

# Bracing II

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## Bracing Works!! But, how we can do it better ?

Prevention of Under-treatment / Prevention of Over-Treatment

When Brace Treatment is indicated ?

Which is the correct wearing time ?

When to stop ?

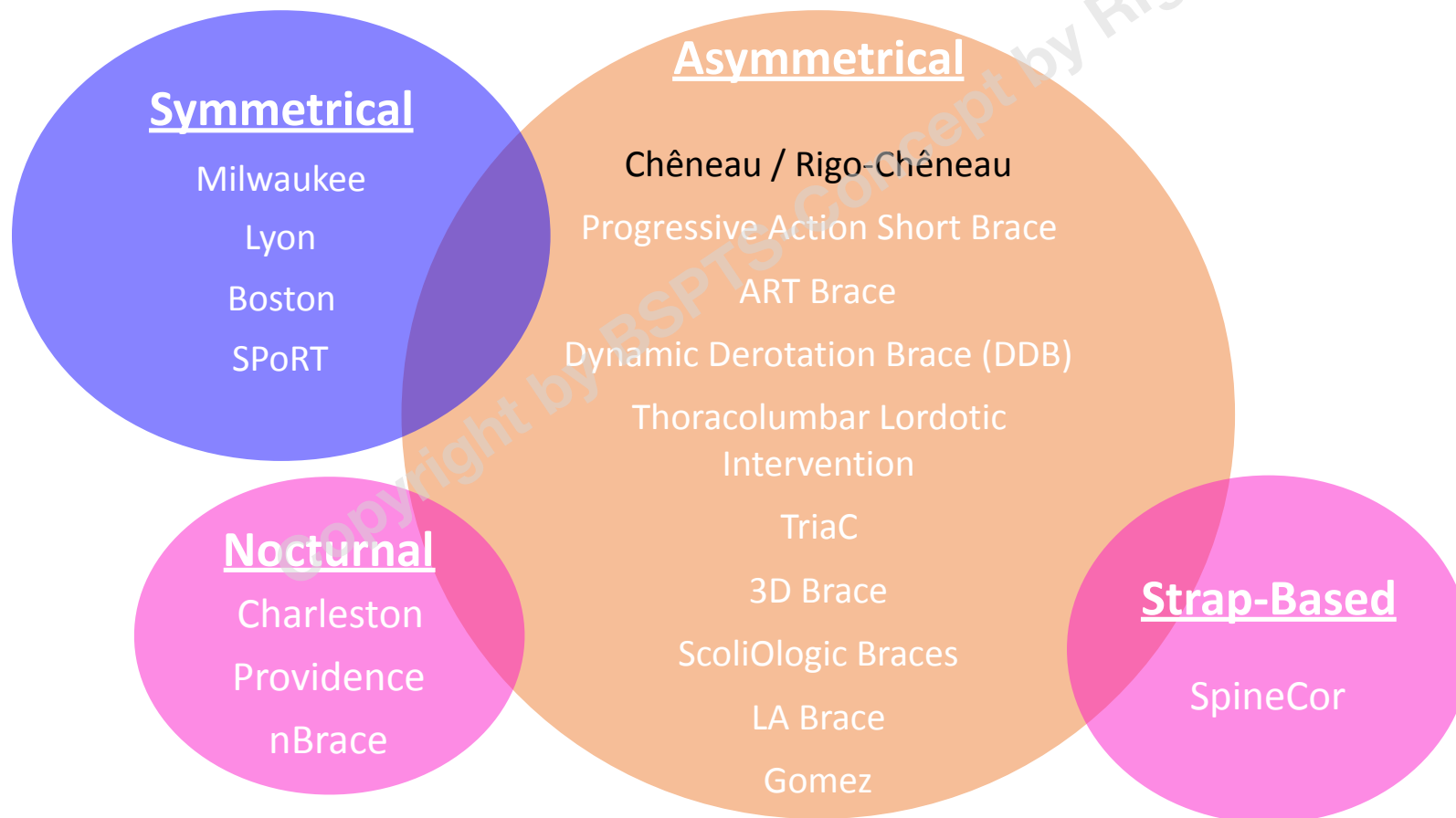
**Brace Quality ?**



# Types of Orthoses

From Luke Stikeleather  
SOSORT EC

## Groupings based on design



## NEW-GENERATION CONCEPTS INSPIRED BY J.CHÊNEAU

- DETORSION NIGHT-TIME BRACING (DNTB) Moreau, Lonjon, Mazda, Ilharreborde
- RSC by Ortholutions
- Gensingen Brace by Weiss
- ELONGATION BENDING DEROTATION BRACE (EBDB) Thometz, Liu, Rizza, English, Tarima

- **3D CONCEPT (Rigo and Jelacic)**

Custom Brace following 3D Principles, designed according to Individual Characteristics and a specific Clinical-Radiological Classification



By Rigo





## Chêneau-Toulouse-Münster Brace

Introduced in 1979 by

J. Chêneau

(Toulouse, France)

Prof. Mathias

(Münster, Germany)

CTM Brace

LATER ON CHÊNEAU BRACE



# CHÊNEAU BRACE CONCEPT

- INTRODUCED BY J. CHÊNEAU (with some historical references: Abbot, Risser, Cotrel and Stagnara)
- EXTERNAL ASYMMETRIC DESIGN
- CONSTANT EVOLUTION FROM 1979, from low to high asymmetry
- TOO MANY VERSIONS AND DIVERGING DERIVATIVES = POOR STANDARD



## Hand Made Original Technique / CAD CAM

CONTACTS LOCATED, SHAPED AND ORIENTED TO PROVIDE 3D CORRECTION  
(According to curve pattern and trunk morphology)

EXPANSIONS ALLOWING TISSUE'S MIGRATION, GROWTH AND BREATHING



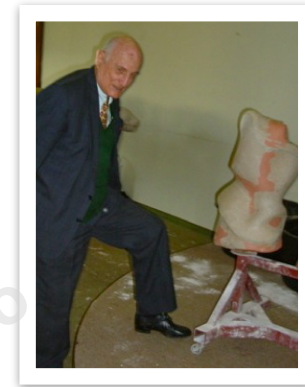
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The **Chêneau Type Brace** is popular in Europe, Asia and increasing popularity in the US and Canada

‘It is not an orthopedic product but a  
INDIVIDUALIZED corrective device’

The standard, however, is poor, with an  
increasing number of derivatives and versions



By Rigo

# TASK FOR STANDARDIZATION

- 1) Understanding about the 3D nature of IS
- 2) GENERAL PRINCIPLE OF CORRECTION
- 3) SPECIFIC PRINCIPLES OF CORRECTION for Individual correction
- 4) Pre-Defined STRATEGIES OF CORRECTION correlating with a reliable classification of clinical types (compatible with radiological curve patterns)

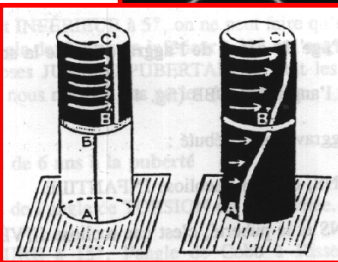
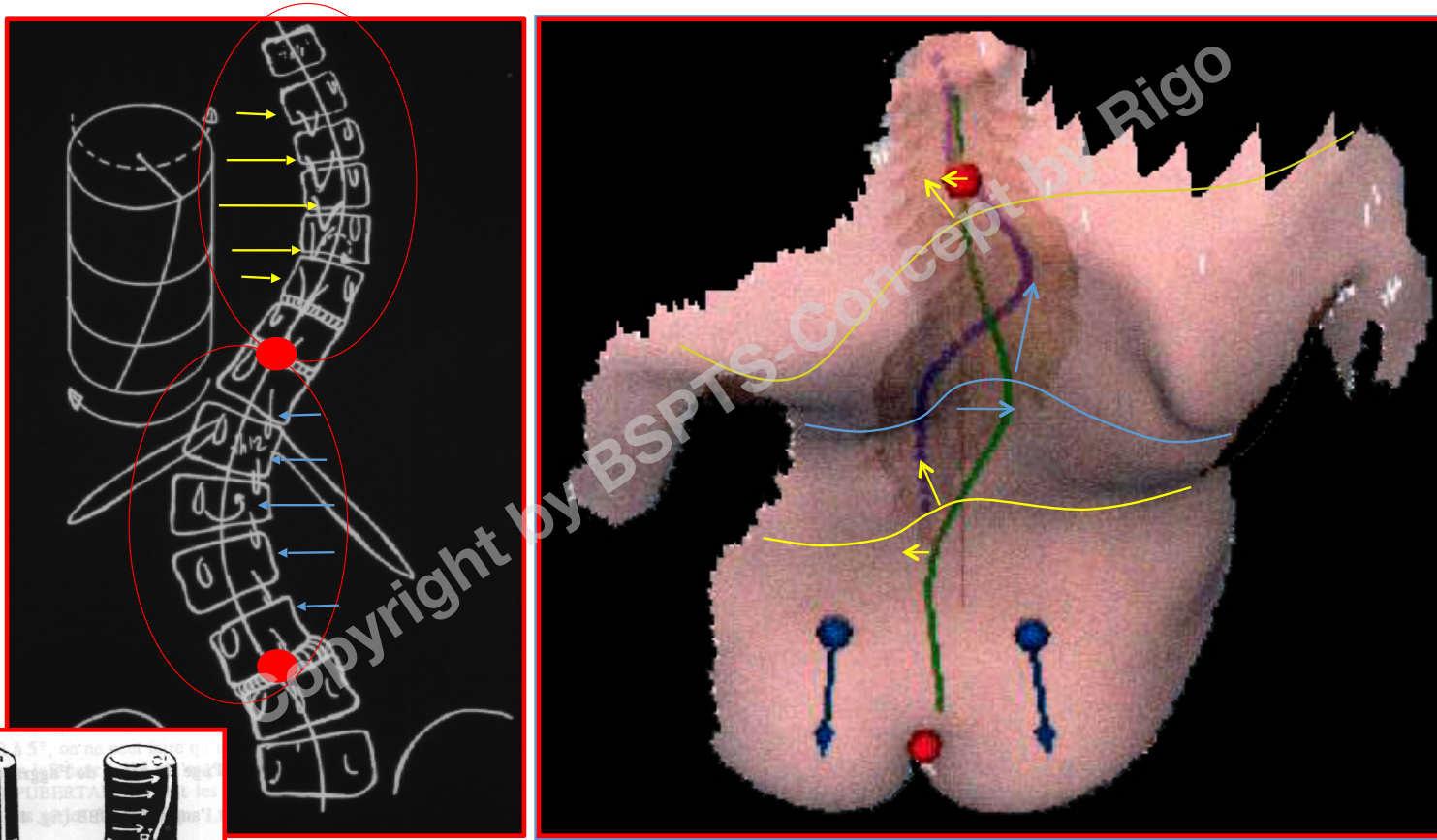




Scoliosis is  
**TRANVERSAL PLANE DEFORMITY**  
and its mechanism can be defined as a  
**GROWING INDUCED TORSION**

Copyright by BSP T Scoliosis Physical Therapy School

# The 3D nature of IS



R. Perdriolle

# TASK FOR STANDARDIZATION

- 1) Understanding about the 3D nature of IS
- **2) GENERAL PRINCIPLE OF CORRECTION**
- 3) SPECIFIC PRINCIPLES OF CORRECTION for Individual correction (How we do it?)
- 4) Pre-Defined STRATEGIES OF CORRECTION correlating with a reliable classification of clinical types (compatible with radiological curve patterns)





# Scoliosis Treatment: General Principle

- “ Reaching the best **possible** frontal and sagittal plane alignment throughout Detorsional Forces”

Dubousset J. **Importance of the three-dimensional concept in the treatment of scoliotic deformities.** In: Dansereau J, Scientific Editor; *International Symposium on 3D Scoliotic Deformities joined with the VIth International Symposium on Spinal Deformity and Surface Topography.* Éditions de l'École Polytechnique de Montréal. Gustav Fischer Verlag. 1992, pp 302-311

## Montreal CA

1<sup>st</sup> International Symposium on 3D  
Scoliotic Deformity / 7<sup>th</sup> ISSST



3D J Dubousset

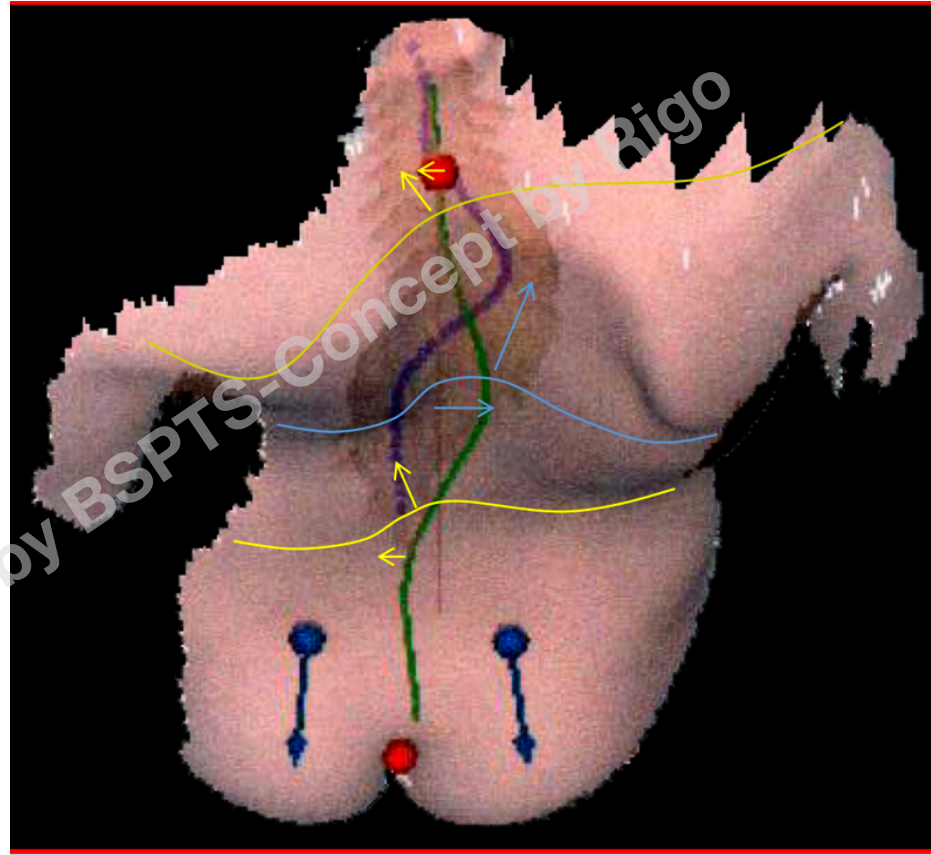
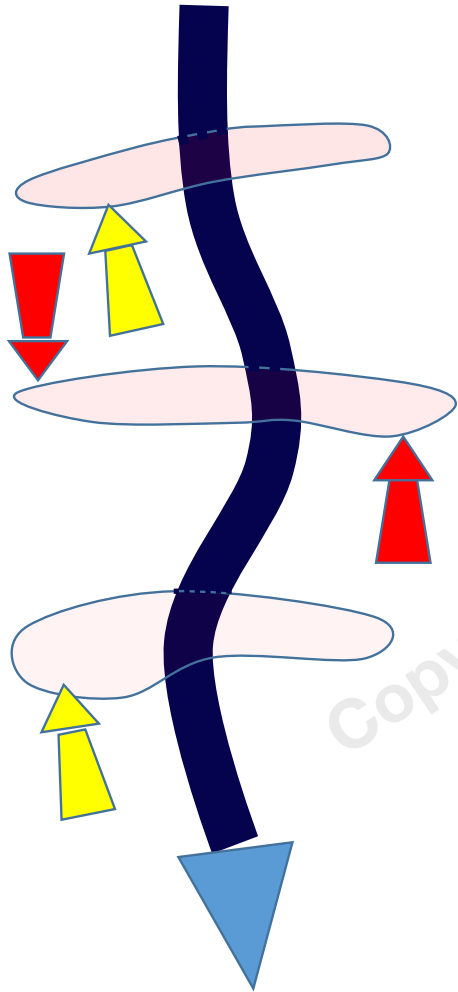


# TASK FOR STANDARDIZATION

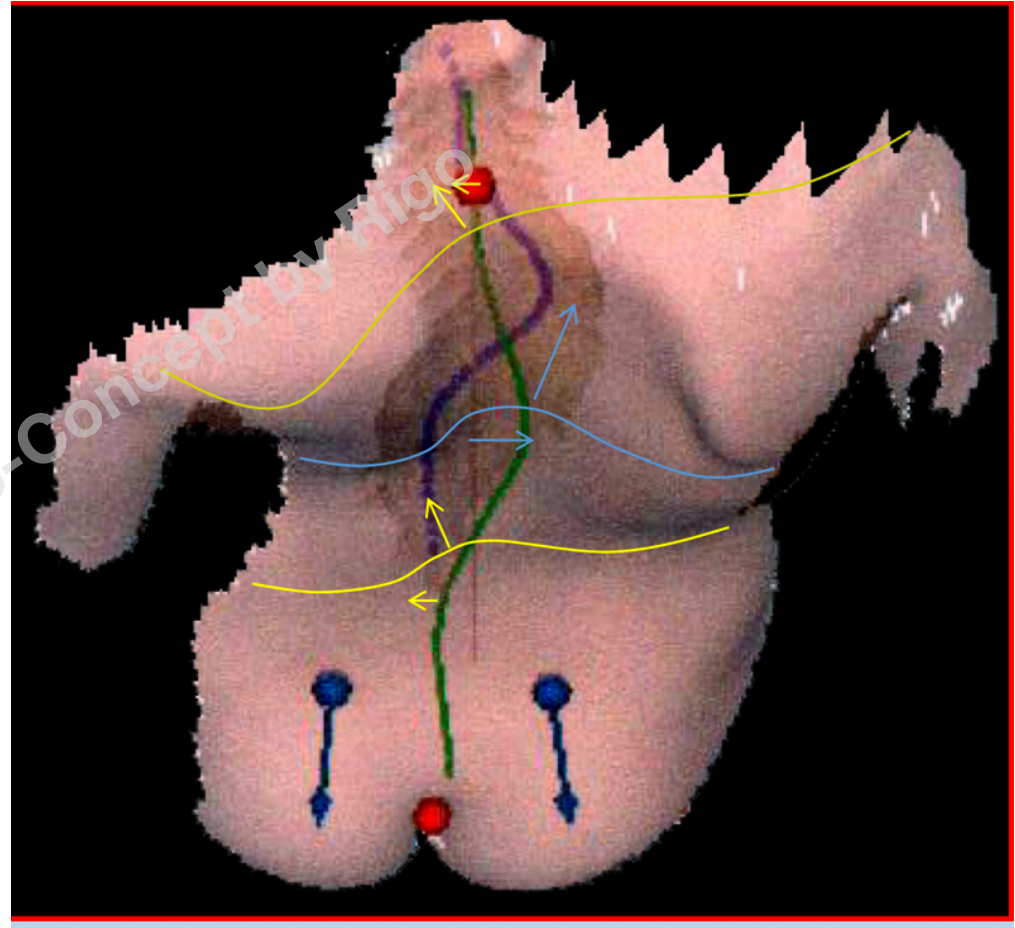
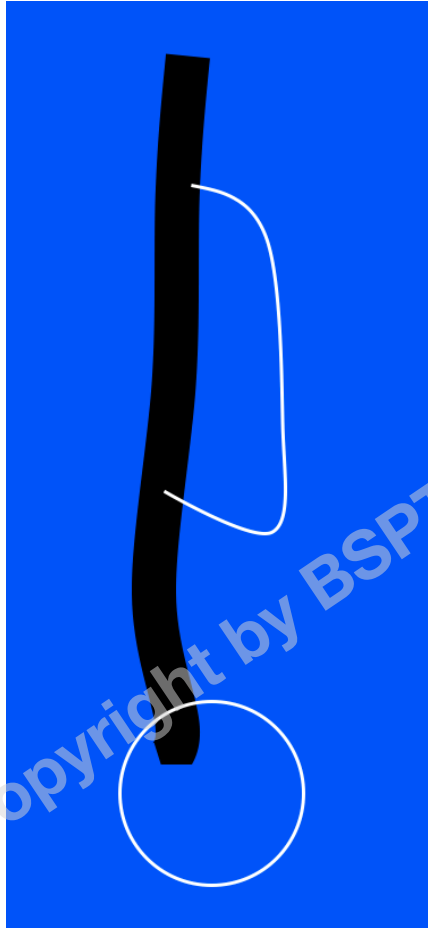
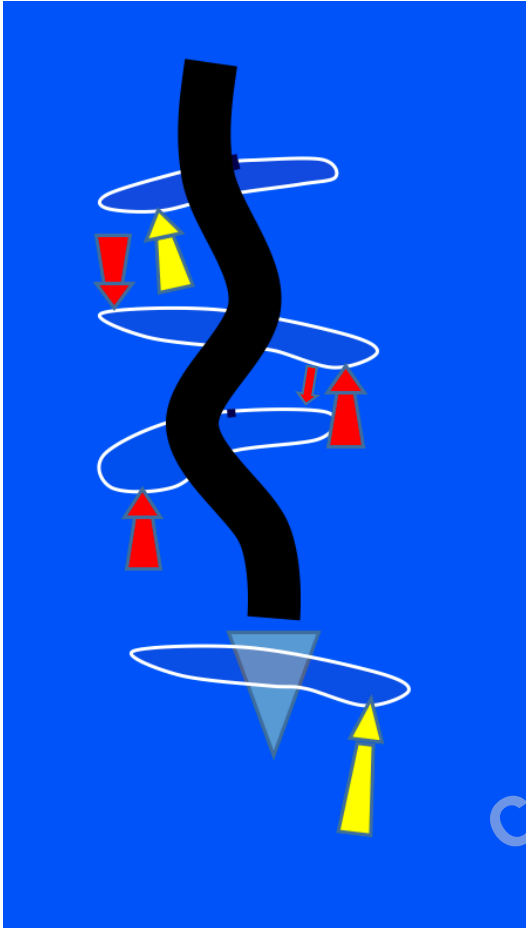
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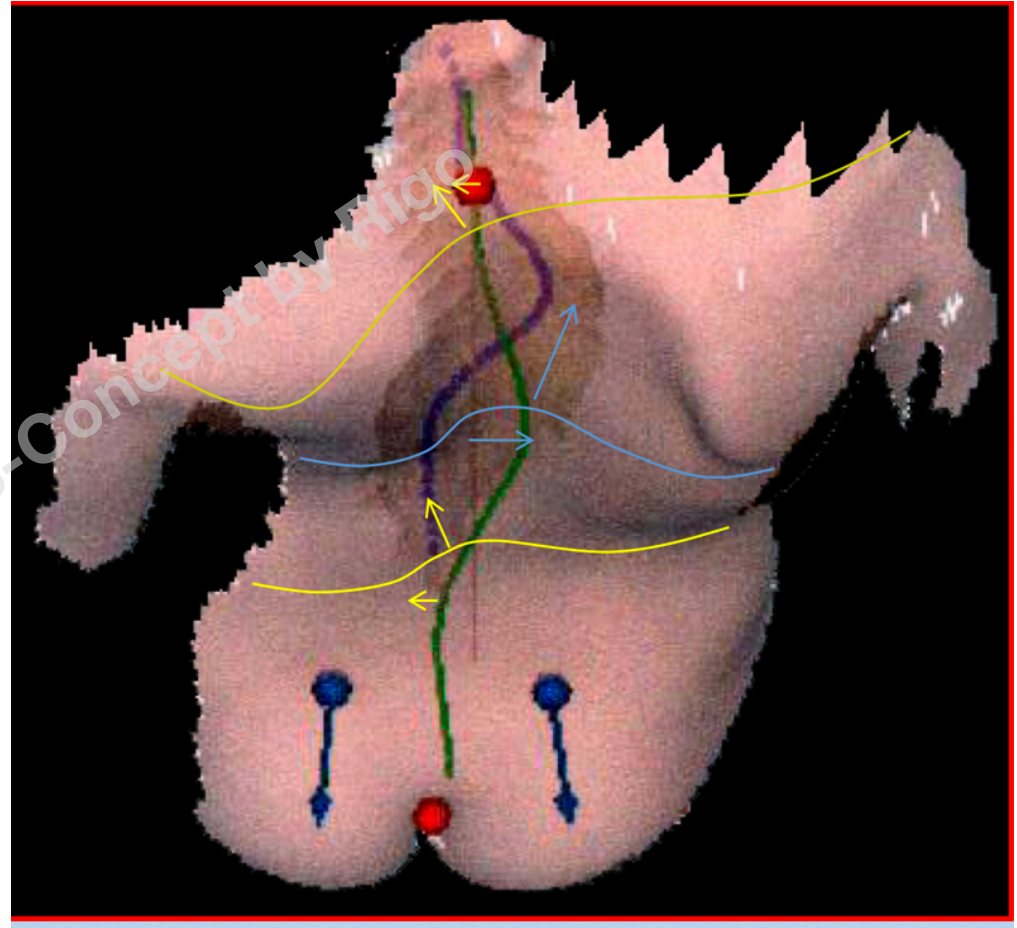
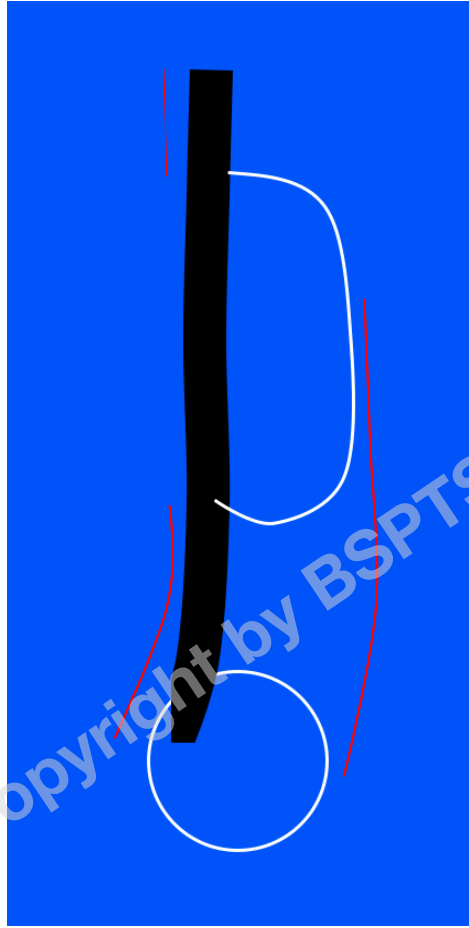
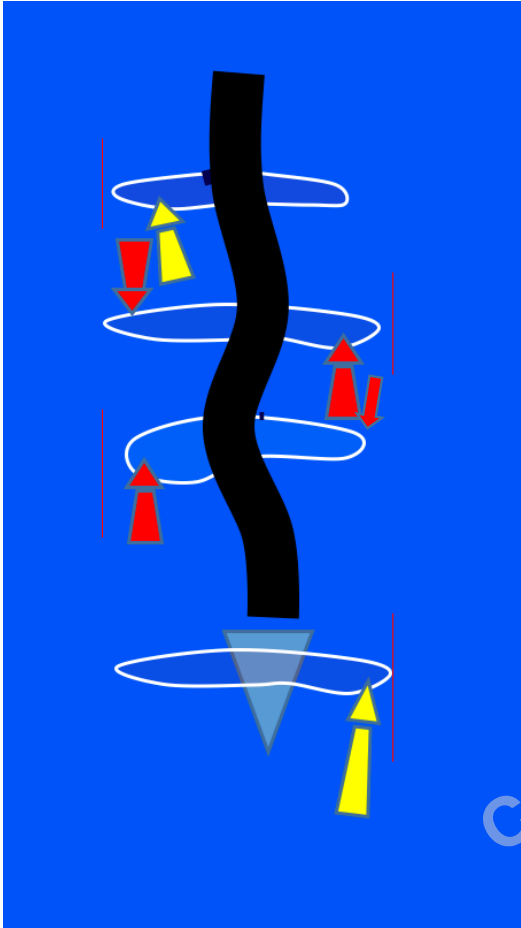
A



B



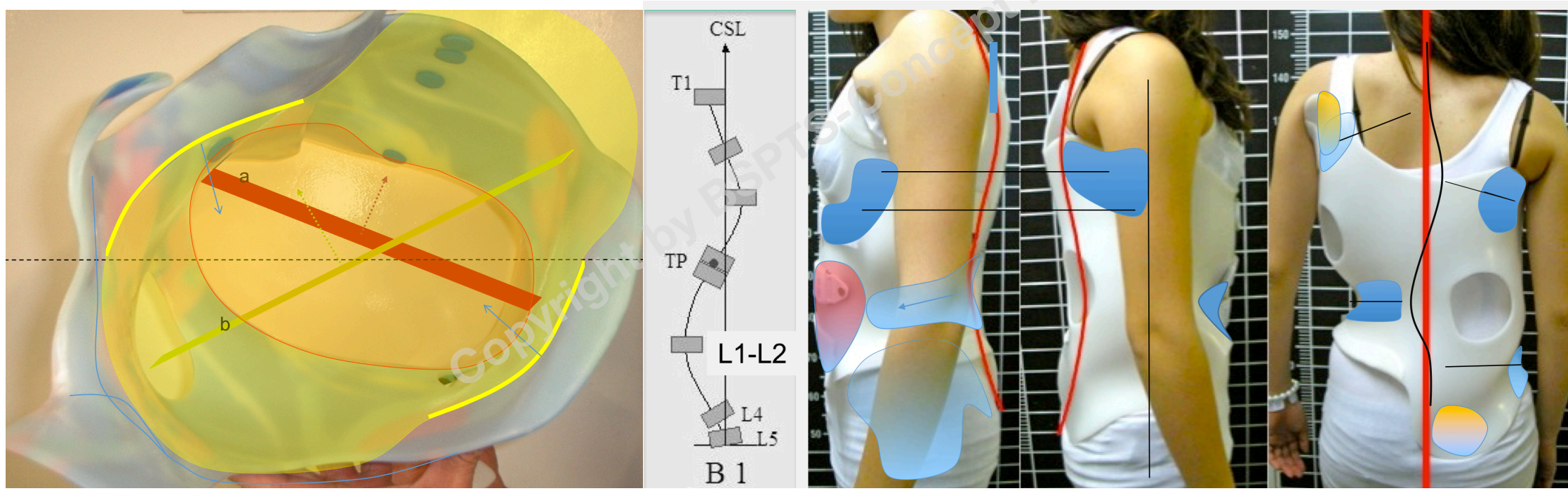
B





THE 3D BRACE CONCEPT (Inspired by J. Chêneau)= Combined 'Detorsional Forces':

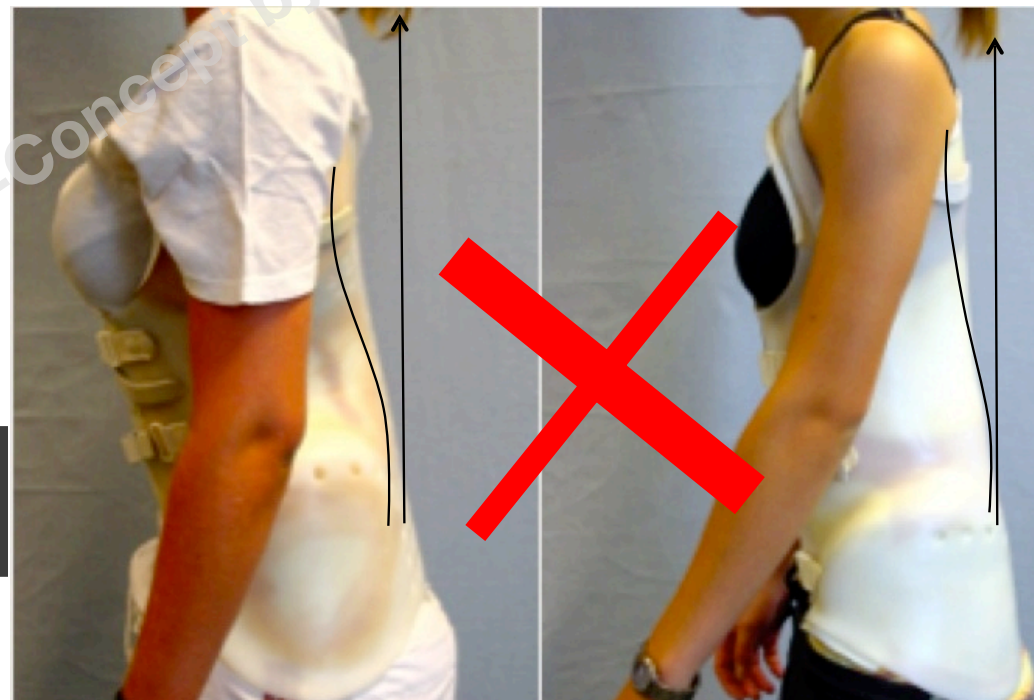
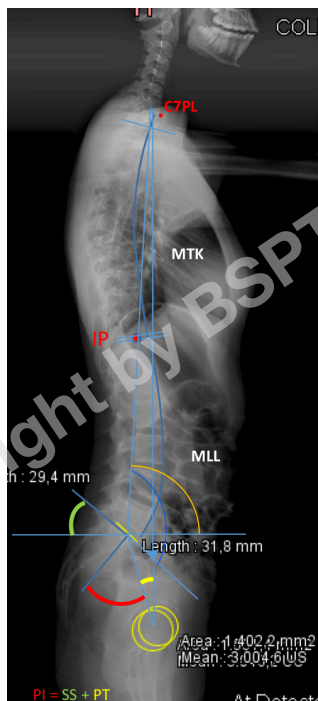
- 1) Regional Derotation (Apical Level with patient in the best possible correction)
- 2) Caudal and Cranial Counter-Rotation Forces
- 3) Three-Point-System Guiding Frontal Plane Alignment
- 4) Proper Sagittal Plane Profile-Balance
- 5) Proper Shape and Orientation of the Contact Areas providing a Dynamic Mechanism to fight against Lordotization



By Rigo



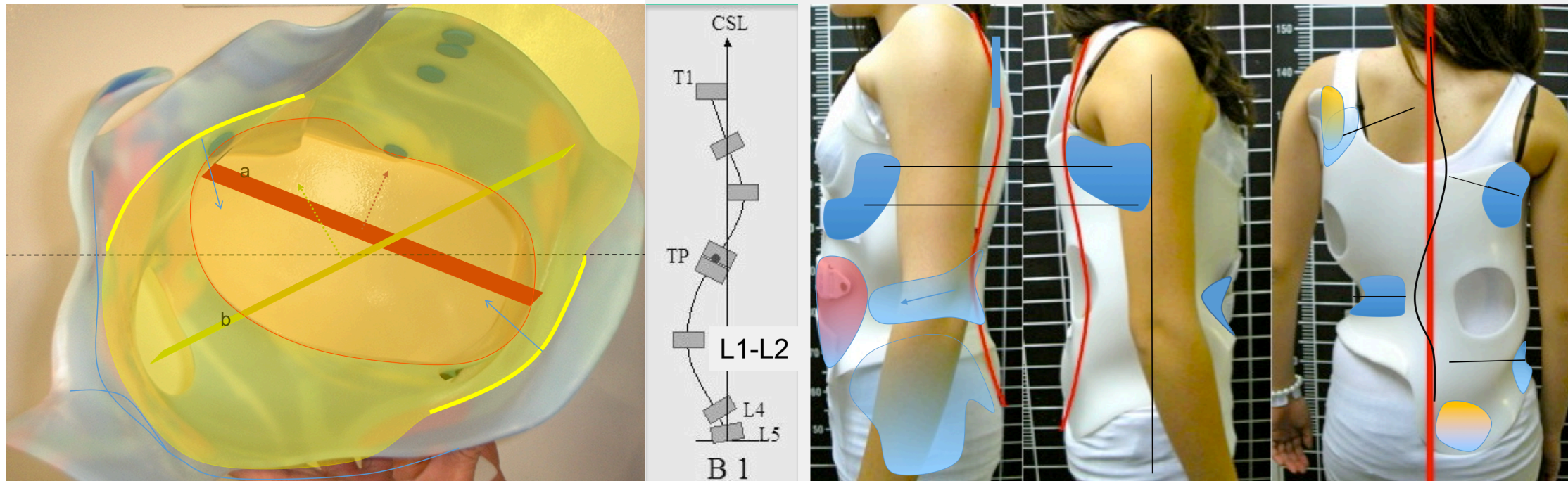
# Physiological sagittal alignment and balance





THE 3D BRACE CONCEPT (Inspired by J. Chêneau)= Combined 'Detorsional Forces':

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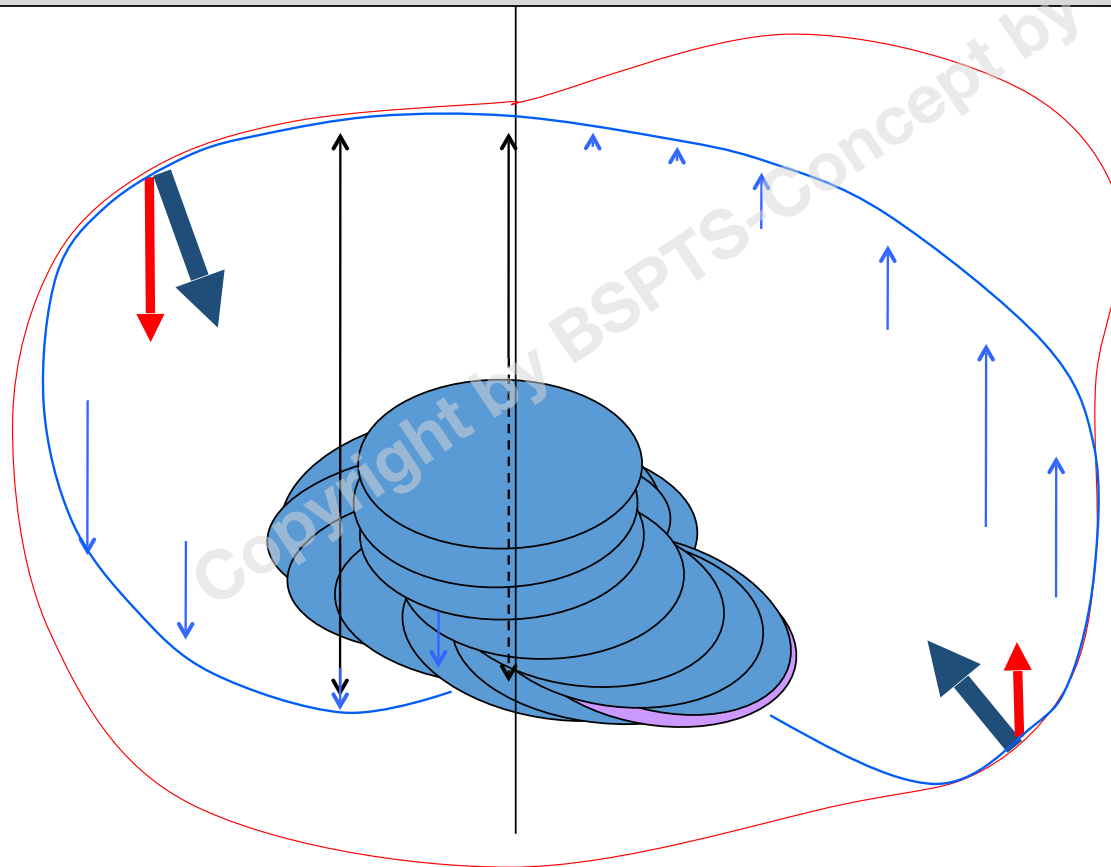


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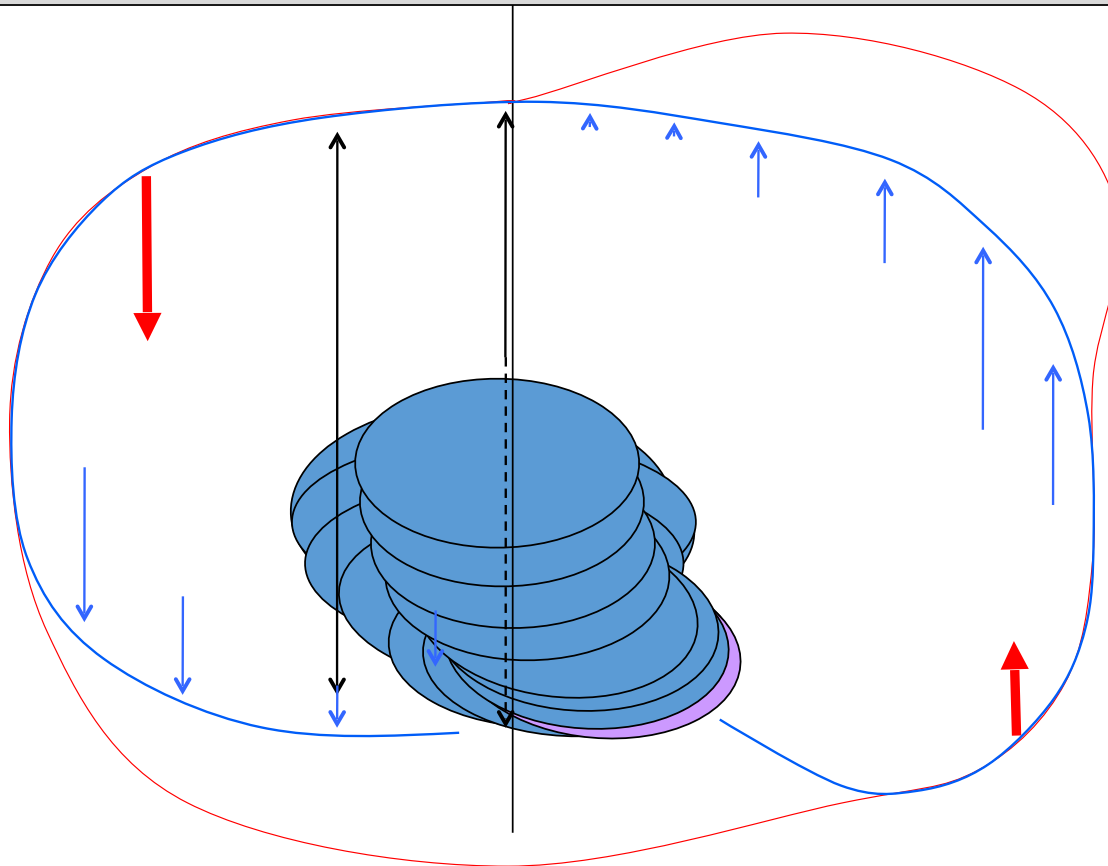


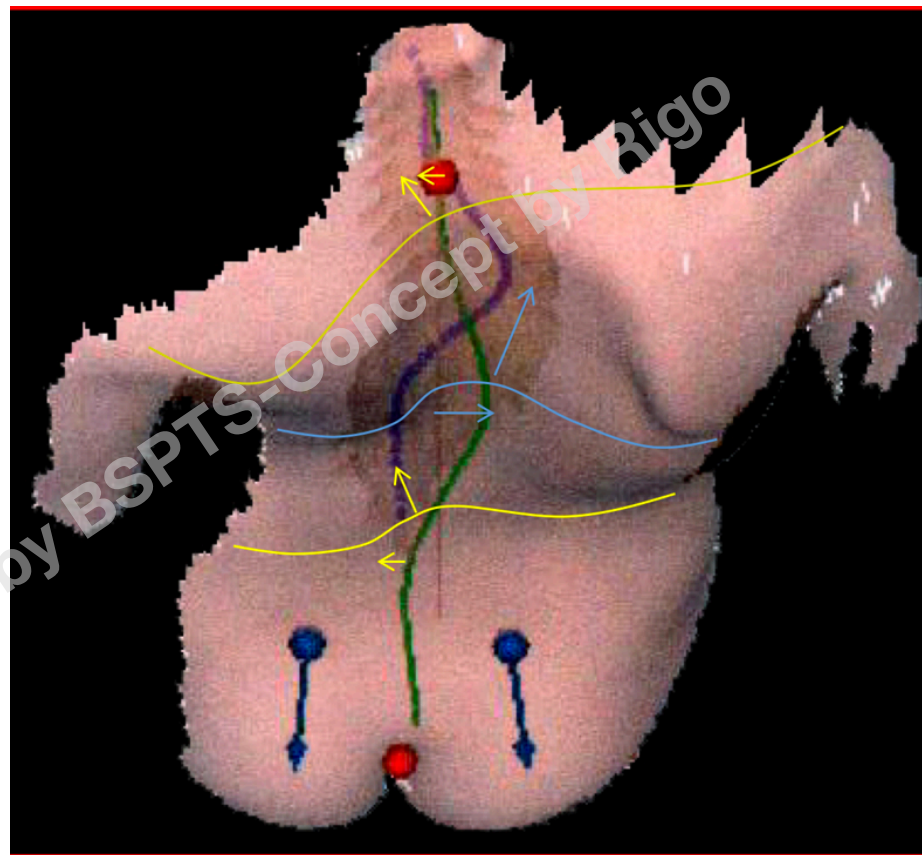
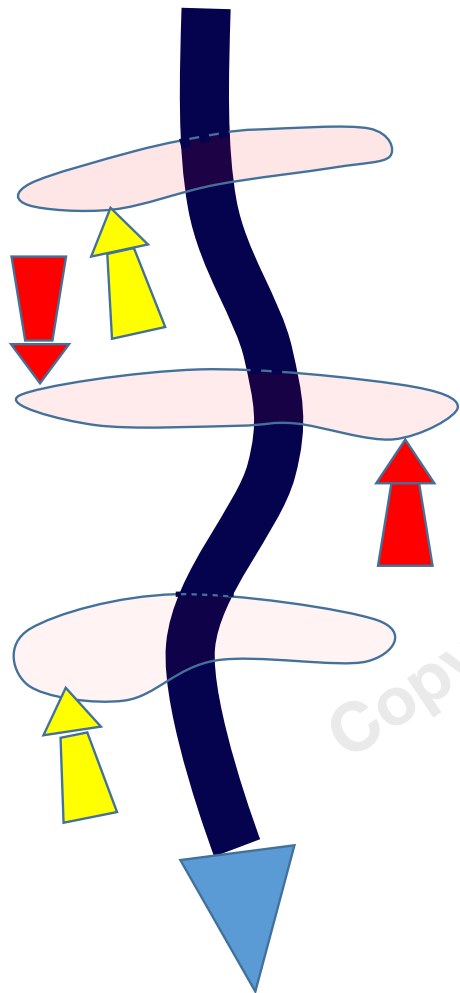


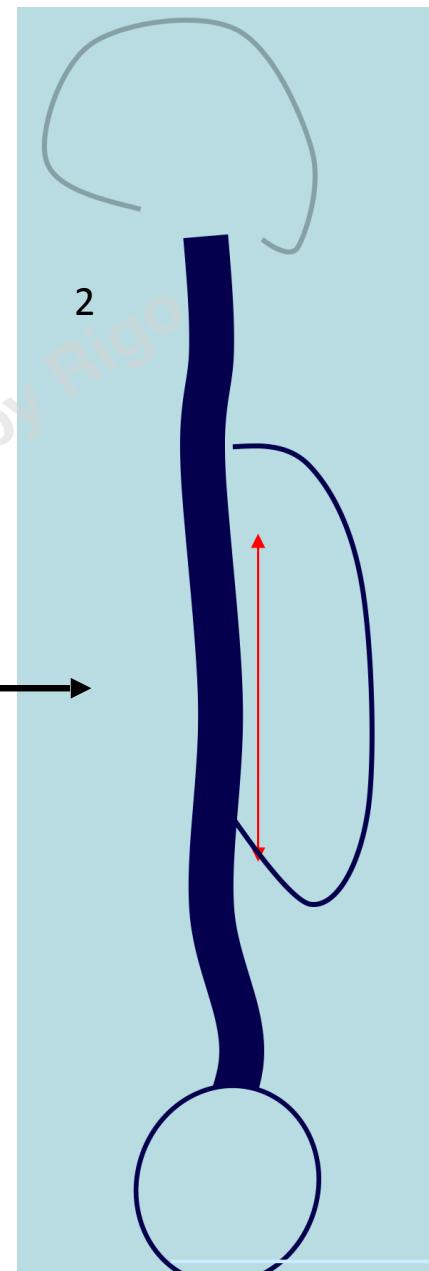
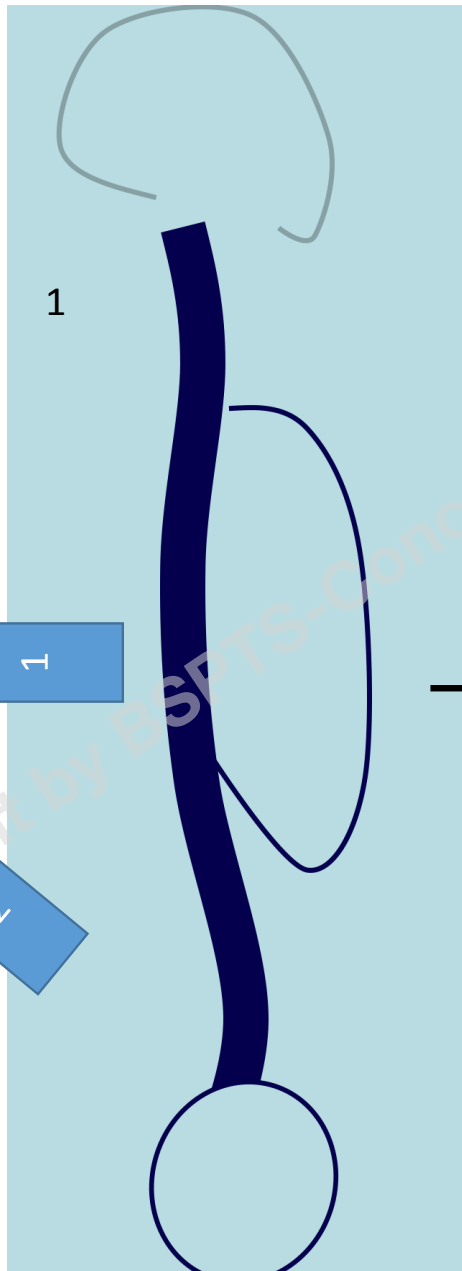
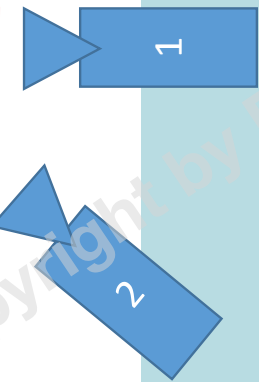
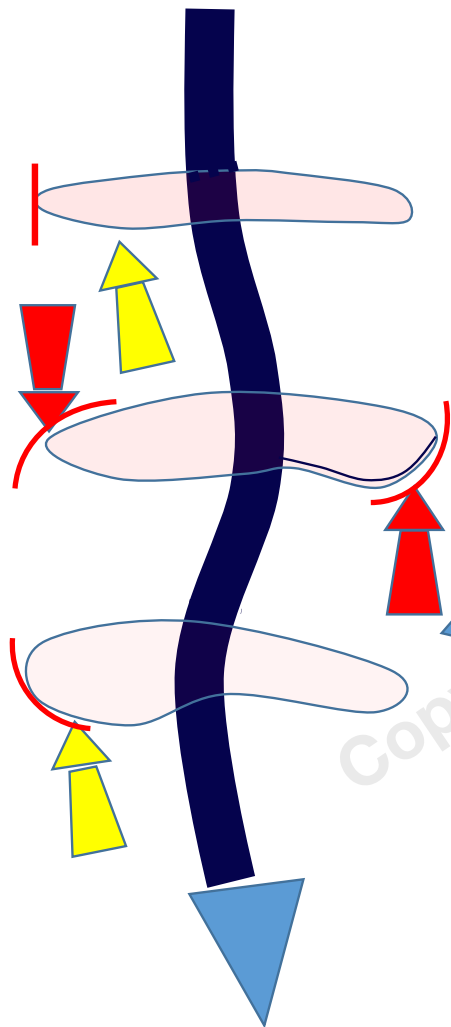
Breathing mechanics creating an internal pair-of-force for derotation and partial correction of the structural flat back

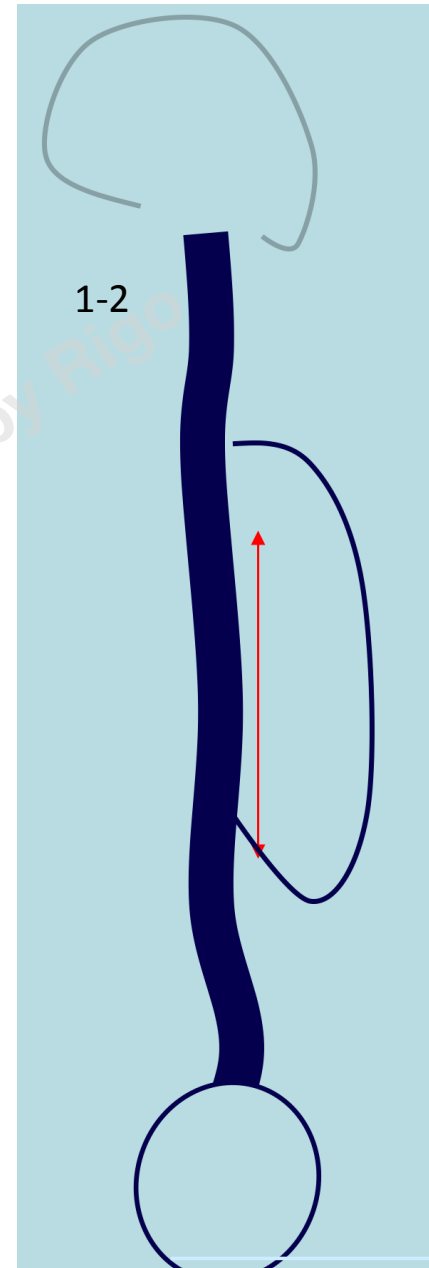
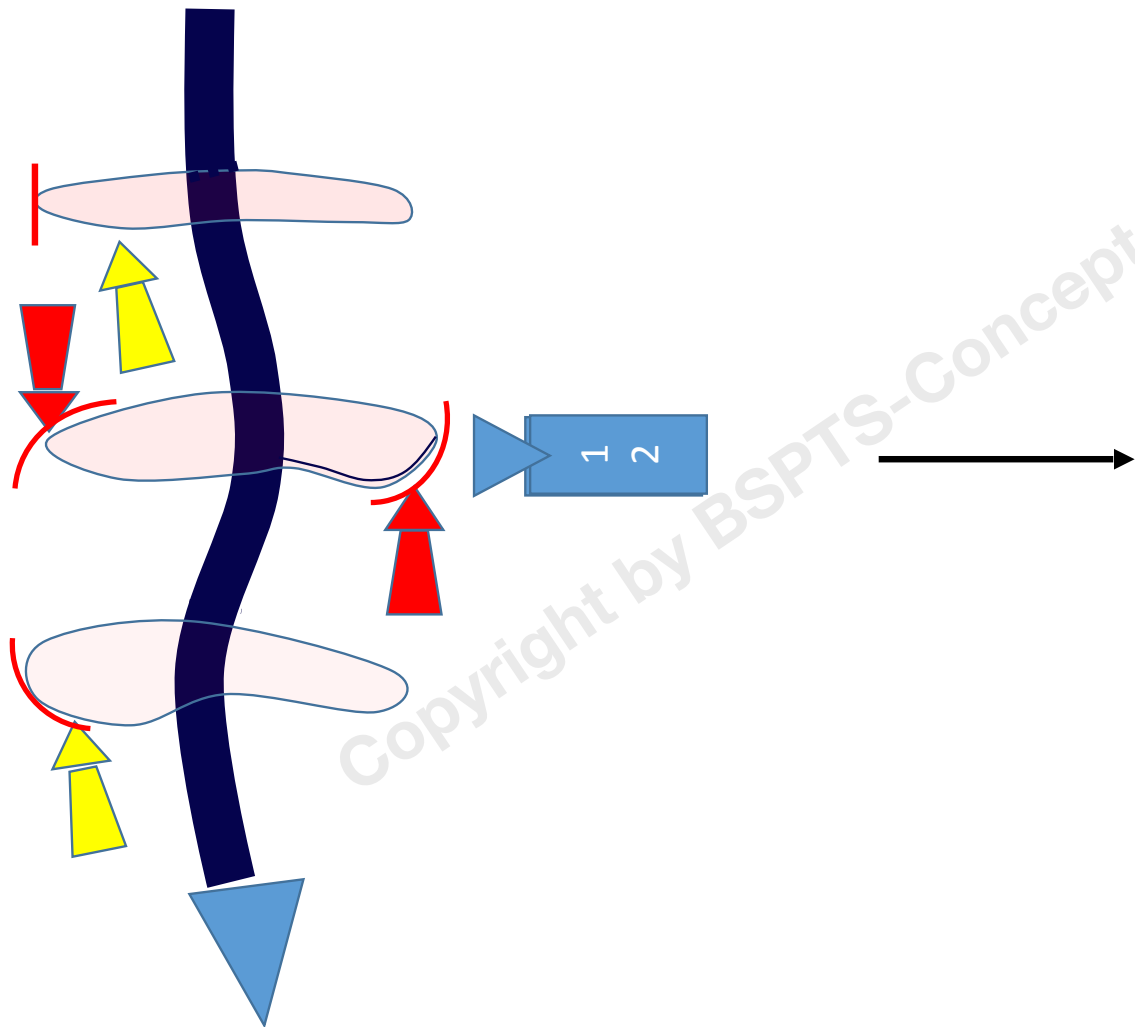


Breathing mechanics creating an internal pair-of-force for derotation and partial correction of the structural flat back



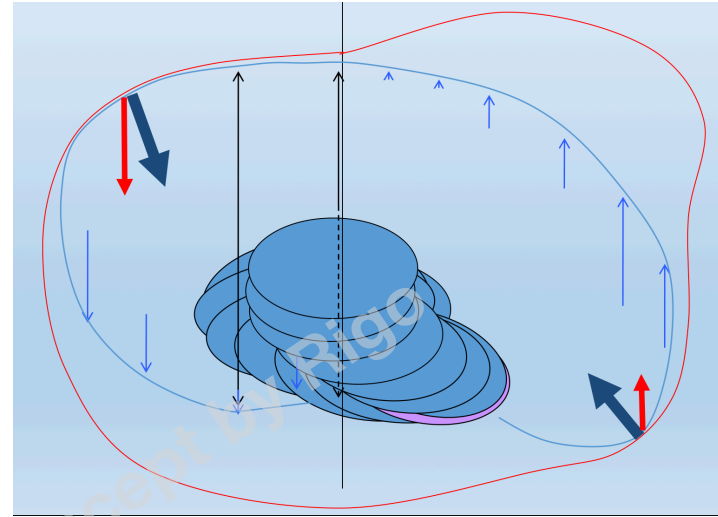
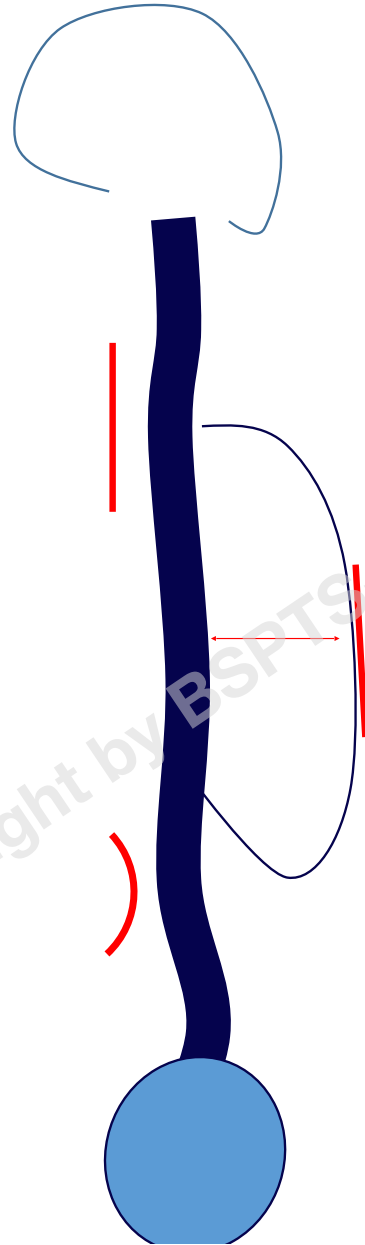




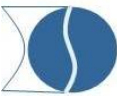


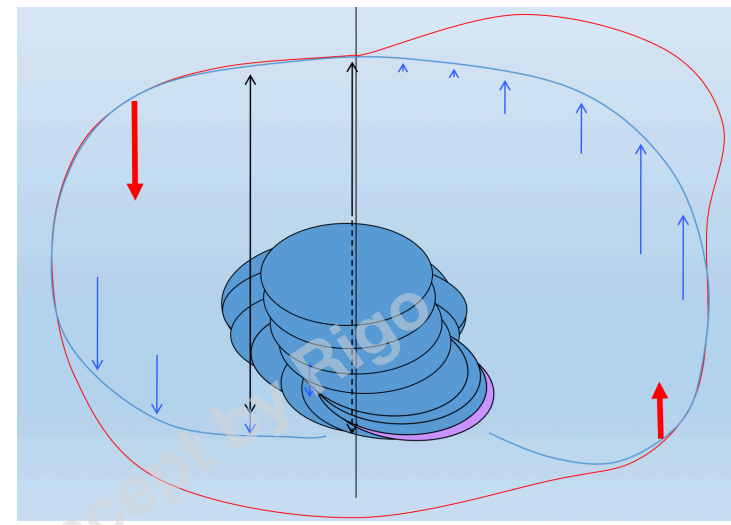
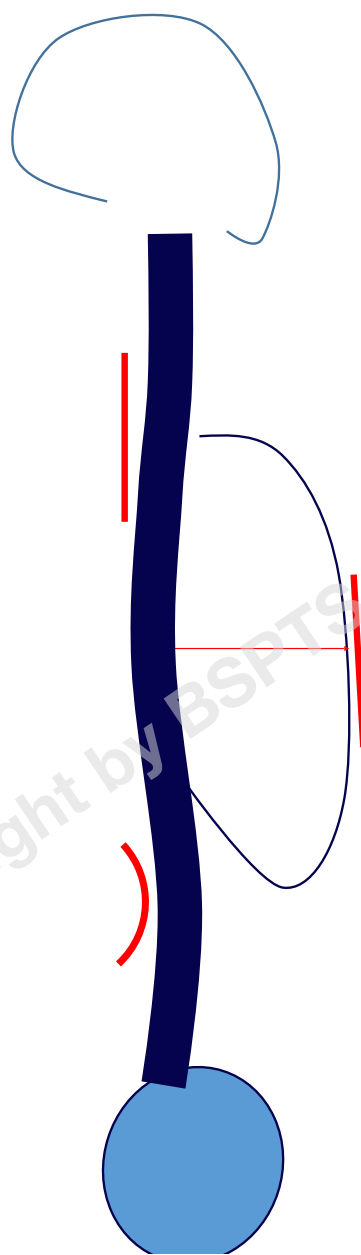
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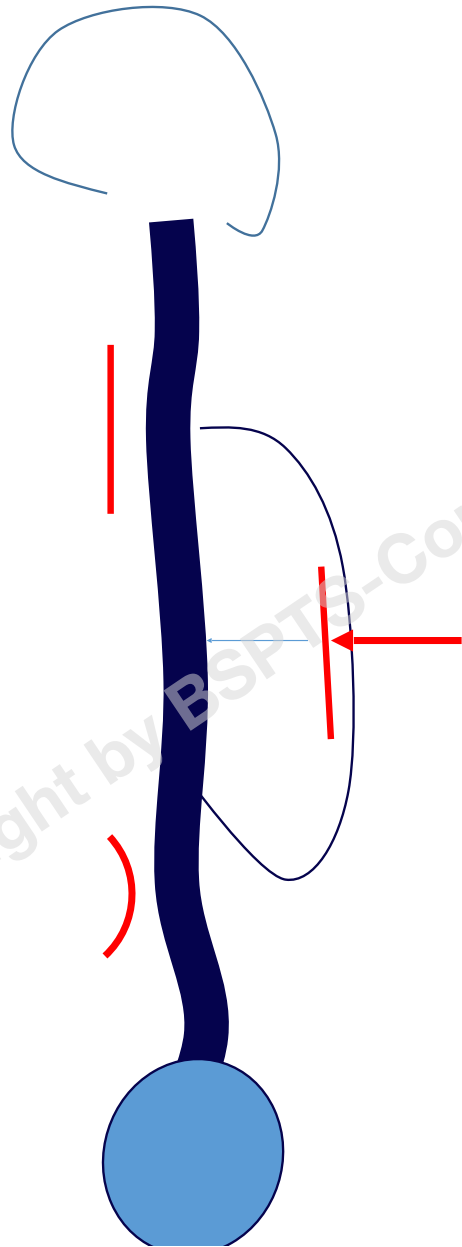




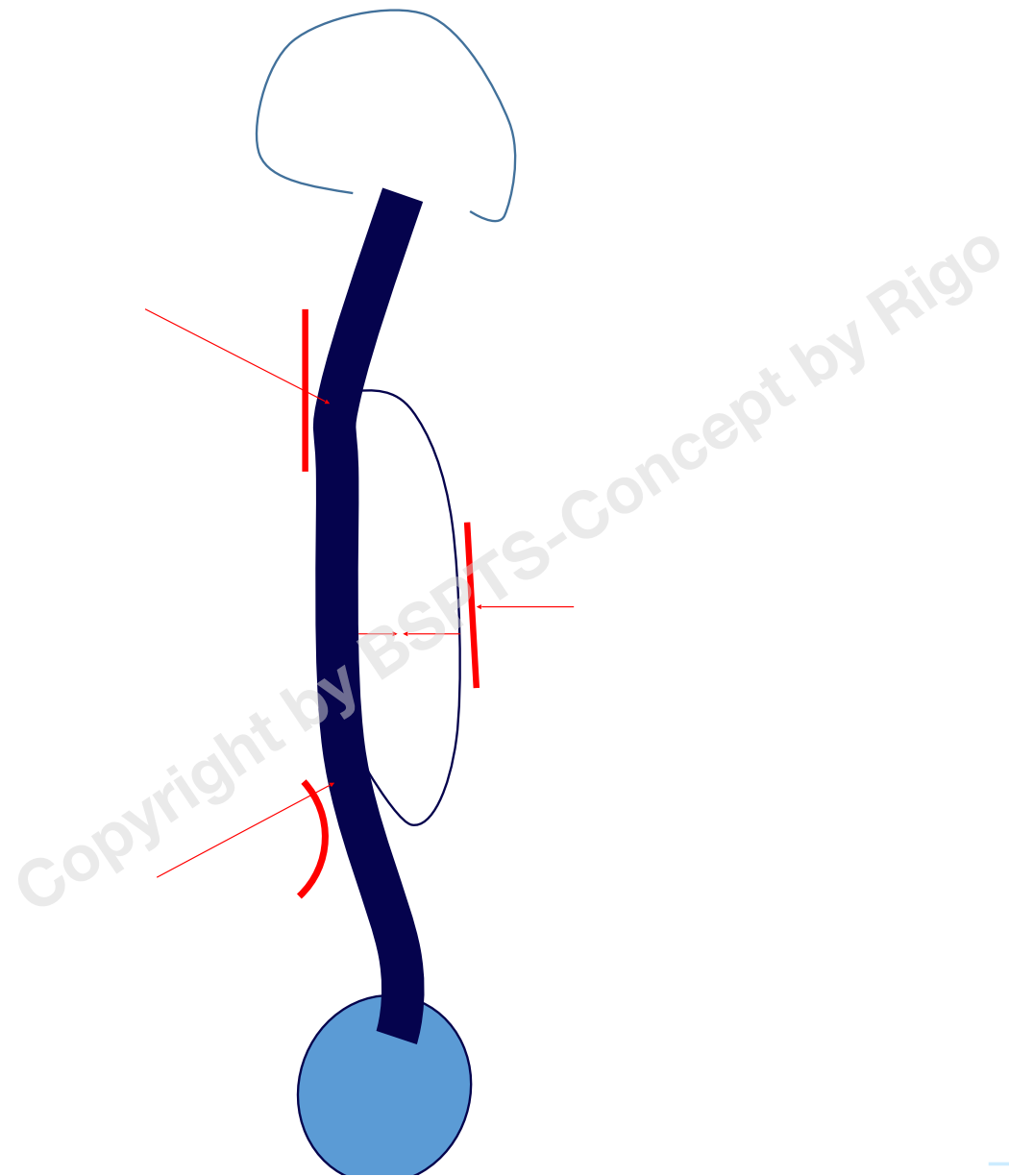
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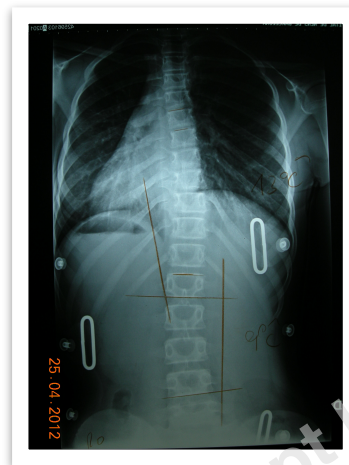
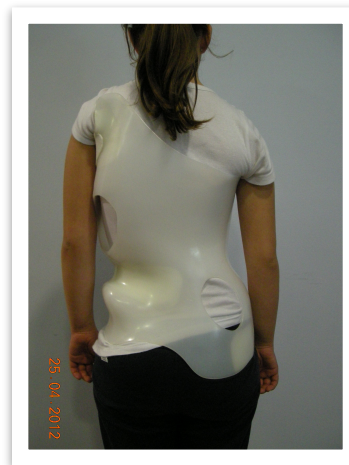


# **BRACE QUALITY: Design, manufacturing and fitting**

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• In-Brace correction =  $[(a-b)/a \%]$

➤  $\geq 50\%$  - Excellent

➤  $< 20\%$  - Poor (insufficient)

a= Cobb<sup>^</sup> out Brace  
 b= Cobb<sup>^</sup> in Brace

Carr WA et al *J Bone Joint Surg Am* 1980  
 MaCollough NC 3rd et al *J Pediatr Orthop* 1981  
 Heine J, Gotze HG *Z Orthop Ihre Grenzgeb* 1985  
 Emans et al *Spine* 1986  
 Noonan KJ et al *J Bone Joint Surg Am* 1996  
 Katz DE, Durrani AA *Spine* 2001

Rowe et al *J Bone Joint Surg Am* 1997  
 Landauer et al *Pediatric Rehab* 2003  
 Bullman V et al *Z. Orthop Ihre Grenzgeb* 2004  
 Lou E et al *Prosthet Orthop Ont* 2004  
 Castro et al *Spine J* 2003  
 Rahman et al *J Pediatric Orthop* 2005  
 Brox JI et al *Eur Spine J* 2012



# In Brace correction depends on both patient and brace quality

- Patient:
- Curve Flexibility determines the percentage of correction with a wide range (19%-61% / Mean of 48% for a Flexible Curve Model and 27% for a Stiff Spine Model)

Clin J, Aubin CÉ, Sangole A, Labelle H, Parent S. Correlation between immediate in-brace correction and biomechanical effectiveness of brace treatment in adolescent idiopathic scoliosis. *Spine* 2010; 35(18): 1706-1713

- In Brace correction can be predicted by assessing curve flexibility using supine-side bending or supine radiographs

Ohrt-Nissen S, Hallager DW, Gehrchen M, Dahi B. Supine Lateral Bending Radiographs Predict the Initial In-Brace Correction of the Providence Brace in Patients with Adolescent Idiopathic Scoliosis. *Spine* 2016; 41(9): 798-802

Cheung JPY, Yiu KKL, Vidyadhara S, Chan PPY, Cheung PWH, Mak KC. Predictability of supine radiographs for determining In-Brace correction for adolescent idiopathic scoliosis. *Spine* 2017 [Epub ahead of print]

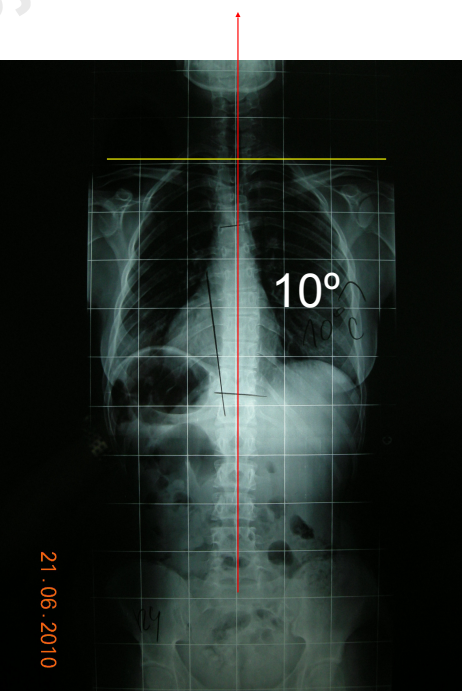
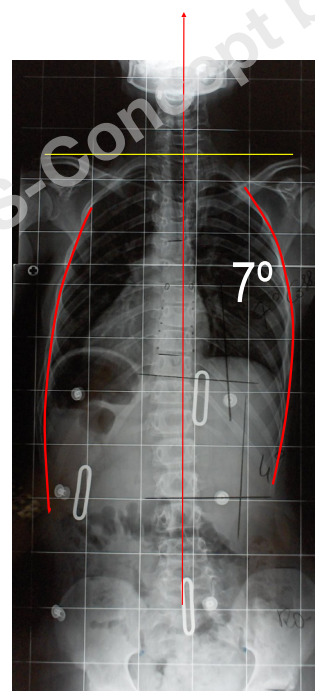
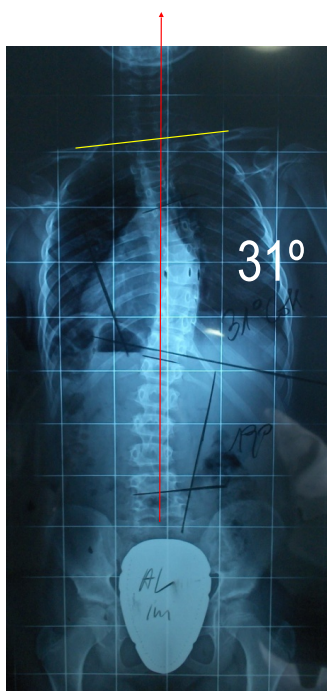


# In-Brace Correction

- Not the same for all the patients
- Some will only accept less correction than 50%
- Some will need a higher in-brace correction than 50%

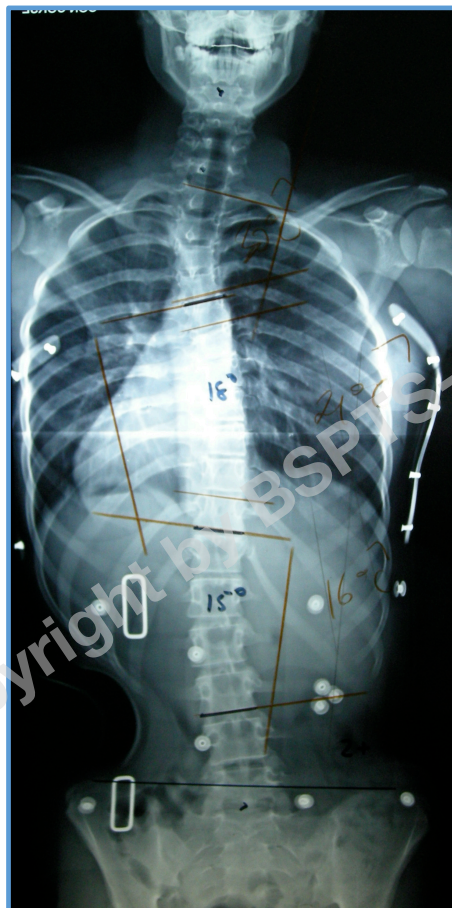
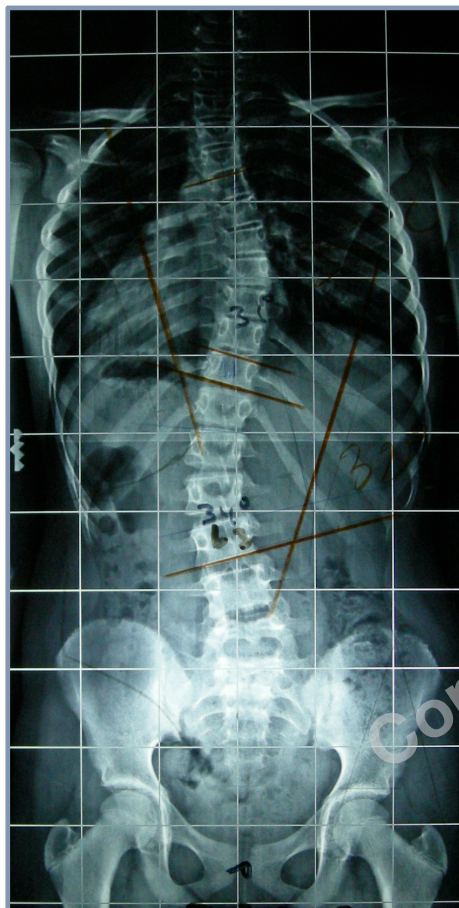


End result in a 16 years old girl with an initial Cobb angle of  $31^{\circ}$  (at 9 years of age), reaching her best in brace correction with her second brace (11 y).



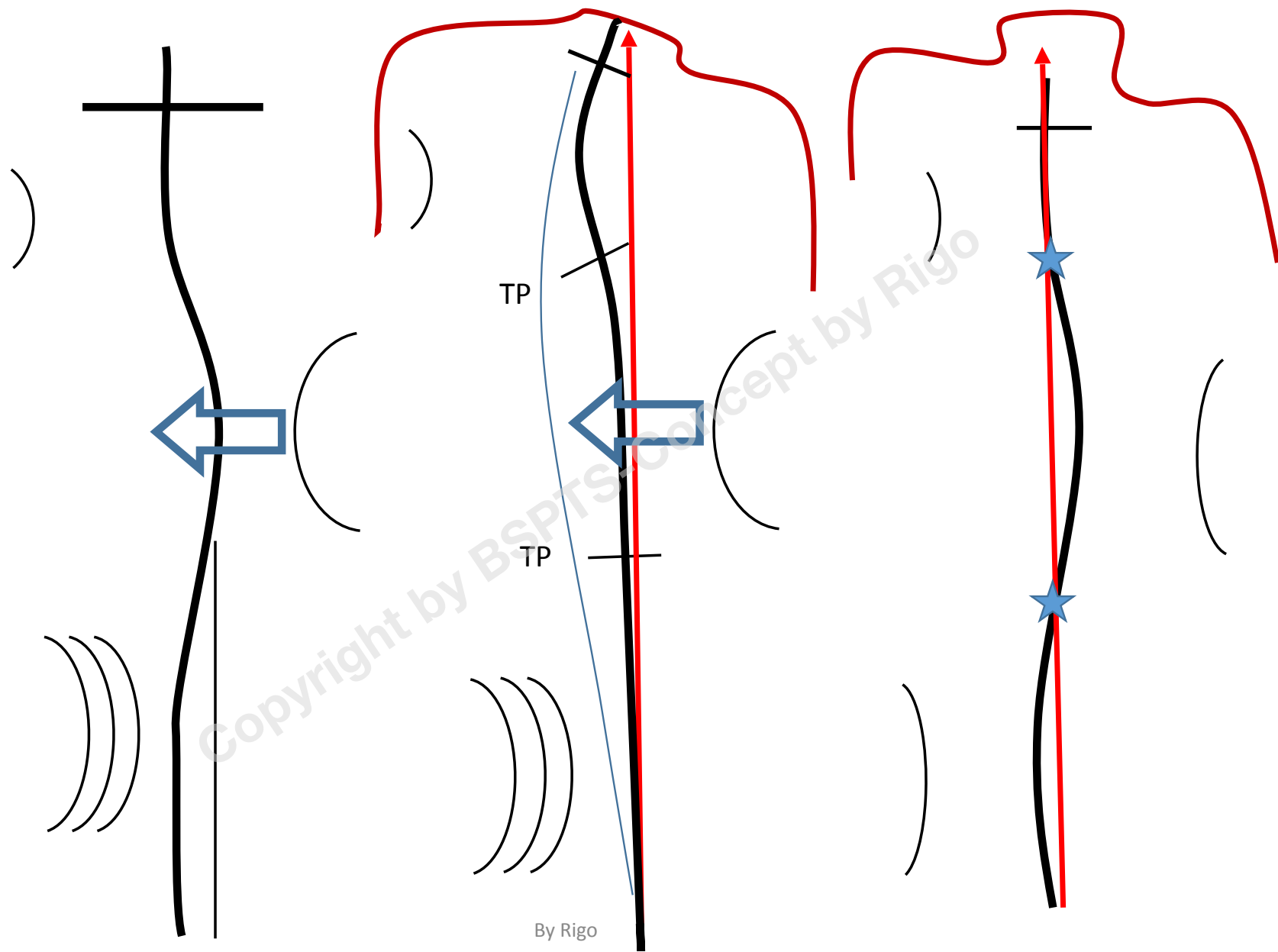


50% in brace correction. Not all of patients accept it!



By Rigo





By Rigo





# A lesson from History – The Human Factor

- A Brace is not an **Orthopaedic Product** but a **Corrective device**. What defines the quality of a brace is not the quality of the name but the quality of the Orthotist ...
- ...and even **THE BEST** orthotist will make some day a **BAD BRACE**



# Messages

- Idiopathic Scoliosis is a complex 3D of the spine and trunk
- No single Concept explains all its complexity but the Dubousset Concept (Venel, Adams, Somerville, Roaf, Perdriolle)
- Physiotherapists and Orthotists should learn as much as possible about this complexity
- Bracing WORKS but we must do it better
- Braces cannot correct 3D but Quasi 3D (No way to correct the morphological lordotization, if perhaps to prevent it, potentially by using breathing mechanics)

