

# Biomechanical Factors in Etiology of the So-Called Idiopathic Scoliosis (Adolescent Idiopathic Scoliosis [AIS]). Dates of Discoveries. Classification, Rules of the Therapy and Prophylaxis

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**Abstract**

Developmental factors of the so-called idiopathic scoliosis were secret over many centuries [1-11]. The biomechanical causes of the deformity were found and described in years 1984-2007. In the development of scoliosis, the main factor is the habit of standing 'at ease' on the right leg, and gait is another one. These two biomechanical factors appear because of the asymmetry of hips movement. In the right hip the adduction, and often internal rotation and extension, are limited.

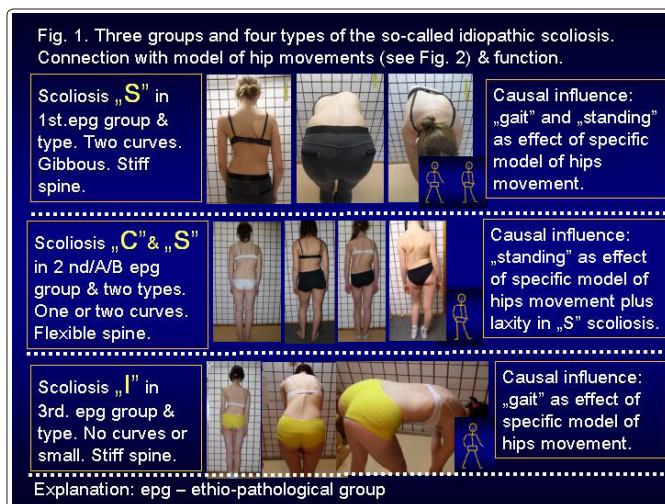
The restriction of movement of the right hip is one of the eight symptoms of the "Syndrome of Contracture and Deformities (SofCD) according to Prof. Hans Mau and Lublin observations. This restriction enables the easy "standing" on the right leg such position is very comfortable thanks to a better stabilization, but with the time it may cause the left convex curve in lumbar spine. The other influencing factor is connected with gait. When the movement in right hip is maximally limited the compensative movement in pelvis and in spine during walking appears and it is the cause of rotation deformity and stiffness of the spine. All points in pathology are connected with various "models the hip's movement". In result there are three groups and four types of scoliosis. In the article, the author presents the new Lublin classification, new tests in examination and a rules of the new treatment and causal prophylaxis of this spine deformity.

**Keywords:** Biomechanical Etiology, New classification, Prophylaxis, Scoliosis, Symptoms, Therapy.

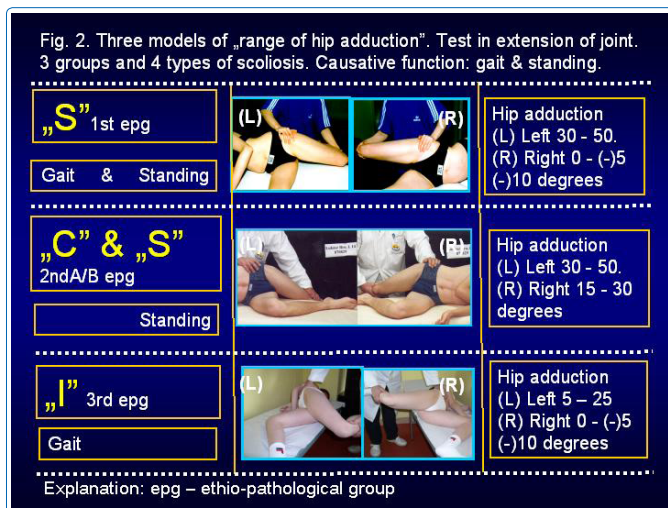
**Introduction**

**Steps in discovery of etiology of the so-called idiopathic scoliosis.**

Eighty 80 % of scoliosis cases were over many years called "idiopathic scoliosis". The causes of the remaining 20 % were: congenital scoliosis, neurological with paresis of muscles, functional or the spine deformity was in various "pathology syndromes". Over many centuries the etiology of "idiopathic scoliosis" was unknown and this type of spine deformity was described as "idiopathic scoliosis" what means "scoliosis with no founded causes". The problem of "idiopathic scoliosis" [Adolescent Idiopathic Scoliosis (AIS)] was the subject of the author's research since 1984 [1, 12 - 32, www.ortopedia.karski.lublin.pl]. During the scholarship stay in Invalid Foundation Hospital in Helsinki / Teholantie 10, Finland in 1984 author (T. Karski) tried to find the etiology of "the idiopathic scoliosis" by the examination of many children with scoliosis. During this one-month study unfortunately the etiology has not been discovered.



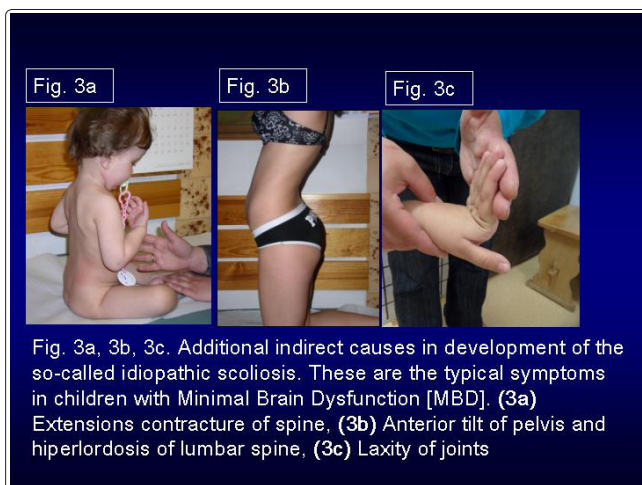
**Figure 1:** Three groups and four types of the so-called idiopathic scoliosis. Connection with model of hip movements (see Fig. 2) & function



**Figure 2:** Three models of „range of hip adduction”. Test in extension of joint. 3 groups and 4 types of scoliosis. Causative function: gait & standing

In the following years, 1984-1995, in Lublin, Poland after examining many children, I discovered an etiological factor. I found that scoliosis is connected with the asymmetrical movement of hips and next with function - permanent “standing ‘at ease’ on the right leg” and “gait”. Noticing the difference in the movement of the hips – limited adduction in straight position of joint was a deciding moment in the discovery of etiology. The limitation of adduction of the right hip, or even abduction contracture of this joint 5 to 10 degree is one of the symptoms of “The Syndrome of Contractures and Deformities” [SofCD] according to Prof. Hans Mau from Tübingen, Germany and Lublin observations [1, 6-8, 12-32]. The straight position in examination is similar to the “standing position” or to the “stance phase in walking” and these “moments” play deciding role in development of scoliosis through function – “standing” and “gait” (Figure 1, Figure 2). Additionally, in many children, secondary causes can appear and there are connected with the Minimal Brain Dysfunctions (MBD):

- Extension Contracture of Trunk,
- Anterior Tilt of Pelvis,
- Laxity of Joints (Figure: 3a, 3b, 3c).



**Figure 3a, 3b, 3c:** Additional indirect causes in development of the

so-called idiopathic scoliosis. These are the typical symptoms in children with Minimal Brain Dysfunction [MBD]. (3a) Extension contracture of spine, (3b) Anterior tilt of pelvis and hiperlordosis of lumbar spine, (3c) Laxity of joints

### Historical dates of discoveries

- 1995** – First lecture about biomechanical etiology of the so-called idiopathic scoliosis during Orthopedic Congress in Szeged, Hungary.
- 1996** – First publication about biomechanical etiology of scoliosis in Orthopädische Praxis in Germany (Literature, point 12).
- 2001** – Describing in new classification two etiopathological groups (epg) of scoliosis – “S” scoliosis in 1st epg, “C” and “S” scoliosis in 2<sup>nd</sup> epg.
- 2004** – Describing in new classification the “I” scoliosis in 3rd epg. In this type the spine is stiff, there are no curves or small ones.
- 2006** – The ultimate description of the “type of hips movement” and the “type of scoliosis”.
- 2007** – Description of indirect influences coming from Central Nervous System (CNS) in children with Minimal Brain Dysfunction (MBD).

### Material

In the years 1984 – 2019, more than 2500 patients with scoliosis were observed and treated. This group included children and youth - 80% in the age of 4 to 25. The remaining 20%, in the age of 30 to 80 years old, consisted of patients with problems of spinal pain. In all patients with back pain one of its causes is scoliosis - and the same etiological factor has been found - standing ‘at ease’ on the right leg. What was found as well, was the asymmetry of the movement of the hips – limited adduction of the right hip in extension position of the joint. The diagnosis of these patients indicated a spine deformity in the form of “C” or “S” scoliosis in 2-nd/A/B etiopathological group.

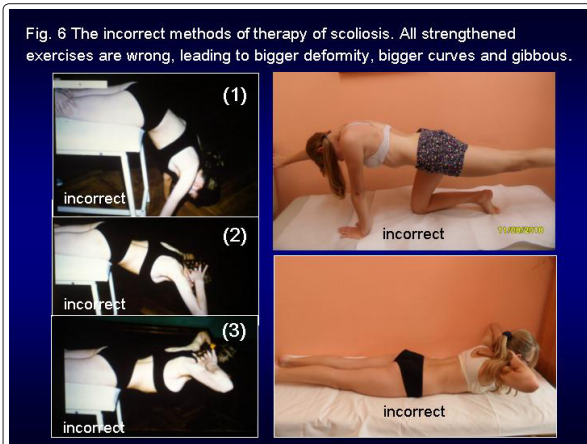
### New Classification- Three groups and four types of scoliosis (Figure 1) [12 - 32].

The type of spine deformity is connected with “model of hips movement” (Figure 2) and etiological factors- “gait” and “standing ‘at ease’ on the right leg”.

(1) Scoliosis 3D - “S” 1st etiopathological group (epg) (Figure 1) - double curve. Stiff spine. Rib hump on the right side of the thorax. Specific model of hip movements – maximally limited movement of right hip and full movement of the left hip (Figure 2). Connection with “gait” and permanent “standing ‘at ease’ on the right leg”. Explanation – during walking, in every step, because of the absence of the adduction and rotation movement of the right hip, appears a compensatory movement in the pelvis and the spine and this produces a rotation distortion in the spine. As a consequence, stiffness appears. Standing ‘at ease’ on the right leg - which is permanent forms curves. Beginning of deformity takes place in the 2<sup>nd</sup> - 3<sup>rd</sup> year of life. Clinical symptoms appear at the age of 5 - 6 years. This type of scoliosis progresses especially during the period of accelerated growth.

(2A) Scoliosis 1D or 2D - “C” 2nd/A epg (Figure 1) - one curve - lumbar left convex. Flexible spine. Specific model of hip movements - minimally limited movement of the right hip and full movement of the left hip (Figure 2). Connected with permanent standing „at ease’ on the right leg. Beginning of the deformity at the age of 2-3 years. Clinical symptoms appear at the age of 8-10 years. This type of scoliosis is without progression or with only minimally progression.

(2B) Scoliosis 2D or 3D “S” 2nd/B epg (Figure 1) - two curves. Specific model of hip movements - minimally limited movement of the right hip and full movement of the left hip (Figure 2). Connection with permanent standing ‘at ease’ on the right leg and additionally with laxity of joints or / and previous, harmful exercises (Figure 6). Beginning of the deformity at the age of 2-3 years. Clinical symptoms appear in age of 10 - 12 years. In the 2nd/A and 2nd/B types of scoliosis - the spine is flexible. This type of scoliosis is with moderate progression.

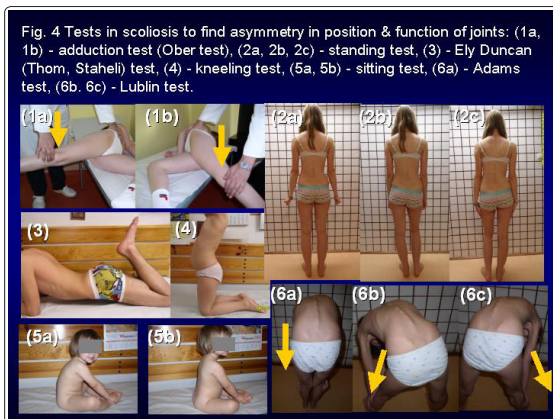


**Figure 6:** Incorrect methods of therapy of scoliosis. All strengthening exercises are wrong, leading to bigger deformity, bigger curves and gibbous

(3) Scoliosis 2D or 3D - “I” 3rd epg (Figure 1). Specific model of hip movements – maximally limited movement of right hip and maximally or partially limited movement of the left hip (Figure 2). Deformity has the form of a stiff spine. No curves or small ones. The only cause is gait. Beginning of the deformity at the age of 2-3 years. Clinical symptoms are “stiffness of the spine in children” and “pain syndromes in adults”. Stiffness, like in the 1st type of scoliosis, is connected with “distortion movement” of intervertebral joints of the spine in every step during gait.

### Test in Scoliosis

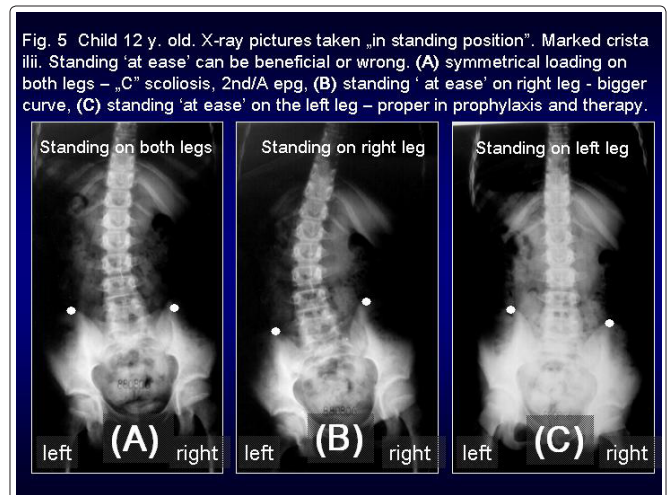
There are presented old and new tests to find the danger of scoliosis or confirm the beginning phase of scoliosis. Checking the movements of the hips is especially important - adduction and rotation and habit of standing (Figure 4).



**Figure 4:** Tests in scoliosis to find asymmetry in position & function of joints: (1a, 1b) - adduction test (Ober test), (2a, 2b, 2c) - standing test, (3) - Ely Duncan (Thom, Stahel) test, (4) - kneeling test, (5a, 5b) - sitting test, (6a) - Adams test, (6b, 6c) - Lublin test.

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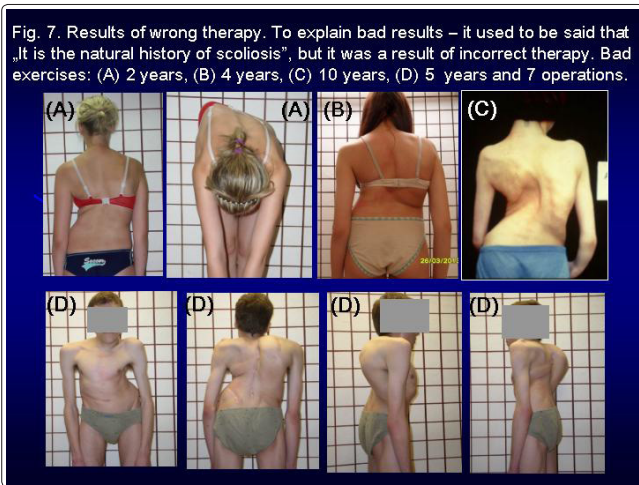
Through checking adduction of the hips in straight position in every patient we are able to define the type of scoliosis, and estimate the risk of developing one. In the case of previous incorrect therapy exercises - we can observe not only worsening of child’s status but also other direction of the curves. Moreover, during X-ray examination standing position is also essential. The Figure 5 shows that, depending from the standing position - on left or on right or on both legs - the scoliosis in the X-ray can be differenced. This knowledge is crucial in diagnosis and in therapy



**Figure 5:** Child 12 y. old. X-ray pictures taken „in standing position”. Marked crista ilii. Standing ‘at ease’ can be beneficial or wrong. (A) symmetrical loading on both legs - „C” scoliosis, 2nd/A epg, (B) standing ‘at ease’ on right leg - bigger curve, (C) standing ‘at ease’ on the left leg – proper in prophylaxis and therapy

### Proper Therapy and Causal Prophylaxis

In this point I want to warn doctors, physiotherapists not to use “strengthening” exercises in the therapy of scoliosis (Figure 6). Such therapy was recommended because the etiology of scoliosis was not found [2, 8-11, 33-40]. Improper therapy gave only negative results (Figure 7). In therapy flexion exercises for spine are important - forwards, to left, to right side - every day, many times (Figure 8). The aim of such therapy is to “overcome reduce” the shortenings of soft tissue on concave site of curve. These stretching exercises which lengthen “shortened soft tissues” are extremely important in the therapy. Here I would like to inform that flexion exercises in the treatment of scoliosis in Poland were introduced by Prof. Stefan Malawski from Warsaw / Otwock many years earlier (1960 – 1970). Prof. S. Malawski in his own material observed only good results after such therapy [3-5 and personal discussions].



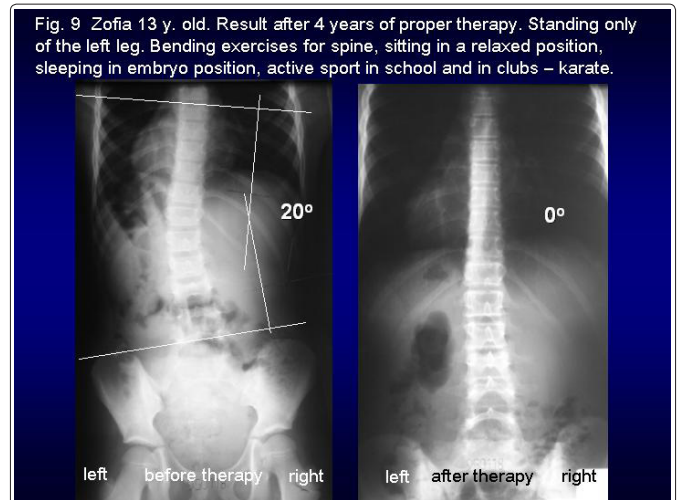
**Figure 7:** Results of wrong therapy. To explain bad results – it used to be said that „It is the natural history of scoliosis”, but it was a result of incorrect therapy. Bad exercises: (A) 2 years, (B) 4 years, (C) 10 years, (D) 5 years and 7 operations



**Figure 8:** Proper exercises in therapy of scoliosis. Aim - obtaining full movement of hips, proper position of pelvis, full movement of spine. Important standing 'at ease' on the left leg and sport - karate, taekwondo, aikido, kung fu, yoga

### The Important Elements of the Causal Prophylaxis Are:

1. Standing 'at ease' only on the left leg,
2. Sitting in a relaxed position - never straight up,
3. Sleeping in the embryo position,
4. Active participation in sports at school and additionally in clubs - the best activities are karate, kung fu, taekwondo, aikido, yoga,
5. Physiotherapy Kinesio-therapy to obtain full, symmetrical movement of both hips and movements of the spine - flexion, deviation, rotation.
6. It is especially important to recover the full adduction and internal rotation movement of the right hip. After such therapy the results are only perfect (Figure 9).



**Figure 9:** Zofia 13 y. old. Result after 4 years of proper therapy. Standing only of the left leg. Bending exercises for spine, sitting in a relaxed position, sleeping in embryo position, active sport in school and in clubs - karate

### Conclusions

1. The etiology of the so-called idiopathic scoliosis is strictly biomechanical.
2. The pathological "model of hip movements" plays an important role in the development of scoliosis and function- "standing 'at ease' on the right leg" and "gait" [18].
3. Additionally, indirect causes are:
  - Laxity of joints,
  - Anterior tilt of pelvis (diminishes the stability of pelvis and spine),
  - Extension contracture of spine even in small children.
- 4) The rules of the therapy and prophylaxis are the following:
  - Standing 'at ease' on the left leg,
  - Sitting in a relaxed position,
  - Sleeping in an embryo position,
  - Physiotherapy: exercises removing the contractures or only limitation of movement of right hip, flexion exercises for spine - especially important are stretching exercises for concave side of scoliosis and removing the anterior tilt of pelvis. Very beneficial are exercises in water, especially in geothermal water.
  - Active participation in sports at school and at home every day,
  - Especially beneficial sports arts are: karate, taekwondo, aikido, kung fu, yoga and other similar.

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