RESEARCH ARTICLE

Health-related Quality of Life After Treatment for Malignant Bone Tumors: A Follow-up Study in China

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Abstract

Aim: We conducted the present study to assess health-related quality of life (HRQoL) among bone cancer patients after surgical treatment in one large teaching hospitals in China, and assess the risk factors for improving the physical or mental HRQoL. Methods: 344 eligible adult patients who were admitted to the hospital with malignant bone tumors during the period of Jun. 2008 to Dec. 2011, and a reference group with 361 health cases was recruited in the same hospital during the same period. All 344 patients were followed up for one year. The HRQoL before treatment and after one year was evaluated with the Medical Outcome Short Form 36 (SF-36). Results: All 8 domains of HRQoL had the lowest scores greatly improved over the first year after discharge. However, the patients still had significantly lower scores in every domain than the reference group one year after discharge. Age and type of surgery were associated with HRQoL in the mental domain. Conclusion: The HRQoL of patients with malignant bone tumors greatly improved one year after the treatment. This study also highlighted the utility of HRQoL assessment for prognostic evaluation of patients after surgical treatment for bone cancer.

Keywords: Health-related quality of life - malignant bone tumors - SF-36 - follow-up

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Introduction

Malignant bone tumors, including osteosarcoma and Eving sarcoma, account for only 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 et al., 2001; Eiser, 2009). Assessment of outcomes after surgical treatment of malignant bone tumors has generally focused on clinical examinations or measures, and our previous study used SF-36 questionnaire to investigate the QoL of bone tumor patients after surgery, and the results showed the HRQoL of bone tumor greatly could be greatly improved. However, our previous study did not use a reference group (Han et al., 2012), and whether the HRQoL is greatly improved is unknown. Moreover, we also need to know which domain of HRQoL is still low among those patients after surgery compared with health population.

Up to our knowledge, there was no previous study assessing HRQoL after surgical treatment for bone tumor compared with the health population. Since evidences in Chinese population are still lacking, we conducted the present study to assess the HRQoL among patients after surgical treatment in two large teaching hospitals in China, and assess the risk factors for improving the physical or mental HRQoL after surgical.

Materials and Methods

Participants and procedures

The study was performed in a large teaching hospital which houses one of the largest orthopedic surgery centers in Guangzhou, and General Hospital of PLA in Beijing, China. Eligible subjects were adult patients who were admitted to this hospital with malignant bone tumors during the period of Jun. 2008 to Dec. 2011. A total of 355

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patients were invited to participate on the day of admission and 344 agree to participate (96.9%). This study was approved by the ethics committee of the hospital and all participants signed informed consents before participation. A reference sample was recruited from people who requested general health examinations in the same hospital during the same period. The reference group was required to be without bone tumor and frequency matched to patients with bone tumor by age (within 5 years) and sex. Face-to-face interviews were conducted to collect information on demographic characteristics and HRQoL from the reference group. A total of 400 people were invited, among which 361 (90.3%) completed the interviews.

Treatment

Limb-salvage or ablative surgery were performed for participants. The surgery choice was determined by the clinical manifestations, results from medical imaging (CT/MRI scan), neuro-physiologic examinations, as well as patients' decision. After surgery, we allowed patients to stay in wards, and patients received ablative surgery got chemotherapy.

Health-related quality of life

We used the Medical Outcome short Form 36 (SF-36) was to evaluate the HRQoL. This questionnaire is a generic measuring toll for HRQoL which has been validated (Sararaks et al., 2005; Qu et al., 2009). The SF-36 questionnaire includes a total of 8 domains which consists of 2 summary scores: the mental component summary (MCS) and the physical component summary (PCS). The SF-36 was administrated twice for each participant, on year apart. On the day of admission, face-to-face interviews were conducted to evaluate the HRQoL of participants. One year after discharge, the participants finished follow-up assessments of HRQoL via telephone interview. TESS score was also used to assess the recovery situation of bone cancer patients after surgery.

Statistical analysis

The SPSS version 13.0 software (SPSS Inc, Chicago, IL) was used for statistical analysis. A two-sided P value <0.05 was determined as statistically significant. We used Wilcoxon's rank sum tests in comparing HRQoL measurements before and after surgical treatment. Non-conditional logistic regression was also performed to estimate odds ratios (ORs) and 95% confidence intervals (Cls) of risk factors for low HRQoL one year after treatment. We chose the medians HRQoL measurement values as cutting points. The inclusion of variables into the model was determined according to both statistical and biological considerations. If the potential confounding factors altered the effect estimates by more than 10%, they were included in the multi-variate models. The final model included the following variables: age at admission, sex, Morphology, annual income, pre-operate HRQoL score. The results remained not substantially changed after including additional variables. Moreover, we assess the correlation between the TESS and HRQoL after surgery by Spearman correlation analysis.

Results

11 patients were lost from the original cohort mainly because of change of telephone number or refusal. The baseline characteristics of the remaining 344 participants are presented in Table 1. There were 197 males and 147 females among these cancer patients, and 202 males and 159 females among reference group. The mean age of patients who were followed up at admission was 18.7±4.9 years. About 60% of the patients taken ablative surgery, and 74% patients were suffering from osteosarcoma.

Results of HRQoL assessments before and one year after treatment are listed in Table 2. All 8 domains of the HRQoL had the lowest scores greatly improved over the first year after discharge. The HRQoL of patients after treatment significantly improved in the four mental health domains, including vitality, social function, role emotion and mental health and all the other four physical health domains one year after treatment. However, those patients had significant lower scores in every domain than the reference group even two years after discharge (data not shown).

Table 1. Baseline Demographic and Clinical Characteristics of Patients with Bone Cancer and the Reference Group

Variables	Patients with bone tumor N=344	Reference N=361	P value
Sex, n (%)			
Male	197(57.3)	202(55.9)	0.73
Female	147(42.7)	159(44.1)	
Age at admission, years			
Mean	18.7±4.9	17.6±5.8	<0.05
Annual family income, n(%)			
<10000 RMB	115(33.4)	113(31.2)	0.39
≥10000 RMB	229(66.6)	248(68.8)	
Type of surgery, n(%)			
Limb-Salvage	135(39.1)	-	
Ablative surgery	209(60.9)	-	
Morphology, n(%)	0		
Osteosarcoma	255(74.2)	-	
Ewing sarcoma	89(25.8)	-	
Localization, n(%)	0		
Distal femur	227(65.9)	-	
Proximal tibia	117(34.1)	-	

Table 2. Health Related-quality of Life Among Patients with Bone Tumore and the Reference Group

Dimensions	Patients with bone tumor N=344		Reference group N=361
	Before treatment	1 year after treatment	
Physical function	31.4(19.6)	51.3(22.3) *	82.4(25.8)
Role physical	35.3(20.5)	54.6(21.8) *	85.7(26.4)
Bodily pain	30.6(17.6)	47.5(23.3) *	83.2(24.6)
General health	23.9(18.5)	50.7(20.9) *	81.8(23.1)
Vitality	37.5(18.8)	44.6(20.5) *	85.7(24.5)
Social function	41.4(20.5)	47.6(21.6) *	76.4(20.8)
Role emotion	39.2(18.6)	56.3(19.7) *	84.6(23.6)
Mental health	38.6(20.4)	41.6(19.8) *	85.3(24.2)
TESS	-	73.2(23.1)	89.5(22.8)

Data are presented as means and standard deviation (SD); *P<0.05 under Wilcoxon's rank sum test compared with measurements before treatment

Table 3. Logistic Regression for Low Health Quality of Life One Year after Treatment Among Patients with Bone Tumor

Variables	PCS Odds ratio (95% CI)	MCS Odds ratio (95% CI)
Age (years)		
<10	1.0(reference)	1.0(reference)
10~20	1.3(0.5-3.7)	1.6(0.7-3.5)
>20	1.6(0.7-4.7)	2.0(1.1-3.8)
Sex		
Male	1.0(reference)	1.0(reference)
Female	1.6(0.8-4.1)	1.8(0.9-3.6)
Annual family income, n(%)		
<5000 RMB	1.0(reference)	1.0(reference)
≥5000 RMB	0.8(0.5-1.4)	0.7(0.4-1.2)
Type of surgery, n(%)		
Limb-Salvage	1.0(reference)	1.0(reference)
Ablative surgery	1.7(0.6-4.4)	2.1(1.2-4.3)
Morphology, n(%)		
Osteosarcoma	1.0(reference)	1.0(reference)
Ewing sarcoma	1.3(0.5-3.1)	1.2(0.4-2.5)
Localization, n(%)		
Distal femur	1.0(reference)	1.0(reference)
Proximal tibia	0.7(0.4-3.2)	0.8(0.6-2.6)

Table 4. Correlation Analysis for the HRQoL and TESS Score

Variables		TESS N(%) <50	50-70	>70	Correlation coefficient (P value)
PCS	<30	40(11.5)	33(9.7)	19(5.6)	0.74
	30-40	30(8.6)	7521.8)	28(8.1)	P<0.05
	>40	22(6.3)	54(15.8)	43(12.6)	
MCS	<30	37(10.8)	26(7.6)	17(4.9)	0.77
	30-40	31(10.8)	87(25.3)	29(8.3)	P<0.05
	>40	23(8.9)	50(14.4)	45(13.1)	

The ORs and 95%CI from logistic regressions for low HRQoL after treatment are presented in Table 3 for different summary scores. We observed that patients aged above 20 years had lower score in MCS than younger patients (OR=2.0, 95%CI=1.1-3.8). Female patients were found to be with non-significantly lower scores in PCS and MCS domains. Patients received ablative surgery had lower score in MCS domain.

We further analyze the relationship between the HRQoL and TESS score in Table 4. The results showed that HRQoL was significantly correlation with TESS score (Correlation coefficient=0.64, p<0.05), that means the HRQoL could better present the situation of bone cancer patients after treatment.

Discussion

Our study was the first longitudinal cohort study to investigate the HRQoL of bone tumor patients after treatment in a Chinese population using SF-36 as the measuring tool. Our study found the HRQoL of bone tumor patients improved one year after treatment, which was in line with previous studies (Eiser et al., 2001; van et al., 2001; Ginsberg et al., 2007; Bekkering et al., 2010; Bekkering et al., 2011). Nevertheless, even one year after treatment, patients with bone tumor still suffered from impaired HRQoL when compared with health population, which was also consistent with previous studies (Bekkering et al., 2010; Bekkering et al., 2012; Han et al., 2012).

Our study observed an improvement in the HRQoL of bone tumor patients one year after treatment. 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 of patients after treatment, in amputation groups, patients may have not to adapt to the new limb, and the physical component scores of HRQoL could not be greatly improved. Moreover, the amputation would bring great psychological burden for patients, because the physical disability would make patients feel different with health population, and make induce depression and mental problems. Therefore, the MCS score of patients received ablative surgery was significantly lower than patients with limb-Salvage treatment. The locations of tumor may have played a role in the HRQoL of patients. When the bone tumor was occurred in different location, patients may have different physical disability, recovery time and mental diseases. Our results showed the difference of our assumption. We found difference HRQoL in different age groups, and patients with old age have lower HRQoL than younger patients. The reason might be old age patients may undertake social role than younger patients, and they may have more mental problems than younger ones. Moreover, males have higher HRQoL than females, and males may have more rehabilitation training than females and would have a higher PCS. However, we did not find the difference in morphology tumors due to the relatively small sample size. Therefore, further large sample study is warranted.

Several limitations of our study should be discussed. First, the patients recruited in this study might not represent for all bone tumor patients in our city and the findings from this study may not apply for the whole population in our city or other Chinese populations because it was conducted in a single setting. Second, because of practical difficulties, the follow up was only one year ans was not long enough to assess long term HRQoL of patients with bone cancer after discharge. Third, the sample size was limited and may not have enough statistical power to find difference.

In conclusion, in this present study, we found that Chinese patients with bone cancer had improved HRQoL one year after surgical treatment. Age and type of surgery were associated with HRQoL in the mental domain. The HRQoL was significantly related to the TESS score in assess the situation of patients after surgery. More large sample studies from Chinese population are still needed.

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