



TRAMA TRAINING in Motion Analysis

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

TRAMA Project
January 14 - 17th 2008
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Politecnico di Milano



COLLABORATION



Bioeng Dept
Politecnico di Milano

Private hospital
"La Residenza"
Rodello (CN)

Course "Motion Analysis and clinics: why to set up a Motion Analysis Lab ?"
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WORK ENVIRONMENT



**REHABILITATION AND
FUNCTIONAL RECOVERY
CLINIC**
N° 100 beds

- Orthopaedic patients
- Neurological patients
- Vascular disease patients

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MAL: MOTION ANALYSIS LAB

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MISSION

WHY A CLINIC MAL

- ➔ EVALUATION
- ➔ DECISION MAKING
- ➔ REVALUATION

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CLINICAL EVALUATION

- GAIT WATCHING
- LESION ANALYSIS
- PATOLOGICAL PATTERN AND ITS PHYSIO-PATOLOGICAL MECHANISM SPOTTING
- INTERFERENCE TESTING OF THESE ALTERATIONS WITH PATIENT'S REQUIREMENTS

➔ QUANTITATIVE ANALYSIS ➔ THERAPEUTIC APPROACH

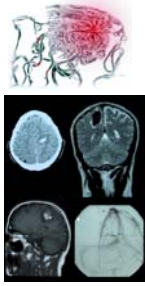
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CLINICAL CASE

46 YEARS
CEREBRAL AVM AT 44 YEARS

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- RIGHT HEMIPARESIS OUTCOMES
- NO INVOLVEMENT OF LANGUAGE FUNCTION




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CLINICAL INVESTIGATION

- **Dissymmetry** lower limbs (left healthy side>right side: 2cm). **Limited right knee extension** (10°) and **limited ankle dorsiflexion** on the right side only (0° with knee extended and 10° with knee flexed) in bed investigation.
- Presence a **shortening at hamstrings level** (popliteal angle 50°) which was not velocity dependent.
Overactivity in rapid passive **right knee flexion** with hip in extension position, not present at slow velocity.
Sustained clonus in right ankle dorsiflexion.
- Functional assessment produced the following results:
Motricity index = 75.5/100;
Trunk Control Test = 100/100;
FIM (Functional Independence Measure) = 119/126.

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EXPERIMENTAL SET UP



KINEMATICS:
DAVIS protocol
(20/22 markers)

KINETICS: 2 PLT

EMG: 8 channels

2 VideoControllers

4 trials for consistency

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PRE TREATMENTS EVALUATION

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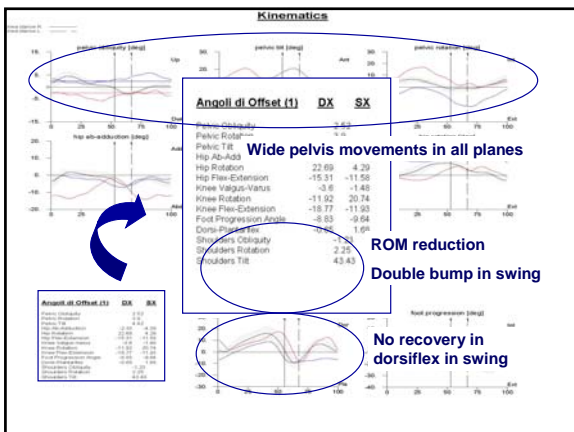
Dati Anamnestici
 Nome: _____
 Patologia: EMIPLEGIA
 Età: 45
 Altezza: 185
 Peso (kg): 82

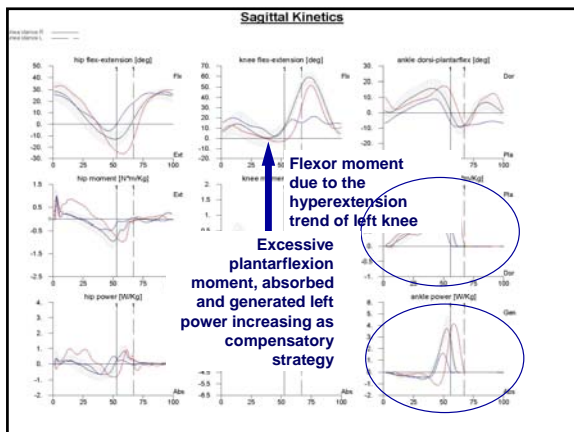
Medici
 Medico richiedente: _____
 Medico interno: _____

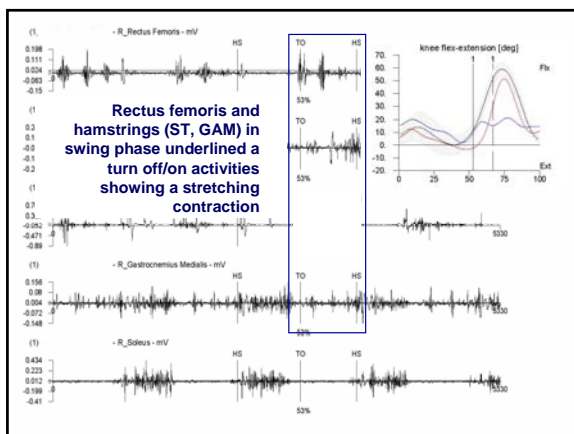
Report
 Tipo di prova: 3 - Normal walking O4
 Data: _____
 Note: -

NORMALITÀ			
Parametri temporali	DX	SX	
Stance time [msec]	750	1140	556-800
Swing time [msec]	750	624	395-452
Stance time (% stride)	49	70	52-61
Swing time (% stride)	51	30	39-42
Stride time [msec]	1500	1764	995-1036
Cadence [steps/min]	76	79	110-120
Double supp. time [msec]	170	195	110-120
Double supp. (% stride)	10	12	-

Parametri di distanza	DX	SX	
Step length [mm]	658	408	630-800
Velocity [m/sec]	0.70	0.69	1.24-1.36
Swing velocity [m/sec]	1.37	1.32	0.92-1.43
Stride length [mm]	1096	1116	1360.00-1467.00
Step width [mm]	233	233	630-800
Mean velocity [m/sec]	0.69	0.69	1.25-1.36







DECISION-MAKING PROCESS

- Right knee ROM reduction
- Right knee double bump in swing
- No recovery in right ankle dorsiflex during swing
- Rectus femoris and hamstrings (ST, GAM) in swing phase underlined a turn off/on activities showing a stretching contraction

Botulinum toxin injection in RF and GAM
Functional stretching binding

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POST TREATMENTS EVALUATION

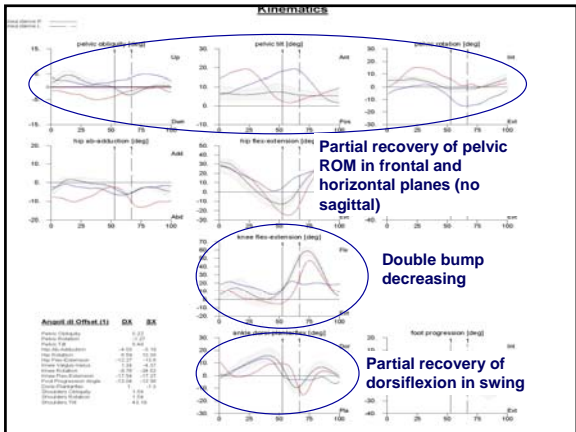
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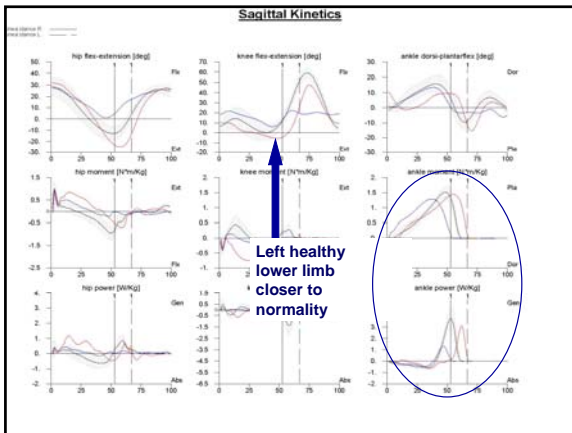
Dati Anamnestici
 Nome: _____
 Patologia: EMIPLEGIA
 Età: 40
 Altezza: 180
 Peso (kg): 68

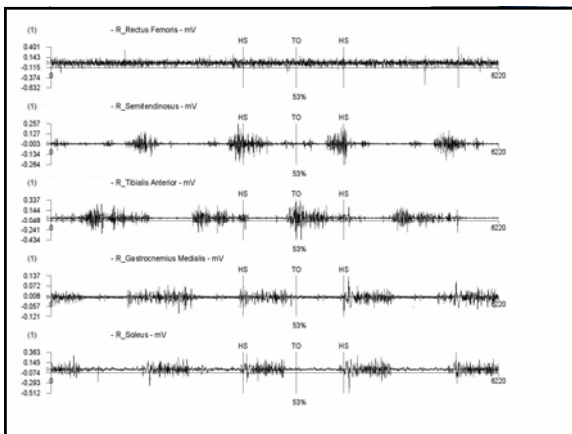
Medici
 Medico referente: _____
 Medico inferno: _____

Raport
 Tipo di prova: 0 - Normal walking 02
 Data: _____
 Note: _____

		NORMALITA'			
		DX	SX	DX	SX
Parametri temporali					
Stance time [msec]	740	970	585-590	585-590	
Swing time [msec]	495	490	595-600	595-600	
Stance time [% stride]	53	67	59-61	59-61	
Swing time [% stride]	47	33	41-43	39-42	
Stride time [msec]	1400	1400	595-600	595-600	
Cadence [steps/min]		84	100-105	100-105	
Double supp. time [msec]	120	190			
Double supp. [% stride]	8	13			
Parametri di distanza					
Step length [cm]	828	482	970-1000	970-1000	
Velocity [m/sec]	0.78	0.78	1.26-1.38	1.24-1.38	
Swing velocity [m/sec]	1.69	2.28	3.15-3.42	3.02-3.43	
Stride length [cm]	1064	1066	1202.00-1402.00	1202.00-1402.00	
Step width [cm]		214	8.00-8.00	8.00-8.00	
Mean velocity [m/sec]		0.77	1.25-1.35	1.25-1.35	







FROM GAIT ANALYSIS DATA...

Decreasing of knee double bump in swing, due to botulinum toxin injection in RF


Partial recovery of right ankle dorsiflexion during swing, due to GAM activity decrease

Symmetric trend of spatio-temporal parameters

Healthy limb kinetics goes to normal values

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...CLINICAL QUESTIONS...



1. No right knee ROM increasing even if botulinum toxin injection in RF: what the reduced ROM during swing is sustained by?
2. Increasing foot push-off activity, reducing the hip flexors muscles activity needing, could improve knee kinematics?

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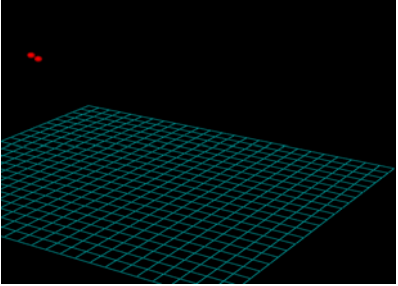
...WORK HYPOTHESIS

FUNCTIONAL SURGERY

- Triceps surae muscle-tendon lengthening
- Digitorum flexors tenotomy
- Flexor hallucis longus transfer pro dorsiflexion
- Flexor digitorum longus transfer pro plantiflexion

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THANK YOU



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