

## Biomechanical Etiology of the So-Called Idiopathic Scoliosis (Adolescent Idiopathic Scoliosis [AIS]) - Observations in Years 1984 - 2022 and in Points

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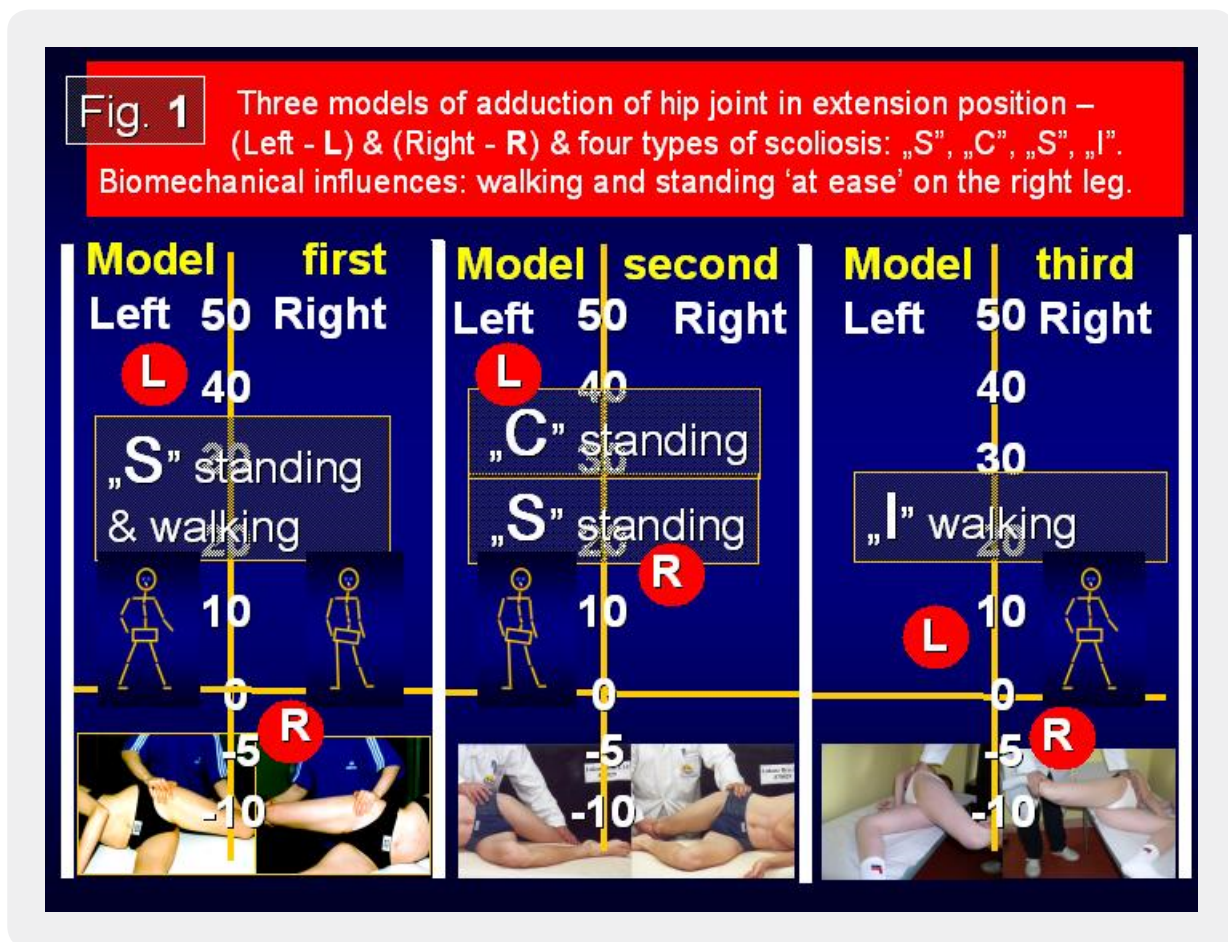
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### Introduction

My research about etiology of idiopathic scoliosis started in 1984, but the etiology and the rules and principles of new therapy have been described in 1995 - 2007. In orthopedic literature, the term Adolescent Idiopathic Scoliosis (AIS) is used very often and I use it also in my article [1-69].



**Figure 1:** Three models of adduction of hip joint in extension position – (Left - L) & (Right - R) & four types of scoliosis: „S”, „C”, „S”, „I”. Biomechanical influences: walking and standing 'at ease' on the right leg.

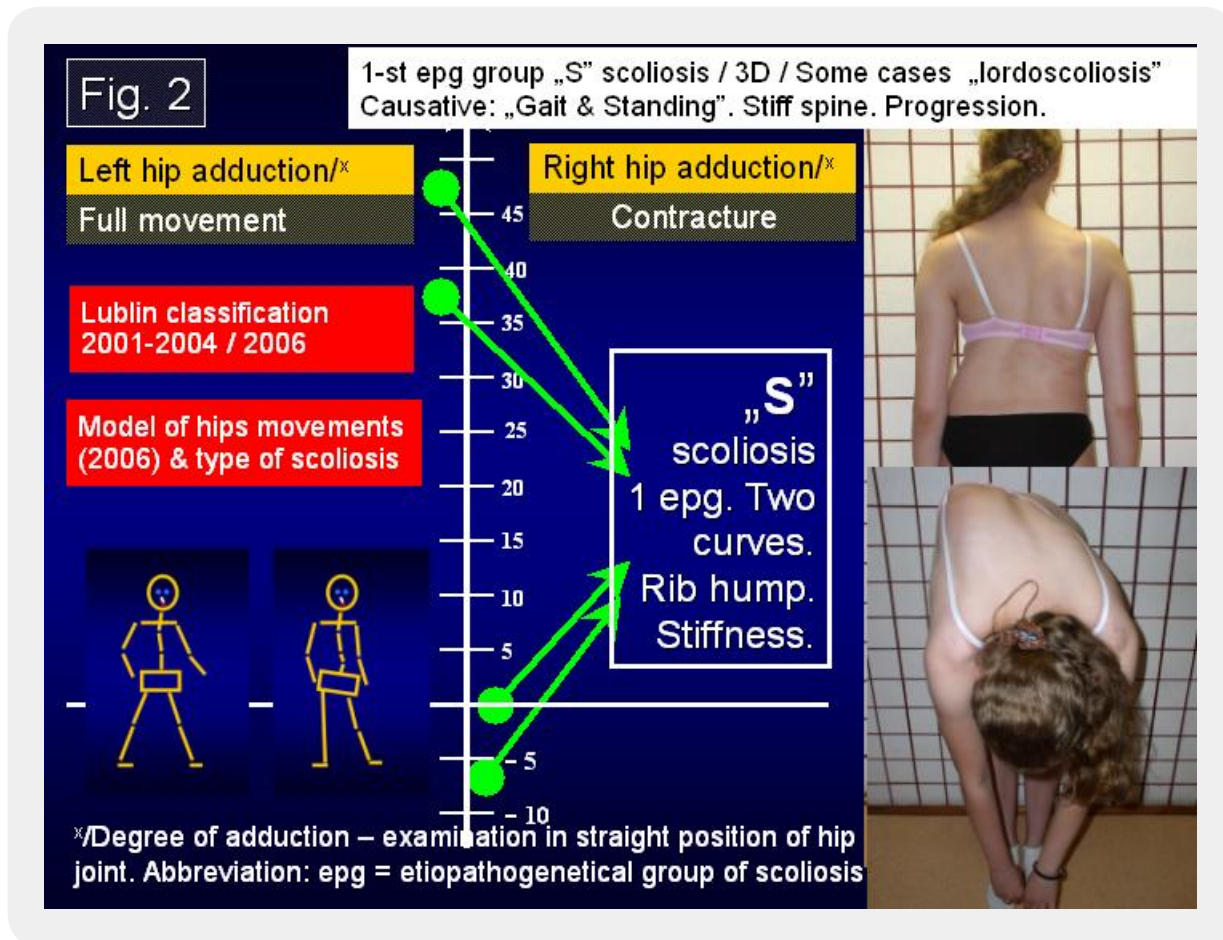
## Material

In the years 1984 till 2022 I examined over 4000 children and adults with scoliosis. There were children from Pediatric Orthopedic and Rehabilitation Department of Medical University in Lublin, Poland from 1984 to 2009 and children and adults from Out-Patients Clinic of my Praxis in years 1984 - 2022.

## Biomechanical Etiology of the So-Called Idiopathic Scoliosis (Ais). Dates of Particular Discoveries

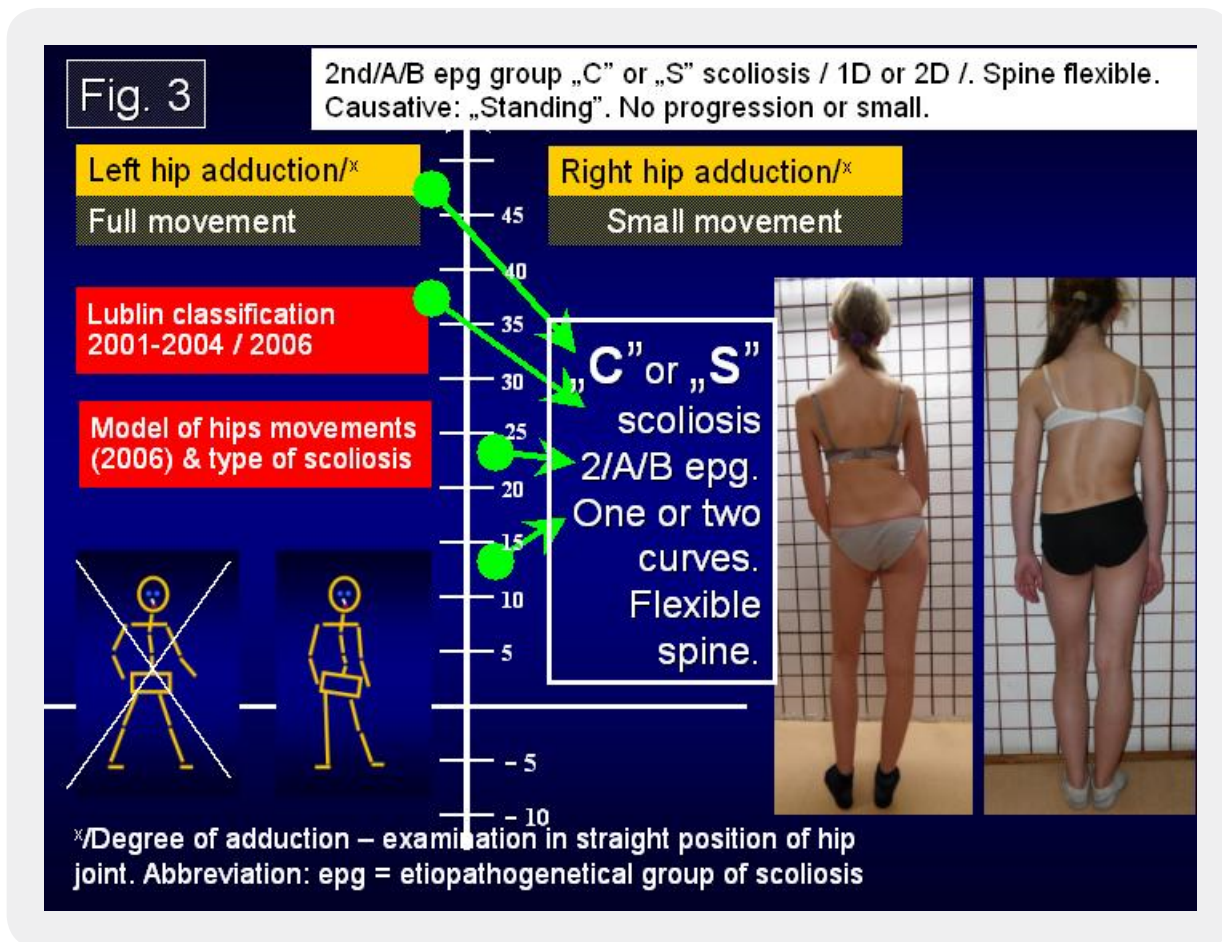
**1984** - In 1984 I participated in a one-month-program of educative scientific stay in Invalid Foundation Hospital in Helsinki, Finland. During this stay I had assist to Dr Olai Snelman in scoliosis operations. In this time, I wanted to find the etiology of the idiopathic scoliosis, but - this time - was no success. In next years - 1984 - 1995 - in Poland, in Lublin step by step I found the etiology.

In children with scoliosis, I had noticed the difference of adduction in strait position of hip joints, and in some cases also asymmetry of internal rotation of the hips. In the right hip the adduction was limited, also in many cases the range of internal rotation was smaller. The differences of adduction movement of right hip, versus to left hip are shown in figures describing new classification in the years 2001 - 2004. (Fig. 1, 2, 3, 4).

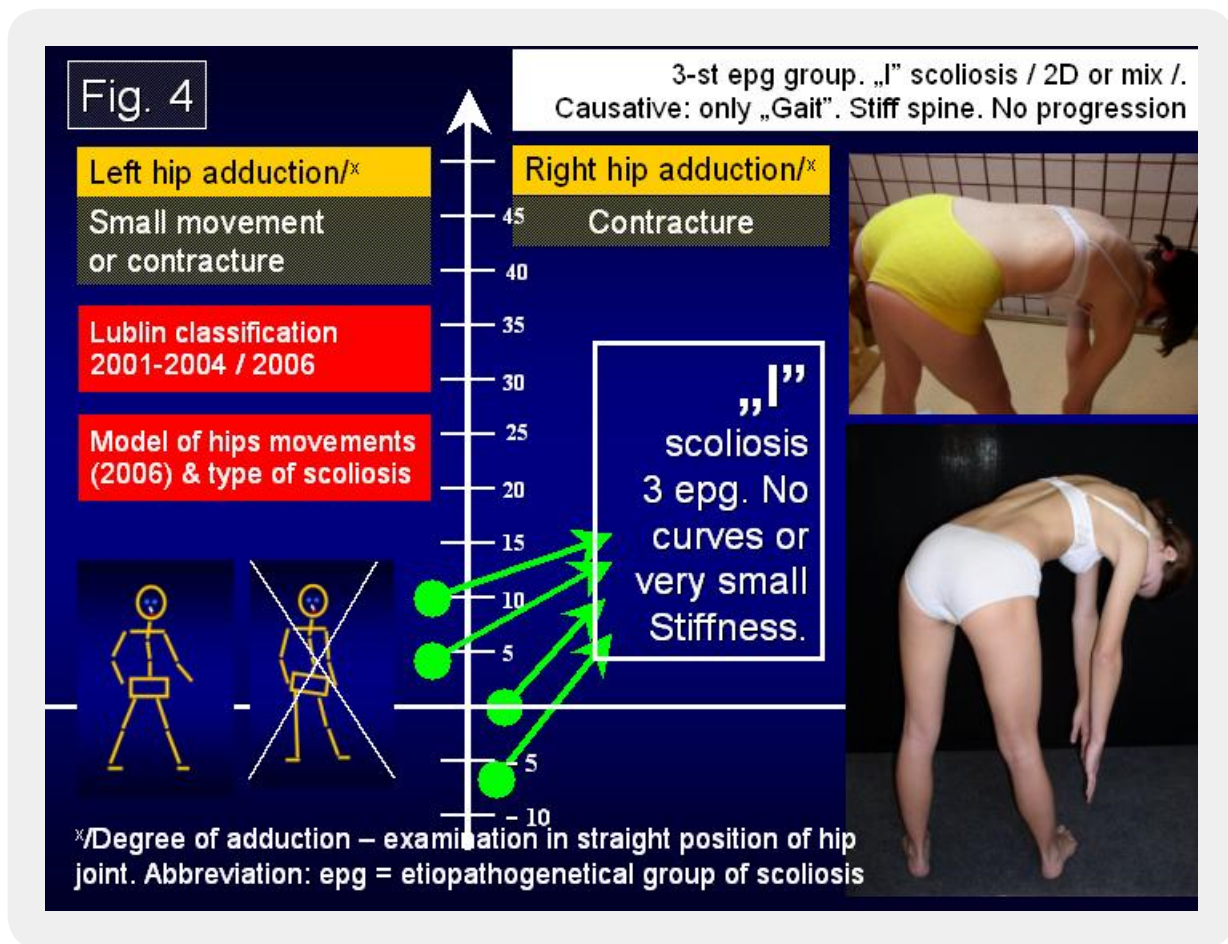


**Figure 2:** Lublin classification 2001-2004 / 2006. Model of hips movements (2006) & type of scoliosis. „S” scoliosis 1 epg., 3D. Two curves. Rib hump. Stiffness. Some cases „lordoscoliosis” Causative „Gait & Standing”. Stiff spine. Progression.





**Figure 3:** Lublin classification 2001-2004 / 2006. Model of hips movements (2006) & type of scoliosis. 2nd/A/B epg group „C” or „S” scoliosis. 1D or 2D. Spine flexible. Causative: „Standing”. No progression or small



**Figure 4:** Lublin classification 2001–2004 / 2006. Model of hips movements (2006) & type of scoliosis. 3-st epg group. „I” scoliosis. 2D or mix. Causative: only „Gait”. Stiff spine. No progression.

In this time I started to say - not “idiopathic scoliosis” but “so-called idiopathic scoliosis”.

**1995** - First lecture about biomechanical etiology of the so-called idiopathic scoliosis (AIS) in Szeged, Hungary. After 11 years of examination and new therapy of children with scoliosis - the knowledge about the problem - was “small but sufficient” that I prepared the first lecture about etiology of the so-called idiopathic scoliosis.

**1996** - First publication about etiology of the so-called idiopathic scoliosis. Full current information about scoliosis at this time (1996) has been given in the article: *T. Karski: Kontraktoren und Wachstumstörungen im Hüft- und Beckenbereich in der Ätiologie der sogenannten “idiopathischen Skoliosen” - biomechanische Überlegungen, Orthopädische Praxis 32, 3 (1996) 155-160.*

**1997** - In this year it was found that all children with scoliosis had the habit to stand 'at ease' only on the right leg. It was a crucial and very important observation and discovery.

It was confirmed on all cases of scoliosis in Lublin but also in consultation of scoliosis children in other places in Poland and also during my scientific excursions abroad - in Berlin, in Vienna, in Salzburg, Debrecen, Budapest, Prague, Helsinki, Copenhagen, Havana, Hong Kong, Beijing.

Two reasons were especially important in the etiology of so-called idiopathic scoliosis and was deciding in the new classification:

A/ the walking,

B/ the habit of standing 'at ease' on the right leg.

Influence going from "walking" is the following:

a/ there is a maximally limited movement in the right hip,

b/ during waking - the "absent movement" of right hip causes a "compensatory movement" in pelvis and spine,

c/ this "rotation movement of spine" is bigger than normal and has the character of "distortion movement",

d/ it causes stiffness of the spine.

**2001** - In 2001 I described two groups and three types of the so-called idiopathic scoliosis (AIS).

**First group** - the deformity in form "S" with stiff spine - double curves - lumbar left convex, thoracic right convex, with the gibbous on the right side of thorax. This deformity is connected with walking and standing 'at ease' on the right leg. This type of scoliosis - as "one" and "only one" is described in Internet, no others groups which I described in "new Lublin classification".

**Second group** - it is "C" - lumbar left convex and "S" scoliosis deformity - thoracic right convex. In both types - "C" and in "S" the spine is flexible. These deformities are connected with standing 'at ease' on the right leg only. Additionally, in all "S" type patients I could notice the laxity of joints [12-42].

**2004** - Third group - describing of the special model of the so-called idiopathic scoliosis. In this type of spine deformity, there is only "stiffness" of the spine. This type of scoliosis is connected only with walking. The influence of "walking" was described in subchapter above [19-42].

**2006** - In this year the model of hips movement in all types of scoliosis was described precisely and definitively. There are three groups of hip's movement models and three groups and four types of scoliosis (Fig. 1).



2007 - A/ Answer to the question - why the blind children do not have scoliosis. B/ Describing of the indirect influences from Central Nerve System (CNS) on development of scoliosis (AIS)

A/ The blind children's gait is different - without lifting legs and without a large movement of pelvis in every step - so there is no influence of the pelvis on the spine during walking.

B/ In many children with scoliosis I could see also the "anterior tilt of pelvis", laxity of joints and even in small children "extension contracture of spine" (Fig. 5). All these symptoms are connected with Minimal Brain Dysfunction. So - there can exist additionally - an indirect influence from Central Nerve System (CNS) in development of scoliosis [17,22,26-42].

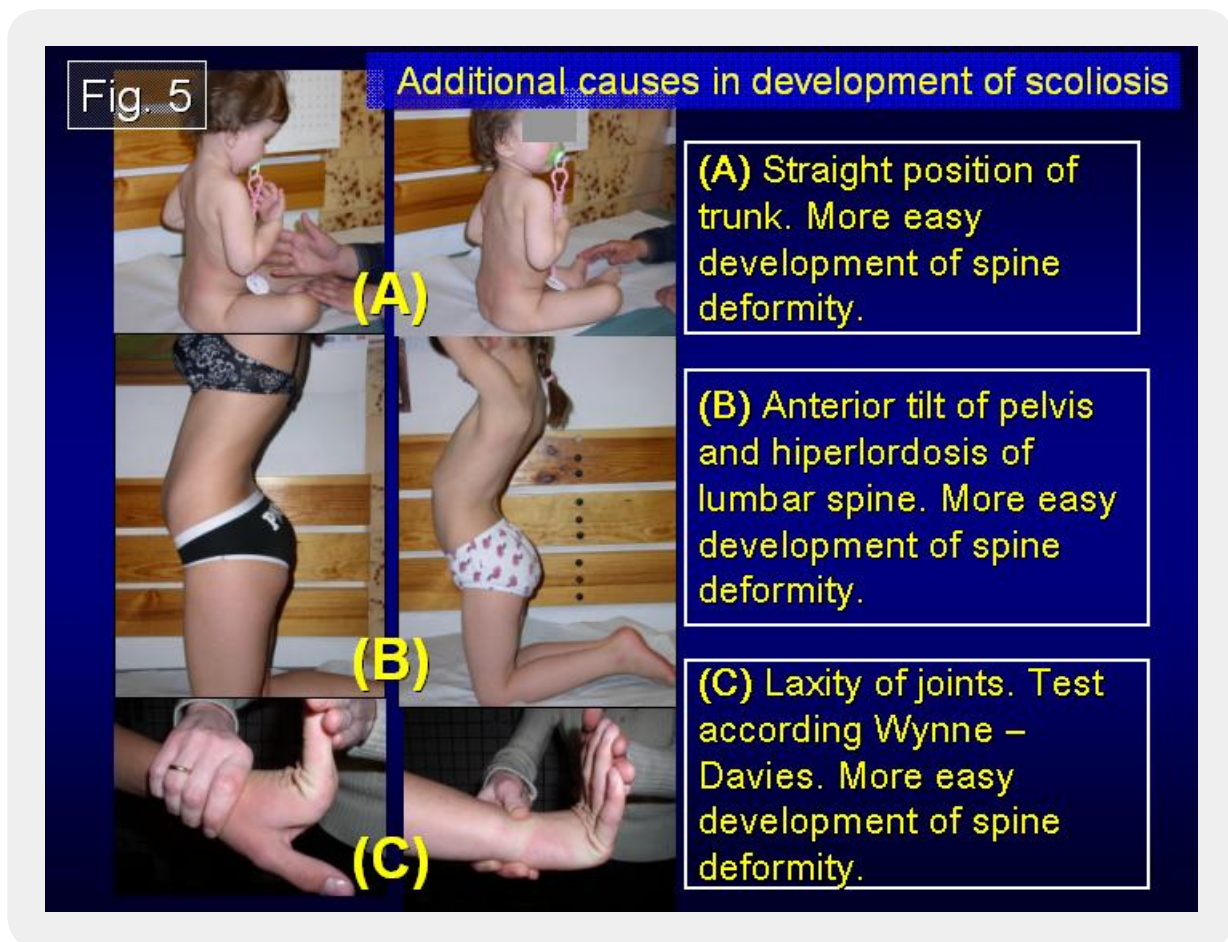


Figure 5: Additional causes in the development of scoliosis. (A) Straight position of trunk. (B) Anterior tilt of pelvis and hiperlordosis of lumbar spine. (C) Laxity of joints - test according Wynne – Davies. Easier development of spine deformity.

**New Classification - Three Groups and Four Types of the So-Called Idiopathic Scoliosis** (Fig. 1, 2, 3, 4) [12-42,67].

**A/ First group** - “S” double scoliosis. 3D. Specific model of hips movement. Left hip - adduction in straight position - full range - 40 - 45 - 50 degrees. Right hip - adduction in straight position - movement maximally limited - range - 0 degree or abduction contracture 5 or 10 degrees. First symptoms - stiffness of spine, next curves. In some cases, there is “lordoscoliosis”. Spine deformity starts to develop in the 2nd year of life. First symptoms appear at 5 - 7.

**B/ Second group** - two types “C” and “S” scoliosis. Both are connected with standing ‘at ease’ on the right leg only. Specific model of hips movement. Left hip - adduction in straight position - full range - 40 - 45 - 50 degrees - right hip - adduction in straight position - smaller 20 or 30 degrees. First symptoms appear at 8 - 10 - 12 years old. In some cases, there is “kyphoscoliosis”. In both types the spine is flexible.

**C/Third group.** In this form of deformity we see only stiffness of the spine. Specific model of hips movement. Left hip - adduction in straight position - very small - only 5 - 10 - 20 degrees.

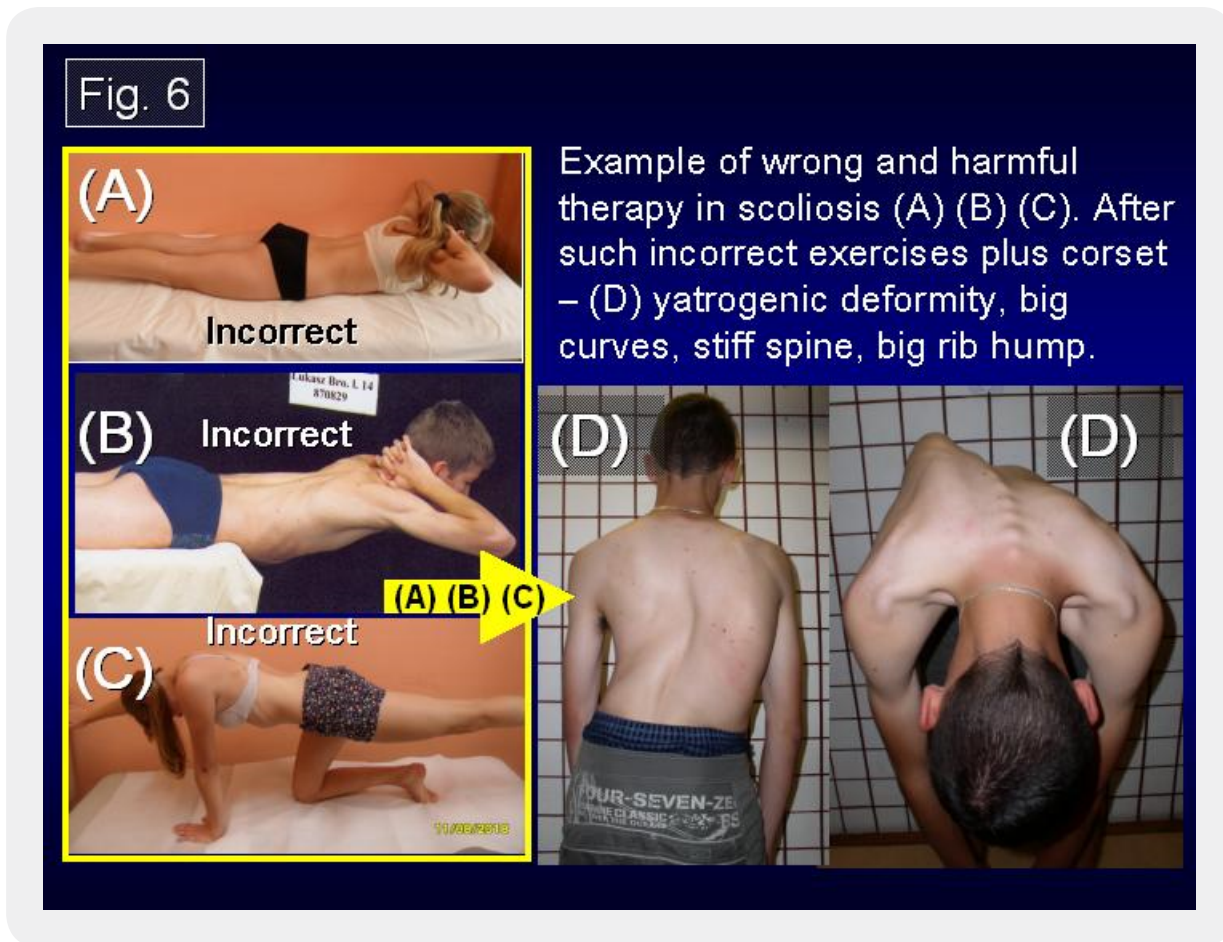
Right hip - adduction in straight position - movement maximally limited - range - 0 degree or abduction contracture 5 or 10 degrees. This spine deformity is connected only with walking. Adults and sometimes also adolescents experience pain - connected with the “stiffness”.

### **Therapy of So-Called Idiopathic Scoliosis (AIS).**

A/ Old Conceptions of Therapy. Scoliosis, in the common opinion - is certainly a result of weak muscles (according to me - it is a mistake of thinking!). Patient needs strengthening exercises (!?).

After such therapy the curves were bigger, spine more stiff, gibbous more expressed, the results were totally bad. Doctors in this situation - used to say to parents and to the child - “it is in the natural history of scoliosis”. No (my explanation) - it is a mistake of therapy. The deformity has iatrogenic character (Fig. 6).

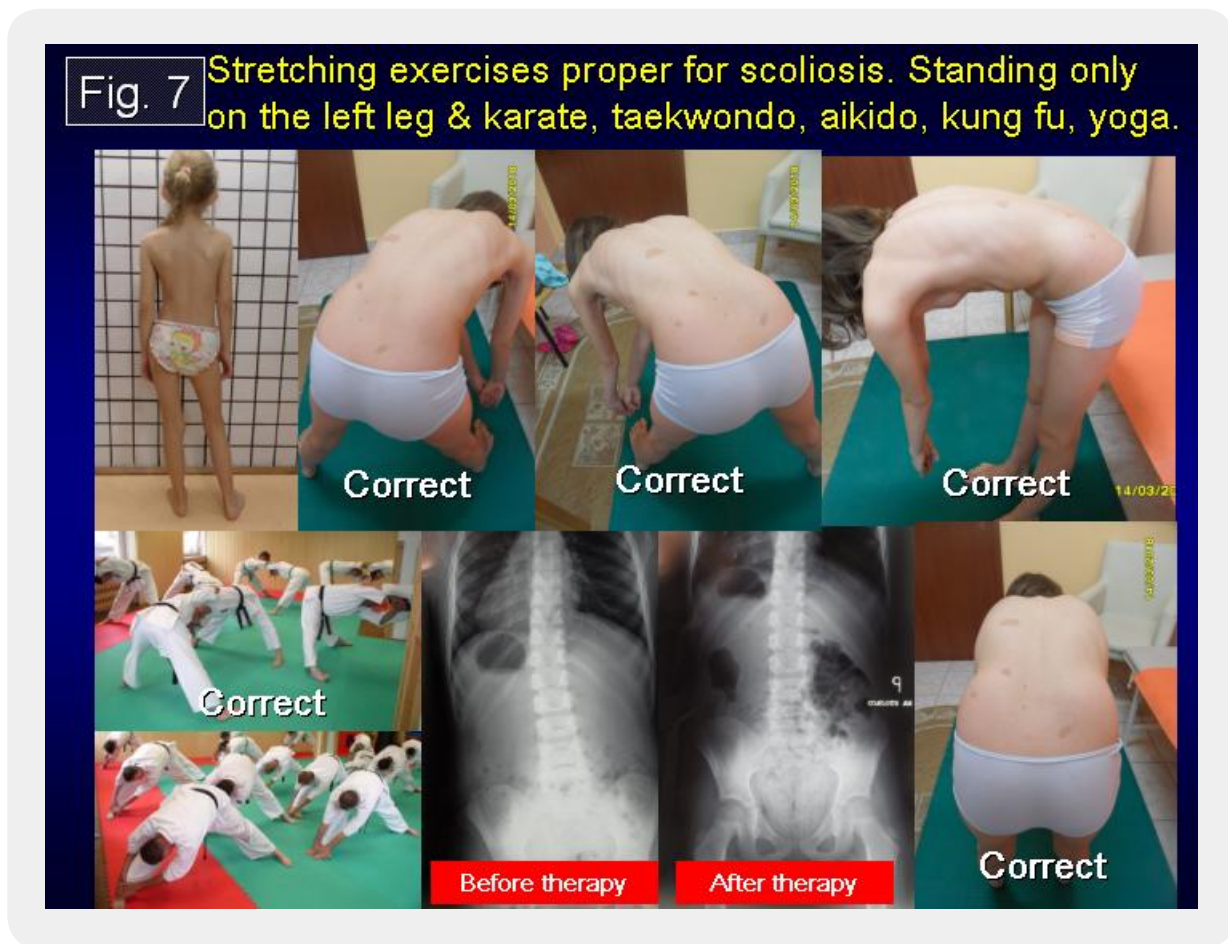




**Figure 6:** Example of wrong and harmful exercises in scoliosis (A) (B) (C). After such incorrect therapy - (D) iatrogenic deformity, big curves, big rib hump and stiff spine.

### B/ New Conceptions of Therapy

If we take in consideration the “biomechanical etiology of so-called idiopathic scoliosis” only exercises leading to full movement of right hip, proper position of pelvis and full movement of spine - in all directions - is the correct, proper therapy (Fig. 7).



**Figure 7:** Stretching exercises proper for scoliosis. Standing only on the left leg & karate, taekwondo, aikido, kung fu, yoga.

So - only stretching exercises - for hips, for proper position of pelvis and whole parts of spine are proper therapy.

In the treatment it is important never to stand 'at ease' on the right leg - only on the left. Also - exercises typical for - karate, taekwondo, aikido and yoga - are perfect for scoliosis therapy.

## Discussion

After over two thousand years - since the first description and therapy of scoliosis (Hippocrates) and after the using the term "scoliosis" (Claudius Galenus) etiology of "idiopathic scoliosis" has been found and described and it is fully "biomechanical etiology". The etiology is connected with functional factors - "standing 'at ease' on the right leg" and with "walking".

These functional causes play the important role through asymmetry of the body's movement during walking and asymmetry of time during standing - right versus left leg - longer on the right leg. All this is connected with asymmetry of movement of hips and this asymmetry is symptom of "Syndrome of Contractures ad Deformities" (SofCD), according to Prof. Hans Mau and Lublin observations. In SofCD is limited movement of right hip - and it is the main cause of scoliosis.

The described biomechanical etiology of the so-called idiopathic scoliosis opened the possibility of proper therapy and the causal prophylaxis of all patients in the whole world.

I hope - the publication of this article will be the way leading to "new looking and thinking about so-called idiopathic scoliosis" not only in Canada but also in the world.

## Conclusions

1/ The etiology of the so-called idiopathic scoliosis is entirely biomechanical - connected with permanent standing 'at ease' on the right leg and walking.

2/ There are three groups and four types of scoliosis - connected with three models of hips movements.

3/ New classification:

a/ Double curves scoliosis "S", 1st etio - pathological - group (epg), 3D, stiff spine, gibbous on the right side, connection with standing and gait, progression,

b/ Scoliosis "C" 2nd / A epg and "S" 2nd / B epg, 2D or 3D, one or two curves, flexible spine, no progression or slight, connection with standing only,

c/ Scoliosis "I" 3rd epg - deformity in form of stiffness, no curves or small. Connection with walking.

4/ In new therapy and in prophylaxis important are "standing 'at ease' on the left leg" and stretching exercises to obtain full movement of right hip, proper position of pelvis, full movement of spine in all directions.

5/ In kindergartens and in primary schools - for gymnastic should be introduced such sports arts like - karate, taekwondo, aikido, kung fu.

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