Original Article

Risk Factors for Preoperative Anxiety and Depression in Patients Scheduled for Abdominal Aortic Aneurysm Repair

Xiao-Yan Liu, Yu-Kui Ma, Ji-Chun Zhao, Zhou-Peng Wu, Lin Zhang, Li-Hui Liu
Department of Vascular Surgery, West China Hospital, Chengdu, Sichuan 610041, China

Abstract

Background: Perioperative emotional disorders of patients underwent abdominal aortic aneurysm (AAA) repair is an emerging area of study, and preoperative mental distress of those patients remains poorly understood. The aim of this study was to investigate the prevalence and identify the risk factors of preoperative anxiety and depression in patients scheduled for AAA repair.
Methods: A total of 189 patients who underwent elective AAA repair between 2015 and 2016 were included in this study. These patients were preoperatively evaluated by Hospital Anxiety and Depression Scale (HADS). Demographics and anxiety and depression scores of the patients were documented. Logistic regression was used to identify the independent risk factors of preoperative anxiety and depression.
Results: A total of 150 AAA patients were included in final analysis. Of these 150 patients, 44 patients (29.3%) had borderline anxiety or clinical anxiety, and 42 patients (28.0%) were found to have borderline or clinical depression. Female (odds ratio [*OR*]: 2.81, 95% confidence interval [*CI*]: 1.08–7.26), the American Society of Anesthesiologists (ASA) Grade 3/4 (*OR*: 4.34, 95% *CI*: 1.13–16.68), higher education (*OR*: 1.44, 95% *CI*: 1.02–2.04), and abdominal or back pain (*OR*: 3.08, 95% *CI*: 1.20–7.87) were identified as significant independent risk factors of abnormal HADS-anxiety in overall patients; and higher level of education (*OR*: 1.87, 95% *CI*: 1.16–3.01) was predictive of anxiety in patients planned for endovascular aortic repair. Besides, higher body mass index (BMI) (*OR*: 1.18, 95% *CI*: 1.04–1.33) and abdominal or back pain (*OR*: 3.93, 95% *CI*: 1.70–9.11) were predictive of abnormal preoperative HADS-depression in overall patients.
Conclusion: As for patients scheduled for AAA repair, female, higher ASA, higher level of education, and symptom may be independent risk factors for preoperative anxiety, and symptom and higher BMI may predict preoperative depression.

Key words: Abdominal Aortic Aneurysm; Anxiety; Depression; Preoperative Care; Risk Factors

Introduction

Abdominal aortic aneurysm (AAA) is a pathological condition characterized by an abnormal, focal dilatation of the descending aorta, with at least a 50% increase over the vessel's normal diameter. As the longevity of population in our society grows, the proportion of older people also increased, as with the prevalence of AAA. It has been estimated that 12.5% of men and 5.2% of women who aged 74–84 years had AAA.[1] Furthermore, evidence has revealed that approximately 11,000 deaths were attributed to AAA each year in the United States,[2] which exert colossus amount of burden on public health. In addition to the high rate of mortality, patients underwent AAA repair may have a high level of psychological distress manifesting as depressive disorders and posttraumatic stress disorder.[3] As surgical skills and perioperative physical evaluation and care system gradually turned mature, the concern for perioperative mental health status emerged and began to be addressed in the current AAA care.

Mental disorders often coexist with or manifest secondary to certain physical stress and then resulted in a complex clinical circumstance.[4,5] As the most commonly addressed issues, anxiety is based on the emotion of fear and mixed with feelings of worry and apprehension, while depression is dominated by sadness and filled with feelings of sorrow and hopelessness.[6] Previous studies suggested that preoperative mental disorders

Access this article online

Quick Response Code:

Website: www.cmj.org

DOI: 10.4103/0366-6999.238154

Address for correspondence: Dr. Yu-Kui Ma, Department of Vascular Surgery, West China Hospital, No. 37, Guoxue Alley, Chengdu, Sichuan 610041, China
E-Mail: hxyymyk@126.com

Received: 29-05-2018 **Edited by:** Xin Chen
How to cite this article: Liu XY, Ma YK, Zhao JC, Wu ZP, Zhang L, Liu LH. Risk Factors for Preoperative Anxiety and Depression in Patients Scheduled for Abdominal Aortic Aneurysm Repair. Chin Med J 2018;131:1951-7.

might be more predictive than postoperative complications and stress in terms of new-onset psychiatric symptoms after AAA repair.[3] Besides, other evidence supported preoperative anxiety and depression as independent predictors of increased rates of persistent postoperative pain and decreased level of health-related quality of life.[7,8] Therefore, it is important to recognize the prevalence and identify the risk factors of preoperative mental disorders during preoperative evaluation. Although a few studies investigated the postoperative depression and cognitive disorders after AAA repair, preoperative mental status of AAA patients remains poorly understood. This study aimed to investigate the prevalence of preoperative anxiety and depression among patients planned for elective AAA repair and to determine the risk factors for those mental disorders. Besides, as open surgical repair (OSR) and endovascular aortic repair (EVAR) exert different impacts on patients, subgroup analysis by intervention types was also performed to further address this issue. We hope that the results can help surgeons have a more detailed pattern during preoperative evaluation in AAA and make early mental care possible for those patients susceptible to mental distress.

Methods

Ethical approval

The study was conducted in accordance with the *Declaration of Helsinki* and was approved by the Ethics Committee of West China Hospital. Informed written consent was obtained from all patients before their enrolment in this study.

Subjects

This cross-sectional study included 189 patients who underwent elective AAA repair in West China Hospital between 2015 and 2016. The procedures of elective AAA repair included both OSR and EVAR. Patients with ruptured AAA, scheduled for endograft revision, or with concomitant surgical procedures involving visceral artery angioplasty, percutaneous coronary intervention, etc., were not considered for inclusion.

Data collection

Patients' demographics, social conditions, major comorbidities, aneurysm characteristics, and operative data were collected from the patient chart. Social conditions of the patients involved occupation (working or retired) and education (elementary, junior school, high school, college, and university). Major comorbidities were recorded as coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), lower extremity artery disease (LEAD), and stroke. The American Society of Anesthesiologists (ASA) classification rating of physical status was also collected as an evaluation of preoperative comorbidity, which was determined by an attending anesthetist at the time of preoperative assessment. Symptomatic AAA was defined as AAA with any abdominal or back pain or discomfort suspected to be resulted from the aneurysm. The size of the aneurysm was measured as the maximum aneurysm diameter derived from computed tomography imaging based on an outer wall to outer wall measurement perpendicular to the path of the aorta.[9]

Outcome measures

Preoperative anxiety and depression were assessed at night before the surgery. The level of anxiety/depression was measured using the Hospital Anxiety and Depression Scale (HADS).[10] The HADS is a reliable and valid tool widely used in patients admitted in the hospital.[4,5,10] The HADS measures anxiety (HADS-A) and depression (HADS-D) based on separate scores ranging from 0 to 21, interpreted as the following subscales: normal (score 0–7), borderline abnormal (score 8–10), and abnormal (score 11–21) anxiety and/or depression. Patients were then grouped into two groups according to each type of mental disorder, namely, HADS-A abnormal (score 8–21) and HADS-A normal (score 0–7) and HADS-D abnormal (score 8–21) and HADS-A normal (score 0–7). All scales were collected by professional nurses in the Vascular Department of West China Hospital.

Statistical analysis

Data analysis consisted of descriptive statistics and regression modeling. Normally distributed continuous variables were summarized as mean ± standard deviation (SD); other continuous variables were reported as median (Q1, Q3). Categorical variables were reported as counts and proportions. Stepwise logistic regression analyses were used to determine the effects of risk variables on preoperative anxiety and depression. When addressing the univariate association between each candidate's risk variable and mental disorders, we used the Student's *t*-test for normally distributed data and the Mann-Whitney *U*-test for nonparametric data, and categorical variables were compared with the Chi-square test or Fisher's exact test. A $P < 0.10$ was considered as the criterion for adding predictors in the model. Then, the selected variables entered a model to determine the independent risk factors for anxiety and depression by multiple logistic regressions. The risk was measured by calculating odds ratios (*OR*s) with corresponding 95% confidence intervals (*CI*s). Level of significance was set at 5% α-level. A $P < 0.05$ was considered statistically significant. All analyses were performed using STATA version 14.2 (StataCorp, Texas, USA).

Results

Of the 189 patients who underwent AAA repair during the study period, 39 patients were excluded from the study, including four patients with past or current mental illness, 29 patients having emergent surgery due to ruptured AAA, and six patients refusing to sign the consent form. Finally, 150 patients, including 109 EVAR and 41 OSR, met the inclusion criteria and completed all scale measurements. The mean age of the overall recruited population was 70.7 ± 11.8 years, and 27.3% patients were female.

Prevalence of preoperative anxiety in patients underwent abdominal aortic aneurysm repair

The baseline characteristics of all 150 patients stratified by HADS-A are summarized in Table 1. The overall incidence

Table 1: Characteristics of all AAA patients stratified by HADS anxiety scores

Characteristics	Total (n = 150)	HADS-A abnormal (n = 44)	HADS-A normal (n = 106)	Statistical values	P
Age (years)	70.7 ± 11.8	70.4 ± 14.3	70.8 ± 10.7	0.224*	0.822
Female	41 (27.3)	17 (38.6)	24 (22.6)	4.005†	0.045
BMI (kg/m²)	23.1 (20.8, 25.7)	23.1 (21.5, 26.1)	23.1 (20.4, 25.6)	−0.477‡	0.645
Hypertension	83 (55.3)	29 (66.0)	54 (50.9)	2.818†	0.095
Diabetes	16 (10.7)	5 (11.4)	11 (10.4)	0.032†	0.859
CAD	27 (18.0)	14 (31.82)	13 (12.3)	8.055†	0.006
LEAD	8 (5.3)	4 (9.1)	4 (3.8)	1.741†	0.201
Stroke	2 (1.3)	1 (2.3)	1 (0.9)	0.418†	0.531
COPD	29 (19.3)	16 (36.4)	13 (12.3)	11.579†	0.001
ASA Grade					
2	97 (64.7)	15 (34.1)	82 (77.4)	25.753†	<0.001
≥3	53 (35.3)	29 (65.9)	24 (22.6)		
Smoking					
Current	69 (46.0)	17 (38.6)	52 (49.1)	1.395†	0.498
Previous	20 (13.3)	7 (16.0)	13 (12.3)		
Alcohol					
Current	33 (22.0)	13 (29.6)	20 (18.9)	2.817†	0.244
Previous	17 (11.3)	3 (6.9)	14 (13.2)		
Occupation					
Working	41 (27.3)	12 (27.3)	29 (27.3)	0.000†	0.991
Retired	109 (72.7)	32 (72.7)	77 (72.6)		
Live status					
With the spouse	106 (70.7)	23 (52.3)	83 (78.3)	10.163†	0.001
Single	44 (29.3)	21 (47.7)	23 (21.7)		
Education					
University	43 (28.6)	23 (52.2)	20 (18.9)	18.653†	0.002
High school	29 (19.3)	5 (11.6)	24 (22.6)		
Junior school	45 (30.0)	11 (25.0)	34 (32.1)		
Primary school	20 (13.3)	2 (4.6)	18 (17.0)		
Illiteracy	13 (8.7)	3 (6.8)	10 (9.4)		
Symptoms of AAA	73 (48.7)	30 (68.2)	43 (40.6)	9.492†	0.002
Aneurysm size (cm)	5.2 ± 1.4	5.4 ± 1.4	5.1 ± 1.4	−0.935*	0.350
Procedure					
OSR	41 (27.3)	14 (31.8)	27 (24.5)	0.631†	0.428
EVAR	109 (72.7)	30 (68.2)	79 (74.5)		
HADS					
HADS-A	5 (3, 9)	11 (9, 14)	4 (3, 6)	−16.477‡	<0.001
HADS-D	6 (4, 8)	6.5 (6, 9)	5 (4, 7)	−3.079‡	0.003

The data were shown as mean ± SD, median (Q1, Q3), or n (%). *Student's t-test; †Chi-square test; ‡Mann-Whitney U-test. AAA: Abdominal aortic aneurysm; HADS: Hospital Anxiety and Depression Scale; HADS-A: Anxiety part in Hospital Anxiety and Depression Scale; HADS-D: Depression part in Hospital Anxiety and Depression Scale; CAD: Coronary artery disease; LEAD: Lower extremity artery disease; COPD: Chronic obstructive pulmonary disease; OSR: Open surgical repair; EVAR: Endovascular aortic repair; ASA: American Society of Anesthesiologists; SD: Standard deviation; BMI: Body mass index.

of preoperative anxiety in patients scheduled for AAA repair was 29.3% (44), including 19 patients (12.6%) with borderline anxiety and 25 patients (16.7%) with clinical anxiety. The median scores of HADS-A were 5 (3, 9) for the total population and 11 (9, 14) for patients with HADS-A abnormal. No significant differences in age, body mass index (BMI), smoking, alcohol consumption, occupation status, hypertension, diabetes, LEAD, and stroke were found between HADS-A abnormal and normal groups. The aneurysm sizes (P = 0.350) and types of scheduled procedures (P = 0.428) were also matched between the two groups. The proportions of female (P = 0.045) and symptomatic patients (P = 0.002) were significantly higher in HADS-A abnormal group, compared with HADS-A normal group. Patients with HADS-A abnormal were also found to have significantly higher grade of ASA, which indicated heavier burden of comorbidities (P < 0.001). Besides, a higher level of education was found in patients with HADS-A abnormal (P = 0.001).

Prevalence of preoperative depression in patients underwent abdominal aortic aneurysm repair

The baseline characteristics of patients stratified by HADS-D are summarized in Table 2. The median score of HADS-D was 6 (4, 8) for the total population, which represented a normal depression level. In overall, 42 (28.0%) patients were found

Table 2: Characteristics of all AAA patients stratified by HADS depression scores

Characteristics	HADS-D abnormal (n = 42)	HADS-D normal (n = 108)	Statistical values	P
Age (years)	69.7 ± 11.7	71.1 ± 11.9	0.667*	0.504
Female	9 (21.43)	32 (29.6)	1.024†	0.312
BMI (kg/m²)	24.4 (22.2, 27.3)	22.5 (20.2, 25.2)	–2.912‡	0.005
Hypertension	25 (59.5)	58 (53.7)	0.414†	0.520
Diabetes	6 (14.3)	10 (9.3)	0.802†	0.374
CAD	8 (19.1)	19 (17.6)	0.043†	0.835
LEAD	4 (9.5)	4 (3.7)	2.029†	0.169
Stroke	0 (0.0)	2 (1.9)	0.788†	0.375
COPD	8 (19.1)	21 (19.4)	0.003†	0.956
ASA Grade				
2	24 (57.1)	73 (67.6)	1.124†	0.229
≥3	18 (42.9)	35 (32.4)		
Smoking				
Current	19 (45.2)	50 (46.3)	0.002†	0.963
Previous	6 (14.3)	14 (13.0)		
Alcohol				
Current	10 (23.8)	23 (21.3)	0.364†	0.545
Previous	6 (14.3)	11 (10.2)		
Occupation				
Working	12 (28.6)	29 (26.9)	0.045†	0.832
Retired	30 (71.4)	79 (73.1)		
Live status				
With the spouse	25 (59.5)	81 (75.0)	3.494†	0.062
Single	17 (40.5)	27 (25.0)		
Education				
University	16 (38.1)	27 (25.0)	7.667†	0.103
High school	7 (16.7)	22 (20.4)		
Junior school	15 (35.7)	30 (27.8)		
Primary school	2 (4.8)	18 (16.7)		
Illiteracy	2 (4.8)	11 (10.2)		
Symptoms of AAA	31 (73.8)	42 (38.9)	14.761†	<0.001
Aneurysm size (cm)	5.3 ± 1.4	5.2 ± 1.4	–0.163*	0.870
Procedure				
OSR	8 (19.1)	33 (30.6)	2.016†	0.160
EVAR	34 (80.9)	75 (69.4)		
HADS				
HADS-A	7 (5, 10)	5 (3, 7)	–2.089‡	0.042
HADS-D	9 (9, 12)	5 (4, 6)	–15.736‡	<0.001

The data were shown as mean ± SD, median (Q1, Q3), or n (%). *Student's t-test; †Chi-square test; ‡Mann–Whitney U-test. AAA: Abdominal aortic aneurysm; HADS: Hospital Anxiety and Depression Scale; HADS-A: Anxiety part in Hospital Anxiety and Depression Scale; HADS-D: Depression part in Hospital Anxiety and Depression Scale; CAD: Coronary artery disease; LEAD: Lower extremity artery disease; COPD: Chronic obstructive pulmonary disease; OSR: Open surgical repair; EVAR: Endovascular aortic repair; ASA: American Society of Anesthesiologists; SD: Standard deviation; BMI: Body mass index.

to have borderline (31, 20.7%) or clinical depression (11, 7.3%). The basic demographics of HADS-D abnormal and normal groups were matched except for a higher level of BMI in patients with HADS-D abnormal (P = 0.005). Besides, symptomatic patients accounted for a significantly larger proportion of patients with HADS-D abnormal (P < 0.001).

Risk factors of anxiety and depression in overall patients

To explore independent risk factors of preoperative anxiety and depression, predictors that entered multivariate logistic regression were those variables found to be significant in the univariate analysis (P < 0.100) or those that may affect mental status from clinical perspective. As for preoperative anxiety, gender, hypertension, CAD, COPD, ASA, smoking, education, symptom, aneurysm size, and HADS-D score were involved in the multivariate model. The results of multivariate logistic analysis of anxiety are summarized in Table 3. We found that female (*OR*: 2.81, 95% *CI*: 1.08–7.26, P = 0.034), ASA Grade 3/4 (*OR*: 4.34, 95% *CI*: 1.13–16.68, P = 0.033), higher education (*OR*: 1.44, 95% *CI*: 1.02–2.04, P = 0.039), and abdominal or back pain (*OR*: 3.08, 95% *CI*: 1.20–7.87, P = 0.019) were identified as significant independent risk factors of abnormal HADS-A in this model. In terms of preoperative depression, BMI, ASA, education, symptom, aneurysm size, and HADS-A entered the final multivariate model, and the results suggested that higher

BMI (*OR*: 1.18, 95% *CI*: 1.04–1.33, *P* = 0.009) and abdominal or back pain (*OR*: 3.93, 95% *CI*: 1.70–9.11) were significant risk factors of abnormal preoperative HADS-D. The results of multivariate logistic analysis concerning depression are summarized in Table 4.

Risk factors of anxiety and depression in patients scheduled for endovascular aortic repair

As minimally invasive procedures may relieve mental stress of patients to some extent, we also perform multivariate logistic analysis for patients scheduled for EVAR. Regarding risk factors of anxiety, gender, hypertension, CAD, LEAD, COPD, smoking, education, ASA, symptom, and HADS-D were included in the multivariate model. Higher level of education (*OR*: 1.87, 95% *CI*: 1.16–3.01) was identified as the independent risk factors for preoperative anxiety in patients scheduled for EVAR. The model concerning depression included BMI, LEAD, ASA, occupation status, education, symptom, and HADS-A, and the results suggested that abdominal or back pain (*OR*: 7.47, 95% *CI*: 2.56–21.84) and high BMI (*OR*: 1.26, 95% *CI*: 1.08–1.48) were independent risk factors for preoperative depression in patients scheduled for EVAR.

Discussion

The relationship of AAA repair and emotional disorders including anxiety and depression is an emerging area of study. Previous evidence suggested that exposure to open AAA repair or aortofemoral bypass was associated with increased risk of developing a new psychiatric (mood or anxiety) disorder, relative to the risk incurred from conservative AAA management.[11] However, whether patients scheduled for AAA repair may be susceptible to preoperative mental stress is still unknown, and their preoperative emotional status also remained poorly understood. This study investigated the prevalence of preoperative anxiety and depression in patients scheduled for AAA repair and identified the potential risk factors of preoperative emotional disorders.

This study found that 29.3% patients scheduled for AAA repair had borderline or clinical anxiety before surgery and 28.0% patients were found to have borderline or clinical depression. Female, ASA Grade 3/4, higher level of education, and abdominal or back pain were identified as independent risk factors of preoperative anxiety in overall patients scheduled for AAA repair. In the subgroup of patients planned for EVAR, higher level of education was predictive of preoperative anxiety. In terms of depression, we found that higher BMI and abdominal or back pain might predict preoperative depression in both overall patients and patients planned for EVAR.

In this study, patients with symptoms, mainly manifesting as abdominal or back pain, were found to be at high risk of anxiety and depression, in accordance with our expectations. Several studies demonstrated worse outcomes in patients with symptomatic AAA repairs compared with asymptomatic patients.[12-14] Moreover, symptoms, commonly presented as

Table 3: Logistic regression model for preoperative abnormal HADS-A

Factors	*OR*	95% *CI*	*P*
Overall patients planned for AAA repair			
Female	2.81	1.08–7.26	0.034
Hypertension	1.40	0.55–3.54	0.483
CAD	1.13	0.32–4.07	0.846
LEAD	0.69	0.11–4.43	0.696
COPD	1.32	0.40–4.33	0.649
Smoking	0.83	0.51–1.36	0.465
ASA Grade 3/4	4.34	1.13–16.68	0.033
Education level	1.44	1.02–2.04	0.039
Abdominal or back pain	3.08	1.20–7.87	0.019
Aneurysm size	1.08	0.78–1.48	0.647
HADS-D scores	1.12	0.97–1.30	0.114
Patients planned for EVAR			
Female	2.13	0.65–2.86	0.212
Hypertension	1.76	0.58–5.37	0.321
CAD	0.76	0.16–3.55	0.729
LEAD	1.01	0.13–7.94	0.995
COPD	1.22	0.29–5.17	0.783
Smoking	0.75	0.43–1.31	0.309
ASA Grade 3/4	2.20	0.45–10.84	0.331
Education level	1.87	1.16–3.01	0.010
Abdominal or back pain	2.60	0.84–8.04	0.096
HADS-D scores	1.14	0.97–1.35	0.103

AAA: Abdominal aortic aneurysm; CAD: Coronary artery disease; LEAD: Lower extremity artery disease; COPD: Chronic obstructive pulmonary disease; HADS-A: Hospital Anxiety and Depression Scale-Anxiety; HADS-D: Hospital Anxiety and Depression Scale-Depression; *CI*: Confidence interval; *OR*: Odds ratio; EVAR: Endovascular aortic repair.

Table 4: Logistic regression model for preoperative abnormal HADS-D

Factors	*OR*	95% *CI*	*P*
Overall patients planned for AAA repair			
BMI	1.18	1.04–1.33	0.009
ASA Grade 3/4	1.14	0.44–2.94	0.782
Higher education level	1.24	0.89–1.72	0.201
Abdominal or back pain	3.93	1.70–9.11	0.001
Aneurysm size	0.99	0.73–1.33	0.942
HADS-A scores	1.05	0.96–1.16	0.264
Patients planned for EVAR			
BMI	1.26	1.08–1.48	0.004
LEAD	1.06	0.13–8.76	0.958
Occupation status	2.73	0.76–9.73	0.122
ASA Grade 3/4	1.47	0.42–5.16	0.545
Higher education level	1.45	0.87–2.39	0.152
Abdominal or back pain	7.47	2.56–21.84	<0.001
Aneurysm size	1.14	0.73–1.78	0.568
HADS-A scores	1.05	0.94–1.17	0.366

AAA: Abdominal aortic aneurysm; BMI: Body mass index; LEAD: Lower extremity artery disease; HADS-A: Hospital Anxiety and Depression Scale-Anxiety; HADS-D: Hospital Anxiety and Depression Scale-Depression; *CI*: Confidence interval; *OR*: Odds ratio; EVAR: Endovascular aortic repair.

abdominal or back pain, would usually exacerbate negative emptions of patients, such as anxiety and depression, which was also described in previous studies regarding other types of surgery.[3,7] Together with our results, more preoperative psychiatric care or nursing may be warranted in symptomatic nonruptured AAA patients. Besides, higher level of education was found to be associated with preoperative anxiety, especially in EVAR patients. Patients with higher education level may have a better understanding or even overinterpretation of risks and complications after EVAR, which further arouse their concerns and anxiety. Surprisingly, the size of aneurysm was not identified as a risk factor of preoperative anxiety or depression, which might be explained by the fact that increased peak wall stress, but not maximum diameter, is more capable of differentiating symptomatic AAA and asymptomatic AAA.[15]

Female gender was found to be predictive of abnormal HADS-A scores in our study. It was reported in the literature that women tend to have enhanced emotional response, increased pain intensity, and duration of pain.[16] In general, women are more likely susceptible to greater preoperative concerns[17] and prefer an interpersonal approach to coping with distress within a social circumstance; thus, they are positively reinforced to communicating assistance and display mental distress,[18,19] which may explain the differences in socialization between men and women and the tendency for women to report higher level of anxiety. Interestingly, higher level of education was found to be predictive of preoperative anxiety not only in overall patients but also in patients planned for EVAR, which might be attributed to heavier concern in high educated people.

Furthermore, ASA Grade 3 and 4 were identified as predictors of preoperative anxiety, indicating heavier psychological burden on patients with more severe comorbidities. Our results were consistent with the findings from Wood *et al.*[20] that higher ASA rating and female gender were predictive of preoperative abnormal HADS-A scores in patients underwent total joint arthroplasty. It was further supported by the opinions that patients with anxiety tend to be more impaired before surgery with greater comorbidities, greater limitations in social activities, and lower energy levels.[19,20] As preoperative anxiety was reported to adversely affect the postoperative recover rate,[11] it is important to identify such patients preoperatively as soon as possible and optimize coexisting medical conditions as clinical guidelines recommended.

In addition, higher level of BMI was predictive for having higher HADS-D scores. There is growing evidence suggesting that higher BMI is associated with both structural and functional brain difference.[21-24] Reduced functional connectivity in the default mode and temporal lobe networks was observed in obese adults;[25] specifically in the elderly. Obese individuals were found to display lower task-related functional connectivity during finger tapping in the default mode network compared to normal weight adults.[21,22] Besides, high BMI was related to augment production of pro-inflammatory cytokines, and the release of dopamine was closely linked to the inflammations in the brain.[26,27] The connection between the inflammation in the brain and the release of dopamine may explain the detrimental effect of dopaminergic-driven cognitive functions observed in obese and overweight individuals[28] and thus may further adversely lead to depressive emotional disorders.

Several limitations should be noted when interpreting the results of this study. First, the sample size of this study was relatively small, hindered by the patient willingness to complete the HADS survey. Besides, this study only included patients from one academic center though from four surgeons, which was also a limitation of the present study. A cross-sectional study including patients scheduled for AAA repair from multicenter would improve the generalizability of our results. Furthermore, this study mainly evaluated preoperative anxiety and depression, and longitudinal investigation of postoperative psychiatric morbidity would help have a better idea of the perioperative mental status of patients underwent AAA repair. In addition, this study did not include the usage of hypnotics and sedatives in the selected patients, which may exert impacts on the results.

In conclusion, over one-fourth of patients scheduled for AAA repair may have preoperative anxiety or depression. Female gender, ASA Grade 3/4, higher level of education, and abdominal or back pain may be independent risk factors for preoperative anxiety in overall patients scheduled for AAA repair. When stratified by EVAR, higher level of education remained the only predictor of preoperative anxiety. On the other hand, higher BMI and abdominal or back pain may predict preoperative depression in both overall patients and patients planned for EVAR.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Hirsch AT, Haskal ZJ, Hertzer NR, Bakal CW, Creager MA, Halperin JL, *et al.* ACC/AHA 2005 guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): Executive summary a collaborative report from the American Association for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients with Peripheral Arterial Disease) endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation; National Heart, Lung, and Blood Institute; Society for Vascular Nursing; Transatlantic Inter-Society Consensus; and Vascular Disease Foundation. J Am Coll Cardiol 2006;47:1239-312. doi: 10.1016/j.jacc.2005.10.009.
2. Roger VL, Go AS, Lloyd-Jones DM, Benjamin EJ, Berry JD, Borden WB, *et al.* Heart disease and stroke statistics–2012 update: A report from the American Heart Association. Circulation 2012;125:e2-220. doi: 10.1161/CIR.0b013e31823ac046.
3. Liberzon I, Abelson JL, Amdur RL, King AP, Cardneau JD, Henke P, *et al.* Increased psychiatric morbidity after abdominal aortic surgery: Risk factors for stress-related disorders. J Vasc Surg 2006;43:929-34. doi: 10.1016/j.jvs.2006.01.026.

4. Snaith RP. The hospital anxiety and depression scale. Health Qual Life Outcomes 2003;1:29. doi: 10.1186/1477-7525-1-29.
5. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361-70. doi: 10.1111/j.1600-0447.1983.tb09716.x.
6. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the hospital anxiety and depression scale. An updated literature review. J Psychosom Res 2002;52:69-77. doi: 10.1016/S0022-3999(01)00296-3.
7. Theunissen M, Peters ML, Bruce J, Gramke HF, Marcus MA. Preoperative anxiety and catastrophizing: A systematic review and meta-analysis of the association with chronic postsurgical pain. Clin J Pain 2012;28:819-41. doi: 10.1097/AJP.0b013e31824549d6.
8. Quartana PJ, Campbell CM, Edwards RR. Pain catastrophizing: A critical review. Expert Rev Neurother 2009;9:745-58. doi: 10.1586/ern.09.34.
9. Chaikof EL, Dalman RL, Eskandari MK, Jackson BM, Lee WA, Mansour MA, *et al.* The society for vascular surgery practice guidelines on the care of patients with an abdominal aortic aneurysm. J Vasc Surg 2018;67:2-7700. doi: 10.1016/j.jvs.2017.10.044.
10. Djukanovic I, Carlsson J, Årestedt K. Is the hospital anxiety and depression scale (HADS) a valid measure in a general population 65-80 years old? A psychometric evaluation study. Health Qual Life Outcomes 2017;15:193. doi: 10.1186/s12955-017-0759-9.
11. King AP, Abelson JL, Gholami B, Upchurch GR Jr., Henke P, Graham L, *et al.* Presurgical psychological and neuroendocrine predictors of psychiatric morbidity after major vascular surgery: A prospective longitudinal study. Psychosom Med 2015;77:993-1005. doi: 10.1097/PSY.0000000000000235.
12. Sullivan CA, Rohrer MJ, Cutler BS. Clinical management of the symptomatic but unruptured abdominal aortic aneurysm. J Vasc Surg 1990;11:799-803. doi: 10.1016/0741-5214(90)90076-M.
13. Cambria RA, Gloviczki P, Stanson AW, Cherry KJ Jr., Hallett JW Jr., Bower TC, *et al.* Symptomatic, nonruptured abdominal aortic aneurysms: Are emergent operations necessary? Ann Vasc Surg 1994;8:121-6. doi: 10.1007/BF02018859.
14. Leo E, Biancari F, Kechagias A, Ylönen K, Rainio P, Romsi P, *et al.* Outcome after emergency repair of symptomatic, unruptured abdominal aortic aneurysm: Results in 42 patients and review of the literature. Scand Cardiovasc J 2005;39:91-5. doi: 10.1080/14017430410016422.
15. Soto B, Vila L, Dilmé JF, Escudero JR, Bellmunt S, Camacho M, *et al.* Increased peak wall stress, but not maximum diameter, is associated with symptomatic abdominal aortic aneurysm. Eur J Vasc Endovasc Surg 2017;54:706-11. doi: 10.1016/j.ejvs.2017.09.010.
16. Keefe FJ, Rumble ME, Scipio CD, Giordano LA, Perri LM. Psychological aspects of persistent pain: Current state of the science. J Pain 2004;5:195-211. doi: 10.1016/j.jpain.2004.02.576.
17. Keefe FJ, Lefebvre JC, Egert JR, Affleck G, Sullivan MJ, Caldwell DS, *et al.* The relationship of gender to pain, pain behavior, and disability in osteoarthritis patients: The role of catastrophizing. Pain 2000;87:325-34. doi: 10.1016/S0304-3959(00)00296-7.
18. Efran JS, Chorney RL, Ascher LM, Lukens MD. Coping styles, paradox, and the cold pressor task. J Behav Med 1989;12:91-103. doi: 10.1007/BF00844751.
19. Keefe FJ, Caldwell DS, Baucom D, Salley A, Robinson E, Timmons K, *et al.* Spouse-assisted coping skills training in the management of osteoarthritic knee pain. Arthritis Care Res 1996;9:279-91.
20. Wood TJ, Thornley P, Petruccelli D, Kabali C, Winemaker M, de Beer J, *et al.* Preoperative predictors of pain catastrophizing, anxiety, and depression in patients undergoing total joint arthroplasty. J Arthroplasty 2016;31:2750-6. doi: 10.1016/j.arth.2016.05.056.
21. Volkow ND, Wang GJ, Telang F, Fowler JS, Goldstein RZ, Alia-Klein N, *et al.* Inverse association between BMI and prefrontal metabolic activity in healthy adults. Obesity (Silver Spring) 2009;17:60-5. doi: 10.1038/oby.2008.469.
22. Hsu CL, Voss MW, Best JR, Handy TC, Madden K, Bolandzadeh N, *et al.* Elevated body mass index and maintenance of cognitive function in late life: Exploring underlying neural mechanisms. Front Aging Neurosci 2015;7:155. doi: 10.3389/fnagi.2015.00155.
23. Gustafson D, Lissner L, Bengtsson C, Björkelund C, Skoog I. A 24-year follow-up of body mass index and cerebral atrophy. Neurology 2004;63:1876-81. doi: 10.1212/01.WNL.0000141850.47773.5F.
24. Stanek KM, Grieve SM, Brickman AM, Korgaonkar MS, Paul RH, Cohen RA, *et al.* Obesity is associated with reduced white matter integrity in otherwise healthy adults. Obesity (Silver Spring) 2011;19:500-4. doi: 10.1038/oby.2010.312.
25. Kullmann S, Heni M, Veit R, Ketterer C, Schick F, Häring HU, *et al.* The obese brain: Association of body mass index and insulin sensitivity with resting state network functional connectivity. Hum Brain Mapp 2012;33:1052-61. doi: 10.1002/hbm.21268.
26. DeBoer MD. Obesity, systemic inflammation, and increased risk for cardiovascular disease and diabetes among adolescents: A need for screening tools to target interventions. Nutrition 2013;29:379-86. doi: 10.1016/j.nut.2012.07.003.
27. Dantzer R. Cytokine-induced sickness behavior: Mechanisms and implications. Ann N Y Acad Sci 2001;933:222-34.
28. Frank GK, Reynolds JR, Shott ME, Jappe L, Yang TT, Tregellas JR, *et al.* Anorexia nervosa and obesity are associated with opposite brain reward response. Neuropsychopharmacology 2012;37:2031-46. doi: 10.1038/npp.2012.51.

腹主动脉瘤患者术前焦虑抑郁危险因素分析

摘要

背景：腹主动脉瘤患者围手术期心理异常逐渐受到研究者关注，而术前焦虑与抑郁情况仍不清楚。本研究目的为探索腹主动脉瘤术前患者焦虑与抑郁的发生率与其危险因素。

方法：本横断面研究纳入189例术前使用医院焦虑抑郁量表（HADS）评估的腹主动脉瘤患者。收集基本信息及焦虑抑郁评分，使用logistic回归确定独立危险因素。

结果：本研究最终纳入150例腹主动脉瘤患者，其中44例（29.3%）患者有交界性或临床焦虑，43例患者有交界性或临床抑郁。研究发现女性（*OR*: 2.81，95% *CI*: 1.08–7.26），ASA分级3或4（OR: 4.34，95% *CI*: 1.13–16.68），高教育等级（*OR*: 1.14，95% *CI*: 1.02–2.04）及腰腹痛（OR 3.08，95% *CI*: 1.20–7.87）为异常HADS-A评分的危险因素，其中高教育等级（*OR*: 1.87，95% *CI*: 1.16–3.01）为腹主动脉瘤腔内修复术前焦虑危险因素。高BMI (*OR*: 1.18, 95% *CI*: 1.04–1.33) 及腰腹痛 (*OR*: 3.93, 95% *CI*: 1.70–9.11) 为术前异常HADS-D评分的危险因素。

结论：女性、高ASA、高教育水平及腰腹痛为腹主动脉瘤术前焦虑危险因素，而高BMI及腰腹痛为腹主动脉瘤术前抑郁危险因素。