

# Patient Care for Adolescent Idiopathic Scoliosis

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## Abstract

Idiopathic scoliosis is commonly found in adolescents of 10 to 17 years of age, patients are required to undergo various types of treatment based on different angles in scoliosis. With the summarized literature and expert opinions, this article describes the treatment and nursing care for various degrees of scoliosis.

**Keywords:** adolescent idiopathic scoliosis, nursing care

## 1. Epidemiology

Idiopathic scoliosis is commonly found in adolescents of 10 to 17 years of age, which is defined as an abnormal vertebral rotation or curvature forming conditions including lateral curvature and vertebral rotation. In adolescent idiopathic scoliosis (AIS), 80% of the cases are idiopathic with unknown origin. The possible causes include hormone, muscular imbalance, and genetic factors (Menger & Sin, 2021). Several common appearance characteristics include: uneven height of bilateral shoulders, one shoulder blade is more prominent than the other, uneven length of bilateral arms, asymmetric waistline, uneven height of bilateral hips, and more prominent ribs (Burton, 2013; Mesiti, 2021).

In the US (Thomas et al., 2021), the incidence rate of AIS reaches 522.5/100,000 person-year, with female incidence rate doubles that in males ( $p < 0.05$ ). In studies (Dunn et al., 2018; Grossman et al., 2018), it is found that the prevalence rate for a Cobb angle of  $\geq 10^\circ$  among idiopathic scoliosis patients aged 10 to 16 years is 1% to 3%. The cumulative incidence estimates are 1.0% for a Cobb angle  $\geq 20^\circ$  and 0.4% for a Cobb angle  $\geq 40^\circ$ . In the study conducted by Bondar et al. (Bondar, Nguyen, Vatani, & Kessler, 2021) for the adolescent group in Southern California, the incidence rate was 28.6/100,000 person-year, in which females had a greater initial curve magnitude than boys (18.1° vs. 16.7°). In China (Qiu, 2017), the incidence rate of scoliosis varied from 0.6% to 2.0%.

## 2. Measures of Treatment and Nursing Care

Patients with different Cobb angles undergo different treatment measures, those with a Cobb angle of  $10^\circ$  to  $25^\circ$  receive X-ray follow-ups at 3-, 6-, or 12-month intervals; patients with a Cobb angle greater than  $25^\circ$  but less than  $40^\circ$  -  $45^\circ$ , or with a curve increase of 5 degrees or more during follow-up period are recommended to wear a brace, undergoing a surgery is primarily required for those who are with more than  $40^\circ$  -  $45^\circ$ , in which spinal fusion is the most common surgery (Dunn et al., 2018; Menger & Sin, 2021).

### 2.1 Brace Treatment

The indication guideline proposed by the US Scoliosis Research Society (SRS) shows (1) Patients with age 10 years or older; (2) Risser grade 0 to II, with less skeletal maturity; (3) Curve magnitude  $25^\circ$  -  $40^\circ$ ; (4) No prior treatment; (5) Less than 1 year of post-menarche (Maruyama, Grivas, & Kaspiris, 2011). Bracing treatment is required to be discussed with the physician on treatment strategies, deciding based on individual conditions. Once brace wear has been finalized, patient should be informed of objective for brace treatment is to minimize aggravation instead of stretching the deformed spine. The earlier recommendation for brace wearing time was 23 hours per day. Research findings indicate that patients wearing a brace for more than 13 hours a day show better prognosis than that in patients wearing a brace for less than 6 hours. Nursing highlights for brace wear include (Mesiti, 2021; Wang, Huang, Fen, & Lin, 2010; Lo, & Huan, 2017): First wear fitted seamless cotton clothing under the brace, with wearing one-or two-size bigger clothes over the brace. For initial brace wear, it is

recommended to wear for about 3 or 4 hours for the first day, gradually increasing the daily wearing time. Take off the brace when taking a bath, doing exercises or attending a physical education lesson but wear it back after completed the exercises, continuing wear may be up to 23 hours a day. In wearing a brace, pay attention to the proper wearing manners and the degree of tightness. After taking a bath or shower, massage using alcohol swab over the areas liable to compression, continuing for roughly two or three weeks can strengthen anti-compression of the skin. For children underwent surgery, wear a brace when getting out of the bed or sitting up. Wearing time varies based on different approaches of surgery, normally requiring to wear for about 3 to 6 months. In the database analysis for 7 studies conducted by Negrini et al. (Negrini et al., 2021), all studies indicate that supporting can prevent curvature progression. Very rigid bracing significantly and successfully improves 20° to 40° curves (Relative Risk [RR] 1.79, 95% CI 1.29 to 2.50). The systematic literature analysis for 7 studies and 5 thesis articles conducted by Ruffilli et al. (Ruffilli, Fiore, Barile, Pasini, & Faldini, 2021) suggests that there is no any difference in curvature progression between traditional full-time thoraco-lumbo-sacral orthoses (TLSOs) and night-time bracing. The systematic literature analysis conducted by Costa et al. (Costa et al., 2021) found the effectiveness of bracing in AIS treatment. Compared to non-using group, rigid full-time braces, rigid night-time braces, and full-time soft braces are all more effective in stopping curvature progression. The effectiveness of night-time braces is similar to that of rigid full-time braces. Soft braces are less effective. Risser is the most widely used indicator for skeletal maturity.

### *2.2 Halo Traction*

Halo traction: used for patients with scoliosis curves greater than 70°, poor spinal flexibility or S-shaped scoliosis, which is undergone with separational operations. First, skull traction is performed by using 4 or 8 stainless steel pins to the skull. The front-lateral skull pins are placed on 1 cm above eyebrows bilaterally, avoiding damage to the trochlear nerve, with the back-lateral pins placed on 1 cm above the auricles bilaterally. Halo traction is roughly performed for 7 to 10 days, the surgery is to be undergone after the vertebral bodies and trunk are gradually straightened out. Highlights for nursing care include the nursing for fixing pins of traction, which is required to keep dry, avoiding infection. Carl et al. (Carl et al., 2021) found that cranio-femoral traction (CFT) had been proved to decrease operative time and blood loss, achieving significant curve correction.

### *2.3 Integrative Body-Mind-Spirit and Social Support Nursing Care*

Menger et al. (Menger & Sin, 2021) found that significant appearance defect resulted from scoliosis can cause anxiety, shrink and depression. Moreover, most scoliosis patients do not participate in exercises due to fear of embarrassment or disgrace. In review for several articles involving the quality of life in adolescents undergoing brace wear treatment, Wang et al. (Wang, Tetteroo, Arts, Markopoulos, & Ito, 2021) found the most significant influence in order as (1) Self-image/body shape; (2) Mental health/stress resulted from the uncertainty during treatment period; (3) Lacking of vitality/exercise endurance. For adolescents studying in junior and senior high schools, the comments from their school peers may influence the inclination of wearing a brace to school, parents should be more thoughtful of that, providing encourage and support.

### *2.4 Others: Rehabilitation, Posture, Diet, and Pain*

Rehabilitation exercises can increase muscle strength and bone mass intensity, avoiding aggravation of scoliosis, including: regular rehabilitation exercises, enhancing muscle strength, especially for the enhancement of paraspinal muscles and core muscles; frequently do stretching exercises to keep the flexibility for thoracic expansion, maintaining the spinal softness; arrange cardiorespiratory endurance training to maintain the normal development for cardiorespiratory function. In daily life, it is required to keep good sitting and standing postures, trying to avoid using excessively soft chair or mattress when sitting or lying. Willson et al. (Willson et al., 2021) suggest that children in the recovery period after scoliosis surgery relatively encounter difficulty to participate in exercises due to pain and bad mood. The postoperative effect on the inclination for doing exercises associates with patient's pain and fear. Therefore, a comprehensive exercise guidance may provide patients with a basis for implementation, enabling healthcare personnel to ensure patient's compliance. In the systematic literature analysis for 8 randomized controlled trials conducted by Ganiz-Bermudez et al. (Ganiz-Bermudez, Obrero-Gaitan, Zagalaz-Anula, & Lomas-Vega, 2022), 7 items of moderate evidence support that exercise can reduce spinal deformity (SMD = -0.52, 95% CI -0.96 to -0.1). In applying other therapies along with exercises, satisfactory effect is also found in reducing spinal deformity (SMD = -0.51, 95% CI -0.89 to -0.13).

In the aspect of diet, frequent protein ingestion is recommended to increase muscle mass, strengthening support for the developing spinal vertebrae, minimizing the aggravation of scoliosis resulted from growing taller.

For chronic pain in scoliosis patients, in addition to taking oral analgesics, other measures for pain management should also be used, such as acupuncture, stretching exercises and yoga, all can achieve pain relief. The qualitative interview conducted by Motyer (Motyer, Dooley, Kiely, & Fitzgerald, 2021) found that pain is the postoperative issue of most concern to patients (25%).

### 2.5 Nursing Care After Surgical Treatment

For patients in developmental stage, the scoliosis curves more than 40 Cobb degrees can affect cardiorespiratory function and daily routine. For patients no longer suitable to use a brace after physician's evaluation, surgical treatment should be considered. Three procedures commonly undergone for spinal surgery include anterior spinal instrumentation, posterior spinal instrumentation and anterior/posterior spinal instrumentation, while posterior spinal instrumentation combined spinal fusion is more widely used (Qiu, 2017). Spinal surgery can prevent atelectasis, enhancing lung expansion. Breathing exercises with augmented reality (AR) are useful measures. Chen (Chen et al., 2021) found that use of preoperative breathing exercises with AR increases vital capacity on the 3<sup>rd</sup> day after surgery, reaching statistical difference ( $p = .04$ ).

The summarized highlights for nursing care of spinal surgery include (Pestana-Santos, Santos, Cabral, Sousa, & Lomba, 2021; Cho, Yao, & Chiu, 2015; Su, Yang, Tsai, & Wu, 2011):

- (1) Prevention of infection: providing wound and catheter care.
- (2) Enhancement for lung expansion exercises.
- (3) Acute pain management: administration of analgesics.
- (4) Enhancement for self-care capability: long-term pain management, use of assistive device, enhancement for activity endurance.
- (5) Reduced anxiety: the anxiety about treatment and prognosis.
- (6) Correction for body image disturbance: assistance in rebuilding self-worth, providing social support system.
- (7) Change of nutritional status: Because of the increased nutritional need resulted from growth and postoperative wound healing, protein and energy ingestion should be improved.

### 3. Conclusion

The treatment of AIS is a diverse and long time. This article provides the care content for children with scoliosis, to promote children's physical and psychological comfort and holistic care. This article takes the disease course of AIS patients as the starting point, takes the concept of whole-person, whole-course care as the framework, through literature and clinical care experience, and comprehensively integrates treatment and care measures at different stages, including brace treatment, Halo traction, body-mind-spirit nursing care, and social support, rehabilitation, posture, diet, pain, and surgical treatment, etc., to provide a reference for medical staff care.

The limitation of this article was the lack of presentation of clinical care prognosis data. In the future, the patient-centered and patient medical journey will be used as the framework to construct the care standard of AIS, and apply it to the clinic to provide a high-quality care model.

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