Original Article

# Analysis of the risk factors of negative emotions in patients undergoing microwave ablation of thyroid nodules during the perioperative period and its impact on prognosis: a prospective cohort study

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**Background:** Thyroid nodule (TN) is one or more abnormal lump structures in the thyroid gland parenchyma caused by genetic, environmental, and other factors. It is the most common thyroid disease in clinics. Microwave ablation (MWA) can significantly reduce the nodule volume and effectively reduce the symptoms caused by nodules. However, the patient's negative emotions during the perioperative period may affect the postoperative recovery. This study explored the risk factors of negative emotions in patients during the perioperative period and its impact on patient prognosis. This data provides a basis for clinical psychological interventions before MWA, so as to improve the quality of life of patients with TN.

**Methods:** A total of 238 patients who were hospitalized for TNs in The First Affiliated Hospital of Soochow University from January 2017 to January 2022, and who received MWA therapy were enrolled in this study. The patients were evaluated with a general situation questionnaire, a Self-rating Anxiety Scale (SAS), and a Self-rating Depression Scale (SDS). The TN volume was followed up to evaluate the prognosis of patients. Binary logistic regression was used to analyze the risk factors of perioperative negative emotions and the impact of negative emotions on the prognosis.

**Results:** The results of binary logistic regression analysis showed that education, income, hypertension, hyperglycemia, and solid nodule volume were independent influencing factors of anxiety ($P<0.05$). Age, income, hypertension, hyperglycemia, and solid nodule volume were independent influencing factors of depression ($P<0.05$). The prognosis of patients with no negative emotions at the first, third, and sixth months after surgery was significantly better than that of patients with negative emotions ($P<0.05$).

**Conclusions:** Negative emotions have a significant impact on the prognosis of TNs. According to individual differences, targeted nursing intervention should be supplemented to stabilize a patient's emotions, improve compliance, and enhance quality of life.

**Keywords:** Thyroid nodule (TN); microwave ablation (MWA); perioperative period; anxiety; prognosis

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## Introduction

Thyroid nodule (TN) is one or more abnormal lump structures in the thyroid gland parenchyma caused by genetic, environmental, and other factors. It is the most common thyroid disease in clinics (1). With the development of high-frequency ultrasound technology, the detection rate of TNs has increased annually. Approximately 80–95% of TNs are benign (2), and asymptomatic benign nodules do not require treatment (3). Treatment is only necessary if the nodule protrusion affects aesthetics, local compression causes discomfort, the related anxiety affects normal life, or there is a possibility of malignancy (1). The surgical treatment of benign TNs includes traditional open surgical resection, endoscopic or endoscopic resection, and other treatment options including radioiodine-131 radiotherapy and drug therapy to suppress thyroid hormone. However, there are certain situations that may affect the quality of life of patients after the above treatments. For example, surgical scars may damage the aesthetics of the neck, radioactive iodine-131 requires life-long administration, thyroid hormone inhibition therapy may be ineffective at reducing the nodule volume, and there is the risk of hypothyroidism. To reduce the long-term impacts of the above treatment methods on patient well-being, ultrasound-guided thermal ablation has gradually become an alternative treatment for benign TNs. Common ultrasound guided thermal ablation methods include laser ablation (LA), radio frequency ablation (RFA), and microwave ablation (MWA). The latter has been applied effectively in liver, kidney, lung, and breast cancer, as well as other diseases (4,5). In recent years, successive MWA therapy has been applied to treat thyroid tumors (6). Liang *et al.* conducted ultrasound guided MWA in 474 cases of benign TNs and followed up for one year. The study showed that the volume reduction rate (VRR) was 94% 12 months later, and the VRR of nodules with cystic components was significantly higher than that of solid and solid components, which confirmed the safety and effectiveness of MWA in treating benign TNs (7-10). In addition, some studies have demonstrated the efficacy of MWA on solid TNs, with a VRR of 45–65% over a 1–12 months follow-up period (7,11-14). Feng *et al.* reported that MWA can effectively improve patient symptoms and beauty scores (11). A comparative study between MWA and surgical treatment of benign TNs demonstrated that MWA significantly reduced the nodule volume and effectively reduced the symptoms caused by the nodules. Compared with surgery, MWA was associated with less trauma, faster recovery, better cosmetic effect, less physiological interference, and lower costs, all of which is conducive to the postoperative recovery of patients (12,15). Heck *et al.* treated 30 patients with benign TNs using MWA, and demonstrated a significant VRR of 51.4% and 55.8% at 3 and 6 months after the operation, respectively. In addition, the serum triiodothyronine (T3), thyroxine (T4), thyroid stimulating hormone (TSH), and thyroglobulin (Tg) levels at 3 and 6 months after the operation were not significantly different from that before the operation. Two patients produced anti-Tg antibodies and anti-thyroid peroxidase (anti-TPO). The study showed that MWA treatment of benign TNs did not affect thyroid function, but long-term observation of antibody levels after the operation is required (16). In addition, the use of "liquid isolation zone" and "mobile ablation technology" during the operation can effectively improve the ablation efficiency and reduce postoperative complications. A lack of knowledge related to MWA therapy of TNs, together with a fear of surgical failure and postoperative recovery, can often lead to psychological adverse stress reactions in patients. Negative emotions can manifest as anxiety and depression during the perioperative period. Such negative emotions can directly or indirectly affect the smooth operation and postoperative recovery. To date, studies have mainly focused on the impact of negative emotions, such as anxiety and depression, on TNs (17-21); with little attention on the impact of anxiety and depression on the prognosis of patients with TNs. Therefore, this current study explored the risk factors of a

### Highlight box

**Key findings**

- Negative emotions have a significant impact on the prognosis of TNs. According to individual differences, targeted nursing intervention should be supplemented to stabilize a patient's emotions, improve compliance, and enhance quality of life.

**What is known and what is new?**

- Negative emotions (such as anxiety and depression) can affect the incidence of TNs.
- Negative emotions have a significant impact on the prognosis of TNs.

**What is the implication, and what should change now?**

- During surgical treatment of TNs, targeted nursing interventions should be applied according to individual differences, including disease education, early psychological guidance, and emotional support to stabilize the patient's mood, thereby improving patient prognosis.

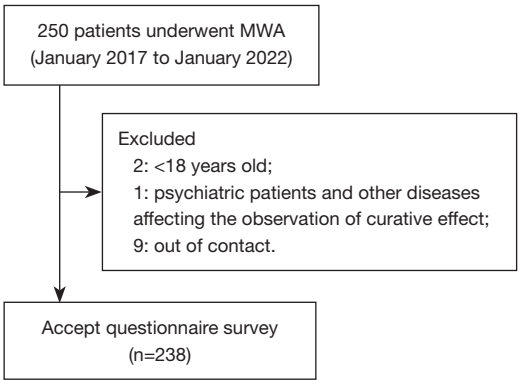


**Figure 1** A flowchart showing the study procedure. MWA, microwave ablation.

patient's negative emotions, anxiety, and depression during the perioperative period and their impact on prognosis. This data will provide a basis for psychological intervention before MWA treatment of TNs, so as to improve the quality of life of patients with TNs. We present the following article in accordance with the STROBE reporting checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-22-696/rc).

## Methods

### *Research participants*

Patients who were hospitalized for TNs in The First Affiliated Hospital of Soochow University from January 2017 to January 2022, and who received MWA of TNs were enrolled in this study.

The following inclusion criteria were applied: (I) thyroid imaging reporting and data system (TI-RADS) indicated a Class 3 nodule and the fine needle aspiration cytopathology Bethesda reporting system indicated that it was Class II, or it was confirmed as a benign nodule by preoperative histopathology; (II) the maximum diameter of nodule was 1 cm or larger; (III) patients who refused surgery and clinical observation, but accepted MWA of TNs, (IV) patients who were conscious and could cooperate to complete the questionnaire; and (V) patients aged 18 years or more who agreed to participate in this study and signed an informed consent form.

The following exclusion criteria were applied: (I) the contralateral vocal cord function of the lesion was abnormal; (II) the patient presented with severe coagulation mechanism disorder or severe cardio pulmonary disease; (III) pregnant women and lactating women; (IV) patients with confirmed malignant tumor; and (V) psychotic patients and those with other diseases that affect the observation of the curative effect (*Figure 1*).

According to the general rules of regression analysis, the proportion of the number of questionnaire items to the sample size is 1:5–10, and thus, the sample size of the study object was determined to be 200. As the subjects of the study were discharged patients, there was the possible of loss to follow-up, and 250 questionnaires were distributed. Finally, 238 cases were recovered.

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of the First Affiliated Hospital of Soochow University (No. 3298719). Informed consent was obtained from all patients.

### *Instruments and equipment*

The following ultrasonic instruments were used: LOGIQ E9 of GE (ML6-15-D linear array probe, frequency 4–16 MHz); and Japan TOSHIBA APLIO 500 (PLT-1005BT ultra wideband linear array probe, frequency 5–14 MHz). The ultrasound contrast agent sonovue was produced by Italian Bracco MWA instrument. The Nanjing Yigao ECO-100E MWA instrument abd disposable MWA needle (16 G, 2,450 MHZ) were used.

### *Surgical methods*

Before ablation, routine electrocardiogram (ECG), routine blood tests, blood coagulation tests, and pre-transfusion tests were performed. All patients were informed of the ablation risks and signed an informed consent form for the operation. The examinee was placed in the supine position with the neck fully exposed. The first contrast enhanced ultrasound (CEUS) was performed by injecting 2.5 mL SonoVue through the elbow vein. The blood flow perfusion of the nodule was observed. The routine disinfection cloth was used, and 1% lidocaine was applied for local anesthesia. Under the guidance of gray-scale ultrasound, the needle was inserted into the isthmus in the transverse section of the thyroid, and normal saline was injected subcutaneously and around the thyroid capsule to form a liquid isolation zone. The ablation needle was placed inside the nodule. The moving ablation technique was used to ablate the TN from inside to outside, from deep to shallow, until the nodule was completely covered by the hyperechoic gasification

area. The ablation power and ablation time were recorded, and CEUS was performed to evaluate the immediate effect of ablation after surgery. The ablation was considered complete if the ablation focus was not enhanced. For cystic and solid nodules, cystic fluid aspiration and ethanol sclerotherapy were performed first, followed by MWA on the cystic wall and solid part of the nodule. After ablation, the patient could leave without local compression for 30 minutes without special circumstances.

### *Follow-up of thyroid function*

Blood samples were collected before and 12 months after the operation, and the levels of free triiodothyronine (FT3), free thyroxine (FT4), and thyroid stimulating hormone (TSH) were measured to assess thyroid function.

### *Follow-up of TN volume*

Before the operation and one month, three months, and one year post operation, the maximum diameter (a) and two vertical orthogonal diameters (b,c) of the nodule were measured by ultrasound, and the nodule volume and the nodule reduction rate (VRR) were compared. The nodule volume = 0.523 × abc; VRR = (nodule volume before treatment – nodule volume during follow-up)/nodule volume before treatment × 100%.

### *Evaluation of treatment effect*

If the nodules disappeared and the VRR =100%, the condition was considered to be cured. If the VRR ≥50%, the treatment effect was considered significant. For 25%≤ VRR <50%, the effect was considered an improvement. Cases where VRR <25% and the nodule volume increased or new nodules appeared, the treatment effect was poor and the patient was considered to have recurrence (22). Any short- and long-term complications after surgery were noted.

### *Survey scale*

#### General information

The "general data survey scale" created by our hospital was used, and included gender, age, marital status, education level, family monthly income, and clinical data (such as nodule composition, initial volume of solid nodules, thyroid hormone level, etc.).

#### Negative emotion assessment

All patients were interviewed face to face using a questionnaire one week after operation.

The Self-rating Depression Scale (SDS) (23) is used to assess depression. It consists of 20 items, with each item scoring between 1 and 4. The standard score is equal to the rough score added to each item's score, and then multiplied by 1.25 to obtain an integer. The cut-off value of the standard score is 53 points, with 53–62 points suggesting mild depression, 63–72 points suggesting moderate depression, and >72 points representing severe depression. The SDS has good reliability and validity, with the Cronbach's α coefficient all being above 0.75.

The Self-rating Anxiety Scale (SAS) (24) was used to assess anxiety, which was composed of 20 items. Each item was scored according to 4 levels. The standard score was equal to the rough score of each item, and then multiplied by 1.25 to obtain an integer. The cut-off value of the standard score is 50 points, with 50–60 points suggesting mild anxiety, 61–69 points representative of moderate anxiety, and ≥70 points suggesting severe anxiety. The SAS has good reliability and validity, with the Cronbach's a coefficient all being above 0.75.

### *Statistical analysis*

The SPSS 24.0 (IBM Corp., Armonk, NY, USA) statistical software was used for data analysis. Measurement data were expressed as mean ± standard deviation (SD). The thyroid related parameters before and after the operation were compared using paired *t*-test. Analysis of variance and chi square test were used for inter-group statistical analysis. The influencing factors of anxiety and depression were analyzed using binary logistic regression. A two-sided test with a P value <0.05 was considered statistically significant.

## Results

### *Baseline data*

Among the 238 patients with TNs who underwent MWA, 37 (15.5%) were male and 201 (84.5%) were female. The average age was 48.26±9.05 years old (range, 30–70 years) and the average body mass index (BMI) was 24.20±2.82. Preoperatively, the FT3 was 5.04±0.63 pmol/L, the FT4 was 15.87±2.32 pmol/L, and the TSH was 1.89±0.98 mIU/L. At 12 months after surgery, the FT3 was 5.02±0.65 pmol/L,

the FT4 was 16.07±2.34 pmol/L, and the TSH was 1.81±0.91 mIU/L. The differences in the preoperative and postoperative thyroid function were not statistically significant. The initial nodule volume was 4.83±8.21 mL before ablation, and 1.827±3.32, 1.263±1.91, 0.562±1.04, and 0.366±0.92 mL at 1, 3, 6, and 12 months after ablation, respectively. There was a statistically significant difference at each time point (P<0.05).

### *Negative emotional status of patients*

Patient income, hypertension, hyperglycemia, and solid nodule volume were common risk factors for SAS/SDS score. Education level was a risk factor for SAS, and age (<60 years old) was a risk factor for SDS (P<0.05; *Tables 1*,*2*).

### *Analysis of the factors influencing a patient's negative emotions*

The results of binary logistic regression analysis showed that background, income, hypertension, hyperglycemia, and solid nodule volume were independent influencing factors of anxiety (P<0.05). Age, income, hypertension, hyperglycemia, and solid nodule volume were independent influencing factors for depression (P<0.05; *Tables 3*,*4*).

### *Prognosis of patients with TNs*

The prognosis of patients with and without negative emotions was observed in the first month, the third month, the sixth month, and the twelfth month after MWA. The results demonstrated that the prognosis of patients without negative emotions in the first month, the third month, and the sixth month was significantly better than that of patients with negative emotions (P<0.05; *Tables 5-8*).

## Discussion

With the development and advancement of modern medical, clinicians are increasingly aware of the influence of the psychological state on the occurrence, development, and prognosis of diseases. Kemeny *et al.* found that acute or chronic psychological stress can cause significant changes in natural and acquired immune responses, which are largely mediated by the neuroendocrine mediators of the hypothalamus pituitary adrenal axis and the sympathetic adrenal axis (25). The levels of CD4 positive cells, natural killer cells, interleukin (IL)-1b, and IL-2 in the serum of patients with depression decreased significantly, suggesting that psychological stress can damage cellular immune function and affect the progression of disease (25). Simen *et al.* demonstrated that patients with depression had elevated levels of tumor necrosis factor (TNF)-α, which can facilitate tumor cell immune escape (26). The hypothalamus-pituitary-thyroid axis has been established as one of the stress response neuroendocrine systems (27), and some researches have begun to examine the onset of thyroid diseases from a psychological perspective (18,21,28). Negative emotions, such as depression and anxiety, were shown to be possible risk factors for the onset and prognosis of thyroid disease (17). MWA is performed under real-time monitoring by ultrasound, where the ablation needle is placed inside the tumor along the predetermined puncture path through the puncture point. The microwave makes the tissue molecules within 1–2 cm around the ablation needle vibrate and rub, causing the temperature of the targeted tissue to rise, generating a thermal effect, which subsequently causes the instantaneous coagulation, denaturation, and necrosis of the nuclear chromatin and proteins. Progressively, the targeted cells become completely inactivated, and the volume of the target tissue shrinks. This method has been applied in clinical practice due to its advantages of rapid temperature increases, large ablation range, strong blood coagulation, short ablation time, and high tumor clearance rate. The effectiveness of MWA in the treatment of TNs has been confirmed by many studies (29-31). Our current study demonstrated that the VRR at 1, 3, 6, and 12 months after ablation was 50.60%, 69.44%, 79.24%, and 90.26%, respectively, which was similar to previous reports (29-31). The lack of knowledge related to MWA of TNs and the fear of surgical failure and postoperative recovery often lead to psychological adverse stress in patients. Negative emotions are mainly manifested as anxiety and depression during the perioperative period (17). The results of this study also suggested that patients had significant anxiety (84.9%) and depression (76.9%) during the perioperative period of MWA. This negative psychology can directly or indirectly affect the smooth operation of the procedure and postoperative recovery. However, to date, relevant studies have mainly focused on the impact of negative emotions, such as anxiety and depression, on TNs (17-21). The results herein revealed that patients with TNs undergoing MWA had depression and anxiety at different times, and some even experienced both emotions simultaneously. The univariate analysis and regression analysis showed economic income, previous hypertension,

**Table 1** Perioperative SAS scores in patients with thyroid nodule

| Item | n (%) | SAS | t/F | P |
|---|---|---|---|---|
| Gender | | | | |
| Male | 37 (15.5) | 55.84±4.29 | 0.106 | 0.915 |
| Female | 201 (84.5) | 55.76±4.90 | | |
| Age (years) | | | | |
| <40 | 41 (17.2) | 56.02±5.07 | 0.603 | 0.548 |
| 40–60 | 165 (69.3) | 55.86±4.61 | | |
| >60 | 32 (13.5) | 54.91±5.45 | | |
| BMI (kg/m$^2$) | | | | |
| <24 | 97 (40.8) | 55.89±4.78 | 0.819 | 0.442 |
| 24–27 | 112 (67.0) | 55.42±4.94 | | |
| >27 | 29 (12.2) | 56.66±4.32 | | |
| Level of education | | | | |
| Junior high school and below | 100 (42.0) | 55.9±5.4 | 5.011 | 0.007 |
| Technical secondary school or high school | 93 (39.1) | 56.54±3.86 | | |
| College degree or above | 45 (18.9) | 53.84±4.7 | | |
| Monthly household income (yuan) | | | | |
| <3,000 | 78 (32.8) | 57.74±4.36 | 68.084 | 0.000 |
| 3,000–6,000 | 129 (54.2) | 56.32±3.86 | | |
| >6,000 | 31 (13.0) | 48.45±1.73 | | |
| Components of nodules | | | | |
| Mainly solid | 154 (64.7) | 55.76±5.07 | 0.172 | 0.871 |
| Mainly cystic | 84 (35.3) | 55.76±4.28 | | |
| Initial volume of solid nodules (cm$^3$) | | | | |
| ≤5 | 146 (61.3) | 55.21±4.62 | 2.238 | 0.026 |
| >5 | 92 (38.7) | 56.63±4.98 | | |
| Hypertension | | | | |
| Yes | 69 (29.0) | 57.77±4.29 | 4.27 | 0.000 |
| No | 169 (71.0) | 54.94±4.76 | | |
| Hyperglycemia | | | | |
| Yes | 59 (24.8) | 58.03±4.29 | 4.2351 | 0.000 |
| No | 179 (75.2) | 55.01±4.73 | | |

Data are shown as $\bar{x}$±s. SAS, Self-rating Anxiety Scale; BMI, body mass index.

and previous hyperglycemic solid nodule volume were common risk factors for depression and anxiety. Age (<60 years old) was a risk factor for depression, and education (junior high school and senior high school) was a risk factor for anxiety. Economic income is a common risk factor for depression and anxiety, likely due to the increased financial burden from treatment costs. A previous study has also shown that low-income patients tend to have a poor

**Table 2** Perioperative SDS scores in patients with thyroid nodules

| Item | n (%) | SDS | t/F | P |
|---|---|---|---|---|
| Gender | | | | |
| Male | 37 (15.5) | 59.84±6.49 | 0.681 | 0.496 |
| Female | 201 (84.5) | 58.96±7.32 | | |
| Age (years) | | | | |
| <40 | 41 (17.2) | 61.76±6.31 | 26.351 | 0.000 |
| 40–60 | 165 (69.3) | 59.91±6.73 | | |
| >60 | 32 (13.5) | 51.5±5.66 | | |
| BMI (kg/m$^2$) | | | | |
| <24 | 97 (40.8) | 58.03±6.89 | 2.036 | 0.133 |
| 24–27 | 112 (67.0) | 59.63±7.38 | | |
| >27 | 29 (12.2) | 60.62±7.19 | | |
| Level of education | | | | |
| Junior high school and below | 100 (42.0) | 59.58±7.19 | 1.175 | 0.311 |
| Technical secondary school or high school | 93 (39.1) | 59.28±7.28 | | |
| College degree or above | 45 (18.9) | 57.64±6.97 | | |
| Monthly household income (yuan) | | | | |
| <3,000 | 78 (32.8) | 61.88±5.26 | 9.342 | 0.000 |
| 3,000–6,000 | 129 (54.2) | 57.7±7.49 | | |
| >6,000 | 31 (13.0) | 57.9±8.24 | | |
| Components of nodules | | | | |
| Mainly solid | 154 (64.7) | 59.21±7.2 | 0.341 | 0.733 |
| Mainly cystic | 84 (35.3) | 58.88±7.22 | | |
| Initial volume of solid nodules (cm$^3$) | | | | |
| ≤5 | 146 (61.3) | 57.89±7.48 | 3.328 | 0.001 |
| >5 | 92 (38.7) | 61.01±6.28 | | |
| Hypertension | | | | |
| Yes | 69 (29.0) | 61.80±5.33 | 3.805 | 0.000 |
| No | 169 (71.0) | 57.99±7.57 | | |
| Hyperglycemia | | | | |
| Yes | 59 (24.8) | 62.19±5.40 | 3.919 | 0.000 |
| No | 179 (75.2) | 58.08±7.43 | | |

Data are shown as $\bar{x}$±s. SDS, Self-rating Depression Scale; BMI, body mass index.

adjustment of their psychological state (32). Hypertension, hyperglycemia, and solid nodule volume are common risk factors for depression and anxiety. Patients with a history of hypertension and hyperglycemia are prone to depression or anxiety, which may be associated with long-term medication and chronic diseases that affect the patient's body over a long period. Through biological mechanisms (such as autonomic nervous dysfunction), patients may have a series

**Table 3** Binary logistic regression analysis of the SAS score

| Related factor | B | Ward | P | Exp(B) | 95% CI |
|---|---|---|---|---|---|
| Level of education | 0.963 | 3.370 | 0.039 | 2.159 | 0.531~5.676 |
| Monthly household income | 0.679 | 2.197 | 0.048 | 1.764 | 0.547~5.451 |
| Initial volume of solid nodules | 1.651 | 6.187 | 0.034 | 4.315 | 1.976~11.197 |
| Hypertension | 2.123 | 9.213 | 0.006 | 6.123 | 3.245~17.457 |
| Hyperglycemia | 1.218 | 4.176 | 0.025 | 3.529 | 2.653~12.135 |

SAS, Self-rating Anxiety Scale.

**Table 4** Binary logistic regression analysis of the SDS score

| Related factor | B | Ward | P | Exp(B) | 95% CI |
|---|---|---|---|---|---|
| Age | 0.826 | 4.812 | 0.028 | 0.282 | 1.187~4.761 |
| Monthly household income | 0.694 | 1.862 | 0.047 | 1.452 | 0.312~3.241 |
| Initial volume of solid nodules | 1.316 | 8.349 | 0.008 | 4.249 | 2.091~12.209 |
| Hypertension | 1.123 | 7.321 | 0.012 | 3.423 | 1.445~9.546 |
| Hyperglycemia | 0.790 | 2.174 | 0.039 | 1.629 | 0.852~3.385 |

SDS, Self-rating Depression Scale.

**Table 5** The correlation between prognosis and negative emotion 1 month after operation

| Prognosis | Poor (n=14) | Improved (n=115) | Significant (n=109) | Cured (n=0) |
|---|---|---|---|---|
| SAS | | | | |
| ≤50, n (%) | 2 (5.5) | 10 (27.8) | 24 (66.7) | 0 (0.0) |
| >50, n (%) | 12 (5.9) | 105 (52.0) | 85 (42.1) | 0 (0.0) |
| $\chi^2$ | | 7.745 | | |
| P | | 0.021 | | |
| SDS | | | | |
| ≤53, n (%) | 2 (3.6) | 11 (20.0) | 42 (76.4) | 0 (0.0) |
| >53, n (%) | 12 (6.6) | 104 (56.8) | 67 (36.6) | 0 (0.0) |
| $\chi^2$ | | 27.077 | | |
| P | | 0.000 | | |

SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale.

of psychological emotions (33). The lower the educational background of patients, the higher their anxiety, and this may be related to poor cognition of the disease and poor self-regulation. The higher the education level, the more the patient knows about the disease and treatment, and will actively communicate with the doctor about their condition, treatment methods, and rehabilitation (34). Patients of different age groups have differing degrees of negative psychological emotions, with the young and middle-aged experiencing a higher degree of negative emotions. The may be due to them being in the developmental period of their studies and careers, and are the mainstay of their families. Considering the burden to their careers and families, they are more worried about surgical complications, curative

**Table 6** The correlation between prognosis and negative emotion 3 months after operation

| Prognosis | Poor (n=0) | Improved (n=41) | Significant (n=197) | Cured (n=0) |
|---|---|---|---|---|
| SAS | | | | |
| ≤50, n (%) | 0 (0.0) | 2 (5.6) | 34 (94.4) | 0 (0.0) |
| >50, n (%) | 0 (0.0) | 39 (19.3) | 163 (80.7) | 0 (0.0) |
| $\chi^2$ | | 4.052 | | |
| P | | 0.044 | | |
| SDS | | | | |
| ≤53, n (%) | 0 (0.0) | 4 (7.3) | 51 (92.7) | 0 (0.0) |
| >53, n (%) | 0 (0.0) | 37 (20.2) | 146 (79.8) | 0 (0.0) |
| $\chi^2$ | | 4.971 | | |
| P | | 0.026 | | |

SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale.

**Table 7** The correlation between prognosis and negative emotion 6 months after operation

| Prognosis | Poor (n=0) | Improved (n=21) | Significant (n=217) | Cured (n=0) |
|---|---|---|---|---|
| SAS | | | | |
| ≤50, n (%) | 0 (0.0) | 0 (0.0) | 36 (100.0) | 0 (0.0) |
| >50, n (%) | 0 (0.0) | 21 (10.4) | 181 (89.6) | 0 (0.0) |
| $\chi^2$ | | 4.105 | | |
| P | | 0.027 | | |
| SDS | | | | |
| ≤53, n (%) | 0 (0.0) | 0 (0.0) | 55 (100.0) | 0 (0.0) |
| >53, n (%) | 0 (0.0) | 21 (11.5) | 162 (88.5) | 0 (0.0) |
| $\chi^2$ | | 6.922 | | |
| P | | 0.009 | | |

SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale.

effects, and rehabilitation-related problems, and thus, may experience greater depression (35).

## Conclusions

This investigation suggested that there are many factors that affect the anxiety and depression of patients after MWA. Effective management of a patient's negative emotional state is the key to improving their treatment compliance and efficacy, and enhancing their prognosis. In the past, conventional nursing was mainly conducted by nurses according to the doctor's instructions for relevant treatment and nursing measures. Although this satisfies the basic needs of the patients, it fails to consider the patient's mental health and individual patient differences. We recommend that during surgical treatment of TNs, targeted nursing interventions should be applied according to individual differences, including disease education, early psychological guidance, and emotional support to stabilize the patient's mood, thereby improving patient prognosis.

There were some limitations to this report. First, the study used SAS and SDS to screen a patient's negative emotions, the results may influence the patient's subjective judgment, which may lead to differences in the evaluation

**Table 8** The correlation between prognosis and negative emotion 12 months after operation

| Prognosis | Poor (n=0) | Improved (n=0) | Significant (n=230) | Cured (n=8) |
|---|---|---|---|---|
| SAS | | | | |
| ≤50, n (%) | 0 (0.0) | 0 (0.0) | 33 (91.7) | 3 (8.3) |
| >50, n (%) | 0 (0.0) | 0 (0.0) | 197 (97.5) | 5 (2.5) |
| $\chi^2$ | | | 3.228 | |
| P | | | 0.072 | |
| SDS | | | | |
| ≤53, n (%) | 0 (0.0) | 0 (0.0) | 51 (92.7) | 4 (7.3) |
| >53, n (%) | 0 (0.0) | 0 (0.0) | 179 (97.8) | 4 (2.2) |
| $\chi^2$ | | | 3.369 | |
| P | | | 0.066 | |

SAS, Self-rating Anxiety Scale; SDS, Self-rating Depression Scale.

results. Second, the sample size was relatively small and the data was obtained from a single center, and this may lead to bias in the results. Future large sample, multi-center, and multi-scale research should be conducted to further examine the relationship between perioperative anxiety and depression and the prognosis of patients with TNs treated with MWA.

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## Footnote

*Reporting Checklist:* The authors have completed the STROBE reporting checklist. Available at https://gs.amegroups.com/article/view/10.21037/gs-22-696/rc

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