Biomechanical Etiology of the So-Called Idiopathic Scoliosis (Adolescent Idiopathic Scoliosis [AIS]: New Knowledge about Classification, Therapy and Prophylaxis

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DOI: 10.34297/AJBSR.2019.06.001096.

Received: August 08, 2019; Published: January 16, 2020

Abstract

The biomechanical etiology of the so-called idiopathic scoliosis [Adolescent Idiopathic Scoliosis (AIS)] has been the subject of the author’s research since 1984. In the period 1984-1995 first observations about the biomechanical etiology of scoliosis were made. In years 1995 – 2007 – all observations were concluded and the etiological factors were described precisely, which led to defining the new classification, the methods of therapy and causal prophylaxis. The etiology of AIS is strictly biomechanical and it is connected with the asymmetry of the movement of the hips, as well as with “standing” and “gait”. There are three groups and four types of spine deformities. Scoliosis develops because of permanent standing ‘at ease’ on the right leg in 2nd / A / B etiopathological group of scoliosis. Together with gait in the 1st group and only with gait in the 3rd group. [1-5].

Keywords: Scoliosis; Biomechanical etiology; Symptoms; New classification; Therapy; Prophylaxis

Material

In the years 1984-2018, more than 2500 patients with scoliosis have been observed and treated. This group included children (80%) in the age of 4 to 25. The remaining 20% of the group consisted of older patients -50-70 years old, seeking medical help because of spinal pain. In all these cases of scoliosis the same etiological factor has been present - limited movement of the right hip. Restrictions of the right hip movement play the crucial role in the etiology of various types of scoliosis. [6-10] Moreover, in many children additional causes connected with the Minimal Brain Dysfunctions (MBD) have been observed – a/ just / already primary “extension contracture of trunk”, b/ anterior tilt of pelvis” and c/ “laxity of joints”.

Explanation of etiology

Figure 1: Range of adduction of the hips and type of scoliosis. Causative influence: “standing” and “gait”. Three group and four types of so-called idiopathic scoliosis. Observations from the years 1995 – 2007.
The main cause in etiology of scoliosis - is the asymmetry of hips movements [11-14]. Each type of scoliosis is connected with "the model of hip movements" [9] and function "gait" and "standing" (Figure 1). There are three various models of hip movements. In all these "models" the rage of the right hip's movements is more or less limited. (Figure 2). Soft tissues on the lateral side of right hip are shortened (Figure 3). When movements of hips are symmetrical, the so-called idiopathic scoliosis never develops. There is no biomechanical pathological influence acting on the spine. The growth of the spine is normal and proper.

When movements of hips - left to right - are asymmetrical - there is an input for the scoliosis to develop. [15-17] The asymmetry of movements of the hips is one of the symptoms of "Syndrome of Contracture" (SofC) according to Prof. Hans Mau (in German "Siebenersyndrom"). Since 2006 we talk in Lublin about the "Syndrome of Contracture and Deformities" (SofCD) because we add the varus deformity of shanks in newborns and babies as the eighth deformity. This varus deformity, in certain conditions - may lead to Blount disease in older children [18-23].

Classification three Groups and Four Types of Scoliosis

(1a) Scoliosis 3D - "S" 1st etiopathological group (epg) - double curve. Stiff spine. Rib hump on the right side of the thorax. Connection with "gait" and permanent "standing 'at ease' on the right leg'. Beginning of deformity in 2 – 3 years of life. Clinical symptoms in age of 5 – 6 years. Specific model of hips movements.

(2a) Scoliosis 1D or 2D - "C" 2nd/A epg – one curve – lumbar left convex. Spine flexible. Connection with permanent standing 'at ease' on the right leg. Beginning of deformity at the age of 2 –
Questions about the problem of scoliosis and authors’ answers based on biomechanical etiology [1-41]

The Etiology is biomechanical, connected with a asymmetry of the anatomy of body and in asymmetry of movements of hips. All these asymmetries are the symptoms of a “Syndrome of Contractures” (SofC) according Prof. Hans Mau or “Syndrome of Contractures and Deformities” (SofCD). In the SofCD there is the asymmetry of the adduction movement of hips - limited rage of movement of the right hip (Figure 3).

Because of these “asymmetries” - there are:

a) asymmetry of loading during gait,
b) asymmetry of time of standing on left: right leg – more on the right(!),
c) asymmetry in development and growth of spine,
d) in result scoliosis in three ethio-pathological (epg) groups and four types.

Why girls suffer from scoliosis more frequently?

The answer - SofCD – appears mostly in girls. Girls are more prone to the “Syndrome of Contractures and Deformities”.

Why lumbar left convex curve?

The answer: The SofCD is mostly “left sided” (90 % - 95 % of pregnancies - Prof. Jan Oleszczuk / Lublin and all gynecologists). In such SofCD - in right hip are limited movements – important - limitation of adduction in extension position of joint. Because of this the right leg is taken for standing. After 8 or 10 years of such standing – lumbar left convex scoliosis appears and fixes.

Why thoracic scoliosis is right convex?

The answer: The SofCD is mostly “left sided” as told above. Permanent standing on the right leg makes lumbar left convex scoliosis and secondary right convex thoracic curve in 2nd / B group / type (see classification).

Why there can be one curve or two curves scoliosis?

The answer: one curve scoliosis is “C” lumbar, either sacrum – lumbar or lumbar – thoracic left convex deformity in 2nd / A epg group / type. The two curves scoliosis are in two form:

*/ “S” is in 1st epg group - spine is stiff

** / “S” 2nd / B epg group / type - spine is flexible.

Why the rib hump is on the right side

In the SofCD can be maximal limited movement of the right hip but in the left hips the movement is full (classification - three groups of “model movement” – see all points). In such situation develop “S” 1st epg group. The “absent movement of the right hip” during waking is produced and transmitted as compensatory movement from the pelvis to the spine. This rotation movement makes, by every step - distortion in inter-vertebral joints and causes stiffness and rib hump on the right side of thorax. In all cases, of course “standing ‘at ease’ on the right leg” play a role as well.

At what age the scoliosis starts to develop

Every type of scoliosis starts to develop when the child starts to “stand” and “walk” – at the age of 2 – 3. The “S” scoliosis in 1st epg we can observe at the age of 5 - 6. The “C” 2nd/A epg scoliosis and “S” 2/B epg we can observe at the age of 8 to 10 or 10 to 12.

What kind of classification is proper

The proper classification is the one based on “biomechanical influenced factors” connected to “model of hips movements” [9] - next “gait” and “standing”. The classification was described above with all details. Here I repeat the important information.


** / “C” 2nd/A scoliosis -connection with permanent standing ‘at ease’ on right leg, Beginning of deformity at the age of 2 – 3. Clinical symptoms – curve – lumbar left convex at the age of 8 – 10.

*** / “S” 2nd/A scoliosis - connection with permanent standing ‘at ease’ on right leg – plus laxity of joints and / or incorrect exercises. Beginning of deformity at the age of 2 – 3. Clinical symptoms – curve – lumbar left convex, thoracic right convex at the age of 10 - 12.
****/“I” 3rd epg scoliosis – small curves or none, small gibbous or none – only stiffness of spine. This group of scoliosis is connected with gait. This deformity till 2004 was never classified as scoliosis.

Why is there a rapid progression of scoliosis in the period of accelerated growth of the child?

The answer: bones grow, contracted soft tissue in the region of the right hip does not grow. Influence “on growing spine” is bigger and more visible.

Which type of scoliosis progresses?

The progression is in the 1st epg “S” scoliosis, because in this group the difference in movement of hips is maximal. The influence of “gait” and “standing” factors is also maximal. Progression happens also because of “incorrect, wrong therapy” [24-26].

Which type of scoliosis does not progress?

The “C” 2nd/A epg, and some cases of “S” 2nd/B epg scoliosis are without progression, or without visible progression. The scoliosis “I” 3rd epg type of deformity – it is only stiff spine – and till 2004 nobody could imagine that it is a type of scoliosis. This type of deformity was discussed in 2004 during scientific meeting of the Lublin Team in Hong Kong [27-30].

Why blind children do not have scoliosis?

The gait of blind children protects before scoliosis – they walk without lifting legs. There is no influence going from hips to pelvis and spine. The standing of blind children is also carefully on both legs (observation of Dr Jolanta Karska - ophthalmologist) [31-35].

Is There Any Influence Of CNS In The Development Of Scoliosis?

Yes – there are only indirect influences in children with Minimal Brain Dysfunction (MBD) or with Attention Deficit Hyperactivity Disorder (ADHD):

a) A extension contracture of the trunk in small children.

b) anterior tilt of pelvis – because of spastic (semi spastic) contracture of m. rectus (part of m. quadriceps), mostly both sides.

c) laxity” of joints – because of changed properties of collagen.

What kind of therapy-conservative or operative should be applied in treatment?

Answer: only conservative therapy. In material from the 1995 – 2009, only 13 % children needed surgery and there were children previously treated with wrong, incorrect exercises. In years 2010 – 2019 the number of children needing surgery in my material is maximally low, only 3 % [36-40].

Are Extension Exercises Correct?

No – such exercises are wrong - they cause “iatrogenic deformity” - bigger curves, bigger rib hump, stiffer spine (Figure 4a & 4b).
What Kinds Of Rehabilitation Exercises Should Be Applied?

Only – stretching exercises – giving symmetry of movements and next symmetry of growth and development of pelvis and spine. In first plan – we should restore the full movement of right hip (Figure 5a, 5b & 5c) and full movement of spine. The best are stretching exercises like karate, taekwondo, aikido, kung fu and other similar (Figure 6,7). In this part of the paper it is my ethical obligation to inform – that – flexion exercises in scoliosis in Poland many years ago were introduced by Warsaw, Otwock [27]. At this time/point the influence of the etiological factors: “standing ‘at ease’ on the right leg” and “gait” was not discovered.

Figure 5a,5b,5c: Two children. On Fig. 5a child present the previous, wrong and harmful exercises recommended by insufficient educated doctors. Fig. 5b The child Karolina 16 years old. Result of incorrect exercises 4 years in previous therapy. Child with iatrogenic deformity - deformed trunk, big curves, big rib hump and maximal stiff spine.

Figure 6: Proper therapy for scoliosis in Sanatorium for Children – under the name - Dr Janusz Korczak - in Krasnobraż. Cooperation with Pediatric Orthopedic and Rehabilitation Department in Lublin from 1977. In program of therapy only stretching exercises – to receive full range of movement of hips, position of pelvis and full movement of spine. Important standing ‘at ease’ only on the left leg in every day situations.
Figure 7: Proper exercises for scoliosis – stretching exercises typical for karate, taekwondo, aikido, kung fu, yoga. These sport arts are the best prophylaxis methods in scoliosis and other deformations and dysfunctions in locomotors system. Pictures take from Internet and also prepared in my own „Orthopedic Praxis”.

Corset Treatment – Yes? No?

Corset was necessary in 20 % of children in “S” 1st epg scoliosis and in 5% - 10% of children in “S” 2nd / B epg scoliosis in years 1995 – 2009. Now I recommend the corset very rarely. Polish understand the new scoliosis theory - their children take part in school physical exercises, gymnastics and sport. Many children do karate. It contradicts many orthopedic surgeons and rehabilitation doctors as they have been recommending the “old, extension, strengthening exercises” and forbidding children from doing sport. After such “therapy” the need of corset is obvious.

Is Causative Prophylaxis Possible?

Yes, the causative prophylaxis we should introduce in all countries for every thread by scoliosis child. To discover the oncoming of scoliosis - we should use the new tests.

List of tests:
1) Define the manner of standing ’at ease’ – left: right leg
2) Test of adduction of both hips
3) Adams – Meyer test – other words - bending test for scoliosis
4) Lublin test - side bending test for scoliosis
5) Ely – Duncan (or Staheli, or Thom) test to discover the anterior tilt of pelvis - flexion contracture of hips - and hiperlordosis of lumbar spine
6) Kneeing test - to discover the anterior tilt of pelvis - flexion contracture of hips - and hiperlordosis of lumbar spine
Prophylactic Recommendations Against Scoliosis in Points

A) Standing ‘at ease’ only on the left leg.
B) Sitting relax – never straight up.
C) Sleeping in embryo position.
D) Active participation in sport in school and additionally in clubs - the best are karate, taekwondo, aikido, yoga.
E) Physiotherapy/Kinesio-therapy to obtain full, symmetrical movement of both hips and movements of spine – flexion, deviation, rotation. Especially important is to recover the full adduction and internal rotation movement of the right hip (Figure 5a, 5b & 5c).

Discussion and My Remarks

Information to this problems is presented in Website www.ortopedia.karski.lublin.pl from 2006. In Poland, in years 1995 – 2009 I have given lectures about “problem of scoliosis” many times – for example on Polish Orthopedics and Traumatology Congresses in Lodz, Szczecin, Poznan, but till now “the explanation of etiology and rules of new therapy is not understood and not accepted”. Why - because the conviction that the “scoliosis is idiopathic” is so deeply incrusted in the minds of many doctors, professors – that nobody searches the new knowledge.

My lectures have also been presented abroad in IRSSD Meetings in Athens (2002), Genth (Belgium 2006), Liverpool (UK – 2008) and in Poznan (Poland 2012) and two times on SOSORT Congresses in Athens and in Wiesbaden and remain till now without response. Only Professor Martha Hawes and Professor Jan Stokes from USA, as well Professor John Sevastik from Sweden and Professor Stefan Malawski from Poland – understood my explanation of the biomechanical etiology of the so-called idiopathic scoliosis [41]. In the article there is all information about etiology, classification, new therapy, but – the most important – the rules of causal prophylaxis of scoliosis. The children of the world are waiting for prophylaxis. I hope that from the USA, the knowledge will spread to other countries, including Poland.

Conclusion

1) In all years of my orthopedic activity and search for scoliosis (T. Karski, 1984 – 2019), the biomechanical etiology of the so-called idiopathic scoliosis was confirmed.
2) Development of scoliosis and the types of spine deformity are connected with pathological “model of hips movements” [9] and function – “standing ‘at ease’ on the right leg” and “gait”.
3) Restricted range of movements in the right hip is connected with the „Syndrome of Contractures and Deformities” according Prof. Hans Mau and Lublin observations.
4) Every type of scoliosis starts to develop at the age of 2-3.
5) There are three groups and four types of scoliosis (see text above).
6) The causal prophylaxis of scoliosis is possible and should be introduced in every country.
7) The rules of prophylaxis for all children in points:
   a) standing ‘at ease’ on the left leg
   b) sitting in a relaxed position,
   c) sleeping in an embryo position,
   d) active participation in sports in school and at home every day,
   e) especially beneficial sports are: karate, taekwondo, aikido, kung fu and other similar.
8) The special “message” to all doctors – “believe the new knowledge and check”. Never say – no in the first moment. Even “anecdotal” cause – standing ‘at ease’ on the right leg - words of my friend – Professor from one Europe Country – is in the first place - real and true. Please remember – “standing ‘at ease’ on the right leg” is not “anecdotal” but “true cause in etiology of the so-called idiopathic scoliosis”.

Acknowledgement

I would like to express my many thanks to Honorata Menet – student of English in University in Caen in France – my dear Granddaughter - for correction of the article.

References


