

Original Article

Influence factors and attitude on post-operative pain in elderly patients with carotid artery stenosis

Huawei Zhuo^{1*}, Yan Shi^{2*}, Qi Zhao¹, Yi Qin¹, Cheng Liu¹, Min Zhou¹, Zhao Liu¹, Changjian Liu¹, Xiaoqiang Li¹, Feng Ran¹

Departments of ¹Vascular Surgery, ²Andrology, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, Nanjing, China. *Equal contributors and co-first authors.

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Abstract: This study aimed to investigate the degree of post-operative pain, influence factors, and attitudes of treating pain in elderly patients with carotid artery stenosis, so as to provide a direction for clinical work. The elderly patients in the Department of Vascular Surgery in the most recent 3 years that were in accordance with the inclusion criteria were recruited for evaluating the post-operative pain scores, demographic data and compliance, the frequency of hospitalization in the previous year, the number of complicated chronic diseases and the attitude of treating post-operative pain. Rank sum test, multiple linear regression, and other statistical methods were used for the analysis of data. Postoperative pain of the elderly patients with carotid artery stenosis was scored from 1 to 7, with an average of 3.3 ± 1.4 . Urban residents, female, and poor compliance were independent risk factors for post-operative pain of the elderly patients with carotid artery stenosis ($P<0.05$). The cognitive attitude of the patients on post-operative pain was mainly fear (76.4%), but the attitude of solving the pain was non-coping (59.7%). Postoperative pain was common in elderly patients with carotid artery stenosis with great differences. The influence factors were more influenced by resident type, gender, and compliance. The attitude of solving the pain was mainly non-coping. This study provided a direction for the medical staff to screen high risk of pain and improve the measures after carotid endarterectomy (CEA).

Keywords: Post-operative pain, influence factors, attitude, improvement measures

Introduction

In recent years, the incidence of carotid artery stenosis in the elderly is increasing. As the classic surgical mode for carotid artery stenosis, carotid endarterectomy (CEA) is safe and effective, which has significantly reduced the incidence of stroke [1-3], but pain after CEA has not drawn enough attention from clinical workers. In recent years, only the local infiltration anesthesia around the incision has been used in order to relieve pain after CEA [4]. At present, the clinicians mainly focus on the post-operative stroke [5], cranial nerve injury (CNI) [6], cerebral hyperperfusion syndrome (CHP) [7] and other issues of the patients. But the trauma of open surgery, the incision mainly at the anterior border of the sternocleidomastoid muscle, the active organs around the incision such as thyroid, the rich blood supply in the

neck easy to cause the incision hematoma, and other conditions suggest the necessity to study post-operative pain of CEA. Postoperative pain can increased heart load and decline in lung function, anxiety, fear, and other psychological and sleep disorders in the short term, leading to delayed wound healing and increased length of hospital stay. A few cases can develop into chronic post-surgical pain (CPSP) [8, 9]. In addition, some developed countries have begun to explore the significance of self-management of pain in patients [10]. Akbaş et al. [11] showed that 85.4% of the pain assessment made by medical staff was merely based on the oral statements of the patients, which indicated most pain assessment was unreliable. The purpose of this study was to understand and analyze the status of post-operative pain, influence factors and attitudes in elderly patients with carotid artery stenosis, so as to provide evi-

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dences for the post-operative pain management, education and propaganda and follow-up in clinic.

Materials and methods

Subjects

Elderly patients who received CEA in the Department of Vascular Surgery of our hospital from November 2014 to October 2017 were selected as the research subjects.

Inclusion criteria: (1) aged 60 years or older; (2) conformed to the standard of diagnosis of carotid artery stenosis, with surgical indications, receiving CEA after excluding the contraindications; (3) patients volunteered to participate in this study and provided an informed written consent; and (4) with good language competence and accomplishment, can cooperate with medical staff to complete the investigation.

Exclusion criteria: (1) chronic pain history, other history of cervical diseases, recent neck surgery history; (2) severe hepatorenal diseases, cardiovascular diseases, hematological diseases and malignant tumors; (3) psychiatric history or family history of mental disorders. This study was conducted in accordance with the declaration of Helsinki and was conducted with approval from the Ethics Committee of Nanjing University. Written informed consent was obtained from all participants.

Contents and methods of investigation

The investigators received systematic bias training, including the knowledge and technology on diseases and surveys, cultivation of responsibility, emphasis of data reliability, and completing questionnaires through pre-survey. The investigation was conducted by delivering the questionnaire bedside, face-to-face inquiries and other methods on the third days after CEA.

Basic content: The social demographic data including gender, age, education level, occupation type (retiree's occupation was that before retirement), income, resident type, personality and history including compliance, frequency of hospitalization in the previous year and the number of complicated chronic diseases were recorded and analyzed.

Pain assessment methods: Given that the patients were all the elderly, the internationally most commonly used visual analogue scale (VAS) [12] was applied in this study to score the pain from 0 to 10. Briefly, a 10 cm horizontal line was drawn on a piece of paper, one end of the line was 0, indicating no pain; the other end was 10 points, indicating the most severe pain. The middle part expressed varying degrees of pain, and the more close to the right side the more severe the pain was. The patient was asked to draw a mark on the horizontal line according to the feeling of pain to indicate the degree of pain. 0-2 indicated mild pain, 3-6 indicated moderate pain, and 7-10 indicated severe pain. The most severe pain in the past 24 hours was signed.

The attitude towards pain assessment methods: According to the mood classification proposed by R.Plutchik, the cognitive attitude of pain was divided into five categories: fear, grief, surprise, acceptance, and optimism. The attitude of pain solving was also divided into five categories: non-coping, neglecting pain, reducing out of bed activity, distracting attention, and seeking medical support. Patients could have multiple choices.

Statistical analysis

Statistical software SPSS18.0 was used for statistical analysis. Total number, percentage and mean \pm standard deviation (SD) were used to statistically describe social demographic data, frequency of hospitalization in the previous year, the number of complicated chronic diseases and pain scores. Since the samples did not meet the normal distribution, the rank sum test was used to analyze the relationship between the scores and other factors. Those with statistical significance in univariate analysis were then included in multivariate analysis. Multiple linear regressions were used for the statistical inference.

Results

General data

A total of 131 elderly patients were included in this study, and 131 sets of questionnaires were issued. There were 129 sets of effective questionnaires, with the response rate of 98.5%. Among the 129 elderly patients providing effec-

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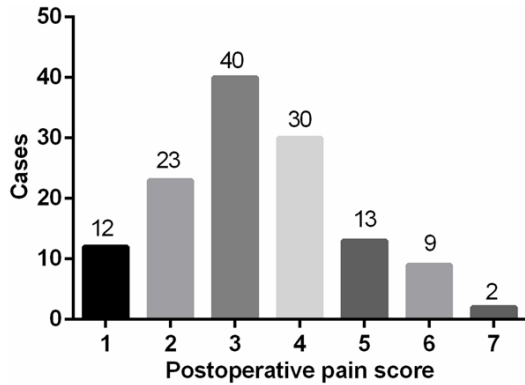


Figure 1. Post-operative pain scores in elderly patients with carotid artery stenosis.

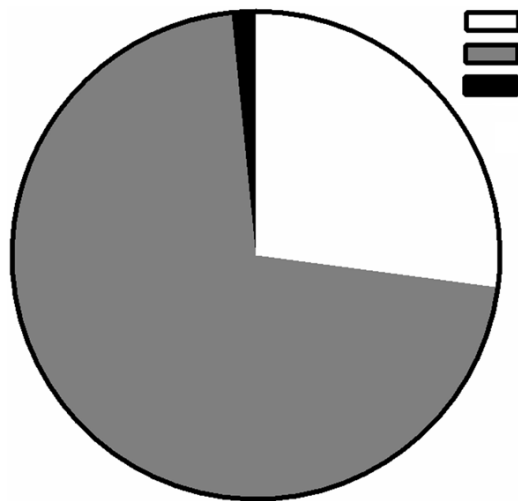


Figure 2. Post-operative pain degrees in elderly patients with carotid artery stenosis.

tive questionnaires, there were 102 males and 27 females, aged from 60 to 86 years with a mean age of 71.8 ± 6.5 years.

Post-operative pain

In the elderly patients with carotid stenosis, there was certain post-operative pain with great differences. The scores ranged from 1 to 7, with an average score of 3.3 ± 1.4 (**Figure 1**). There were 35 cases of mild pain (27.1%), 92 cases of moderate pain (71.3%) and 2 cases of severe pain (1.6%) (**Figure 2**).

Univariate analysis of post-operative pain scores

The post-operative pain score in elderly patients with carotid artery stenosis was set as the test

variable, the various factors were used as grouping variables, and then univariate analysis was carried out one by one using the rank sum test. The results showed that gender, educational level, occupation type, resident type, the number of complicated chronic diseases, personality, compliance were the influence factors for the post-operative pain in elderly carotid artery stenosis ($P < 0.05$, **Table 1**).

Multivariate analysis of post-operative pain scores

The post-operative pain score of the elderly patients with carotid artery stenosis was set as the dependent variable and the factors of statistical significance in univariate analysis ($P < 0.05$) were used as independent variables for multivariate linear regression analysis. The independent variables were screened stepwise ($\alpha_{\text{input}} = 0.05$, $\alpha_{\text{output}} = 0.10$). As a result, resident type, gender and compliance were selected into the multivariate linear regression equation. The results show that post-operative pain scores of the elderly patients with carotid artery stenosis were higher in the urban, female and poor compliance patients, especially the urban patients. Serious multiple collinearity has been excluded among the independent variables (**Table 2**).

Attitude analysis of post-operative pain management

The investigation showed that the cognition attitude and solving attitude towards post-operative pain in the elderly patients with carotid artery stenosis were mainly passive (**Table 3**).

Discussion

Carotid artery stenosis and CEA

Stroke is one of the important causes of death, disease and disability in the elderly [13]. The Global Burden of Disease Study shows that stroke is the second leading cause of death worldwide, and the burden risk continues to increase [14, 15]. 20%-25% stroke is associated with carotid artery stenosis [16]. In addition, carotid artery stenosis is a risk factor [17, 18] for reduced cognitive function, affective disorder, and cerebral white-matter disease and so on. In summary, the prevention and treatment of carotid artery stenosis is particularly important. CEA is the surgical treatment of carotid

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Table 1. Univariate analysis of the post-operative pain scores in elderly patients with carotid artery stenosis

Variables	Cases (%)	Scores	Z/H	P
Gender				
Male	102 (79.1)	3.14±1.41	-3.603	<0.001
Female	27 (20.9)	4.11±1.05		
Age (years)				
≤65	26 (20.2)	3.04±1.08	1.145	0.564
≤75	58 (45.0)	3.34±1.35		
>75	45 (34.8)	3.51±1.58		
Educational levels				
Primary school or less	49 (38.0)	2.88±1.29	11.936	0.003
High school or less	48 (37.2)	3.38±1.42		
Above high school	32 (24.8)	4.00±1.30		
Occupation type				
Physical work	65 (50.4)	2.98±1.38	-2.847	0.004
Brain work	64 (49.6)	3.70±1.34		
Incomes (RMB/M)				
≤3000	25 (19.4)	2.88±1.20	3.445	0.179
≤6000	68 (52.7)	3.37±1.41		
>6000	36 (27.9)	3.61±1.46		
Resident type				
Rural	59 (45.7)	2.73±1.26	-4.555	<0.001
Urban	70 (54.3)	3.86±1.31		
Number of complicated chronic diseases				
0	24 (18.6)	3.08±1.53	10.260	0.006
≤2	57 (44.2)	3.05±1.33		
>2	48 (37.2)	3.81±1.32		
Personality				
Introversion	59 (45.7)	3.05±1.47	-2.336	0.020
Extraversion	70 (54.3)	3.59±1.30		
Compliance				
Poor	37 (28.7)	3.70±1.47	-2.036	0.042
Good	92 (71.3)	3.20±1.35		
Frequency of hospitalization in the previous year				
≤1	70 (54.3)	3.44±1.41	-0.798	0.425
>2	59 (45.7)	3.22±1.39		

artery stenosis, which is a gold standard in common. Abott conducted a retrospective research on the guide systems in the treatment of carotid artery stenosis from all regions of the world [19] and found that for the asymptomatic patients with 50%-99% stenosis, 86% of the guide systems support CEA, while for the symptomatic patients, 94% support CEA except for those with major complications or vascular anatomy abnormality. Although carotid artery stenting (CAS) has been widely promoted in recent years, the mortality is still significantly

higher than those after CEA [20]. CEA aims to relieve carotid artery stenosis, reduce the incidence of stroke and improve prognosis by revealing, freeing, blocking, and opening carotid artery and removing the plaque and intima attached on the carotid artery intima.

The overall condition of post-operative pain

To investigate the degree of post-operative pain was one of our objects. The results of this survey suggested that post-operative pain commonly occurred in elderly patients with carotid artery stenosis, and most patients were in moderate or severe pain. Combined with the particularity of the surgical incision site and the trauma of surgery, this result was consistent with our expectations. Since Campbell first proposed pain as the "fifth vital sign" [21], post-operative pain has been regarded as a special kind of pain. Although it has gradually gotten more and more medical attention in recent years, and many new drugs and new technologies have been used for the pain management [22], the individual differences of patients and subjectivity of pain promote the post-operative pain to be a big problem [23, 24]. However, there are few investigations on the post-operative pain in carotid artery stenosis, which may be related to the serious complications such as stroke and cerebral injury caused by the carotid artery stenosis surgery, underdevelopment of the Department of Vascular Surgery in many countries, and small number of such operations.

The influence factors of post-operative pain

Univariate analysis showed that gender, educational level, occupation type, resident type, the number of complicated chronic diseases, personality, and compliance could affect post-operative pain scores. But in multivariate analysis, resident type, gender and compliance showed great significance. Urban, female and

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Table 2. Multivariate analysis of post-operative pain scores in elderly patients with carotid artery stenosis

Variables	Partial regression coefficient	Standard error	Normalized regression coefficient	t	P	Tolerance
Constants	1.600	0.612		2.615	0.010	
Resident type	1.027	0.220	0.367	4.673	0.000	0.982
Gender	0.830	0.269	0.242	3.083	0.003	0.982
Compliance	-0.495	0.240	-0.160	-2.058	0.042	0.998

Table 3. Attitude analysis of post-operative pain management in elderly patients with carotid artery stenosis

Cognition attitude	Cases (%)	Attitude of solving	Cases (%)
Fear	110 (85.3)	Non-coping	86 (66.7)
Grief	83 (64.3)	Neglecting pain	48 (37.2)
Surprise	66 (51.2)	Reducing out of bed activity	84 (58.3)
Acceptance	43 (33.3)	Distracting attention	53 (65.1)
Optimism	38 (29.5)	Seeking medical support	49 (38.0)

poor compliance patients had higher post-operative pain scores than others. This result was also consistent with our expectations. The reasons may be the urban residents are more delicate in life than the rural residents, and experience less pain events and feeling of fatigue during their growth. In recent years, more and more research studies report the gender difference on pain, which has become a consensus [25]. Women have higher sensitivity, lower threshold, and worse tolerance towards pain than men. The reasons and mechanisms are not clear yet. It has been suggested to be related to hormone, pain-related receptor neurotransmitter, pain central level, psycho and mental differences [26-29]. In terms of compliance, patients with poor compliance cannot work well with the medical staff after operation, thus the relief degree of post-operative pain may be relatively low. The post-operative pain of the elderly patients with carotid artery stenosis is affected by many factors. Compared with the surgical procedure and techniques and other objective factors and given the subjective characteristics of pain, the post-operative pain in the elderly patients with carotid artery stenosis is more likely to be affected by age, sex and occupation types, resident types and other social demographic characteristics and medical history. Such factors are easier to be realized by medical staff and can better assist medical staff to improve post-operative

pain management for the patients after surgery.

Attitude of solving the post-operative pain management

Most elderly patients with carotid artery stenosis had negative attitude towards the post-operative pain. Therefore, it was not surprising that because the high age, the declined physical fitness, surgical trauma, social and economic pressure on hospitalization, and the anxiety of the prognosis of the disease may contribute to the negative attitude. In addition to doctor-patient conflicts highlighted by

the media and the poor quality of a few medical staff, the patients rarely take active measures to solve the post-operative pain.

Improvement measures for pain management

In view of the results of this study, combined with the relevant literature and books, we proposed some improvements. First, medical staff should provide full education on the post-operative pain for the elderly patients with carotid artery stenosis and their family members, and encourage the patients to fill the confidence to overcome the disease. Second, after the operation of carotid artery stenosis, the post-operative pain should be included into the routine ward rounds and the nursing records. Medical staff should encourage the patients to feedback the post-operative pain, so as to adjust the treatment and nursing plan in time according to the post-operative pain. Third, according to the social demographic characteristics, history of hospitalization, complications and other characteristics, medical staff should focus on those with several influence factors in the peri-operative period, so as to effectively reduce the degree of post-operative pain and overall improve the post-operative pain in the elderly patients with carotid artery stenosis. Fourth, medical staff should take the initiative to build a good relationship between doctors and patients, care more about the patients in the spiri-

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tual level, and find the patient's problems in time and deal with them actively. Fifth, the patient's pain file can be set up to provide experience and convenience for the later clinical work and the patient's medical treatment.

Limitations and shortcomings of this study

First, this investigation had a long study period of 3 years. Second, post-operative pain was analyzed on the third day after the surgery, but a small number of patients were not at the peak pain due to the individual differences. Third, this study was carried out in one center. Fourth, in the univariate analysis, because the numerical data did not meet the normal distribution, nonparametric statistical analysis methods were used for the statistical analysis, which did not make full use of the data. However, in view of the fact that the diagnosis and treatment of carotid artery stenosis were almost unchanged during the period of investigation, and the individual differences in the post-operative pain were the smallest at the third day after operation, as well as the sample size was enough, we believed that our results were still highly reliable. A multi-center study with larger sample would be conducted in future.

In summary, post-operative pain is common in the elderly patients with carotid artery stenosis, but there are many differences. The influence factors are diverse, among which resident type, gender and compliance are of more significance. The patients are negative on the treatment of the pain. Our results suggest that besides caring about whether there is stroke, CNI, and CHP in the elderly patients after CEA, post-operative pain should also be a major concern. At the same time, it provides directions for the medical staff to screen high risk groups of post-operative pain and improving the measures for pain management.

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Disclosure of conflict of interest

None.

Address correspondence to: Feng Ran, Department of Vascular Surgery, Nanjing Drum Tower Hospital, The Affiliated Hospital of Nanjing University Medical School, 321 Zhongshan Road, Nanjing 210008, China. Tel: +86 25 68182222 60731; Fax: +86 25 68182222 60731; E-mail: doctor_ran@163.com

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