

# Health-related quality-of-life assessment in surgical patients with papillary thyroid carcinoma

## A single-center analysis from Mainland China

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### Abstract

Even with a favorable prognosis, the health-related quality of life (HRQoL) of papillary thyroid carcinoma (PTC) patients remains unclear and conflicting. Thus, in the present study, we compared the HRQoL of PTC patients with that of the general population (GP).

The study was performed in our thyroid and parathyroid surgery department, and 186 PTC patients who had undergone thyroidectomy were included. The exclusion criteria were an age < 18 years, no follow-up, and the presence of other malignant neoplasms. The control group included 186 volunteers who were matched by age, gender, and socioeconomic status. The survivor and control groups were asked to complete the Chinese version of the SF-36 questionnaire.

The 186 volunteers from the GP were well matched to PTC patients with respect to the baseline demographic characteristics. PTC patients showed significantly lower scores than those of the control group in 7 domains of the HRQoL: role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). PTC was a risk factor for a low Physical Component Summary (PCS) score and a low Mental Component Summary (MCS) score (all *P* values were less than .05). Significant reductions in the scores of all 8 domains were observed at 1 month after the operation, and obvious recovery was noted at 6 months according to the PCS and MCS scores (all *P* values were less than .05). However, even 2 years after surgery, few domain scores had recovered to levels found in the GP, including the PCS and MCS scores (all *P* values were less than .05).

Due to the decreased preoperative and postoperative HRQoL scores, much attention should be given to and more long-term observation should be performed for PTC patients, even those who have undergone surgery.

**Abbreviations:** BP = bodily pain, GH = general health, GP = general population, HRQoL = health-related quality of life, MCS = mental component summary, MH = mental health, PCS = physical component summary, PTC = papillary thyroid carcinoma, RE = role-emotional, RP = role-physical, SF = social functioning, VT = vitality.

**Keywords:** papillary thyroid carcinoma, quality of life, surgery

Editor: Jorg Kleeff.

*Authorship:* The first authors of this manuscript are JG, WC, and JL. These 3 contributed equally to this study and should be cofirst authors. JG, WC, and JL performed research and wrote the first draft. All authors contributed to the design and interpretation of the study and to further drafts. HT is the guarantor.

*Funding/support:* This study was supported by grants from Sichuan Province Science and Technology Project of China (No.2017SZ0139), Sichuan University for youth fund (2017SCU11016), Health and Family Planning Commission of Sichuan Province (17PJ398), and Postdoctoral Sustentation Fund of Sichuan University (2017SCU12035).

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

The authors report no conflicts of interest.

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Medicine (2017) 96:38(e8070)

Received: 26 March 2017 / Received in final form: 8 August 2017 / Accepted: 22 August 2017

<http://dx.doi.org/10.1097/MD.0000000000008070>

## 1. Introduction

The incidence of thyroid cancer has tripled over the last 3 decades,<sup>[1]</sup> and papillary thyroid carcinoma (PTC) is the main histological subtype that has contributed to the increase.<sup>[2]</sup> Although most PTC patients can achieve an excellent long-term outcome, survival alone as an outcome measure is not sufficient. In recent years, patient-centered care has become the main focus of clinical diagnosis and therapies. Health-related quality of life (HRQoL) is one of the most important fields of patient-centered care and is focused on how patients feel and the tasks that they can perform in everyday life. HRQoL indicates the impact of the disease or the treatment on the psychological, physical, social, and somatic domains of functioning or well-being.<sup>[3]</sup> HRQoL evaluation is now more and more being used in clinical works to monitor patients' conditions and to help clinical decision-making,<sup>[4]</sup> such as monitoring patients with pain, tracking patients with chronic diseases, and so on.<sup>[5]</sup>

Disease-specific and generic measures are the 2 main broad categories of HRQoL. Disease-specific HRQoL typically emphasize the evaluation of symptoms of disease, functioning of the body and patients' perception that may be related to a disease or condition. Measures mainly include the categories of functioning and well-being and comparisons between the disease and the treatments' benefits.<sup>[6]</sup> Hundreds of disease-specific HRQoL measures exist.<sup>[7]</sup> The SF-36 is the most extensively validated and

used instrument to measure HRQoL.<sup>[8]</sup> The HRQoL is measured by the given questionnaires, and the responses to the items are converted into numeric values. Three domains, physical, mental, and social, are the main factors in the definition of HRQoL.<sup>[6]</sup>

Although previous studies have focused on the quality of life of PTC patients, most were focused on comparing the HRQoL between different surgical procedures, such as robotic versus conventional open thyroidectomy<sup>[9]</sup> or single-port access endoscopic thyroidectomy via an axillary approach.<sup>[10]</sup> Goldfarb and Casillas<sup>[11]</sup> studied the HRQoL in young adults with thyroid cancer; however, thyroid cancers with different histological characteristics showed significantly different outcomes. To date, no study has compared the HRQoL between PTC and control cases, and no report exists on the HRQoL changes after surgery. Our present study used the short-form (36 items) health survey (SF-36) HRQoL questionnaire to evaluate the baseline HRQoL of PTC patients (preoperative fine needle aspiration [FNA] without surgery) compared with that of control subjects and to assess postoperative changes in HRQoL after surgery.

## 2. Methods

### 2.1. Patient population

This is a prospective observational study; from February 2015 to March 2017, 186 PTC patients treated at West China Hospital of Sichuan University completed the SF-36 questionnaire (Chinese version) at least twice: preoperatively (necessary, after FNA of PTC, and before undergoing surgery) and postoperatively (at least 1 time: 1 month, 3 months, 6 months, 12 months, and 24 months after surgery). All questionnaire items were self-reported and completed under our guidance. Only respondents with no missing items were included, and the data were inputted into Excel files. The exclusion criteria consisted of a benign thyroid nodule or other thyroid cancer such as anaplastic thyroid cancer and medullary thyroid cancer; an age less than 18 years; and the inability to complete the questionnaire due to conditions such as blindness or illiteracy. Our present study was approved by our West China Hospital's ethical committee, and signed consent was obtained from all patients. The control group of 186 volunteers was matched by age, gender, ethnicity, educational level, marital status, work status, yearly income, diabetes or hypertension status, and smoking or alcohol consumption, as much as possible; all these volunteers were from those who did annual physical examination in the outpatient department; these subjects only completed one SF-36 questionnaire.

### 2.2. SF-36 questionnaire

The SF-36 (Chinese version) was used to evaluate the quality of life of our patients in the present study. The Chinese version of the SF-36 has been tested and is widely used in China.<sup>[12,13]</sup> The SF-36 questionnaire produces an 8-scale profile (physical functioning [PF], general health perceptions [GH], vitality [VT], role-physical [RP], bodily pain [BP], role-emotional [RE], social functioning [SF], and mental health [MH]) of health that can be used to calculate summary mental and physical health composite scores.<sup>[12]</sup> Each scale of scores is transformed to a scale of 0 to 100; higher scores indicate better quality of life, and lower scores indicate worse quality of life. Next, the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores were summarized and compared. The overall questionnaire also collected sociodemographic information

such as age, gender, marital status, education, and income level on the supplementary page.

### 2.3. Follow-up

All follow-up items for the 1-, 3-, 6-, 12-, 24-month questionnaires were completed in the outpatient department. The patients had to complete the questionnaires in person and alone; completion of the questionnaire by other individuals was forbidden. Although most of the HRQoL surveys were developed as simple paper-pencil questionnaires, Web and mobile technologies have further increased the ability to deliver the survey to patients in the clinic as well as outside of the traditional clinical visit to monitor patient progress with greater continuity.<sup>[14]</sup> Each copy of the questionnaire was examined by a specially trained person to evaluate the quality, for example, nonstandard or ambiguous answers, and then the investigators and respondents were contacted for timely verification.

### 2.4. Statistical analysis

The data were obtained by thyroid surgeons and were analyzed by biostatistics experts. Data entry was performed using Excel, and SPSS 17.0 (SPSS Inc., Chicago) was used for the statistical analysis. Descriptive statistics were used to report the distribution of clinical characteristics. Continuous variables were compared by 1-way analysis of variance or nonparametric tests; frequency variables were analyzed using Chi-square tests. A probability value of  $P < .05$  indicated a statistically significant difference. Spearman correlation analysis was used to identify the correlations between factors and quality of life in the present study, and then multiple regression analysis was performed to detect the independent factors of quality of life.

## 3. Results

### 3.1. Study sample

**3.1.1. Characteristics of the PTC patients and control group.** All volunteers' information were compared with that provided by the PTC patients. As summarized in Table 1, more female patients were included in both groups, although more patients who smoked were noted among PTC patients (27 vs

**Table 1**  
Baseline demographic features of the PTC patients and control group.

	PTC patients		P
	186	186	
Age	45.4 ± 13.3	45.1 ± 13.5	.820
Sex (male/female)	48/138	46/140	.710
Ethnicity (Han/others)	180/6	181/5	.760
Educational level (EE/SE/HE/PE)	3/60/109/14	8/63/101/14	.360
Married status (no/yes/divorced)	14/165/7	21/153/12	.765
Work status (working/ unemployed/retired)	98/15/74	88/13/85	.284
Yearly incoming (low/middle/high)	132/45/9	136/38/12	.737
Diabetes (yes/no)	5/181	10/172	.191
Hypertension (yes/no)	17/169	21/161	.516
Smoking (yes/no)	27/159	16/166	.057
Alcohol consumption (yes/no)	28/158	25/157	.622

EE = elementary education; HE = higher education; high income = more than 500 thousand RMB, low income = less than 100 thousand RMB; middle income = 100–500 thousand RMB; PE = postgraduate education; SE = secondary education.

**Table 2**  
**Baseline SF-36 scores of the PTC patients and control group.**

	PTC patients	General population	P
	186	186	
Physical functioning (PF)	92.1 ± 10.7	94.0 ± 9.5	.070
Role-physical (RP)	80.5 ± 32.3	86.4 ± 22.4	.041*
Bodily pain (BP)	87.5 ± 15.3	90.5 ± 11.8	.037*
General health (GH)	48.4 ± 10.8	52.6 ± 9.1	.000‡
Vitality (VT)	73.0 ± 16.6	78.0 ± 14.2	.002†
Social functioning (SF)	79.1 ± 19.4	85.5 ± 16.8	.001†
Role-emotional (RE)	74.6 ± 37.1	82.8 ± 29.0	.018*
Mental health (MH)	68.6 ± 15.4	73.4 ± 13.6	.002†
PCS	77.1 ± 13.1	80.9 ± 8.0	.001†
MCS	73.8 ± 18.2	79.9 ± 11.3	.000‡

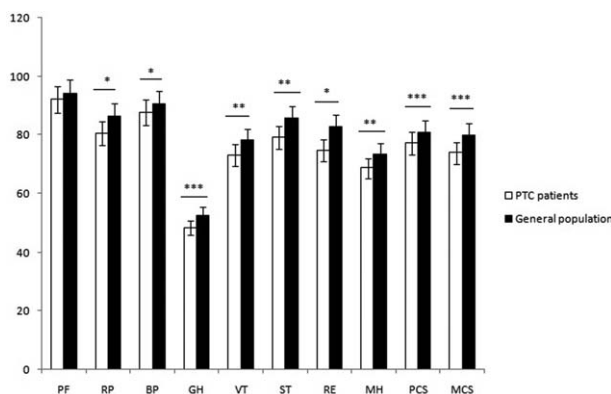
BP=bodily pain; GH=general health; MCS=Mental Component Summary; MH=mental health; PCS=Physical Component Summary; PF=physical functioning; RE=role-emotional; RP=role-physical; SF=social functioning; VT=vitality.

\* P < .05.  
 † P < .01.  
 ‡ P < .001.

16); however, this difference did not reach statistical significance (P=.057). Thus, the baseline characteristics of the general population were comparable with those of the PTC patients, indicating that our general population selection was effective.

**3.1.2. Baseline SF-36 scores.** As summarized in Table 2, PTC patients showed much lower scores on 7 domains (all P values were less than .05) of the SF-36. The difference in the PF domain was not statistically significant (P=.070). Meanwhile, the PCS and MCS scores were also much lower in the PTC patients than in the general population (all P values were less than .001, as shown in Fig. 1).

**3.1.3. Univariate and multivariate analysis for MCS and PCS scores.** To identify the risk factors for lower MCS and PCS scores, we defined the cutoff values of PCS and MCS scores as 77.1 and 73.8, respectively, based on the mean values of the PTC patients. The univariate analysis included the following factors: age >45 years, female gender, Han ethnicity, lower education level (EE/ SE), divorced, unemployed, low income, diabetes or hypertension, smoking or alcohol consumption, and PTC.



**Figure 1.** Baseline SF-36 score comparison between PTC patients and the control group: PTC patients showed significantly lower scores than the control group in 7 domains of HRQoL (RP, BP, GH, VT, SF, RE, MH) and on the PCS and MCS (all P values were less than .05).

Among these factors, diabetes or hypertension and PTC were shown to be statistically significant and were included in the multivariable analysis, as summarized in Table 3. PTC was the risk factor for lower PCS and lower MCS scores (P < .001).

**3.1.4. SF-36 score changes during follow-up.** Compared with the baseline preoperative SF-36 scores, the follow-up scores showed a significant reduction in all 8 domains; however, only PF, RP, BP, and RE reached statistical significance (the a, b, c, and d values were less than 0.05), as summarized in Table 4. In addition, the PCS and MCS scores showed a significant reduction from the preoperative levels at 1 month postoperative (the e and f values were less than 0.05). However, when the 6-month SF-36 scores were compared with the 1-month SF-36 scores, an obvious recovery was observed for all aspects, and PF, RP, and BP were significantly increased (the g, h, and I values were less than 0.05); a similar trend was observed for the PCS scores. Even with the obvious increase in the MCS scores, the difference did not reach statistical significance (P=.078). A significant decrease was found 12 months after surgery, although only RF showed a significant reduction (P=.020). The continuous changes in the PCS and MCS scores are shown in Fig. 2. However, 2 years after surgery, most domain scores had not recovered to the levels of the general population, including the PCS and MCS scores (all P values were less than .05).

**4. Discussion**

Although PTC has a low disease-specific mortality, patients must undergo a substantial lifelong surveillance for PTC recurrence. This issue is likely responsible for the increased complaints regarding psychological issues and anxiety,<sup>[15]</sup> which are related to the quality of life after surgery. Previous studies have reported that emotional and psychological concerns are largely unmet in PTC patients.<sup>[10,16,17]</sup> Our current analysis should be considered in the context of the variable results of several reports on HRQoL in PTC patients. However, our study has some potentially important improvements compared with these previous reports.<sup>[10,15,18]</sup> First, we compared the baseline HRQoL of 186 PTC patients with that of the 186 subjects from the general population and found that all 8 domains of HRQoL were lower in the PTC patients; 7 domains were significantly different. Second, we have identified PTC and diabetes or hypertension as risk factors for lower HRQoL scores. Third, we observed consistent changes in HRQoL after surgery. Finally, our study is the first report from an Asian country to use the SF-36 to evaluate HRQoL in PTC patients.

The results of the present study revealed that the HRQoL was worse than that of the control general population, despite the excellent prognosis of PTC.<sup>[19]</sup> In addition, 6 domains of general health (VT, RP, BP, RE, SF, and MH) were significantly lower in the PTC patients than in the control group. The primary reason for the lower score may be associated with the negative emotions related to the patient’s body image and perceived stigma, as well as struggles and fears related to the cancer experience.<sup>[15,20]</sup>

As might be expected and as reported in previous studies, the HRQoL of PTC patients was at its lowest level during the first 6 months and improved during the 2 years after surgery; however, the HRQoL was still compromised 2 years later, consistent with the findings in previously published papers.<sup>[16,21,22]</sup> In a study by Smith et al,<sup>[22]</sup> PTC patients showed worse HRQoL according to both PCS and MCS scores at 6 months after diagnosis and surgery. In our present study, the worst HRQoL

**Table 3****Univariate and multivariate analyses of factors contributing to lower PCS and MCS scores.**

	Univariate analysis		Multivariate analysis	
	<i>P</i>	HR (95% CI)	<i>P</i>	
<b>PCS</b>				
Age ( $\leq 45 / > 45$ y)	.872			
Gender (male/female)	.281			
Race (Han/Others)	.984			
Education level (low/high)	.522			
Married status (divorced/other)	.382			
Employ status (employed/unemployed)	.678			
Family income (low/high)	.462			
Diabetes (yes/no)	.029	2.012 (0.943–2.832)		.091
Hypertension (yes/no)	.018	1.761 (0.820–3.161)		.132
Smoking consumption (yes/no)	.761			
Alcohol consumption (yes/no)	.289			
PTC (yes/no)	<.001	12.349 (6.832–18.922)		<.001
<b>MCS</b>				
Age ( $\leq 45 / > 45$ y)	.621			
Gender (male/female)	.271			
Race (Han/Others)	.182			
Education level (low/high)	.872			
Married status (divorced/other)	.472			
Employ status (employed/unemployed)	.561			
Family income (low/high)	.283			
Diabetes (yes/no)	.027	1.282 (0.891–2.478)		.211
Hypertension (yes/no)	.046	1.562 (0.936–2.652)		.187
Smoking consumption (yes/no)	.091			
Alcohol consumption (yes/no)	.188			
PTC (yes/no)	<.001	8.661 (4.543–15.336)		<.001

CI = confidence interval; HR = hazard ratio; MCS = Mental Component Summary; PCS = Physical Component Summary.

was also observed at 1 month after surgery, as shown in Fig. 2. The cause may be due to transient complications; 30% to 60% of patients may develop transient hypoparathyroidism or recurrent laryngeal nerve paralysis,<sup>[23]</sup> and most of these transient complications may show recovery within 1 year.<sup>[24,25]</sup> Meanwhile, this is an obvious reduction from 6 to 12 months after surgery; the main reason may be the radiation therapy or PTC recurrence. Previous studies have shown that, within the first year after surgery, an obvious scar may negatively affect the HRQoL of PTC patients.<sup>[26]</sup> Furthermore, 1 year after surgery, the fluctuation of laboratory tests such as the measurement of the thyroid stimulating hormone (TSH), free thyroxine (FT)<sub>4</sub>, FT<sub>3</sub>,

or Tg levels may increase the patient's fear of PTC recurrence and lead to multiple visits to clinics, hospitals, and doctors' offices. A study by Lubitz et al<sup>[15]</sup> reported that the HRQoL returns to baseline by the 12-month follow-up visit, which was not consistent with our results; the main reason may be due to their short-term follow-up period. In 1 cross-sectional survey of 318 patients over 11 years of follow-up, half of the patients continued to experience health deficits, and the number of patients who complained of health effects was twice that of patients with other types of cancer.<sup>[27]</sup> Other studies from Austria have reported that the domains of VT and RE remained reduced years after surgery even without the recurrence of PTC.<sup>[15]</sup>

**Table 4****Quality of life after surgery for PTC patients.**

	Preoperative	1 mo	6 mo	12 mo	24 mo
Physical functioning (PF)	92.1 ± 10.7	82.3 ± 16.9 <sup>a</sup>	92.9 ± 8.6 <sup>g</sup>	83.6 ± 22.6 <sup>k</sup>	89.2 ± 13.5 <sup>m</sup>
Role-physical (RP)	80.5 ± 32.3	57.0 ± 42.2 <sup>b</sup>	80.3 ± 32.4 <sup>h</sup>	71.9 ± 43.0	75.8 ± 28.2 <sup>n</sup>
Bodily pain (BP)	87.5 ± 15.3	78.4 ± 18.2 <sup>c</sup>	87.3 ± 10.7 <sup>i</sup>	81.2 ± 16.1	82.8 ± 12.7 <sup>o</sup>
General health (GH)	48.4 ± 10.8	49.5 ± 13.2	49.5 ± 12.7	47.1 ± 12.9	49.3 ± 11.6
Vitality (VT)	73.0 ± 16.6	68.0 ± 15.7	71.3 ± 20.4	68.4 ± 18.4	71.5 ± 15.9 <sup>p</sup>
Social functioning (SF)	79.1 ± 19.4	75.9 ± 19.7	80.3 ± 16.6	73.8 ± 21.8	70.4 ± 21.9 <sup>q</sup>
Role-emotional (RE)	74.6 ± 37.1	64.6 ± 42.3 <sup>d</sup>	74.6 ± 39.8	66.7 ± 50.8	71.1 ± 34.7 <sup>r</sup>
Mental health (MH)	68.6 ± 15.4	67.6 ± 18.0	69.0 ± 20.2	68.8 ± 20.1	65.7 ± 19.9 <sup>s</sup>
PCS	77.1 ± 13.1	66.8 ± 16.5 <sup>e</sup>	77.5 ± 12.2 <sup>j</sup>	71.0 ± 16.7	74.3 ± 11.8 <sup>t</sup>
MCS	73.8 ± 18.2	69.0 ± 17.8 <sup>f</sup>	73.8 ± 20.0	69.4 ± 23.2	69.7 ± 17.7 <sup>v</sup>

1 month vs preoperative: a = 0.001; b < 0.001; c < 0.001; d = 0.049; e < 0.001; f = 0.048.

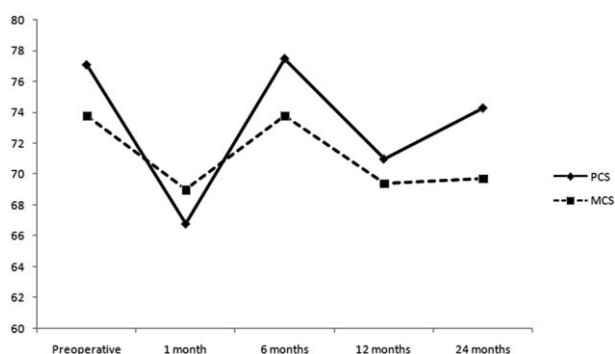
6 months vs 1 month: g = 0.016; h = 0.028; i = 0.014; j = 0.04.

12 months vs 6 months: k = 0.020.

24 months vs general population: m = 0.016; n = 0.022; o = 0.001; P = 0.024; q < 0.001; r = 0.048; s = 0.009; t < 0.001; v < 0.001.

MCS = Mental Component Summary; PCS = Physical Component Summary.





**Figure 2.** Postoperative changes in the PCS and MCS scores of PTC patients: A significant decrease was observed 1 month after surgery, and then an obvious recovery occurred 6 months after surgery; however, the scores did not reach those of the general population level, even after 2 years of follow-up.

We acknowledge that our present study has some limitations. The cohort of the study participants was small, and the study was a single-center analysis that may not entirely reflect the Chinese population. In addition, many reports have compared different types of HRQoL questionnaires.<sup>[15]</sup> Due to language limitations, only the SF-36 has a Chinese version<sup>[28]</sup>; thus, our present study only used the SF-36 to evaluate the HRQoL in PTC patients. Postoperative therapies such as RAI or TSH-suppressive therapies may also influence the HRQoL,<sup>[15]</sup> and these factors were not considered in the present study.

In conclusion, PTC patients need much attention and more long-term observation even with surgery for the decreased preoperative and postoperative HRQoL scores.

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