


**TRAMA** *TR*Aining in  
Motion Analysis

**Second Course "Motion Analysis and clinics:  
why set up a Motion Analysis Lab ?"**  
- *Clinical cases presentation* -

**TRAMA Project**

**January 14 - 17<sup>th</sup> 2008**

Iván Carlos Uribe Prada  
Instituto de Ortopedia Infantil Roosevelt






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**Clinical case presentation**

D.M.B

6 years old  
Cerebral palsy – diplegic.

2d pregnancy  
6th month pregnancy with premature delivery.  
Intraventricular hemorrhage.  
One month of ICU – pulmonary distress.

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**Clinical case presentation**

- Motor development:
  - Cephalic control - 12 months old.
  - Sitting – 2 years old
  - Walked at 3 years of age.

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 **Clinical case presentation**  

- Initial physical examination (6 years old):
- Diplegic spasticity.
- Poor equilibrium sitting and standing.
- Independent gait in flat surfaces, requires permanent external support outside home or in irregular surfaces.

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 **Clinical case presentation**  

- Initial physical examination
- Diminished knee and ankle reflexes.
- Strength: 3 – 4 / 5 in hips, knees.  
1 – 2 / 5 in ankles and feet.
- Muscle selective control: Good in hips and knees.  
Fair to poor in ankles and feet.
- Articular mobility: Free of deformities except for right equinus of 40°.

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 **Clinical case presentation**  

- Initial physical examination
- Musculotendinous contractures:
  - Right hip: (+) Thomas test (10°).
  - Bilateral hamstring retraction (40°).
  - Bilateral (+) Elly Duncan test.
  - Right ankle: Rigid equinus
  - Left ankle: (+) Silverskiold test.
  - Cavus, varus, adductus right foot.

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**Clinical case presentation**

- Initial physical examination
- Torsional profile of lower extremities:
  - Femoral anteversion
    - Right 55°, left 40°.
  - Tibial torsion (external)
    - Right 30°, left 20°.
- Longitudinal discrepancy with 1 cm shortening of right extremity.

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**Clinical case presentation**

RADIOGRAPHIC FINDINGS



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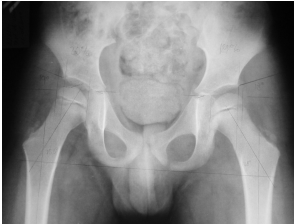
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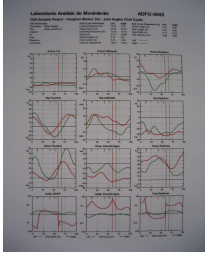
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**Clinical case presentation**

• INITIAL GAIT ANALYSIS - KINEMATICS



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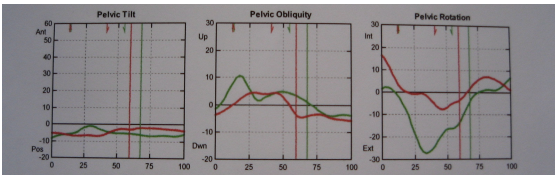
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**Clinical case presentation**

• INITIAL GAIT ANALYSIS – PELVIS KINEMATICS



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• INITIAL GAIT ANALYSIS – HIP KINEMATICS

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• INITIAL GAIT ANALYSIS – ANKLE AND FOOT KINEMATICS

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• INITIAL KINETICS – ARTICULAR MOMENTS

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**Clinical case presentation**

• PRIMARY ALTERATIONS DETECTED BY GAIT ANALYSIS

1. Right iliopsoas muscle contracture.
2. Bilateral coxa valga and abnormal femoral anteversion.
3. Bilateral hamstring contracture.
4. Right knee co-spasticity.
5. Right anterior and posterior tibial tendon hiperactivity.

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**Clinical case presentation**

• PRIMARY ALTERATIONS DETECTED BY GAIT ANALYSIS

6. Bilateral dimanyc equinus.
7. Right external tibial torsion.
8. Equinus, cavus, varus, aductus right foot.
9. Unstable, valgus, left flatfoot.
10. Longitudinal discrepancy (1 cm shortening of right extremity).
11. Energy compsumption index: 0.42

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**Clinical case presentation**

**SUGGESTED THERAPEUTICAL INTERVENTION**

- WEEKLY CAST MANIPULATION OF RIGHT FOOT FOLLOWED BY MULTIPLE SURGICAL INTERVENTIONS:
  1. CORRECTION OF CAVUS VARUS, ADUCTUS RIGHT FOOT THROUGH SOFT TISSUE LIBERATION.
  2. BILATERAL SUBTALAR FOOT ARTHROLYSIS.
  3. BILATERAL STRAYER PROCEDURE.
  4. RIGHT BAKER PROCEDURE.
  5. RIGHT ANKLE ANTERIOR AND POSTERIOR TIBIALIS SPLIT TENDON TRANSFERS.

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**Clinical case presentation**

**SUGGESTED THERAPEUTICAL INTERVENTION**

- 6. RIGHT TIBIAL INTERNAL DEROTATIONAL OSTEOTOMY.
- 7. RIGHT HAMSTRING LENGTHENING.
- 8. RIGHT KNEE RECTUS ANTERIOR TRANSFER.
- 9. BILATERAL FEMORAL VARUS DEROTATIONAL OSTEOTOMIES, WITH LEFT FEMORAL OSTEOTOMY.
- 10. BOTOX APPLICATION IN HAMSTRINGS AND LEFT SOLEUS.

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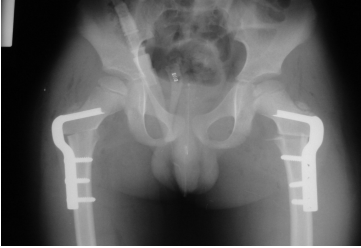
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• SURGICAL PROCEDURES



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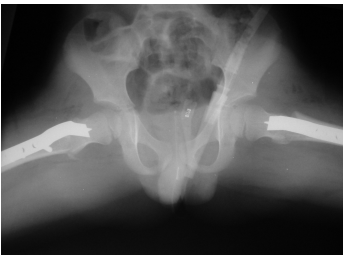
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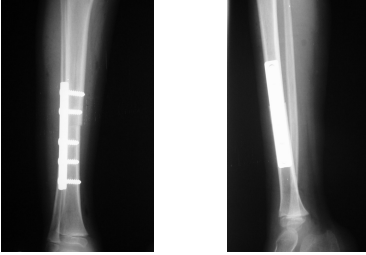
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• SURGICAL PROCEDURES



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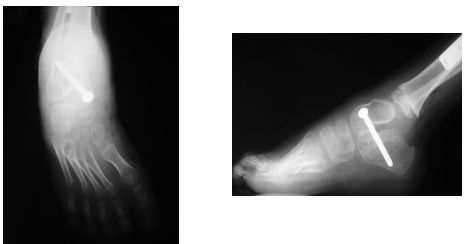
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• SURGICAL PROCEDURES



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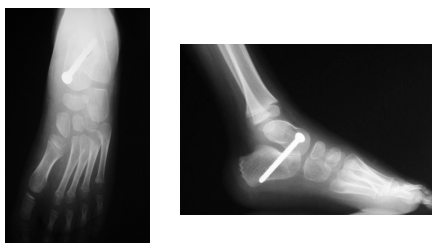
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• SURGICAL PROCEDURES



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**Clinical case presentation**

• POSTOPERATIVE THERAPEUTIC PLAN

- IMMEDIATE POSTOP: REGIONAL ANALGESIA.
- SHORT LEG BILATERAL CASTS AND PERMANENT KNEE EXTENSION ORTHESIS ( 6 WEEKS).
- PERMANENT FOOT-KNEE ORTHESIS – NIGHT KNEE EXTENSION ORTHESIS.
- INTENSIVE PHYSICAL THERAPY.

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- TWO YEARS OF FOLLOW-UP (6 TO 8 YEARS OF AGE)
  - INTERMITTENT PHYSICAL THERAPY
  - USE OF ANKLE-FOOT ORTHESIS DURING THE DAY.

NEW PHYSICAL ASSESMENT AND GAIT ANALYSIS.

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 **Clinical case presentation**  

- PHYSICAL EXAMINATION
  - Persistence of deficient equilibrium towards the right side and posteriorly.
  - Independent gait with minimal surveillance in irregular surfaces.

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 **Clinical case presentation**  

- Follow-up physical examination
  - Strength: 3 – 4 / 5 in hips, knees (no variation).  
2 – 4 / 5 in ankles and feet (previous 1 – 2 / 5).
  - Muscle selective control: Good in hips and knees.  
Fair to poor in ankles and feet.
  - Articular mobility: Free of deformities.

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**Clinical case presentation**

- Follow-up physical examination
- Musculotendinous contractures:
  - (-) Thomas test.
  - Bilateral hamstring retraction of 40° ( no variation).
  - (-) Elly Duncan test.
  - (-) Silverskiold test.

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**Clinical case presentation**

- Follow-up physical examination
- Torsional profile of lower extremities:
  - Femoral anteversion
    - Right 25°, left 20°.
  - Tibial torsion (external)
    - Right 6°, left 16°.
  - No longitudinal discrepancy.

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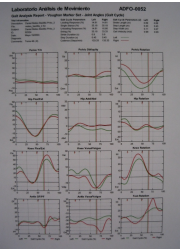
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• KINEMATICS



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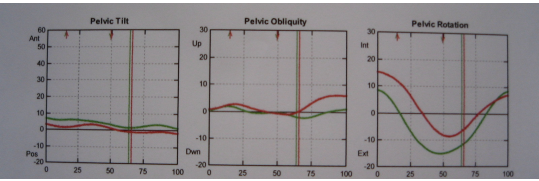
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• PELVIC KINEMATICS



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• HIP KINEMATICS

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• KNEE KINEMATICS

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• ANKLE AND FOOT KINEMATICS

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**• FOLLOW UP KINETICS**

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**• FOLLOW UP KINETICS – ARTICULAR MOMENTS**

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**• FOLLOW UP KINETICS – JOINT POWER**

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**Clinical case presentation**

**• FOLLOW UP GAIT ANALYSIS CONCLUSIONS**

- GOOD THERAPEUTIC RESPONSE.
- PERSISTENT PELVIC GIRDLE WEAKNESS AND HAMSTRING CONTRACTURE.
- RECOMMENDATIONS: IMPLANT WITHDRAWAL ASSOCIATED WITH BOTOX INJECTION IN HAMSTRING GROUPS.
- CONTINUOUS PHYSICAL THERAPY, ORTHESIC SUPPORT.

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**• GRACIAS POR SU ATENCIÓN!!!!**  
**• THANK YOU FOR YOUR ATTENTION !!!!**

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