

ABECEDNA (A, B, C, (D), E) KLASIFIKACIJA SKOLIOZA PO RIGU



Stjepan Čota

Klinika za dječje bolesti Zagreb, Hrvatska
e-mail: stjepancota@yahoo.com

Skolioza se definira kao postranična zakrivljenost kralježnice veća od 10° mjerena na konvencionalnom radiogramu, najčešće praćena rotacijom kralježaka (engl. *Scoliosis Research Society*, SRS) (1,2). Krivine manje od 10° smatraju se asimetrijom. Također se klasificira i prema dobi nastanka, kao infantilna (0-3 godine), juvenilna (4-10 godina), adolescentna (11-18 godina; najčešća) i adultna (≥ 18 godina). Mogućnosti liječenja uključuju konzervativno liječenje (primjena ortotike i skolioza specifičnih vježbi) te operativno zbrinjavanje. Učinkovitost ortotskog liječenja adolescentnih idiopatskih skolioza (engl. *adolescent idiopathic scoliosis*, AIS) više se ne smatra upitnom. U sistematskom pregledu literature Maruyama i sur. zaključili su da je, u usporedbi s praćenjem, ortotsko liječenje učinkovitije u sprječavanju progresije krivine te da ne utječe negativno na kvalitetu života (3). Nadalje, prema SOSORT smjernicama (engl. *International Society on Scoliosis Orthopaedic and Rehabilitation Treatment*) multidisciplinarni tim (uključujući liječnika, ortotičara, fizioterapeuta i po potrebi psihologa) ima značajnu ulogu u uspjehu ili neuspjehu liječenja, neovisno o primijenjenom tipu ortoze (4). Najčešće korištene ortoze u liječenju AIS-a su Boston ortoza, Milwaukee ortoza, Lyon ortoza i Rigo-Cheneau ortoza. U publikaciji o tehnologiji izrade ortoza, Rigo i Jelačić su torako-lumbo-sakralnu (TLSO) ortozu po Rigo-Cheneau definirali kao specifično izrađenu korektivnu ortozu za dovođenje kralježnice i trupa u optimalni posturalni i trodimenzionalni (3D) korigirani položaj uz pomoć kombinacije sila koje se preko posebno oblikovanih pelota prenose na površinu trupa (uz konstruiranje ekspanzijskih prostora) (5). Korektivni odgovor tijela ovisi o udaljenosti (razini), obliku i orijentaciji pelota. Prema autorima, ova statična ortoza može generirati potrebne detorzijske sile za postizanje željene 3D korekcije primjenom kombinacije triju mehanizama: sustava „triju točaka“ u frontalnoj ravnini, „para sila“ za regionalnu derotaciju te korigiranja balansa i posture u sagitalnoj ravnini (5). Važno je napomenuti da navedeni principi djeluju u kombinaciji, a ne izolirano. Pojedinačni sustav triju točaka primjenjuje se za korekciju pojedine spinalne krivine u frontalnoj ravnini. Iako sile i protusile djeluju od lateralno prema medijalno, pelote (primarno torakalna i lumbalna) postavljene su u kosoj ravnini, čime se dodatno generiraju sile koje pridonose derotaciji u transverzalnoj ravnini (5). Zbroj tih sila može rezultirati detorzijskim mehanizmom te je povezan s automatskim učinkom aksijalne elongacije, bez primjene torzijske sile (5). Položaj, razmak, oblik i orijentacija pelota ključni su ne samo u frontalnoj i transverzalnoj, već i u sagitalnoj ravnini, kako bi se optimiziralo poravnanje trupa i obnovio sagitalni profil kralježnice (5). Sustav para sila također djeluje na strukturnu lordozu

glavne torakalne krivine suprotstavljajući se RASO fenomenu (engl. *Relative Anterior Spinal Overgrowth*). Dizajn ortoze temelji se na različitim obrascima krivina (6). Klasifikacija „obrazaca krivina“ definirana je na temelju kliničkih i radioloških kriterija (6). Prema Rigu, postoje četiri osnovna klinička tipa: 1) obrazac tri krivine ili tip A, 2) obrazac četiri krivine ili tip B, 3) ni-tri-ni-četiri ili tip C te 4) jednostruka lumbalna/torakolumbalna krivina ili tip E (5). Klinička dijagnoza temelji se isključivo na fizikalnom pregledu bolesnika. Ipak, potvrda (pod)tipa zahtijeva AP rendgensku projekciju (5,6). Tip „tri krivine“ dijeli se na podtipove A1, A2 i A3 u odnosu na konfiguraciju lumbalne krivine. Tip „četiri krivine“ dijeli se na podtipove B1 i B2 u odnosu na konfiguraciju torakalne krivine. „Ni-tri-ni-četiri“ tip dijeli se na podtipove C1 i C2 u odnosu na lumbalnu konfiguraciju, dok jednostruke lumbalne i torakolumbalne krivine imaju dva podtipa - E1 i E2 (5,6). Radiološki kriteriji temelje se na kompatibilnom obrascu krivine prema SRS terminologiji, položaju tranzicijske točke (TP) između torakalne krivine i bilo koje kaudalne krivine, položaju T1 kralješka u odnosu na središnju sakralnu liniju (engl. *central sacral line*, CSL) te orijentaciji L4 kralješka u frontalnoj ravnini i njegovu odnosu prema L5 kralješku (6). Obrasci krivina uključuju više prepoznatih tipova, kao što su: jednostruka torakalna, jednostruka glavna torakalna, jednostruka duga torakalna, kompenzatorna lumbalna, nestrukturna lumbalna, mala lumbalna, dvostruka torakalna i lumbalna, dvostruka torakalna i torakolumbalna, jednostruka lumbalna, jednostruka torakolumbalna te na kraju torakolumbalna glavna i torakalna manja krivina (6). Vrh skoliotične krivine ili apeks određuje naziv krivine: T2-T11 za torakalnu, T12 i L1 za torakolumbalnu te L2-L4 za lumbalnu krivinu. Tranzicijska točka (engl. *transitional point*, TP) definirana je kao središnja točka između donjeg ruba najkaudalnijeg kralješka (engl. *lower end vertebra*, LEV) torakalne krivine i gornjeg ruba najkranijalnijeg kralješka (engl. *upper end vertebra*, UEV) kaudalne krivine (6). TP i T1 mogu biti u ravnoteži na CSL-i ili neuravnoteženi prema konveksnoj ili konkavnoj strani torakalne krivine (6,7). Orijeentacija L4 kralješka u frontalnoj ravnini procjenjuje se u odnosu na L5. Može biti horizontalna ili nagnuta (frontalna rotacija) prema konveksnoj ili konkavnoj strani torakalne krivine. Pozitivan L4-L5 nagib ili „tilt“ (u tipovima B i E) javlja se kada je L5 nagnut u istom smjeru kao L4, ali u manjoj mjeri, što rezultira kompenzacijskom, nepotpunom lumbosakralnom krivinom (6).

Ključne riječi

djeca, skolioza, ortoze

RIGO'S ALPHABETICAL CLASSIFICATION OF SCOLIOSIS

Children's Hospital Zagreb, Department of Physical and Rehabilitation Medicine, Zagreb, Croatia

According to the Scoliosis Research Society (SRS), scoliosis is defined as a lateral (side-to-side) curvature of the spine measuring greater than 10° on a standing radiograph, typically accompanied by vertebral rotation (1,2). Curvatures measuring less than 10° are considered spinal asymmetry. Scoliosis may be classified, according to the age of onset, as infantile (0-3 years), juvenile (4-10 years), adolescent (11-18 years; the most common), and adult (≥ 18

years). Treatment options include conservative management such as bracing and "Physiotherapeutic Scoliosis-Specific Exercises" (PSSE), and surgical intervention. The effectiveness of bracing in the management of adolescent idiopathic scoliosis (AIS) is no longer considered controversial. In a systematic review, Maruyama et al. concluded that, compared with observation alone, bracing is more effective in preventing curve progression and does not appear to negatively affect patients' quality of life (3). Furthermore, according to the guidelines of the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT), the involvement of a multidisciplinary treatment team (including physician, an orthotist, physiotherapist, and possibly a psychologist) plays a significant role in the success or failure of treatment, regardless of the prescribed brace concept (4). The most commonly used braces include the Boston brace, Milwaukee brace, Lyon brace and Rigo-Cheneau brace. As described in their publication about brace technology, the TLSO Rigo-Cheneau-type brace is a corrective device uniquely constructed to bring the spine and trunk into the best possible postural and morphological three-dimensional (3D) corrected alignment by using a combination of forces applied to the trunk surface by specifically designed pads, facilitated by expansion or escaping spaces (5). The body's corrective response depends on the level, shape, and orientation of the pads. According to Rigo and Jelačić, this static brace can generate the necessary detorsional forces to achieve the desired 3D correction by employing a combination of three mechanisms: three-point systems in the frontal plane, paired forces for regional derotation, and appropriate balance with physiological alignment in the sagittal plane (5). These principles operate in combination rather than in isolation. A single three-point system is applied to correct an individual spinal curvature in the frontal plane. While the forces and counterforces act laterally to medially, the pads (primarily thoracic and lumbar) are positioned in an oblique plane, thereby also generating forces that contribute to derotation in the transverse plane (5). The sum of forces could be producing a detorsional mechanism and is associated with an automatic effect of axial elongation, in the absence of any traction force (5). The position, spacing, shape, and orientation of the pads are also critical in the sagittal plane, in order to optimize trunk alignment and restore the physiological sagittal geometry of the spine (5). The pair-of-force system also addresses the structural lordosis of the main thoracic curve by counteracting the effects of "Relative Anterior Spinal Overgrowth" (RASO). The brace design is based on the different curve patterns (6). A "curve pattern" classification was developed based on clinical and radiological criteria (6). According to Rigo, there are four basic clinical types: 1) three-curve pattern or A type 2) four-curve pattern or B type 3) non-3, non-4 or C type 4) single lumbar/thoracolumbar or E type (5). Clinical diagnosis relies solely on physical examination of the patient. Nevertheless, confirmation of the (sub)type requires a frontal radiographic projection (5,6). "Three curves" type is divided in subtypes A1, A2 and A3 in relation with lumbar configuration. "Four curves" type is divided in subtypes B1 and B2 in relation with thoracic configuration. Non three-non four type is divided in subtypes C1 and C2, in relation with lumbar configuration, while

single lumbar and thoracolumbar have two subtypes - E1 and E2 (5,6). The radiological criteria are based on a compatible curve pattern according to the SRS terminology, the position of the transitional point (TP) between the thoracic curve and any caudal curve, T1 position according to the central sacral line (CSL), and the orientation of L4 in the frontal plane and its relation with L5 (6). Curve patterns include several recognized curve types, such as: single thoracic, single major thoracic, single long thoracic, compensatory lumbar, non-structural lumbar, minor lumbar, thoracic and lumbar double, thoracic and thoracolumbar double, single lumbar, single thoracolumbar and finally thoracolumbar major and thoracic minor (6). The apical level determines the name of the curve: T2-T11 for thoracic, T12 and L1 for thoracolumbar and L2 to L4 for lumbar. TP is defined as the middle point between the lower end vertebra (LEV) of the thoracic curve and the upper end vertebra (UEV) of the caudal curve (6). TP and T1 can be balanced on the CSL or imbalanced to the convex or to the concave thoracic side (6,7). The orientation of L4 in the frontal plane is assessed in relation to L5. It may be horizontal or tilted (frontal rotation) toward the convex or concave side of the thoracic curve. A positive L4-L5 counter-tilt (in B and E type) occurs when L5 is inclined in the same direction as L4 but to a lesser degree, resulting in a compensatory, incomplete lumbo-sacral curve (6).

Keywords

children, scoliosis, bracing

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