

Huashan Perioperative Nursing Program for Stroke Patients Undergoing Contralateral Seventh Cervical Nerve Transfer

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Methodology

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Abstract

Background: The previous investigation regarding contralateral seventh cervical nerve transfer (CC7) revealed a novel and effective approach to improve arm function in patients with chronic spastic paralysis. The patients who underwent both CC7 and standard rehabilitation showed greater functional improvements and spasticity reductions than did the control group who underwent rehabilitation only. Additional efforts are needed to maximize the benefits in patients and establishing a supporting nursing program is a promising way of achieving this goal.

Methods: The present Huashan nursing program was established in consideration of the following elements, that were the routine perioperative care, ensuring surgical safety and improving patient cooperation. Before surgery, psychiatric nursing, health education and risk control were stressed. After surgery, in addition to routine nursing and positioning, special attention was needed for the targeted nursing of postoperative adverse events. In addition, we performed descriptive statistical analysis on the clinical data of patients receiving the Huashan nursing program, focusing on postoperative adverse events. Totally 85 patients were included in the study, and postoperative adverse events occurred in 10 patients, including severe pain (5, 5.88%), neck hematoma (2, 2.35%), dyspnea (2, 2.35%) and hoarseness (1, 1.18%). The above adverse events were alleviated under the targeted nursing guided by the Huashan program.

Discussion: This article introduces the Huashan nursing program, which is based on preoperative evaluations, educational sessions, postoperative monitoring and targeted nursing, for patients undergoing CC7. The present nursing program helped the promotion and provided the opportunity to maximize the benefits of CC7.

1. Background

Stroke causes various types of functional impairments, which persist years following stroke onset and may even be permanent. Despite advances in medicine, the overall stroke burden has been reported to continuously increase in recent years [1, 2]. Urgent demands for stroke recovery have been proposed, and the study on the contralateral seventh cervical nerve transfer (CC7), provided new insights into the treatment of chronic stroke. By transferring the C7 nerve, the functional connection between the spastic arm and ipsilateral hemisphere was established, and the healthy hemisphere could gain control over the paralyzed arm [3]. As reported in our recent trial, CC7 surgery in combination with rehabilitation led to an average 17.7-point increase in the Fugl-Meyer score, massively exceeding the magnitude of improvement in the control group who underwent rehabilitation only [4]. In addition to improvements in arm motor function, spasticity and difficulties performing activities of daily living were also ameliorated [4]. CC7 surgery is an entirely novel approach for stroke recovery, and much more effort should be made to promote CC7. Considering the essential roles of nursing in all medical treatments, establishing a standard perioperative nursing program may be a promising approach.

The nursing program was mainly developed on the basis of the following two aspects: patient characteristics and CC7-related side effects. The former aspect mainly includes advanced ages and basic diseases, which require detailed preoperative assessments and education [5]. Moreover, because most stroke survivors have difficulties performing activities of daily living, the nursing program also focuses on providing assistance in daily activities and preventing accidental injuries (such as falls) [6]. The injuries include hematoma and injuries of surrounding nerves (e.g., the superior laryngeal nerve, the recurrent laryngeal nerve and the phrenic nerve), which may lead to hoarseness and dyspnea. Additionally, paraesthesia is usually reported after nerve transfer [7], and the management of paraesthesia, especially in the presence of severe pain, is also a topic of concern. Targeted care for the above side effects is essential for recovery.

In view of this, this paper proposes a perioperative nursing plan for contralateral seventh cervical nerve transfer: the Huashan nursing program. The key points in nursing work were addressed to ensure patient safety and successful surgery and reduce adverse events. Moreover, we performed descriptive statistical analyses on the clinical data of 85 patients admitted to our center to expound the clinical outcomes of the Huashan nursing program intervention.

2. Methods

2.1. Participants

A total of 85 participants were included in the study, and they underwent CC7 surgery in Huashan Hospital from June 2015 to June 2018. The inclusion and exclusion criteria were similar to those in our previous study [4].

2.2. The Huashan nursing program

The Huashan program was illustrated in Figure 1, and the details were elaborated as following [8, 9].

A. Preoperative nursing

Psychiatric Nursing: All patients were educated in a routine manner after admission to hospital, mainly on CC7-related principles, possible complications and reasonable postoperative expectations. In addition, the hospital anxiety and depression scale (HADS) was used to assess the psychological states of the patients, and special attention was given to the patients with a score ≥ 8 [10]. We encouraged communication among patients to eliminate negative emotions and build patients' confidence in treatment, and multimedia materials were also used to share information on CC7.

Clinical Path in Health Education: We outlined the entire track a patient is expected to follow throughout the course of the treatment. Both orderliness and timeliness were stressed, and education was scheduled in phases [11]. The path will lead to a better understanding and the cooperation of patients and promote efficient and orderly operations for nursing work.

Surgical Risk Assessment: The assessment is essential, as most stroke survivors are characterized by an advanced age and many basic diseases [5]. Special effort should be made to prevent pulmonary embolism, pulmonary infection and stroke recurrence. Details regarding the preoperative examinations were listed in Table 1. The patient's medical history and physical signs are of great significance, and examinations should be performed appropriately to minimize risk.

Preoperative Preparation: Routine preparation includes stopping taking antiplatelet and anticoagulant drugs 5 days before surgery; water and food fasting for 6 hours before surgery; removing the denture; training for cough and sputum excretion; and preparing the skin of both armpits, the jaw and the uninjured limb (for the preparation of a sural nerve graft).

B. The routine postoperative nursing

The patients took a supine position after surgery. Two negative pressure drainage tubes were used, and the color, quality and quantity of drainage fluid were monitored. Generally, the drainage tubes were removed when the color of the drainage fluid turned faint yellow and the volume collected over 24 hours was less than 20-30 ml. When the volume increased suddenly or the color turned bright red, we checked for active bleeding and reported it in a timely manner. In contrast, when the volume decreased suddenly, an obstruction could have occurred, and we needed to identify and resolve the problem. Meanwhile, sandbags were placed over the bilateral clavicle for 48 hours to reduce bleeding and the incidence of hematoma. The patient's state, particularly regarding complaints of chest tightness, difficulty breathing and neck swelling, was closely monitored.

ECG monitoring and oxygen inhalation were performed for 4-6 hours after surgery. Blood pressure management is essential for the prevention of cerebrovascular accidents. We instructed the patients with hypertension to continue antihypertensive therapy as usual. A low ambient temperature, anxiety, pain and sleep disturbances can increase blood pressure, and the impact of these factors should be minimized as much as possible (details provided in the next section). Esophageal edema may occur due to the stimulation or pulling of the esophagus during the operation; thus, postoperative dietary guidance is required to protect the esophagus. A liquid diet was allowed 6 hours after surgery, and a semiliquid diet was provided on postoperative day 2. From postoperative day 3 onward, the patients consumed a soft diet, and after 1 month, the patients consumed a general diet. For the prevention of lung infection, early out-of-bed activity was encouraged, and the range and intensity of activity was gradually increased. For the prevention of lower extremity deep venous thrombosis, air pressure treatment can be utilized.

C. The position and immobilization

To reduce the magnitude of traction on the transferred C7 nerve, a neck collar and bandage were used to reduce the movement of the head and the paralyzed arm, respectively, for 4 weeks after surgery [12]. The shoulder on the paralyzed side was kept in an adducted position, and we helped the patients hold a towel with the paralyzed hand to relieve spasticity.

D. Targeted nursing for adverse events

As shown in Table 2, adverse events occurred in 10 patients after surgery. Targeted nursing for the above adverse events played essential roles in recovery, and the details are as follows (also seen in Figure 2).

Neck Hematoma. Attention should be paid to the self-reported symptoms of patients and the quality and quantity of the drainage liquid. When the amount of drainage liquid increased and the color turned dark, we needed to remove the neck collar, watch the color of the neck, observe whether the neck widened, and palpate the neck to assess muscle tension. Neck hematoma is usually caused by poor drainage and the use of anticoagulant drugs. For obstructed drainage, the tubes were repositioned. For the patients with a medical history of anticoagulant drugs, pressure dressings were effective, and drainage tubes were not removed unless the situation improved.

Hoarseness. Injuries of the recurrent laryngeal nerve can lead to hoarseness, which is generally caused by excessive traction during surgery or neck hematoma compression [13]. Attention should be paid to monitor whether there is a change in voice or coughing when drinking, especially in patients with neck hematoma. For patients suffering from nerve traction, hoarseness spontaneously resolves within approximately one week, and we should increase doctor-patient communication and relieve the anxiety of patients during the nursing process. Regarding patients with neck hematoma, treatments of the primary disease should be stressed, and the details are listed above. For nerve traction, hoarseness spontaneously resolves, but attention should be paid to patient comfort and communication with nurses so that the patients consistently maintain a positive mood.

Severe Pain. Pain and numbness of the arm were the most common adverse events after surgery [4]. In severe cases, sleep disorders, anxiety and depression, and fluctuations in blood pressure and blood glucose levels can occur, which ultimately negatively impact recovery. The face rating scale (FRS) was utilized to assess the severity of pain [14]. For patients with a score less than 5, the preferred treatment was physical therapy. For the patients with a score between 5 and 7, imagery therapy was added, and the patients were asked to relax their minds and imagine good things, which attenuated sympathetic activation to relieve pain. For the patients with an score higher than 7, sleep disorders can occur, and drug therapy is often necessary. Painkillers (i.e., gabapentin and pregabalin) and sleeping pills were used as needed.

Dyspnea. Phrenic nerve injury can lead to dyspnea [15], which is usually caused by excessive traction or accidental injury when the scalenus is cut anteriorly. We closely monitored the patients' self-reported symptoms, respiratory frequency and oxygen saturation. When dyspnea occurred, a high concentration of oxygen was used, and emergent blood gas analysis and chest CT scans were performed to determine the severity. Afterwards, patients were asked to enhance thoracic breathing. The exercise was performed three times on the first day for ten minutes each time. Then, the duration and intensity of breathing exercise improved gradually. To prevent lung infection, the head of the bed was raised to 30°, the patient was assisted in turning over, the back of the patient was patted, and atomization inhalation was performed [16, 17].

3. Discussion

Presently, we proposed the perioperative nursing program for stroke patients undergoing CC7, the Huashan program. Further, the preliminary study enrolling 85 patients suggested its' feasibility and effectiveness.

Before surgery, nurses focused on performing a comprehensive examination, which was established based on the complex conditions of stroke patients. The risk assessment of complications represents an essential step to ensure surgical safety. Moreover, the clinical path for health education was key in reducing patient's worries and building their confidence [18, 19]. Regarding postsurgical nursing, attention should be paid to the management of surgery-related complications, especially neck hematoma, hoarseness, severe pain and dyspnea [4]. In addition to the early discovery and timely treatment of complications, the prevention of accidents and treatment of basic diseases by nurses must also be stressed.

To conclude, CC7 is a novel and effective treatment approach for patients with spastic arm paralysis in the chronic stage. Based on the patients' characteristics and surgery-related side effects, the present program provided the feasible template. The Huashan nursing program helps maximize the benefits of CC7. Moreover, it can also provide novel perspectives of nursing for patients with brain injury and patients undergoing nerve transfer.

Abbreviations

CC7, contralateral seventh cervical nerve transfer;

HADS, the hospital anxiety and depression scale;

FRS, face rating scale.

Declarations

Ethics approval and consent to participate

The institutional review board of Huashan Hospital approved the study, and each participant provided written informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

Fan Su and Xiaoqian Wang collected the data and wrote the paper. Ying Liu, Wendong Xu and Jinyao Zhang designed the program and directed the study. Ye Xu and Yiqun Zhou assisted in program design and paper writing.

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Tables

Table 1. The examinations before CC7 surgery

	Examination program	Examination purpose
Basic Examination	Blood routine analysis, coagulation function test, electrocardiogram, tests of viral hepatitis, syphilis and HIV	Routine preoperative assessment
Specific Examination	echocardiography	Whether cardiopulmonary function is capable of surgery;
	pulmonary function test	whether mural thrombus occur
	carotid artery ultrasound	Whether severe vascular stenosis or unstable plaques exist
	head CT angiography	
	lower limbs deep vein ultrasound	Whether deep vein thrombosis exist
	brachial plexus MRI	Whether there is anatomic variation
	brain functional MRI	Access brain plasticity

Table 2. The demographic data and adverse events

		no. (%)
Gender	male	74 (87.06%)
	female	11 (12.94%)
Side of paralyzed hand	left	45 (52.94%)
	right	40 (47.06%)
Cause of injury	cerebral hemorrhage	48 (56.47%)
	cerebral infarction	37 (43.53%)
Adverse events	Neck Hematoma	2 (2.35%)
	Hoarseness	1 (1.18%)
	Severe Pain	5 (5.88%)
	Dyspnea	2 (2.35%)

Figures



Figure 1

Illustration of the Huashan nursing program for stroke patients undergoing contralateral seventh cervical nerve transfer. Preoperative care mainly included psychiatric nursing, health education, risk control and general preoperative preparation, while postoperative nursing main consisted of routine nursing, position and target nursing for adverse events.

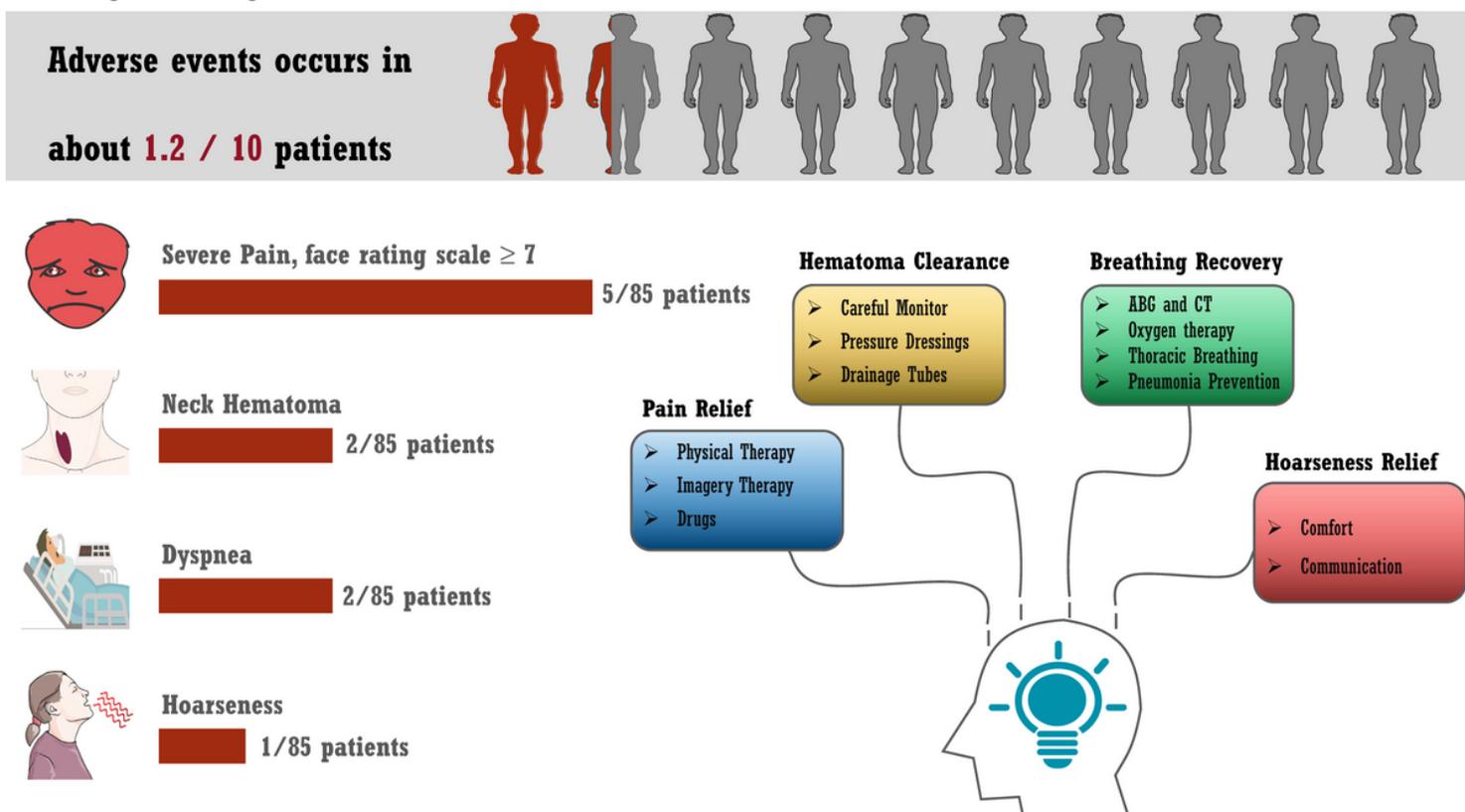


Figure 2

CC7-related adverse events and the targeted nursing program. The occurrence and manifestation of postoperative adverse events were illustrated. The targeted nursing program was proposed for pain relief, hematoma clearance, breathing recovery and hoarseness recovery.