



Application of Standardized Nursing in the Perioperative Period of Patients with Idiopathic Scoliosis

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Abstract: Objective — To explore the standardized nursing program for idiopathic scoliosis deformity correction under general anesthesia during perioperative period. Methods — Retrospective analysis 28 patients with adolescent idiopathic scoliosis (AIS) as the research object admitted from 2020 July to August 2021. The nursing plan formulated in the operating room of our hospital was strictly implemented, patients and surgical risks were comprehensively evaluated before surgery, the operating room, surgical instruments and intraoperative drugs were carefully prepared, the operation was performed with strict aseptic techniques, the surgical medical team cooperated skillfully, and the changes of the condition were closely observed after surgery. Results — Operations were smoothly conducted for all the 28 patients with full recovery. The patients were proved without presence of symptoms of skin pressure injury, nervous system injury, serious timeout, postoperative paralysis, hemorrhagic shock and other serious adverse events. Conclusions — Posterior orthopaedic surgery for scoliosis is proved to be difficult for operation with long duration and high risks. There are many risk factors in perioperative nursing. According to standardized and specialized nursing programs, strict intervention throughout the perioperative period can improve the quality of nursing in the operating room, which can improve the efficiency of surgery, reduce the risk of surgery, ensure the safety of patients, and promote the rapid recovery of patients.

Keywords: idiopathic scoliosis, perioperative period, standardized nursing plan

Adolescent idiopathic scoliosis (AIS) refers to a spinal deformity in which one or more segments of the spine curve lateral and the vertebral body is twisted. Idiopathic scoliosis accounts for about 80% of the total scoliosis in juvenile patients aged 10-18 years according to the age at first diagnosis, which is the most common type of scoliosis with the main symptoms of asymmetrical shoulders. As a consequence, it is prone to give rise to chest deformation and affect the respiratory function, visceral function, which will lead to varying degrees of lumbago and backache and movement restrictions in thoracic dorsal based activities. AIS has a high incidence and rapid progression, causing great adverse effects on patients' growth and development, learning and communication, quality of life and mental health. At present, surgery is the most effective way to treat the disease, aiming to correct scoliosis and restore the normal curvature of the spine to maintain the balance of the spine^[1]. In addition, adolescent idiopathic scoliosis orthopaedic surgery is characterized by high degree of difficulty with long duration as well as high risk, which can be successfully conducted with the coordination of multidisciplinary teams, etc. Intervention in perioperative nursing is proved with high degree of complexity, as a result, standardized and specialized nursing programs need to be formulated. Twenty-eight AIS patients were admitted to our hospital during the summer vacation from July 2021 to August 2021, with an average age of 14±3 years old. The patients were diagnosed with the Cobb Angle of 42° ~ 110° in preoperative period, and the an average angle of 76. All patients were treated with posterior spinal orthopedic bone grafting and internal fixation under general anesthesia, and perioperative standardized nursing plan formulated by our hospital was adopted. Quantification and qualitative characterization were conducted for objectives in nursing management, technical regulations, nursing quality, service mode, etc. All the 28 patients achieved good expected results in postoperative recovery, with 0 death and 0 serious adverse events. The postoperative Cobb Angle was 0° ~ 35°, and all patients recovered successfully and were discharged from hospital. The introduction is as follows.

1. Data and methods

1.1 Clinical Data

There were twenty-eight patients satisfying the inclusion criteria, including 11 males and 1 female, aged from 10 to 18 years, with an average medical history of 5 years of AIS. They were diagnosed with scoliosis by imaging examination in preoperative during, and surgery was confirmed for treatment. Lateral bending position: 10 cases in thoracic segment,

11 cases in thoracolumbar segment, 7 cases in lumbar segment. All 28 patients with AIS malformation were treated with posterior spinal orthopedic bone grafting and internal fixation under general anesthesia, and all patients were treated with standardized specialized nursing program of our hospital during perioperative period.

1.2 Surgical methods

The patient was placed in prone position after successful anesthesia. After routine disinfection, a posterior midline incision was made to fully expose the spinous process and lamina of the malformed segment. Under g-arm fluoroscopy, appropriate screws were implanted at both sides of the vertebral arch screws, and a rod of corresponding length was placed on the left and right sides. After the rotation of the orthosis, the screws were locked. The deformity was corrected and the somatosensory evoked potential was normal. The Cobb Angle was determined again according to the G arm lateral fluoroscopic image to ensure the pre-determined angle of osteotomy correction. After the completion of osteotomy and orthopedics and internal fixation, the wake up test was carried out. After the normal movement of both lower limbs, the bone bed was made. The removed posterior vertebral structure was crushed and bone graft fusion was performed. The incision was cleaned and the drainage tube was indwelled to close the wound layer by layer^[2].

2. Surgical care

2.1 Preoperative nursing

2.1.1 Preoperative visit

The doctors and nurses in the spinal orthopaedic ward will conduct the work in health education for patients and their families, and popularize the disease knowledge of adolescent idiopathic scoliosis(AIS). For example, the doctors can show them the photos before and after surgical correction of similar medical records, explain the surgical process, perioperative precautions to sweep away the feared state of mind, as a result, patients will cooperate with us for the conduction of standardized specialized nursing program in an active manner. The operating room nurse visited the patients on the first day after admission and the day before surgery. The physical conditions and mental health status of patients were evaluated, and the precautions and requirements for coordination in the prone position were informed by form of graphic cards, short videos and other methods, and exercise in the prone position was started to improve the adaptability of patients in this position during surgery^[3].

2.1.2 Preoperative traction

For patients with severe scoliosis, preoperative traction was performed according to the status of the disease, and the traction methods included craniopelvic ring traction (HOLo frame) and pelvic traction with traction duration of 2-3 weeks so as to relax the muscle ligaments and facet joints of paravertebral contracture to reduce the operation difficulty, shorten the operation time and to achieve maximum correction for deformity.

2.1.3 Training for pulmonary functions

Routine test for pulmonary functions in preoperative period was conducted with training for pulmonary functions in order to improve and reduce the incidence of complications. The training methods are: Blowing air into a glass bottle filled with water or blow the balloon for 4 ~ 5 times /d with each duration of 10-15 min. In addition, patients can be guided to climb stairs for 3 times/d with each duration of 10-15 min . Patients can make adjustment from low speed to fast speed. All of the above training can increase lung capacity and improve lung function without feeling palpitations and shortness of breath

2.1.4 Wake up training

In order to timely understand whether patients have spinal cord injury during or after surgery and whether the spinal nerves are damaged due to excessive pulling after the placement of the pedicle internal fixation system, the patients can be given wake-up experiment education. Before surgery, patients were informed of the methods and precautions of the wake up experiment, so that they could timely and actively cooperate. Specific methods: After the operator gives instructions for the awakening experiment, the anesthesiologist stops drug administration and wakes the patient gradually. The medical staff calls the patient and asks the patient to move his hands and feet in sequence under the guidance of the surgical nurse, so as to timely observe and treat the patient and avoid complications such as spinal cord injury^[4].

2.1.5 Preparation of operating room and materials

The surgery is a major Type I surgery with long operative duration and various implantation materials and intraoperative fluoroscopy tests. It must be carried out in the hundred-level laminar flow surgery room specially equipped with lead plate in orthopedics. Strict control should be made in the number of visitors and to give stringent review and train for the surgical participants, so that they can master the surgical process, nursing plan and emergency plan, to grasp skilled

nursing plan, emergency plan. To conduct strict check and inspect drugs, instruments and equipment for the operation such as: Operating room ventilation and lighting system, communication system and conventional posterior spine surgical instruments, instrument, spinal cord monitoring instrument, the implant, ecg blood oxygen monitoring instrument, high-speed grinding drilling system, ultrasonic treatment, autologous blood back to the conveyor, G arm X-ray machine, electric coagulation system, negative pressure center attract bed system, special surgery, anesthesia machine, anesthesia and emergency medicine.

2.2 Intraoperative nursing

2.2.1 Preoperative position

All patients were treated with tracheal intubation and general anesthesia, with prone position and indwelling catheter before surgery. Closing both eyes and stick protective film on them. At least 4 medical staff will cooperate with the patient at the same time. Turn the patient to the prone bracket with the axis of the spine, the patients with spinal axis of turn over to one side rotate to the stomach stents to guarantee the chest hung up, not oppressed by their own weight, forehead, knee, foot pad with soft mat, Both upper limbs are raised up and placed on both sides of the head. The elbow joint is naturally flexed and placed on both sides of the forearm bracket respectively. Pay attention to the excessive abduction of the shoulders to prevent brachial plexus nerve injury. The head rotates naturally to one side to keep the tracheal circuit unobstructed. Soft pads are placed on both sides of the head. Eyes, mouth and nose are placed in the gap of the head ring to prevent compression. To protect all parts of the body under pressure and bone carina, to reduce the occurrence of intraoperative pressure injury. Fill in the informationized "3S Risk Factors Assessment Scale for Stress Injury in surgical patients" ^[5] before the operation.

Measures to keep warm should be made before placing sterile sheets to prevent hypothermia shock. During the operation, the doctors and nurses should conduct regular check in whether the trachea is broken or loose, whether the venous passage is returned or shed to keep the reliable and safe trachea and venous passage. Checking regularly during the operation whether the trachea is broken or loose, and whether the venous passage has blood return or falls off, and always maintain reliable and safe trachea and venous passage. During the operation, to regularly observe the liquid scale in the negative pressure suction tank, pay attention to the monitoring of intraoperative blood loss, timely report to the surgeon and anesthesiologist, timely infusion of blood products (such as leukocyte-removed suspended red blood cells, platelets, fresh frozen plasma, cryoprecipitate, etc.) according to the fluid loss of patients during the operation, if necessary. The type of transfusion or infusion is determined by the surgeon and the anesthesiologist, and autologous blood transfusion apparatus may be used if necessary. During the operation, spinal cord electrophysiological monitoring was applied, and the sensitivity of the electrophysiological monitoring instrument was regularly observed to check whether the monitoring guide wire connector fell off or had poor contact, so as to prevent the occurrence of false positives in spinal cord electrophysiological monitoring. In addition, we should always pay attention to and record the influence of muscle relaxants on the amplitude and latency of monitoring during the monitoring process, resulting in misjudgment of false positive results^[10]. When it is confirmed that spinal cord or nerve injury occurs during the operation, report to the surgeon in time, stop the relevant operation in time, correct it as soon as possible, save the spinal cord nerve injury as much as possible, and reduce the injury to the patient. The itinerant nurse recorded and reported the arterial pressure value of the patient in time, so that the blood pressure could be stabilized in a certain range, which could not only avoid spinal cord and kidney ischemia injury, but also keep the blood pressure stable, and reduce intraoperative bleeding as much as possible.

2.2.2 Keeping the respiratory circuit unobstructed during the operation

Due to the need to use the screw rod system for scoliosis correction, parallel lamina decompression costal joint fusion and other operations during the operation, diaphragm elevation and thoracic dilation can be limited, resulting in the reduction of respiratory reserve function of patients, respiratory muscle breathing disorders resulting in restricted insufficient ventilation and reduced pulmonary ventilation function. In addition, during the awakening process, the anesthetic effect becomes shallow, and the patient's respiratory secretions increase, which is prone to the risk of phlegm blockage. Therefore, during the whole operation, itinerant nurses should closely observe the respiration and blood oxygen saturation value, and actively cooperate with anesthesiologists to prepare respiratory muscle stimulants and sputum suction items to keep the respiratory tract unobstructed, and sputum suction should be taken when necessary.

2.2.3 Strict observation of all indicators

Close intraoperative observation included vital signs, blood loss, urine volume, aseptic operation of the operator on the table, safety of body position, body temperature, spinal cord monitoring, etc. Due to the large trauma and high difficulty of the operation, in addition to the rich blood vessels around the vertebral body of the spine, intraoperative blood leakage, patients should actively cooperate with the surgeon to control bleeding, and general control measures include: Preoperative

position is placed with empty abdomen to avoid abdominal vein compression. During the operation, to adjust the intensity of electrocoagulation in time for rapid hemostasis. Intraoperative blood pressure data can be reported to anesthesiologist in time, so as to adjust intravenous drug dose and administration speed in time, so as to reduce blood pressure in time, which can reduce bleeding. During surgery, the patient's thermoregulatory system is suppressed by anesthetic drugs. Due to the influence of factors such as low operating room temperature, large incision input of cryogenic fluid and blood products, Patients will have rapid heart rate, increased oxygen consumption and other stress reactions, which will reduce oxygen and blood supply to organs and tissues, resulting in ischemia and hypoxia of tissues and organs, resulting in shock, organ damage, increased risk of infection and other adverse consequences. Therefore, we should pay attention to heat preservation during the operation, and try to wrap the patient's limbs with auxiliary materials for heat preservation to reduce direct skin exposure. During the operation, pay attention to posture safety observation at all times, especially after the intraoperative wake up experiment, pay attention to posture displacement and timely adjustment. In addition, due to the long operation time, the pressurized parts of the patient's head, face and limbs should be suspended regularly. The method is to lift the patient's head or extremities every hour for 1-2 minutes to strengthen the blood flow of the pressurized parts of the skin and reduce the occurrence of pressure injuries^[5-6].

2.2.4 Nursing of awakening in intraoperative anesthesia

Intraoperative anesthesia awakening refers to a short period of awakening during anesthesia to check the physiological function of the patient, and the anesthesia will be maintained after the awakening test. Complications of spinal cord injury are easy to occur due to accidental injury of spinal nerves due to instrument operation or excessive spinal cord pulling during spinal orthopaedic surgery. If timely detection and treatment can be carried out during surgery, irreversible spinal cord injury can be avoided. Methods After the operation of osteotomy and orthopedic and internal fixation, the doctors were tested to wake up and move their limbs in accordance with the instructions of the doctors.

2.3 Postoperative care

After the operation, to assist the doctor to turn over and cross the bed, pay attention to keep the movement coordinated, avoid torsion of the patient's position, so as not to loosen the internal fixation. In addition, carefully check the patient's body pressure parts, as well as all kinds of pipe circuit (such as respiratory circuit, venous channel, urinary tube, wound drainage tube, etc.), to prevent all kinds of pipe circuit discount, blockage or slippage. Finally, the patient should be sent to the anesthesia recovery room for shift, and cooperate with the anesthesiologist for anesthesia recovery. After resuscitation, pay attention to the discharge of wound and sensory activity of lower limbs^[7-8].

3. Conclusion

Scoliosis orthopaedic surgery is characterized by high difficulty with long duration and high risk, which can be conducted with cooperation from multi-disciplinary teams. Perioperative nursing intervention is more complex, and the implementation of standardized and specialized nursing programs can reduce the difficulty of surgery, shorten the operation time, and reduce the occurrence of serious complications during and after surgery. Strict verification, full preparation, skilled cooperation, close monitoring and observation, and scientific and effective management are the prerequisites for the successful completion of each highly difficult operation. Therefore, high-quality perioperative nursing intervention is the guarantee for the smooth completion of surgery^[9].

The staffs engaged in operating department of our hospital has formulated a set of standardized and specialized nursing programs after summarizing the nursing experience of idiopathic scoliosis orthopaedic surgery in the past five years (including the analysis of the causes of the previous intraoperative and postoperative complications, etc.) with the purpose is to further improve the quality of the nursing in operating room, strengthen the team cooperation, reduce adverse events occurred in the process of operation. The standard nursing plan for scoliosis surgery in our hospital is not static, rather in constant improvement with relentless innovation. "Learn from failure and refine improvement measures from experience. " "The staffs in our hospital are not afraid of failure, it is our fear that we fail to learn anything from repeated failures. ""Advance with the times for self-innovation" are one of the working concepts of the surgical nursing team of our hospital. Through unremitting efforts and exploration, the work efficiency and quality of the surgical nursing team in our hospital have been continuously improved, especially in the face of such difficult and high-intensity work tasks as scoliosis deformity correction in the "problem discovery - problem solving - problem summary - problem improvement - problem avoidance".

Perioperative nursing intervention is complicated, which include: Preoperative communication and cooperation of the medical teams, preoperative education, preoperative evaluation, preoperative position placement, intraoperative vital signs

monitoring, intraoperative response to spinal cord injury, intraoperative wake-up experiment, postoperative maintenance of various channels and pipelines, postoperative resuscitation, etc. Therefore, a standardized and specialized nursing plan should be formulated. It can improve the working efficiency of surgical team, improve the quality of work, reduce the occurrence of complications and promote the rapid recovery of patients.

Acknowledgments

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References

- [1] Cai Siyi, Chen Feng, Wang Shujie, Ma Lulu, Et al. Expert consensus on the implementation process of accelerated rehabilitation surgery with posterior orthopaedic fusion in adolescent idiopathic scoliosis[J]. *Chinese Journal of Bone and Joint Surgery*, 2019; 09: 652.
- [2] Zhao Haiyan, Zhou Kaiyan, Clinical treatment and nursing progress of scoliosis[J]. *Hebei Medicine*, 2015; 09: 1537-1539.
- [3] Guan Lin, Lin Luojin. Influence of humanized nursing intervention on mood state and complications in patients with scoliosis orthopedics[J]. *Journal of medical university*, 2020; 42(3): 283-288.
- [4] Jiang Zhongyan, Li Changyan, Peng Shishan, Li Xyan, Perioperative nursing care of 28 cases of adolescent idiopathic scoliosis orthopedics[J]. *Journal of Qilu Nursing*, 2015; 12: 84-86.
- [5] Ou Chunhong, Chen Yunchao, Luo Ruxiang. Nursing care of patients with ankylosing spondylitis and kyphosis[J]. *Journal of Guangxi Medical University*, 2011; 28(5): 819-820.
- [6] Hu Ying, Wang Zonggui, Application of responsibility holistic nursing in patients with scoliosis during perioperative period[J]. *Journal of Qilu Nursing*, 2019; 25(22): 96-98.
- [7] Qu Hongxia, Wang Fujuan, Deng Hua. Surgical Coordination for posterior scoliosis correction[J]. *Cardiovascular Disease Journal Of integrated traditional Chinese and Western Medicine*. 2017; 5(22): 29-30.
- [8] Qiu Guixing. Treatment of idiopathic scoliosis of adolescents[J]. *Chinese Bone and Joint Surgery*, 2011; 4(4): 261-264.
- [9] Zhang Jiqin, Perioperative nursing care of adolescents with idiopathic scoliosis deformity[J]. *Abstract of The World's Latest Medical Information*, 2015; 015: 222-225.
- [10] Min Tiantian, Ruan Na, Xu Yong. Application of neuroelectrophysiological monitoring in three-dimensional orthopaedic surgery of scoliosis[J]. *Orthopaedic Nursing*, 2020, 11(1): 78-81.