

Advances in Conservative Treatment of Idiopathic Scoliosis in Young Adults

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Abstract

Scoliosis refers to the deformity of the spine that deviates from the connecting line between the occipital midpoint and sacral spine in the coronal plane. Accompanied by vertebral rotation, thoracic deformation, and physiological bending changes, it is a three-dimensional deformity of the spine. Scoliosis usually worsens with the growth and development of adolescents, which can lead to a deficiency in cardiopulmonary function. For scoliosis, clinical treatment at home and abroad can generally be divided into surgical treatment and conservative treatment. In recent years, many studies have shown that PSSE combined with brace therapy is effective in the conservative treatment of scoliosis. This article will summarize the classification, PSSE, and various kinds of braces for adolescent idiopathic scoliosis at home and abroad, in order to provide a reference for those who are new to scoliosis treatment.

Keywords

Scoliosis; Conservative treatment; Brace treatment; Exercise treatment

Scoliosis The Institute classifies scoliosis into two main categories: non-structural scoliosis and structural scoliosis [1]. The former is a type of temporary scoliosis caused by some reason, after intervention to remove the cause, the scoliosis will disappear, but if you choose to let it develop without intervention, it can also develop into structural scoliosis [2]. The latter can be divided into: (1) congenital scoliosis; (2) idiopathic scoliosis; (3) neuromuscular scoliosis; (4) postural or compensatory scoliosis; and (5) acquired scoliosis. Idiopathic scoliosis (IS) is the most common type of scoliosis, also known as adolescent idiopathic scoliosis (AIS) [3].

1. AIS classification system

1.1 King classification

In 1983, Howard King proposed the classification system of AIS and first proposed the concept of stable vertebrae. The classification system classifies scoliosis into 5 types according to the level, apex, degree of scoliosis and spinal flexibility. However, because the classification was based on coronal deformity of scoliosis and the effect of Harrow rod correction, it did not take into account sagittal deformity, and did not take into account single thoracolumbar bend, single lumbar bend, double main bend and triple bend. When this classification system is used as the guiding principle of surgery, it is easy to cause postoperative decompensation, so the utilization rate gradually decreases [4].

1.2 Lenke classification

In 2001, Lawrence Lenke proposed a new classification system and proposed some new definitions: (1) Major bend:

the bend with the greatest degree, always structural. (2) Secondary bending: the bending with a small degree can be structural or non-structural. (3) Non-structural bending: the bending Angle under the X-ray film is less than 25 degrees. The classification system divided scoliosis into 6 types according to coronal and sagittal malformations. According to the position relationship between CSVL and the top of lumbar curvature, three modified types were added. At the same time, according to the Angle of the lumbar kyphosis, three modified types were added. Compared with the King classification, the Lenke classification has higher reliability and repeatability, which is highly recommended by the SRS Association and popularized in clinical practice [5, 6].

1.3 PUMC classification

In 2003, Qiu Guixing's team proposed a new AIS classification system, namely the PUMC (Concorde) classification system, after summarizing the AIS cases treated in the past 20 years and their return visit data [7]. Qiu Guixing's team members took into account the horizontal deformity of AIS patients on the basis of coronal and sagittal deformities. The classification system divides AIS into type II and type III according to the number of scoliosis vertices. If the number of vertices is 1, it is type I. Then in each type, different subtypes are divided according to different criteria, a total of 13 subtypes. At the same time, the corresponding surgical suggestions and fusion guidance for each subtype are put forward, which is of high clinical value.

1.4 Rigo classification

In his years of research, Dr. Rigo found that there is no classification system suitable for conservative treatment of scoliosis so far [8]. Therefore, after years of clinical research, Dr. Rigo proposed the Rigo classification based on Lehnert-Schroth's three - and four-arc classification and subsequent extension classification. According to the observation of the clinical signs of the back of the patients, the classification was divided into three arcs (3C), four arcs (4C), non-three non-four (N3N4), and single waist/single chest bend (L/TL), and then the clinical subclassification was performed by imaging criteria. The type of "3C" could be divided into A1, A2, and A3 subtypes; The "4C" type can be divided into B1 and B2 subtypes; N3N4 is divided into C1 and C2 subtypes; L/TL can be divided into E1 and E2 subtypes. This classification provides guidance for conservative treatment of scoliosis with high reliability and reproducibility [6].

2. Introduction to PSSE

International scoliosis-specific therapy is divided into many schools, according to the order of development of these schools, respectively, France's Lyon therapy, Germany's Schroth therapy, Italy's scientific exercises approach to scoliosis (SEAS), the Barcelona Scoliosis Physical Therapy School(BSPPTS), Dobomed Therapy in Poland, Side Shift therapy in the UK, and the Functional Individual Therapy of Scoliosis (FITS) in Poland [9].

Most PSSEs are based on specific active correction principles that encourage patients to strengthen neuromotor system training, proprioceptive training, and balance training. In addition, PSSE especially encourages patients to take the initiative to carry out rehabilitation training in daily family life activities. PSSE is generally used in the following three clinical conditions [10]: (1) PSSE is only used as the main treatment for mild scoliosis; When the Cobb Angle of scoliosis is doctors often recommend limiting or reducing the progression of scoliosis by PSSE rather than by brace correction; (2) Combined with other treatments to correct moderate scoliosis: PSSE is usually combined with brace therapy to reduce side effects associated with brace wearing; (3) Can be used in adulthood: When the scoliosis angle exceeds a certain limit, certain problems can follow, such as back pain, respiratory dysfunction, muscle contracture, and disease exacerbation. At this point, PSSE can help mitigate the impact of these issues.

2.1 Lyon therapy

In the mid-20th century, French doctor Pierre Stagnara invented Lyon therapy, which consists of Lyon braces and PSSE, a conservative treatment for scoliosis. During the treatment, the patient's posture is evaluated first, and the patient is also made aware of their own problems, and then the patient needs to wear a Lyon brace for some PSSE training. PSSE training includes three-dimensional correction of the spine, correction of the ilia-lumbar Angle (lumbar scoliosis), patient education, and self-control of activities of daily living, such as sitting control and breathing pattern training [9].

The purpose of Lyon therapy is to strengthen the control of the spinal nerves and surrounding muscles, and to improve the strength and coordination of the core muscles through braces and patient education.

2.2 Schroth therapy

In 1921, Katharina Schroth's scoliosis treatment received public attention. Back in 1910, Schroth, a 16-year-old moderate scoliosis patient, after experiencing painful steel frame treatments, decided to develop a more functional set of treatments on his own. Inspired by the way balloons were inflated, she tried to correct the deformity of her torso by breathing in front of a mirror, and through continuous hands-on experiments, eventually formed the early Schroth therapy [11]. The therapy involves multiple corrections, such as breathing posture and self-perception. After years of improvement, Schroth therapy has been popularized in many countries and has become the gold standard of exercise therapy for scoliosis [12].

The Schroth therapy divides the body into blocks, a classification that explains why scoliosis is a compensatory adaptation. A change in one part of the torso causes other parts to change due to compensation. Schroth therapy advocates the use of the interaction between the body's various areas, through the principle of balance reflex, the trunk adjustment of the force to the spine, through the guidance of the therapist and the patient's self-supervision in front of the mirror, combined with the unique Rotation Angular Breathing (RAB). After repeated training, the deformity was finally corrected.

2.3 SEAS therapy

SEAS is based on the Lyon therapy and was established in the 1970s and 1980s. It is a personalized exercise therapy that has been scientifically adjusted, and with the increasing research on AIS in scientific literature, the treatment concept and treatment mode of this therapy have been constantly updated in practice for many years, aiming to achieve the best correction effect in the field of scoliosis [9].

The treatment process of SEAS is as follows: (1) Educate patients to recognize their own malformations, and guide patients to take the initiative to self-correct after recognizing their malformations; (2) In the corrected posture, strengthening muscle strength exercise helps the spine maintain balance; (3) stimulating the neural sensory mechanism of postural maintenance helps the patient finally achieve a subconscious self-posture correction. In addition, another important aspect of SEAS therapy is the emphasis on "teamwork." Strengthen communication among physicians, therapists, orthopedic surgeons, patients, and their families to improve patient adherence to exercise and ultimately improve scoliosis outcomes.

2.4 BSPTS therapy

BSPTS was founded in 1968 by Spanish physiotherapist Elena Salva as a scoliosis clinic in Barcelona, Spain. In the 1980s, Manuel Rigo, the founder's son-in-law, went to Germany to learn the Schroth therapy and later returned to Spain, and after more than ten years of development, finally founded the BSPTS therapy [13].

BSPTS therapy has its roots in Schroth therapy, an outpatient exercise program that combines cognitive, sensorimotor, and kinesthetic training. It emphasizes that the treatment flow should be personalized, determined by the type of scoliosis curve and that treatment should only be performed after the patient has achieved as much alignment of the lower limbs, pelvis, and torso as possible. The correction follows the principles of overall posture adjustment and creates a high-intensity correction force within the body through specific breathing postures. Its goals are: (1) To correct the scoliosis to a normal posture; (2) Stabilize the spine and prevent the progression of curvature; (3) Patient education; (4) Improve respiratory function; (5) Improve activity levels, such as activities of daily living and functional activities; (6) Improve overall self-image and self-esteem; (7) Relieve pain. In addition, BSPTS are often used in combination with RSC braces to help patients train themselves with proper breathing patterns and maintain good spinal posture.

2.5 Dobomed therapy

In 1979, Polish professor Dobosiewicz developed a 3D self-correction method, the Dobomed method, after studying the pathmechanics of AIS. This method has been used in Poland for the conservative treatment of scoliosis since 1982. According to the developer, based on ergonomic theory, since the movement of the main bend is a closed chain movement based on the symmetry of the scapula and pelvis, when the spinal deformity of the sagittal plane and the horizontal plane is corrected, the coronal deformity will be corrected naturally [9, 13].

The treatment process of Dobmed therapy includes three aspects: (1) Anterior bend stage: The anterior bend is completed with the pelvis and shoulder strap strictly fixed with the upper and lower limbs. The purpose is to keep the pelvis and shoulder strap symmetrical and stable on the basis of positive self-correction between the two, which helps patients with scoliosis consolidate the correct posture; (2) Preparation stage: At the beginning of the practice, after the warm-up, the low movement. These low movements relieve the mechanical stress caused by resistance to gravity when the back muscles support the spine. (3) Active self-3D correction in the upright position: Carried out in the vertical position of the spine, the purpose is to make the spine muscles resist all gravity, so as to support the spine and complete self-correction.

2.6 Side shift therapy

In 1984, Dr. Mehta developed the Side Shift therapy for correcting scoliosis curves. This therapy is based on the theory that the flexible curve can be stabilized by lateral movement, and the lateral curvature of the coronal plane can be corrected by excessive deflection [14].

Side Shift therapy was classified using the King classification and Lenke classifications. Scoliosis is divided into three categories according to the patient's range of motion and ability to return to the coronal midline: (1) Scoliosis can be corrected to the coronal midline, and the vertebral body does not rotate; (2) A type of scoliosis in which the scoliosis curve can be corrected to the coronal midline and the spine and pelvis can be aligned, but the vertebral body is partially rotated; (3) The scoliosis curve cannot be corrected to the coronal midline, and the vertebral body cannot rotate.

In addition, the therapy has two training principles: (1) Hitch principle: For patients with thoracolumbar and lumbar lateral curvature, with the knee maintained straight, the convex heel for 10 seconds a day, 30 times a day. (2) Hitch shift principle: For patients with two main bends, while keeping the hips and knees straight, lift the left heel of the side in the same direction as the lumbar scoliosis and switch to the suspension position. Then apply a contralateral corrective force to the convex spine with the hand and hold for 10 seconds, 30 times a day [9, 13].

2.7 FITS therapy

In 2003, Bialek and Mhango, physiotherapists in Poland, set up a foundation based on a summary of a number of other therapies. FITS can be used independently to prepare children for surgery, or to correct the shoulder and pelvis after surgical intervention. In addition, the FITS method can also be used as a treatment for other structural and non-structural scoliosis [15].

FITS therapy consists of three parts: (1) Patient assessment and education: check the spine flexibility of patients and make patients aware of their own deformity; (2) Preparation part: including sensorimotor balance training, detection and elimination of myofascial tension limiting 3D correction movement; (3) Three-dimensional correction part: by improving the negative gravity line of the foot and pelvis, improving the stability of the waist, correcting the breathing posture, and promoting the three-dimensional self-correction of scoliosis. In addition, it is proposed to conduct balance training in daily life to correct walking posture and daily abnormal posture [13].

Although many current cases and experiments have shown that PSSE has a clear positive effect on the treatment of AIS [12, 14-16], the main purpose of PSSE is to prevent the progression of deformity and prevent the occurrence of some secondary diseases related to the deformity. At present, no exercise therapy can completely cure scoliosis. In addition, for the time being, there has been no scientific systematic study on the effect comparison between various exercise therapies. Therefore, it makes sense to set up more high-quality randomized controlled trials to further determine which exercise therapy is more effective.

3. Classification and description of common scoliosis braces

3.1 Evolution history and classification of braces

The use of braces in the field of scoliosis dates back to more than 400 BC, but modern scoliosis correction braces originated in the 1940s. In 1945, American Blount and his partner Schmidt invented the detachable cervical thoracolumbosacral brace, which became an important milestone in brace treatment of scoliosis. After years of development and continuous improvement by clinical therapists, scoliosis braces have gradually formed two major systems, the European branch and the North American branch [17].

European branches include Cheneau braces and its derivative braces (CBW, RSC, GBW, ScolioOlogiC® Cheneau light), Lyon braces, PASB, Sforzesco braces, etc.

The North American braces include Boston braces (including OMC braces modified by it), Milwaukee braces, Charleston braces, Providence braces, Rosenberger braces, Spinecor braces, Wilmington braces, Miami braces, etc.

3.1.1 Cheneau brace and its derived brace

Cheneau brace is currently widely used in Europe. It is an asymmetrical thoracolumbosacral brace that uses the asymmetric position of the chest under the orthosis to guide the patient's breathing and promote the active progression of the spine to the normal curvature Angle. Cheneau brace is suitable for idiopathic scoliosis correction below T6, Cobb Angle, and other conservative treatments of scoliosis, generally requiring patients to wear 20-23h per day. However, there is a risk of limiting the development of the thorax and causing shoulder imbalance in the presence of a traditional Cheneau brace.

Variants of the Cheneau brace include the CBW brace, the RSC brace, the ScolioLogiC® Cheneau light brace, and the GBW brace. The CBW brace combines the advantages of the Cheneau brace and the Boston brace. It is suitable for scoliosis below T6 and Cobb Angle below 50°. The brace has good anti-rotation function with posterior slit. The concave side is pulled longitudinally by the support of the axillary, and the pressure acts vertically on the spine to straighten the curved spine [18]. The RSC brace is a modification of the Cheneau brace, which is more suitable for unbalanced thoracic curvature, thoracolumbar curvature and other types of scoliosis. The brace has an anti-rotating pad on the upper chest, which rotates the chest relative to the waist, thus normalizing the physiological features of the sagittal surface [19]. ScolioLogiC® Cheneau light brace is another derivative of the Cheneau brace. This brace is lighter, more comfortable, and easier to wear, aiming at higher patient compliance during treatment. However, the disadvantage is that this brace is only suitable for patients with thoracolumbar dextrososis and lumbar dextrososis, and there is no model suitable for patients with thoracolumbar curvature and patients with small body size [20]. In order to solve the above problems, Dr. weiss invented the GBW brace, which can be designed and manufactured in about three days by combining CAD/CAM technology. Besides, this brace is lightweight and easy to adjust, suitable for people under 10 years old or thin people [21].

3.1.2 Lyon brace

The Lyon brace was invented by Pierre Stagnara in 1947 as a supplement to Lyon's motor therapy to correct scoliosis [22]. The Lyon brace is a modular brace with adjustable and modifiable features. It is mainly used for correction of thoracolembar and mid-to-high thoracolembar scoliosis and fixation after thoracolembar surgery with Cobb Angle < 50°. Lyon brace is based on the three-point force correction principle, by adding padding within the brace to provide counter-rotational force to the spine, in conjunction with specific breathing patterns, to complete the three-dimensional correction of scoliosis.

3.1.3 PASB brace

The PASB brace is a custom thoracolumbar sacral brace originally designed by Dr. Lorenzo Aulisa in Italy and is only suitable for conservative treatment of patients with scoliosis in the lumbar and thoracolumbar segments. The brace is designed on the basis of the biomechanical principle that the restrained spine can correct scoliosis by reversing the abnormal load distribution during growth. The specific correction principle can be divided into two stages, the first stage is based on the elastic theory: first use external force to reduce the scoliosis deformity as much as possible, and then apply a bending moment and torque in the direction opposite to the deformation below the top vertebrae, according to the elastic interaction, the scoliosis above the application point will be corrected and straighter; The second stage is based on the principle that the internal forces of continuous correction are generated by applying appropriate constraints to the natural movement of the spine. With PASB braces, the natural movement of the torso in the forced direction creates deflection and rotation torques that, generated by appropriate constraints, adapt to changes in the system and maintain their effectiveness over time. PASB supports are lightweight, do not restrict daily activities, and can be hidden by clothing. Moreover, since the brace utilizes the force generated by the natural movement of the torso, the patient does not need to perform any programmed exercise during treatment [17, 23].

3.1.4 Sforzesco brace

The Sforzesco brace is a customizable thoracolumbar sacral brace designed and manufactured by Stefano Negrini and CPO Gianfranco Marchini in 2004 in Milan, Italy, based on the concept of sports. Movement concepts include symmetry, patient-oriented, rigid, three-dimensional, and active. In particular, it should be noted that compared with castings, the rigidity of the material is very high because only two large parts are used for forming the fixture [17, 24].

Sforzesco braces are based on the principles of efficacy and acceptability: they encourage patient freedom of

movement, emphasize teamwork, are aesthetically pleasing, and are highly compliant after wearing. According to a prospective study, the Sforzesco brace was effective for the correction of scoliosis in T4-T5, T10-T12, L1, and L5 in the horizontal plane and T3-T6 and T10-L1 in the coronal plane.

3.1.5 Boston brace

Boston brace is a thoracolumbosacral orthosis developed in 1972 by Hall et al. on the basis of the design and principle of various previous scoliosis braces. The brace is suitable for scoliosis patients with a Cobb Angle of 25° - 45° below the apex T7. Because the Boston brace is a prefabricated symmetrical module, different models can be selected according to the patient's body type, reducing the time spent on brace production [25]. In addition, Boston brace has been developed over the years and has been customized by combining CAD/CAM technology. The biomechanical characteristics of the Boston brace are as follows: (1) By increasing the pressure pad, the internal abdominal pressure of the patient is increased, the axial draft force of the spine is generated, and the lumbar lordosis is reduced; (2) the principle of three-point force is used to correct the lumbar scoliosis on the coronal plane; (3) The lateral pressure pad can produce a rotating force, which plays a twisting role on the vertebral body.

3.1.6 OMC brace

The OMC brace is not strictly a North American brace, but was developed by researchers at the Osaka Medical University on the basis of the Boston brace. It is a lumbothoracosacral brace [26]. OMC brace is suitable for adolescent scoliosis patients who are still in the growth stage, Cobb Angle is 25° - 50° , and the apex vertebra is below T8. The OMC brace is characterized by its lightness, which reduces the restriction of chest wall movement; The design is inconspicuous, and the patient's wearing compliance is high. The design concept of this brace is to maintain the alignment and balance of the whole body, according to the principle of three-point force, with the pelvis as the basis, to correct the lumbar scoliosis and rotation; The compression pad attached to the thoracic vertebra is used to correct the curvature of the thoracic vertebra and finally achieve the purpose of maintaining the balance of the spine.

3.1.7 Milwaukee brace

Milwaukee brace is a neck thoracolumbosacral brace jointly developed by Blout and Moe in 1945. The early Milwaukee brace was actually a brace with a stretcher function that could be used to treat polio [27]. The Milwaukee brace is suitable for patients with AIS who are in growth and development, whose parietal vertebrae are at or above T4, and whose Cobb Angle is 20° - 50° . Lateral bending of the cervical and cervicothoracic segments can be controlled by mounting pressure pads on the shoulders and underarms. The structure of the traditional Milwaukee brace consists of a pelvic brace, one front brace and two back brace, a pressure pad and a neck brace, which is relatively simple in structure and less tolerant of the limbs, so it is suitable for hot and humid climates. Because of the presence of the neck brace, the Milwaukee brace often causes tooth deformities in the wearer, and because the neck brace is difficult to hide, the brace is not very beautiful, and patients are often reluctant to wear it for a long time.

3.1.8 Charleston brace

The Charleston brace is the world's first night brace and an asymmetric thoracolumbar sacral brace. The brace is made in the supine position of the patient and in the opposite direction of the scoliosis to take shape when bending [28, 29]. Through excessive correction, the soft tissue near the spine is stretched, and then the scoliosis is corrected. The indication of the Charleston brace is similar to that of the Boston brace and is suitable for AIS patients with Cobb Angle 25° to 45° , single chest bend, single waist bend, or single chest bend during growth, especially for patients who are unable to use the brace all day. However, due to excessive correction of the brace and poor wearing comfort, it is easy to lead to poor patient compliance.

3.1.9 Providence brace

The Providence brace is also an asymmetrical night brace with a front opening design that corrects deformities by applying a counter-rotating force to the scoliosis [30]. This brace is more excellent than the Charleston brace, mainly because the Providence brace does not have excessive correction, the patient does not have discomfort when wearing the brace, and the correction range is within the patient's tolerance. The Providence brace is suitable for patients with a Cobb Angle of 25° - 35° for thoracolumbar curvature and lumbar curvature.

3.1.10 Rosenberge brace

The Rosenberge brace is a thoracolumbosacral brace developed by Dr. Richard Rosenberger at the University of Chicago and first used clinically by Dr. Wilton Bunch [31]. Rosenberge brace provides a reaction force by using a three-point force system on the main concave side, which works with a lateral liner to help correct and stabilize the

scoliosis. The Rosenberge brace is suitable for idiopathic scoliosis below T7, Cobb Angle $< 50^\circ$, and postoperative fixation. From an aesthetic point of view, the Rosenberge brace is more acceptable to adolescents than the Milwaukee brace, and because it is an adjustable brace with a front and side opening, it is more convenient to wear and better fits the patient's body type.

3.1.11 Spinecor brace

Spinecor brace is an all-day soft brace consisting of a rigid pelvic base and four corrective elastic straps that bypass the thigh and hip. Compared with traditional braces, the production of Spinecor braces often requires the assistance of CAD/CAM, which is a personalized and customized brace [27]. This brace is suitable for scoliosis patients with a Cobb Angle of 20° - 30° and is often used in conjunction with scoliosis specific exercise therapy in clinical use. As one of the most commonly used soft supports at present, it has high comfort and is easy to be hidden by clothing, but long-term wearing will have the risk of aggravating scoliosis.

3.1.12 Wilmington brace

The Wilmington brace is a thoracolumbosacral brace invented by American G. Dean Mac Ewen in 1969 [32]. The Wilmington brace is usually worn throughout the day and is used in scoliosis patients with a Cobb Angle of 25° - 39° and a top vertebra below T7 for chest curvature, chest lumbar curvature and lumbar curvature. The Wilmington brace is a passive brace, and the force involved in scoliosis correction is directly generated by the brace, without the involvement of active muscle activity.

3.2 Therapeutic effect of braces on AIS

After long-term research by domestic and foreign scholars, the therapeutic effect of braces on AIS has been certified. Lange et al used the Boston brace to treat 109 AIS patients [33], Fang et al used the Cheneau brace to treat AIS patients [34], Aulisa used a Lyon brace to treat 102 AIS patients [35], and Allington used the Wilmington brace to treat 98 AIS patients [36]. The results of these studies showed that patients with scoliosis improved after using the brace.

4. Conclusion

The treatment of idiopathic scoliosis should follow the principle of early detection and early treatment. PSSE and brace therapy should be used in combination as an effective way to slow the progression of adolescent scoliosis curves in AIS patients and to prevent or improve back deformities. The authors suggest that clinicians should choose the appropriate treatment plan according to the actual situation of patients, such as the Angle of scoliosis, age, type of scoliosis, treatment compliance, and so on. In the future work of medical workers, it is necessary to pay close attention to the study of its etiology, expand the research progress of its conservative treatment in theory and technology, and further obtain scientific research and innovation. In addition, teenagers need to consciously consider adjusting their posture and actively participate in physical exercise during the growth process. It is also meaningful to encourage schools to conduct preliminary screening and epidemiological investigations of AIS.

Table 1. List of common scoliosis

Type of orthosis	Certificate of fitness	Advantage	Shortcoming
Cheneau brace	It is suitable for the conservative treatment of idiopathic scoliosis patients with scoliosis below T6, Cobb Angle and other scoliosis patients	The asymmetric position of the chest under the orthosis is used to guide the patient's breathing and promote the active progression of the spine to the normal curvature Angle	There is a risk of limiting thorax development and affecting shoulder balance
CBW	It is suitable for idiopathic scoliosis patients with parietal T6 and below and Cobb Angle	Rear side slit, good anti-rotation function	/
RSC	For patients with original Cobb Angle $>50^\circ$ and scoliosis	Modified on the Cheneau brace, it is more suitable for scoliosis such as uneven chest curvature and thoracolumbar curvature.	/
ScoliO-logiC® Chêneau	It is suitable for thoracic scoliosis and left lumbar scoliosis	Lightweight, easy to wear, improve the comfort of patients wearing, there are several scoliosis models for	This model is suitable only for patients with right thoracic and left lumbar prominence, and lacks

light		therapists to choose from	models for patients with thoracolumbar curvature and small body size
GBW	Suitable for people under 10 years old or with thin body	Optimized production process, easy to adjust, comfortable to wear, suitable for all types of scoliosis patients	/
Lyon brace	It is suitable for thoracolumbar and middle-high thoracolumbar scoliosis and fixation after thoracolumbar surgery with Cobb Angle less than 50 degrees	A modular brace that can treat scoliosis and can be used as a fixed orthotic device for the fixation of the thoracic and lumbar vertebrae after surgery to support and stabilize the spine, while being adjustable and modifiable.	/
PASB	It is suitable for the protection and treatment of lumbar and thoracolumbar scoliosis patients.	Using the internal forces generated by the movement of the spine, the stress load acting on the scoliosis site is reversed without the need for exercise. Lightweight, does not restrict daily activities, can be hidden by clothing	/
Sforzesco brace	It is suitable for scoliosis of T4-T5, T10-T12, L1 and L5 on the cross section and T3-T6 and T10-L1 on the frontal surface	High degree of freedom, allowing patients to actively move. The appearance is more beautiful, and the patient's compliance is high after wearing.	/
Boston brace	Suitable for scoliosis patients with Cobb Angle scoliosis cone below T7	/	For some very large Angle of the chest curvature correction effect is not good. The opening is designed on the back side, which is inconvenient for patients to wear
OMC brace	Modified on the basis of the Boston brace, it is suitable for scoliosis patients below T8	Light weight, beautiful appearance, less restriction to the chest wall, through the righting reflex to correct high chest curve	/
Milwaukee brace	It is mainly used in scoliosis patients with the parietal vertebra at T4 and above T4	Suitable for hot and humid climate conditions, can be highly adjusted, suitable for the height of children during the growth period	The structure around the neck of the orthotic device restricts the daily living activities of the patients, and the appearance is not beautiful, which will bring psychological disorders to most adolescent female patients
Charleston brace	For Cobb Angle 25° -45° single lumbar curvature, single chest curvature, thoracolumbar curvature of scoliosis patients with the best curative effect, multiple night use	Suitable for those who cannot wear all day	There is excessive correction, poor comfort, easy to lead to poor patient compliance.
Providence brace	It is effective for patients with soft single lumbar curvature, thoracolumbar curvature and scoliosis, and can also be used for patients with thoracolumbar curvature and double curved scoliosis, especially for thoracolumbar segment with Cobb Angle of 25°-35°	Use at night, the patient compliance is good	For simple thoracic curvature or poor spinal flexibility, the deformity correction effect of Cobb Angle cannot be corrected by external force is poor
Rosenberge brace	It is suitable for idiopathic scoliosis below T7, Cobb Angle less than 50° and postoperative fixation	Light and easy for teenagers to accept	/
Wilmington brace	For patients with scoliosis with Cobb Angle 25° -40°, lumbar curvature, thoracolumbar curvature, and low thoracic curvature below T7	Front side opening, easy to slip on and off. Seamless fit, beautiful.	/
Spinecor brace	Spinecor brace is the most commonly used soft brace for scoliosis patients with a small Cobb Angle (20°-30°).	Good comfort, high patient compliance, can be covered by clothing, more beautiful.	It needs to be worn for a long time, and it has the risk of aggravating the scoliosis when used alone, which

			increases the risk of surgery to a certain extent.
Miami brace	Suitable for scoliosis of the cervical spine at T7 or below	/	/
TriaC brace	Soft brace for scoliosis between Cobb Angle 20°-40°, apex vertebrae T7-T11 and S4-S5	Soft support, comfortable to wear. High flexibility, does not affect the corrective force of body movement	Sagittal corrective forces can only be applied to the chest

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