BARCELONA SCOLIOSIS PHYSICAL THERAPY SCHOOL

Concept by Rigo

Basic Level

Unit 4: EOS, AIS, AdS

www.bspts.net elearning@bspts.net

Scoliosis: Classification according to the age of onset

Idiopathic Scoliosis is the most common form of morphological scoliosis and appears in apparently healthy children during any period of life

THE JOURNAL OF BONE AND JOINT SURGERY

VOL. 36 B, NO. 1, FEBRUARY 1954

IDIOPATHIC SCOLIOSIS

The prognosis, diagnosis, and operative indications related to curve patterns and the age at onset

J. I. P. JAMES, LONDON, ENGLAND

From the Royal National Orthopaedic Hospital and the Institute of Orthopaedics

- Three peak periods of onset

- 0-3 years
- 5-8 years
- 10-end of growth

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- Three peak periods of onset

- 0-3 years.....INFANTILE
- 5-8 years.....JUVENILE
- 10-end of growth.....ADOLESCENT

https://www.srs.org/professionals/online-education-and-resources/glossary/revised-glossary-of-terms

Revised Glossary of Terms

SRS Terminology Committee and Working Group on Spinal Classification Revised Glossary of Terms

By the Working Group on 3-D Classification (Chair Larry Lenke, MD), and the Terminology Committee, March 2000

Chronological presentation of Idiopathic Scoliosis:

1) **Infantile Scoliosis** presenting from birth trough age 2 + 11
2) **Juvenile Scoliosis** presenting from age 3 trough age 9 + 11
3) **Adolescent Scoliosis** presenting from age 10 trough the age of 17 + 11
4) **Adult Scoliosis** presenting from age 18 and beyond

Early Onset Scoliosis (EOS)

- To confirm a worse prognosis in scoliosis beginning before the age of 10 in comparison with scoliosis beginning from 10 years of age and beyond, called Late Onset Scoliosis (LOS)

PROGNOSIS IN IDIOPATHIC SCOLIOSIS

IGNACIO V. PONSETI and BARRY FRIEDMAN
J. Bone Joint Surg. Am. 32:381-395, 1950.

Early Onset Scoliosis (EOS) from Dickson R.A.

- EOS = Infantile Scoliosis and later on 'scoliosis present in children younger than 5 years of age including Idiopathic, Neuromuscular, Congenital or Syndromic'

The Journal of Bone and Joint Surgery. British volume, Vol. 67-B, No. 2 | 1985

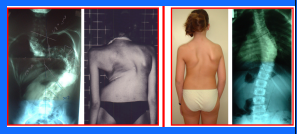
Conservative treatment for idiopathic scoliosis

RA Dickson

REVIEW ARTICLE

CONSERVATIVE TREATMENT FOR IDIOPATHIC SCOLIOSIS

R. A. DICKSON



EOS LOS

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EOS is nowadays defined as curvature of the spine ≥ 10º in the frontal plane with onset before 10 years of age including congenital, neuromuscular, syndromic and idiopathic.

Scoliosis is a Biphasic Process and current diagnosis of EOS according to SRS means very little in terms of Natural History and Prognosis (Sevastik J 1996)

- EOS
  - It can go into progression before 10 years of age (Cobb angle at the end of growth use to be higher than 90º)
  - It can remain stable and progress only later during Adolescence With similar prognosis than AIS (or LOS)
  - It can spontaneously regress

Scoliosis

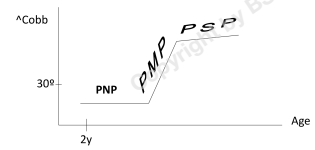
RESEARCH Open Access

In favour of the definition "adolescents with idiopathic scoliosis": juvenile and adolescent idiopathic scoliosis braced after ten years of age, do not show different end results. SOSORT award winner 2014

Natural History and Prognosis

- Age of ONSET is not so important but age of PROGRESSION

Period of Maximum Progression (PMP) occurs during rapid growth



Perdriolle and Vidal, Spine 1985

Escoliosis sintomaticas. Causas.

Rebecca Sauvagnac Quera. MD
PM&R specilist

Structural Scoliosis are most idiopathic

- **Idiopathic (75%-80%)**
- Congenital (10%)
- Neurological (5%-7%)
- Recklinghausen (2%-3%)
- Others (Marfan, Beals, … tumors)

Scoliosis Research Society

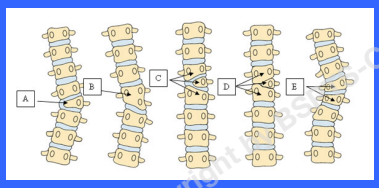
Escoliosis congenital

- Debido a un desarrollo vertebral anormal entre la 4a y 6a semana gestacional que resulta en un crecimiento asimétrico de la columna.
- Historia natural:
  - **25% no progresan**
  - **25% progresan lentamente**
  - **50% progresan rápido**
  - Lo que determina la progresión curva: tipo de anormalidad, localización y edad del paciente
- Anomalías asociadas
  - Genito urinarias (20-40%)
  - Musculo esquelético
  - Cardiovascular (18-26%)
  - Anomalías del axis neural (40%)
  - Ex: VACTERL syndrome (vertebral anomalies, anorectale atresia, cardiac anomalies, tracheo-esophageal fistula and/or esophageal atresia, renal and limb anomalies); Klippel-Feil syndrome (cervical spine anomalies)

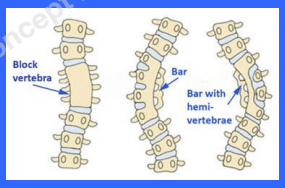
REVIEW ARTICLE. What's New in Congenital Scoliosis? Joshua M. Pahys, MD and James T. Guille, MDw. J Pediatr Orthop 2016;00:000–000*

Escoliosis congenital

Deformidad causada por una formacion anormal de las vertebras



Defect of formation



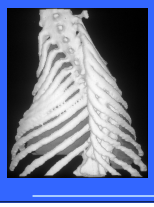
Defect of segmentation

A. Misshapen vertebra with scoliosis
B. Misshapen vertebra fused to normal vertebra with scoliosis
C. Three Misshapen vertebrae without scoliosis
D. Three fused vertebrae without scoliosis
E. Trapezoidal shaped vertebrae with scoliosis

https://www.srs.org/professionals/online-education-and-resources/conditions-and-treatments/congenital-scoliosis

Escoliosis Neurologicas (1)

- Columna con una hipo o híper tonia de los músculos del tronco con asimetrías de control de tronco
- En una columna en crecimiento
- Las deformidades de columna y tórax son indisociables → Los tratamientos son indisociables



Escoliosis Neurologicas (2)

Table 1 Main neuromuscular etiologies of spinal deformity.

Central neurological causes Central motor neuron involvement	Cerebral palsy Hereditary ataxia (Friedreich, etc.) Syringomyelia Other central causes (encephalopathy, Rett's syndrome, etc.)
Peripheral neurological causes Peripheral motor neuron involvement	Acute anterior poliomyelitis Infantile spinal amyotrophy Hereditary motor and sensory neuropathy Hereditary sensory and vegetative neuropathy (familial dysautonomia)
Mixed central and peripheral neurological causes	Medullary lesion Myelodysplasia Myelomeningocele
Neuromuscular junction (motor end-plate)	Myasthenia
Muscular causes	Duchenne myopathy Other muscular dystrophy Arthrogryposis

REVIEW ARTICLE. Neuromuscular scoliosis R. Vialle, C. Thévenin-Lemoine, P. Mary. Orthopaedics & Traumatology: Surgery & Research (2013) 99S, S124—S139*

Escoliosis Neurologicas (3)

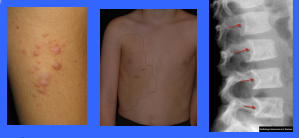
Table 2 General population prevalence of scoliosis according to etiology [6].

Etiology	Prevalence (%)
Cerebral palsy	25
Myelodysplasia	60
Spinal amyotrophy	67
Friedreich's ataxia	80
Duchenne myopathy	90
Medullary lesion (< 10 years of age)	100

REVIEW ARTICLE. Neuromuscular scoliosis R. Vialle, C. Thévenin-Lemoine, P. Mary. Orthopaedics & Traumatology: Surgery & Research (2013) 99S, S124—S139*

Recklinghausen Neurofibromatosis type 1

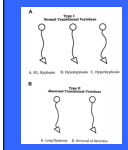
- Enfermedad multisistemica
  - Cutáneos : tacas "Cafés au lait", Neurofibromas cutáneos
  - Extra cutáneos : Escoliosis, Pectus excavatum, otras deformidades esqueléticas… patologías cardio vascular
- 10% de los pacientes tendrán escoliosis (osteopenia y displasia) con
  - Scalloping of vertebrae
  - Bone dystrophy

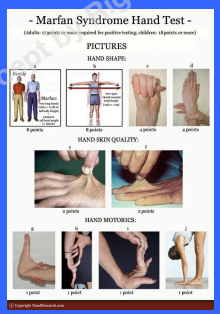


Neurofibromatosis type 1. Kevin P. Boyd et al. J Am Acad Dermatol. 2009 July ; 61(1): 1–16. doi:10.1016/j.jaad.2008.12.051.

Marfan syndrome

- Enfermedades del tejido conectivo
- 62% de los paciente hacen escoliosis
- Patrón de curvas similar a los de las escoliosis idiopáticas, pero con diferencias de perfil





Sponseller PD, Hobbs W, Riley LH 3rd, et al. The thoracolumbar spine in Marfan syndrome. J Bone Joint Surg Am 1995;77(6):868; with permission.

Others …

- Otras patologías del tejido conectivo
  - Síndrome de Beals : Contracturas congénitas, aranodactilia, camptodactilia, kyphoscoliosis
  - Loeys-Dietz síndrome, Ehler Danlos síndrome…
- Tumoral : osteoma ostéoïde
- Infección : spondilodiscite

Escoliosis sintomáticas

= Escoliosis secundarias =

Estas escoliosis tienen un doble potencial de progresión:

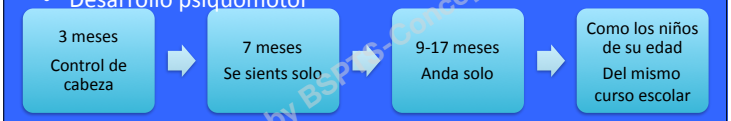
- El de la enfermedad. Cada tipo de escoliosis sintomáticas tendrá un evolución diferente.
- La misma que las escoliosis idiopáticas, durante el pico de crecimiento.

Escoliosis symptomaticas. Banderas rojas.

Rebecca Sauvagnac Quera. MD
PM&R specilist

Historia clínica

- Historia neonatal
- Desarrolló psiquomotor



- Historia medica personal:
  - Malformaciones asociadas genitourinarias, musculo esqueléticas, cardiovasculares…
  - Historia familiar de patologías neurológicas o óseas…

Generalidades

- Insuficiencia respiratoria
- Soplido cardiaco
- Fiebre crónica
- Astenia, anorexia, slimming

Valoración de la escoliosis

- Curva torácica izquierda
- « Rigid spine »
- Escoliosis angular

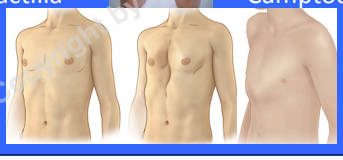
Valoración Osteo articular

- Articulaciones: Rígidas o hyperlaxes

- Aranodactilia

Camptodactilia

- Pectus



Normal – Excavatum - Carinatum

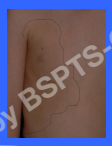
Valoración neurológica

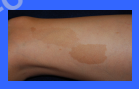
- Tono muscular : aumentado o disminuido
- Reflejos Osteo tendinosos (ROT) : ausentes, disminuidos o aumentados
- Reflejos cutanéo abdominales (RCA): Ausentes ou disminuidos
- Dismetría : pruebas dedo-nariz o talón-rodilla
- Marcha atáxica
- Movimientos anormales

Valoración dermatológica

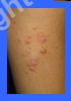
- Estigmas de anomalías del eje neural

- Tacas « café-au-lait »





- Neurofibromas



Red flags

Congenital Scoliosis	Other malformation	
Neurological scoliosis	Neuro muscular (nerve, muscle...) - OTR Absence or diminution - Hipo tonia - Rigid spine - Joint stiffness	Neuro central (cerebral palsy, siringomyelia...) - OTR Exacerbation - Hiper tonia - ACR absents - Joint stiffness
Fridriech ataxia	- Dismetria at finger-nose test, heel-knee test - Ataxic walking	
Medular lesion (syringomyela or occipito-cervical malformacion)	- Left toracic curve - Asimetris of ACR	
Tumoral	- Angular scoliosis - Alteracion of general state	- Escoliosis reactiva
Marfan syndrome	- Arachnodactyly - Joint hyperlaxity - Cutaneous hyperlaxity - Pectus excavatum	
Neurofibromatosis type 1 or Recklinghausen	- Cafés au lait" macules, Cutaneous neurofibromas - Pectus excavatum - Heart murmur	