

The quantification and clinical analysis of depression and anxiety in patients undergoing Da Vinci robot-assisted radical gastrectomy and open radical gastrectomy

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The purpose of paper is to investigate the depression and anxiety as well as independent influential factors between patients who underwent Da Vinci robot-assisted radical gastrectomy and radical gastrectomy. This study is a partially randomized patient preference trial. A total of 98 patients with gastric cancer were divided into the Da Vinci robot-assisted radical gastrectomy group (46 patients, observation group) and open radical gastrectomy group (52 patients, control group). They were also postoperatively and preoperatively measured with Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS). The postoperative and preoperative data of each group were compared. The postoperative and preoperative standard scores of SDS and SAS in patients with the observation group were NS differences ($P > 0.05$). In the conventional control group, the postoperative mean scores of SDS and SAS were significantly higher than those in the preoperative mean scores and the postoperative mean scores of the observation group, respectively ($P < 0.01$). The multivariate logistic regression analysis indicated that the independent influential

factors of depression and anxiety in patients with radical gastrectomy included tumor, node, metastases stage, pain grading, other postoperative complications and postoperative insomnia ($P < 0.05$). Robot-assisted radical gastrectomy for gastric carcinoma is conducive to relieving patients' anxiety and depression and improving their quality of life due to the advantages of relatively low incidence of pain, reduced complications and relatively good sleep. *European Journal of Cancer Prevention* 30: 442–447 Copyright © 2020 The Author(s). Published by Wolters Kluwer Health, Inc.

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Introduction

Gastric cancer is a very common malignant tumors worldwide, with the fifth highest incidence rate in the world and the third highest mortality rate in the world is the main cause of cancer death after lung cancer (Torre *et al.*, 2015; Hulko *et al.*, 2012). There are 989 600 new cases of gastric cancer and 738 000 deaths of gastric cancer every year in the world, with its morbidity and mortality accounting for 8% and 10% of cancer patients, respectively. In addition, more than 70% of these newly diagnosed cases of gastric cancer and deaths are found in developing countries (Jemal *et al.*, 2011). At present, the primary treatment for gastric cancer is surgery. The surgical modes mainly include: open radical gastrectomy, laparoscopic radical gastrectomy and Da Vinci robot-assisted radical gastrectomy. With the advancement of medical technology, the Da Vinci surgical system has been widely used in radical surgery for gastric cancer due to its stability, flexibility and fineness (Garcia and Rayhrer 2017).

With the transformation in the medical model, the influences of psycho-social factors on the occurrence, development and outcome of gastric cancer has been drawing increasing attention from the medical community. The study on anxiety and depression originated from the evaluation of mental state and therapeutic effect of mental patients and some neurological disorder patients. In recent years, it has been gradually applying to the mental evaluation of cancer patients. It has been demonstrated by modern medicine to not only cause digestive and physical lesions in patients, but also bring exert mental and psychological effects on patients. Anxiety and depression are the most common negative emotions experienced by gastric cancer patients during the treatment and have an important impact on the prognosis and quality of life of gastric cancer patients (Xu *et al.*, 2016). The incidence of anxiety and depression in gastric cancer patients is reported to be up to 37%, and age, gender, education background, tumor stage and fear to surgery are independent factors affecting depression and anxiety in gastric cancer patients (Arrieta *et al.*, 2013). The increased scores of depression and anxiety following the radical gastrectomy for gastric cancer are closely associated with the surgery-induced trauma and complications

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(Yu *et al.*, 2012). Therefore, the combination of psychosocial therapy as part of comprehensive treatment with the conventional treatment for gastric cancer can not only assist and enhance the effect of conventional treatment, but also prolong patients' survival time and improve their quality of life. There has been no report on the incidence, degree and influencing factors of depression and anxiety in patients undergoing Da Vinci robot-assisted radical gastrectomy for gastric cancer. In the present study, we quantified the preoperative and postoperative depression and anxiety in patients undergoing Da Vinci robot-assisted radical gastrectomy for gastric cancer and open radical gastrectomy by using the psychiatric scales, to study the changes in the preoperative and postoperative psychological emotions in patients with gastric cancer, analyze the factors affecting patients' psychological emotions and provide a basis for the clinical investigation of the preoperative and postoperative psychological state changes and their influencing factors. It has been demonstrated by modern medicine to not only cause digestive and physical lesions in patients, but also bring exert mental and psychological effects on patients.

In the present study, we quantified the preoperative and postoperative depression and anxiety in patients undergoing Da Vinci robot-assisted radical gastrectomy for gastric cancer and open radical gastrectomy by using the psychiatric scales, to study the psychological effects of different surgical modes on patients with gastric malignant tumors, analyze the influencing factors, provide a basis for individualized precision treatment of gastric cancer in clinical research and achieve a better improvement in the quality of life of patients with gastric carcinoma.

Materials and methods

Ethics statement

This study was approved by the Medical Ethical Committees for Ethical Review of Bengbu Medical College (065). The methods were performed in accordance with the relevant guidelines and regulations.

General data

This will be a partially randomized patient preference trial. The primary endpoint is depression and anxiety. A total of 98 patients with gastric cancer admitted from January 2018 to October 2019 to the Department of Oncological Surgery, the First Affiliated Hospital of Bengbu Medical College. During the single enrollment period, patients were allowed to choose their group assignment, the Da Vinci robot-assisted radical gastrectomy group (46 patients) and open radical gastrectomy group (52 patients). They were aged from 35 to 75 years old, with a mean of 58.42 ± 7.65 years old. Inclusion criteria were as follows: all patients underwent endoscopic biopsy and were pathologically diagnosed with gastric cancer; no previous history of major abdominal surgery; preoperative exclusion of contraindications for radical surgery: (a) difficulty in tolerating surgery due to general conditions; (b)

incapability of receiving complete resection due to local infiltration; (c) confirmed evidence of distant metastases, including distant lymph node metastasis, extensive peritoneal dissemination and more than three metastases in the liver; (d) difficulty in tolerating surgery due to obvious functional defects in important organs such as heart, lungs, liver, and kidneys, severe hypoproteinemia, anemia and malnutrition; (e) refusal to surgery; postoperative hospital stay for more than 1 week; no chronic disease-related complications such as hypertension, diabetes and heart disease; with a clear mind and voluntarily taking the survey and obtaining informed consent. Exclusion criteria were as follows: patients received chemotherapy or radiotherapy before surgery; tumor recurrence or metastasis; patients with previous history of mental disorders and patients who could not tolerate surgery.

Investigation methods

Questionnaires, the Zung's Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS), were administered to patients on the second day after admission and on the seventh day after the operation. This study design is a randomized, controlled trial. The primary endpoint is depression and anxiety. The trial implemented and managed by professionally trained doctors and nurses. The respondents completed the questionnaires independently and without families present, with doctors available to clarify questions as needed regarding the 20 items of the SDS and the 20 items of the SAS. Investigators collected the completed questionnaires. The threshold scores for depression and anxiety were 50 for the SDS and 50 for the SAS. However, the questionnaire must be personally completed by the patients. At the time of the self-assessment, the family members were asked to withdraw themselves and the scale was collected on site. A total rough score was obtained by adding the scores of the 20 items, and then converted by the formula: $Y = \text{Int}(1.25 X)$, where Y was the standard score, X was the total rough score and Y was the integer part of the number obtained from multiplying the total rough score by 1.25 times. A standard score of ≥ 50 points indicated that the patient had anxiety or depression.

Statistical analysis

Data are presented as mean \pm SD. Statistic comparisons were performed using Student's *t*-test for paired observations or by the chi-square test for grouped comparison. Logistic regression was used for analysis of the correlated influence factors. The statistical significance level was set at $P < 0.05$.

Results

Preoperative and postoperative mean scale value of depression and anxiety were compared between the Da Vinci group and open surgery

According to Chinese norms, the 50 points was a borderline score, and a standard score of not less than 50 points

Table 1 Preoperative and postoperative mean scale value of depression and anxiety were compared between the Da Vinci group and the open surgery group (mean ± SD)

	SDS			SAS		
	BO	AO	P value	BO	AO	P value
Da Vinci	44.63 ± 4.66	46.59 ± 4.81	0.071	41.98 ± 5.72	43.63 ± 6.2	0.084
Open surgery	44.81 ± 5.14	51.94 ± 5.32	0.000	41.67 ± 6.11	48.31 ± 5.36	0.026
P value	0.437	0.007		0.460	0.002	

AO, after the operation; BO, before the operation; Da Vinci, Da Vinci robot-assisted radical gastrectomy; SAS, Self-Rating Anxiety Scale; SDS, Self-Rating Depression Scale

Table 2 Comparison of clinical features in gastric cancer patients with depression and anxiety

	N	PWD	P value	PWA	P value
Sex					
Male	60	25	0.068	22	0.072
Female	38	14		20	
Age (years)					
≤60	18	12	0.118	16	0.159
>60	80	37		26	
Disease course (days)					
≤7	35	23	0.075	19	0.172
>7	63	26		23	
Residence					
Rural	42	24	0.115	24	0.104
Urban	56	25		18	
Medical insurance					
Yes	62	28	0.081	25	0.067
No	36	21		17	
Fasting blood glucose (mmol/l)					
≥8	41	21	0.092	19	0.136
<8	57	28		23	
TNM stage					
I-II	61	23	0.022	20	0.031
III-IV	38	26		23	
Tumor size (cm)					
≤3	47	20	0.046	16	0.0610
>3	52	29		26	
Histological type					
H-M differentiated adenocarcinoma	67	30	0.037	27	0.053
Low-undifferentiated adenocarcinoma	31	19		15	
Intraoperative blood loss (ml)					
<200 ml	57	18	0.042	16	0.063
≥200 ml	41	31		26	
Pain rating					
<II	37	15	0.017	11	0.002
≥II	61	34		31	
PASC					
With	8	36	0.025	33	0.007
Without	90	13		9	
Insomnia					
With	26	33	0.011	31	0.012
Without	72	16		12	
Operation methods					
Da Vinci Robot	46	11	0.004	10	0.020
Open surgery	52	38		32	

Da Vinci, Da Vinci robot-assisted radical gastrectomy; H-M differentiated adenocarcinoma, high-medium differentiated adenocarcinoma; PASC, postoperative anastomotic stoma complications; PWD, patients with depression; PWA, patients with anxiety; TNM, tumor, node, metastases.

indicated the presence of anxiety or depression. There were no statistically significant differences in preoperative standard SDS and SAS scores between the patients receiving the Da Vinci robot-assisted radical gastrectomy group and the open radical gastrectomy ($P > 0.05$). There were no statistically significant differences between the postoperative SDS and SAS scores and the preoperative SDS and SAS scores for the patients in the Da Vinci

Table 3 Comparison the complications, pain and insomnia between the Da Vinci robot-assisted radical gastrectomy group and the laparotomic radical gastrectomy group

	Da Vinci Robot	Open surgery	P value
Pain rating			
≥II	15	35	0.000
<II	31	17	
PASC			
With	3	5	0.037
Without	43	47	
Insomnia			
With	10	19	0.013
Without	36	33	

PASC, Postoperative anastomotic stoma complications.

robot-assisted radical gastrectomy group ($P > 0.05$). The postoperative SDS and SAS scores in the open radical gastrectomy increased significantly, showing statistically significant differences, compared to those in the Da Vinci robot-assisted radical gastrectomy group ($P < 0.01$). The specific data are shown in Table 1.

Comparison of clinical features in gastric cancer patients with depression and anxiety

The degree of depression and anxiety assessment in gastric cancer patients was associated with tumor, node, metastases (TNM) stage, pain level, complications, insomnia and surgical mode. The incidence of depression and anxiety in patients with TNM stage III-IV, pain of grade II or above, postoperative complications and postoperative insomnia, and patients at the status post-open radical gastrectomy remained relatively high ($P < 0.05$). The specific data are shown in Table 2.

Comparison complications, pain and insomnia between the Da Vinci robot-assisted radical gastrectomy group and open radical gastrectomy

The patients in the Da Vinci robot-assisted radical gastrectomy for gastric cancer had lower incidence of complications, milder pain and improvement in insomnia, compared to those in the open radical gastrectomy, showing statistically significant differences ($P < 0.05$). The specific data are shown in Table 3.

Multivariate analysis of the relationship between depression, anxiety and the clinical features

Logistic multivariate regression analysis showed that the incidence of depression and anxiety in patients with

TNM stage III–IV, pain of grade II or above, postoperative complications and postoperative insomnia, and patients at the status post-open radical gastrectomy remained relatively high ($P > 0.05$). The specific data are shown in Table 4.

Discussion

At present, the treatment of gastric cancer is a multidisciplinary team model, involved in the scheduled and rational use of therapeutic measures such as surgery, chemotherapy, radiotherapy and biological targeting treatments, to achieve radical cure or maximum tumor control, prolong patient's survival and improve their quality of life. The cancer patients are at a relatively general poor status of mental health, and the incidence of depression and anxiety is twice that of normal people, especially in patients with gastrointestinal tumors (Jadoon *et al.*, 2010). In patients with gastric cancer, the occurrence of depression and anxiety greatly affect their treatment, prognosis and quality of life. Therefore, how to effectively reduce the occurrence of depression and anxiety and timely and accurately diagnosis of depression and anxiety is also a new problem emerging in the current treatment of gastric cancer.

The application in surgical oncology not only helps in reducing patients' complications and facilitating their rehabilitation, but also plays an active role in helping medical staffs to change the traditional treatment thinking and nursing modes. SAS and SDS scales are characterized by a relatively wide application in clinical treatment and scientific research, high validity, good reliability, and simple and easy application; its contents involve emotional experience and emotion-related somatic symptoms, and these symptoms are relatively common in patients at the status post-open radical gastrectomy (Lijuan *et al.*, 2018). Compared to the traditional open radical gastrectomy for gastric cancer, Da Vinci robot-assisted radical gastrectomy for gastric cancer is characterized by small trauma, accurate surgical range, less intraoperative bleeding, early proper timing for postoperative food intake and high rate of lymphatic clearance (Suda *et al.*, 2015),

which makes the Da Vinci surgical system increasingly applied in radical gastrectomy. There has been no report on the comparative study on the depression and anxiety measurement in patients at the status post-Da Vinci robot-assisted radical gastrectomy for gastric cancer and open radical gastrectomy for gastric cancer. The present study showed that the preoperative SDS and SAS scores in the Da Vinci robot-assisted radical gastrectomy group and the open radical gastrectomy were not statistically significant. The preoperative and postoperative SDS and SAS scores in the Da Vinci robot-assisted radical gastrectomy group were not statistically significant. The SDS and SAS scores of the patients at the status post-open radical gastrectomy were higher than the status post-Da Vinci robot-assisted radical gastrectomy. These results indicated that compared to the open radical gastrectomy, the Da Vinci robot-assisted radical gastrectomy could relieve depression and anxiety and was beneficial to postoperative recovery and quality of life. The comparison of clinical features in gastric cancer patients with depression and anxiety showed that the incidence of the depression and anxious mood was associated with female patients, patients with pain of grade II or above, postoperative complications and postoperative insomnia, and surgical mode (open radical gastrectomy). Multivariate logistic regression analysis found that TNM stage III–IV, pain of grade II or above, complications, insomnia and laparotomy were independent influencing factors of depression and anxiety in patients after radical gastrectomy. These results suggested that the observation of the patient's psychological state should be strengthened during the active treatment of gastric treatment, together with the timely detection of the patient's abnormal psychological state and behaviors; in addition, effective psychological intervention should be performed to correct the patient's psychological state. Under the modern new medical mode of 'biology-psychology-society' (Song *et al.*, 2010), a single biological treatment model does not match the diagnosis and treatment goals of gastric cancer. More attention should be paid to the mental health of cancer patients, so that patients can maintain good emotions, thus achieving improvement in the prognosis of malignancy, quality of life and survival rate of patients with malignant tumor (Pinquart and Duberstein 2010).

Da Vinci robot-assisted radical gastrectomy for gastric cancer reduces the postoperative pain in patients by reducing skin incision and reducing trauma, thus relieving their psychological stress (Cohen and Raja 2013; Park *et al.*, 2010). Tumor patients have more intraoperative bleeding and are more likely to experience fatigue, weakness and negative emotions, further affecting overall health. The cause is the insufficient oxygen supply to the brain due to anemia and psychological emotions (fatigue, emotional health and cognitive impairment) (Vulser *et al.*, 2016). Human psychological stress induces inflammatory responses by producing small messenger molecules and

Table 4 Logistic regression analysis of the clinical features in gastric cancer patients with depression and anxiety

Variables	β value	SE	Wald χ^2		OR	95% CI	P value
			value	value			
Depression							
TNM stage (III–IV)	0.521	0.131	10.342	1.241	1.510–2.142	0.000	
Pain rating (>II)	0.475	0.201	9.384	1.742	1.226–1.919	0.000	
PASC	0.646	0.172	12.338	1.528	1.435–1.896	0.010	
Insomnia	0.576	0.163	10.991	1.637	1.324–1.796	0.030	
Anxiety							
TNM stage (III–IV)	0.547	0.150	10.988	1.369	1.621–1.944	0.000	
Pain rating (>II)	0.611	0.201	11.728	1.642	1.186–1.854	0.000	
PASC	0.658	0.212	12.978	1.778	1.351–1.947	0.013	
Insomnia	0.596	0.189	11.683	1.621	1.434–2.045	0.011	

CI, confidence interval; OR, odds ratio; PASC, postoperative anastomotic stoma complications; TNM, tumor, node, metastases.

proinflammatory cytokines, such as interleukin-1 β (IL-1 β), interleukin-6 (IL-6) and tumor necrosis factor alpha (TNF α); these proinflammatory cytokines could in turn act on the brain-induced depression-like state, and there is a reason to believe that stress-induced inflammatory responses increased the psychological disorder in patients (Slavich and Irwin 2014). Complications post-radical gastrectomy such as duodenal stump fistula, anastomotic leakage, intestinal obstruction, abdominal hemorrhage, acute pancreatitis, gastroparesis syndrome and lung infection are an inflammatory reaction; the release of inflammatory mediator often aggravates the postoperative psychological disorders in patients, causing anxiety and depressive state. The main reasons for the lower incidence of anxiety and depression in patients with gastric cancer following Da Vinci robot-assisted radical gastrectomy are as follows: Da Vinci robot-assisted radical gastrectomy for gastric cancer is characterized by small trauma, low volume of bleeding, and smaller amount of inflammatory factors than open radical gastrectomy, and the extent of postoperative anxiety and depression is correspondingly reduced. As a latest way for the radical operation for gastric cancer, Da Vinci robot-assisted radical gastrectomy for gastric cancer can significantly relieve the pain and achieve early remission, compared to the laparoscopic and open radical gastrectomy, which is the main cause for the low incidence anxiety and depression after the Da Vinci robot-assisted radical gastrectomy for gastric cancer; Da Vinci robot-assisted radical gastrectomy for gastric cancer is characterized by a relatively postoperative recover, enhanced confidence in fighting the disease by the efficacy within a shorter period of time and reduced negative emotions. Da Vinci robot-assisted radical gastrectomy for gastric cancer has become the mainstream trend of minimally invasive surgery. It has the advantages of less trauma, wide indications of minimally invasive surgery, reduced postoperative pain, reduced volume of blood loss, and reduced intraoperative tissue trauma and inflammatory response, because of which, the patient's postoperative state of anxiety and depression are reduced, thereby improving their quality of life after surgery with reduced mortality and complications. During the clinical treatment of gastric cancer, we should pay more attention to the patient's mental and psychological state, minimize the psychological barriers caused by surgical trauma, have a strict mastery on the indications of minimally invasive surgery and strengthen the doctor-patient communication and family-patient communication. For patients with an SDS and SAS scores greater than 50, most of them have personality deviation, characterized by stubbornness, stereotype, irritability and suspiciousness, which seriously affects the treatment effect and quality of life of patients with gastric cancer. First, attempts should be made to improve the understanding of specialists on depression and anxiety, and learn the harm of depression and anxiety on patients; second, in terms of treatment, patients should be given

psychologic counselling, and if necessary, a consultation with a psychiatrist is required, with the combination of symptomatic treatment of depression and anxiety, and the following recommendations are proposed: the cognitive behavior therapy, dynamic psychological therapy, biological feedback therapy and relaxation therapy, and so on, can be adopted for psychological intervention so that patients can establish a healthy thinking, emotional and behavioral modes for diseases. Doctor-patient communication should be consolidated to stimulate patient's psychosomatic self-regulation so that the treatment of primary diseases can be greatly boosted based on the elimination of depression and anxiety (Zhu *et al.*, 2016). The drug treatment is as follows – the current psychotropic antidepressive and antianxious drugs mainly include: β -adrenaline receptor blocking agent, mono-oxygenase inhibitor, benzodiazepine, selective 5-hydroxytryptamine (5-HT) reuptake inhibitor and other drugs (such as buspirone hydrochloride tablets and venlafaxine) (Fang *et al.*, 2019). Psychiatrists are advised to give individualized treatment after consultation under the condition of drug intervention (Cohen *et al.*, 2016).

In summary, patients with gastric cancer are somewhat at a status of anxiety and depression before surgery, and patients receiving open radical gastrectomy have significantly elevated postoperative depression and anxiety, compared to before surgery. In comparison with traditional open radical gastrectomy, Da Vinci robot-assisted radical gastrectomy for gastric cancer greatly reduces patient's depression and anxious mood due to the advantages of less trauma, low volume of blood loss, reduced pain and complications, which represents another major advantage of Da Vinci robot-assisted radical gastrectomy.

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Conflicts of interests

There are no conflicts of interest.

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