphology tumors due to the relatively small sample size. Therefore, further large sample study is warranted.

There are several limitations in our study. Firstly, the different disease status, such as remission, relapse, complications or death may have great impact on the HRQoL. However, the impact of these factors could not be analyzed in this study due to the small sample size. If we analyzed these factors, the limited number of patients could limit the statistical power and probably enhance a positive selection of the study population. Secondly, we did not included a reference group in our study to comparison the effect of surgery for bone tumor. We use a HRQoL in the general population to comparison, but a more comparable group is warranted in further study.

In conclusion, our study showed the surgery for bone tumor could greatly improved the QoL of patients, especially for the physical function, Role-Physical and Bodily Pain. The emotion and mental health need long time to improve. Age, sex and type of surgery were associated with physical or mental HRQoL after surgery for bone tumor. Further large sample study is needed to provide information to decide which therapy is the best choice according to clinical and QoL scores.

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