

Salsomaggiore, 24 novembre 2012

IL DOLORE DI ORIGINE VERTEBRALE:
ANALISI E VALUTAZIONE POSTURALE
CON SPINOMETRIA FORMETRIC
E
TRATTAMENTO CON CHELT THERAPY

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FISIOTRE

Mendrisio-Svizzera-

lombalgia

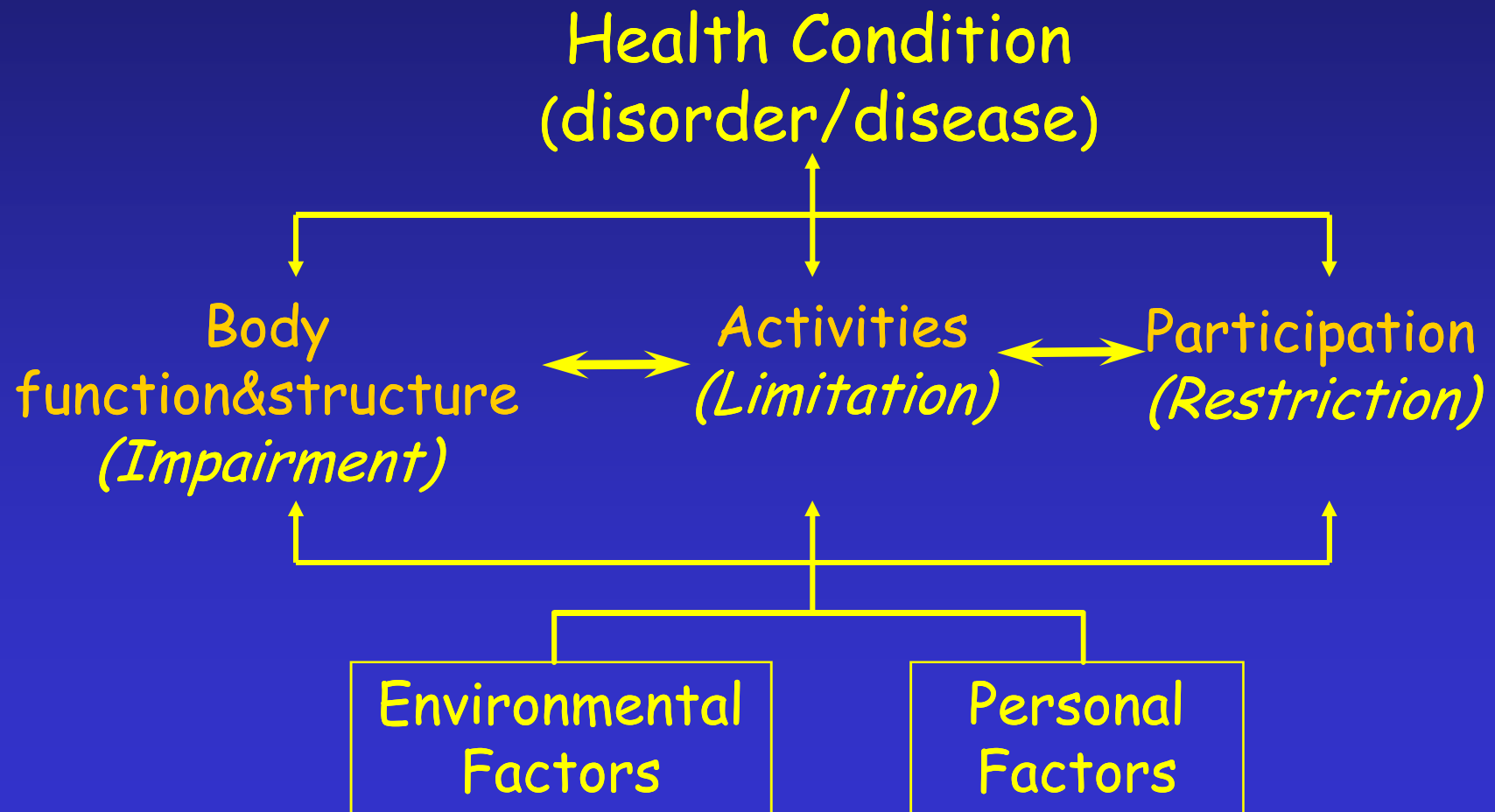
- patologia molto frequente
- 85% aspecifica
- modello patologico-anatomico

lombalgia

- approccio globale
- causa posturale
- misure quantitative dei parametri posturali (piano frontale e sagittale)

Interaction of Concepts

ICF-2



ICF Components

Body Functions & Structures



Functions

Structures

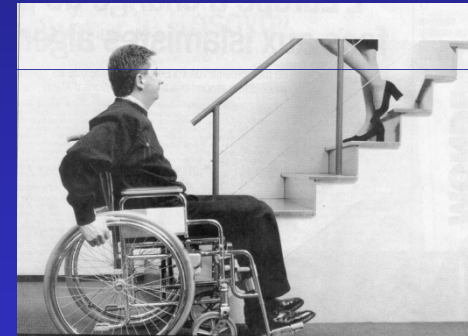
Activities & Participation



Capacity

Performance

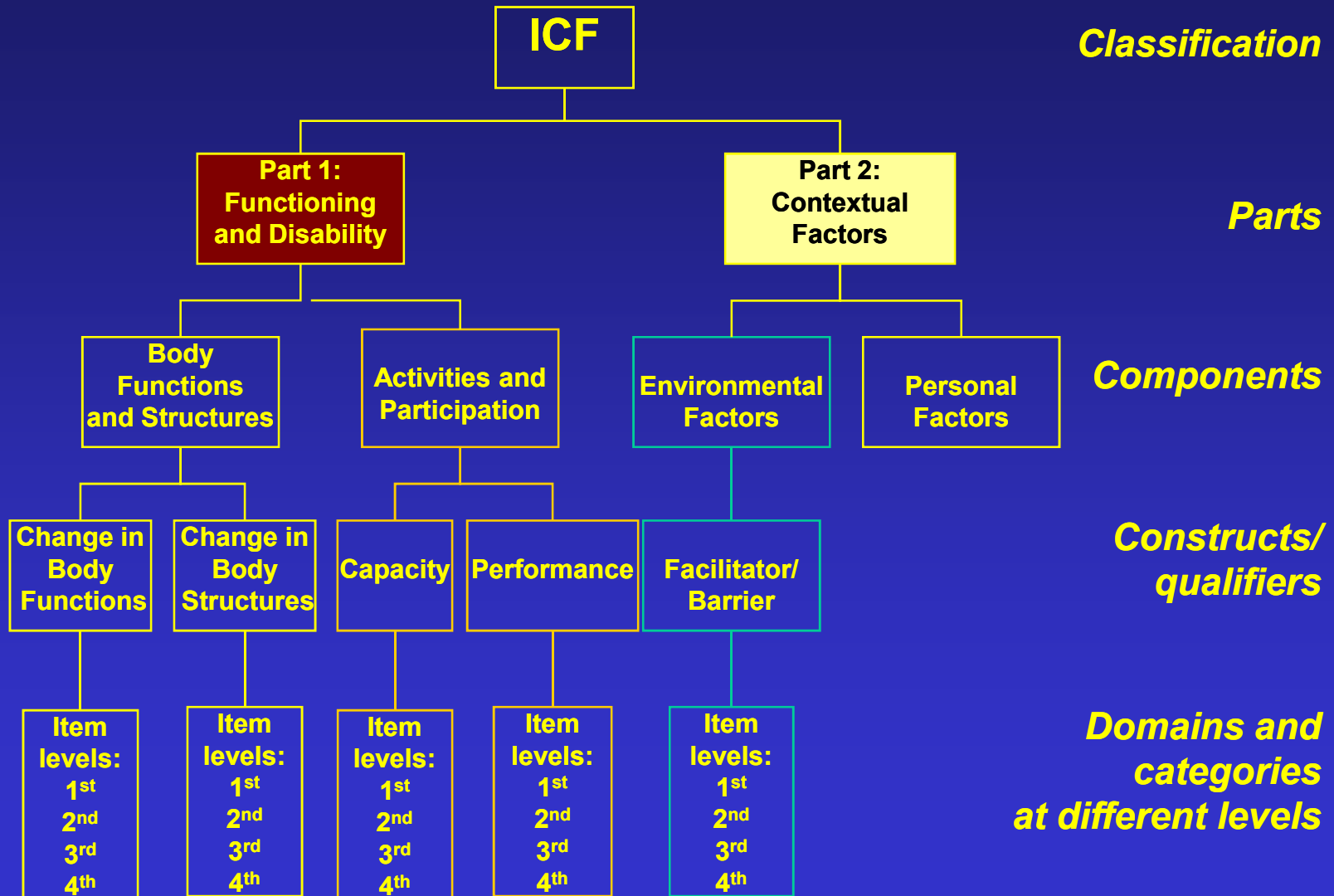
Environmental Factors



Barriers

Facilitators

Structure



STRUMENTI DI VALUTAZIONE

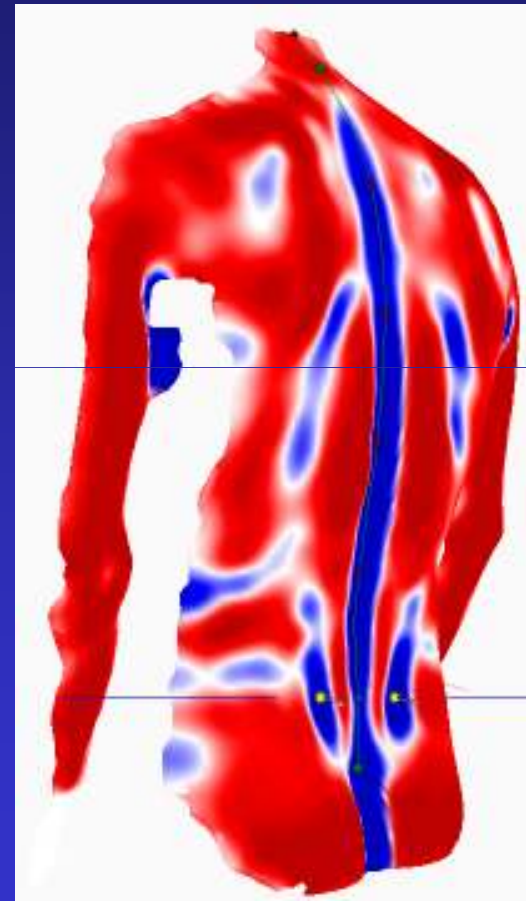
Introduzione

La radiografia rappresenta tutt'oggi l'unico metodo universalmente riconosciuto e standardizzato per la valutazione delle deformità della colonna.

Tuttavia essa presenta dei limiti:

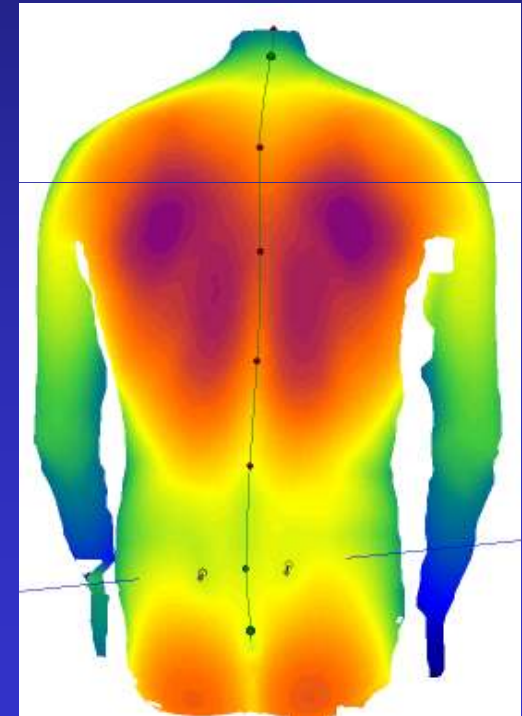
- bidimensionalità
- poca accuratezza nel quantificare i parametri
- non è dinamica
- invasività

SPINOMETRIA FORMETRIC



SPINOMETRIA FORMETRIC

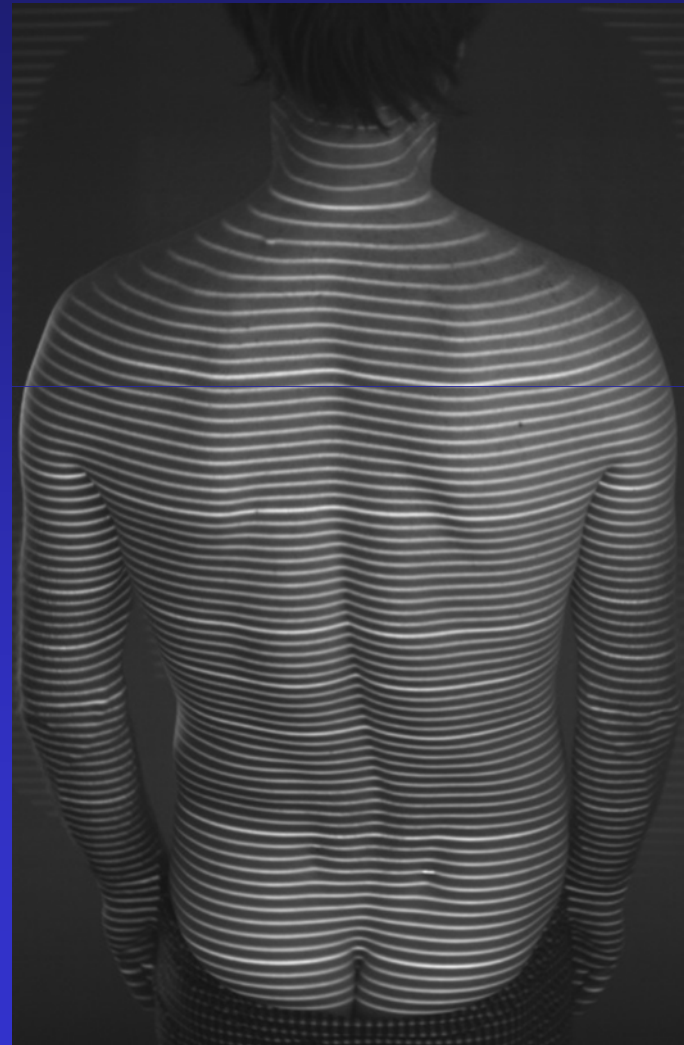
la Spinometria Formetric
consente di eseguire una
rilevazione della morfologia 3D
del tronco con estrema
accuratezza, rapidità e sicurezza



SPINOMETRIA FORMETRIC

Video Raster Stereografia

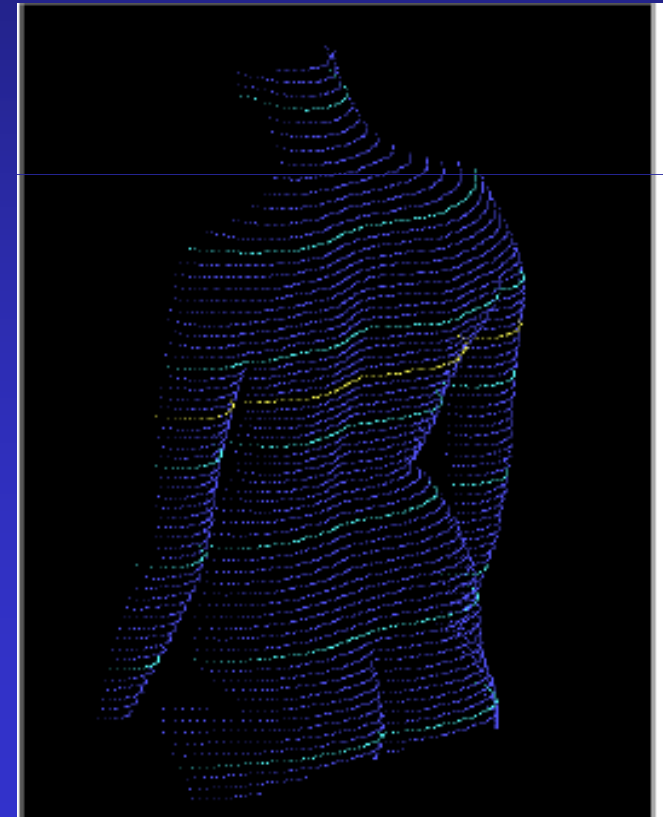
Nella rasterstereografia un reticolo di linee orizzontali (80) ad alta risoluzione (luce bianca, distanza 10 mm) viene proiettato sul dorso del paziente in posizione ortostatica con l'ausilio di un apposito dispositivo



SPINOMETRIA FORMETRIC

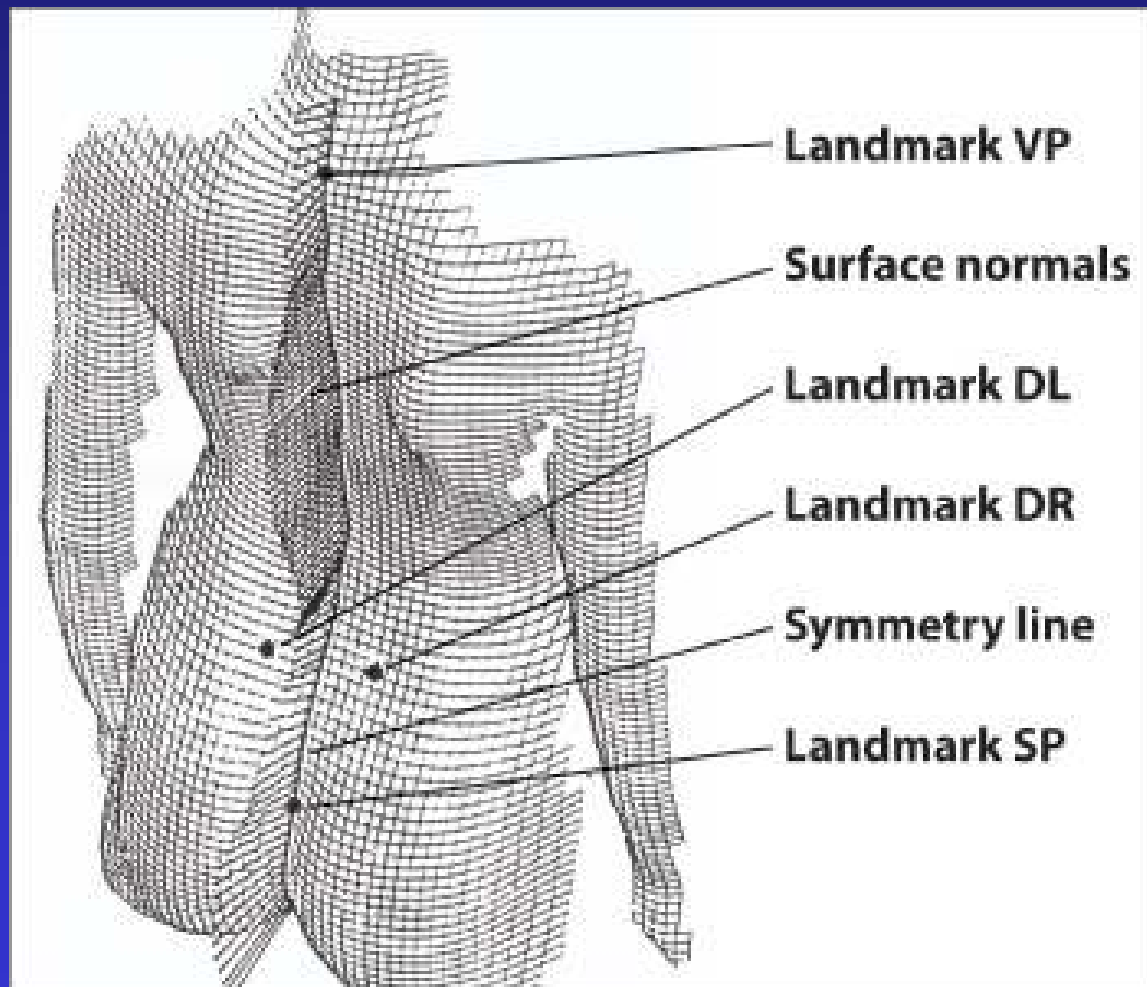
Dati acquisiti:

Morfologia Superficiale del
Dorso (precisione = 0,01 mm)



SPINOMETRIA FORMETRIC

Individuazione automatica punti di repere



SPINOMETRIA FORMETRIC

Sistema Formetric 3D/4D

Specifiche di Sistema:

- Videocamera CCD
- Proiettore a Bande
- Colonna telescopica
- Sistema PC



SPINOMETRIA FORMETRIC

Modalità di acquisizione:

- statico: 1 foto
- averaging: 12 foto in 6 sec.
- posture: film con 1 foto/sec
- dynamic 4D: film con 10 foto/sec
- motion: film con 50 foto/sec

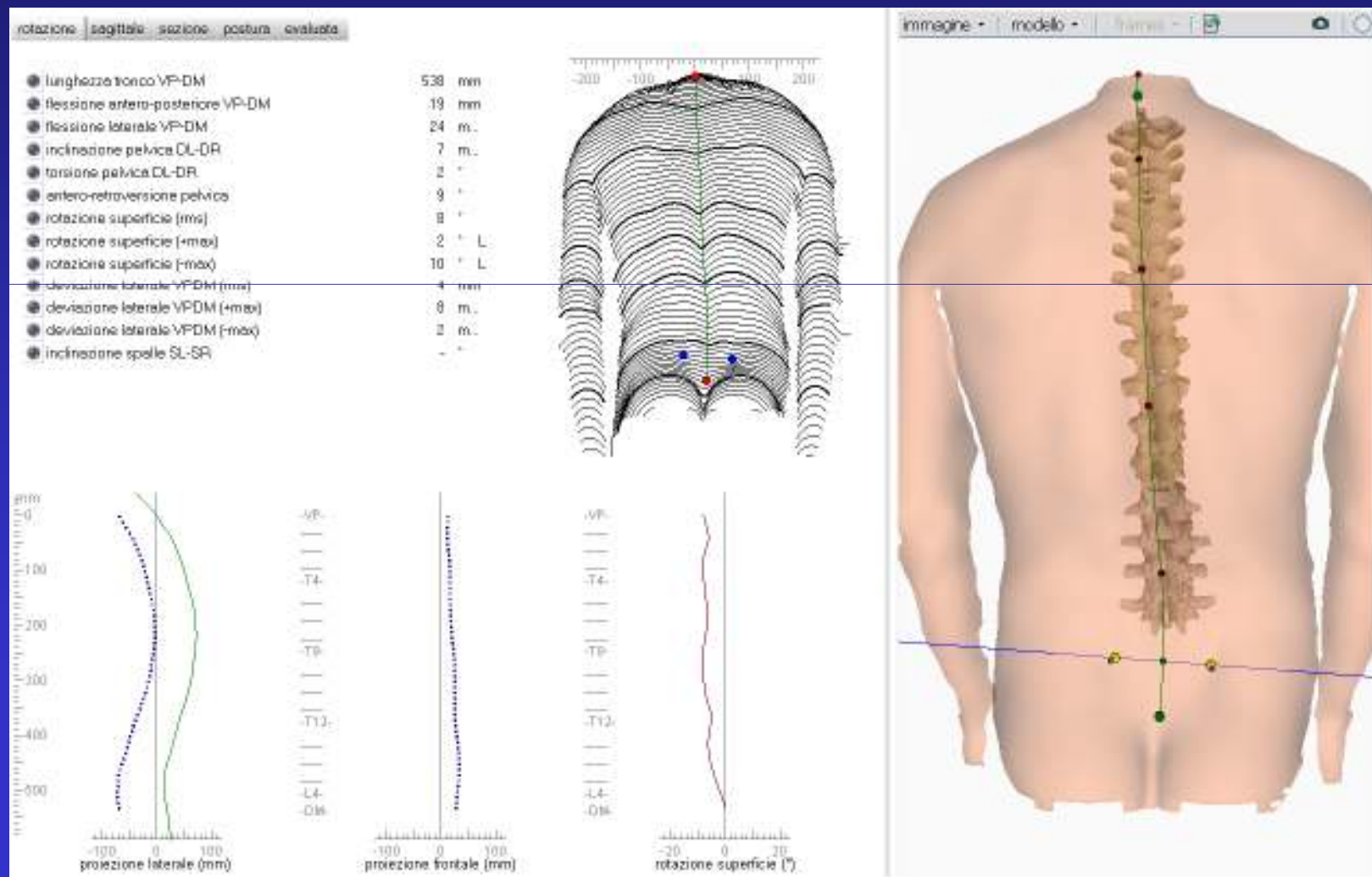
SPINOMETRIA FORMETRIC

dati ottenibili

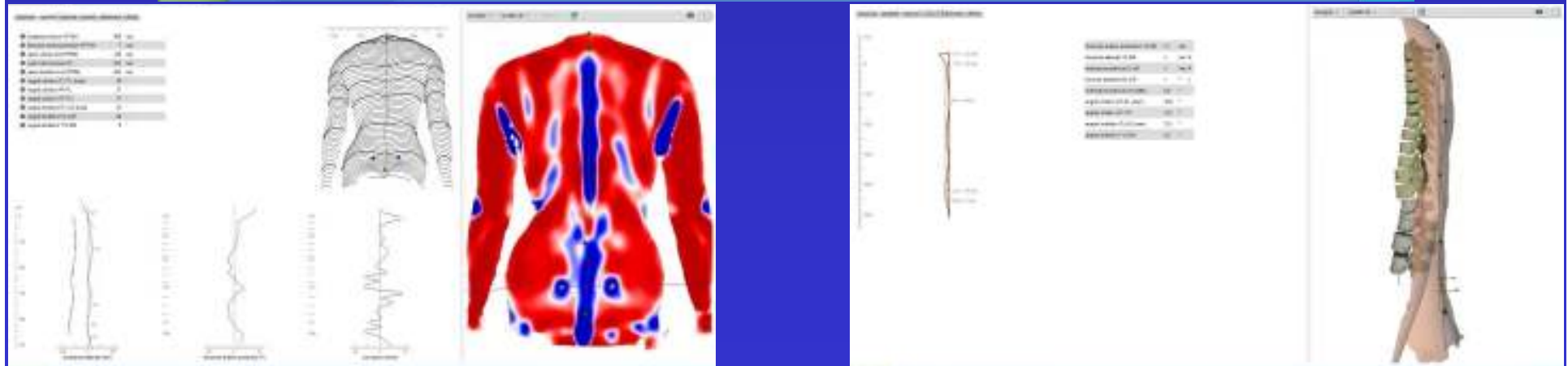
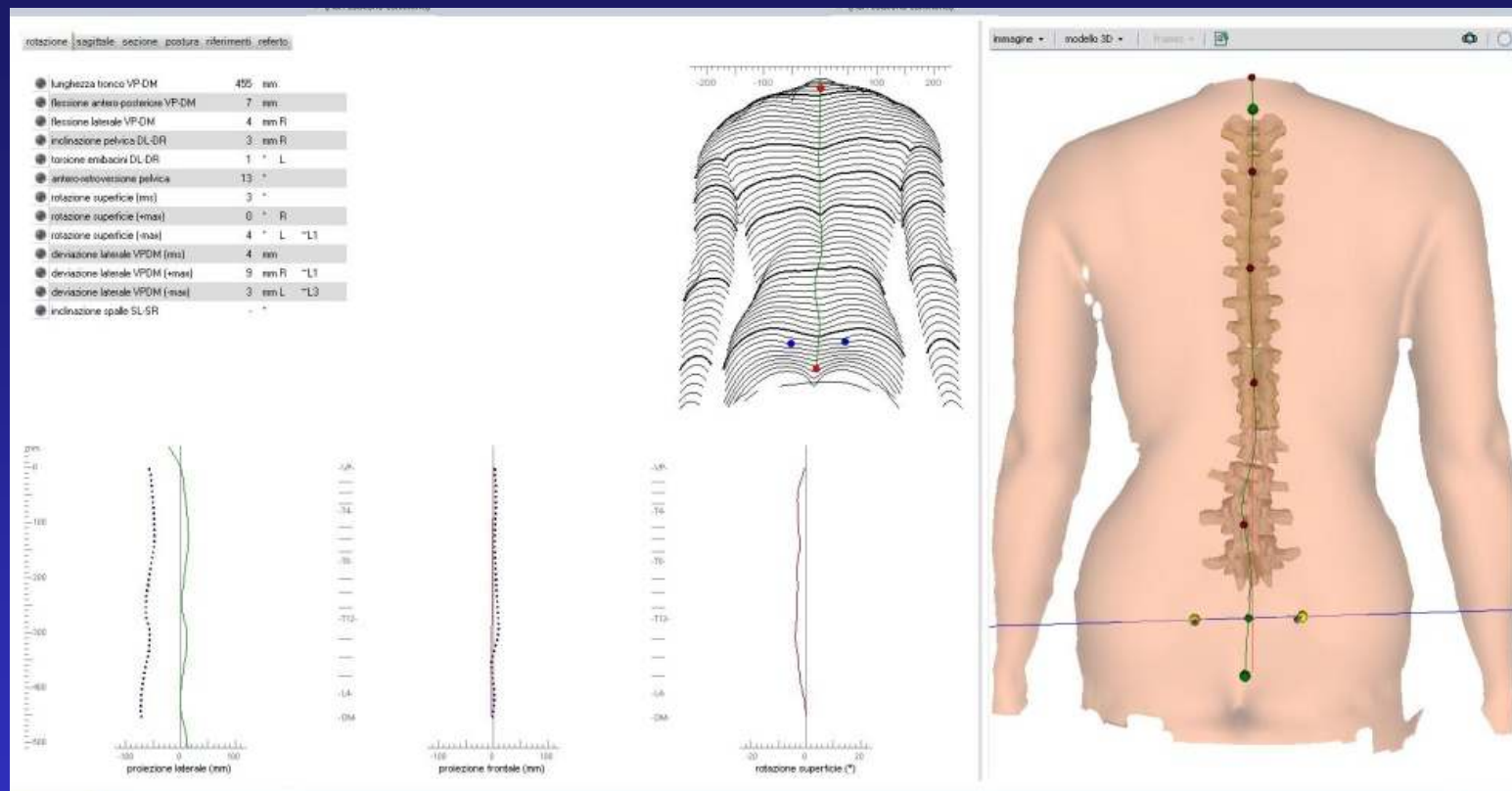
- VP
- DR e DL
- DM
- ITC
- ILS
- KA
- LA
- flessione laterale
- inclinazione pelvica
- torsione emibacini
- deviazione laterale
- antero-
retroversione pelvica
- angolo cifotico
- angolo lordotico
- freccia cervicale
- freccia lombare

SPINOMETRIA FORMETRIC

Rappresentazione Tridimensionale della Colonna Vertebrale



SPINOMETRIA FORMETRIC





Rasterstereographic back shape analysis in idiopathic scoliosis after posterior correction and fusion

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Received 5 February 2003; accepted 8 July 2003

Abstract

Objective. To determine the accuracy of rasterstereographic three-dimensional back surface analysis and reconstruction of the spine in idiopathic scoliosis treated by posterior correction and fusion.

Design. Prospective imaging study of 25 patients with idiopathic scoliosis who underwent posterior correction and fusion and were followed for one year.

Background. In an earlier study published in this journal rasterstereography has proved to be an accurate imaging modality for quantifying the changes in the three-dimensional shape of the spine and posterior rib cage after anterior correction and fusion. Goal of the present study was to determine the accuracy for the more common posterior correction and fusion with attention paid to the presence of the posterior implants and scarring.

Methods. Twenty-five patients with idiopathic scoliosis with maximum Cobb angles of 78° were examined by rasterstereography and radiography. Seventy-one anterior–posterior radiographs were digitised. Twenty-four were preoperative and 47 postoperative radiographs. Rasterstereographic and radiographic curves were compared by best-fit superimposition. Root-mean-square differences were calculated as parameters of accuracy.

Results. The accuracy of rasterstereography in severe idiopathic scoliosis with Cobb angles between 48° and 78° was satisfactory with root-mean-square differences of 5.8 mm for the lateral deviation and 4.8° for vertebral rotation. Following posterior correction the accuracy was good. The root-mean-square difference was 4.5 mm for the lateral deviation and 4.3° for vertebral rotation.

Conclusion. The accuracy obtained for posteriorly-operated scolioses between 50° and 80° was similar to the findings for scolioses operated via anterior approach, as well as those with curves up to 50° Cobb angle. Therefore rasterstereography can be used postoperatively to reduce the number of radiographs and radiation exposure. Additionally, the method provides an objective quantification of the postoperative improvement in the cosmesis of the back shape.



J Spinal Disord Tech. .2008 Feb; 21 (1): 23-8

Raster stereography versus radiography in the long-term follow-up of idiopathic scoliosis

Schulte TL, Hierholzer E, Boerke A, Lerner T, Liljenqvist U, Bullmann V, Hackenberg L.

STUDY DESIGN: Raster-stereographic and radiographic evaluation of idiopathic scoliosis without braces in a retrospective longitudinal long-term follow-up study. **OBJECTIVE:** To investigate the reliability and accuracy of raster stereography in comparison with radiography as the gold standard, using a longitudinal long-term study design in idiopathic scoliosis, to reduce the number of radiographs required during follow-up in scoliosis patients. **SUMMARY OF BACKGROUND**

DATA: It has been confirmed that raster stereography produces reliable data in patients with conservatively and surgically treated idiopathic scoliosis, up to a Cobb angle of 80 degrees. This means that the method can be used to replace radiography during the follow-up in these patients. However, no data have yet been published on the use of raster stereography in a longitudinal setting during a long-term follow-up period in comparison with radiography as the gold standard.

METHODS: Raster stereographs and digitized anterior-posterior radiographs of 16 patients with idiopathic scoliosis were studied retrospectively in a longitudinal study design, with a mean follow-up period of 8 years (range 3 to 10 y). Lateral vertebral deviation and vertebral rotation were measured between C7 and L4 using raster stereography and radiography, compared with Cobb angles, and correlated. **RESULTS:** During the follow-up period, the Cobb angle increased on average by 13 degrees. The progression of lateral vertebral deviation measured using both techniques, and that of vertebral rotation measured with radiography, was greater than that of the Cobb angle, whereas that of raster-stereographic vertebral rotation was lower. However, there was an excellent correlation between the raster-stereographic and radiographic progression of these parameters ($R^2 \geq 0.5$). The mean difference between raster stereographs and radiographs was 3.21 mm for lateral vertebral deviation and 2.45 degrees for vertebral rotation. **CONCLUSIONS:**

Using the parameters of lateral vertebral deviation and vertebral rotation, raster stereography accurately reflects the radiographically measured progression of idiopathic scoliosis during the long-term follow-up, but these parameters are not directly comparable with the Cobb angle. In the follow-up of scoliosis patients, the authors would recommend a raster-stereographic examination every 3 to 6 months and a radiographic examination every 12 to 18 months only, provided that raster stereography does not show rapid deterioration of the scoliosis. The patient's radiation exposure can be reduced using this approach.



Review of rehabilitation and orthopedic conservative approach to sagittal plane diseases during growth: hyperkyphosis, junctional kyphosis, and Scheuermann disease

Since we are evaluating a growing patient, it is useful to verify the presence of scoliosis through a surface trunk analysis using a dedicated instrument called a Scoliometer: the patient is asked to forward bend with arms dangling and palms pressed together. The Scoliometer is placed on the back and used to measure the most leaning point of each hump.

Some electronic instruments are also available to complete the clinical evaluation. The Formetric is one of the most used instruments, that showed also a high sensitivity and precision and it is one of the most used tool and whose measurements showed to be quite similar to the one of X-ray.¹⁹ Other instruments include Spinal Mouse, ISIS, Quantec, AUSCAN and others,²⁰⁻²⁶ but up to date the lateral X-ray is still considered as the gold standard. The X-ray allows to verify the eventual presence of spinal deformities, the stage of maturation of the vertebrae and the measurement of the Cobb Angle relative to Kyphosis and Lordosis. The Kyphosis Cobb angle is generally measured by drawing perpendicular to the upper plate of the 4th thoracic vertebra and lower plate of the 12th. One of the limits of the X-ray evaluation relies in its

at least 18 up to 23, according to the rigidity and the degree of vertebral deformity. During brace wearing, specific exercises should be performed in order to improve the efficacy of the brace pushes and to reduce the spinal stiffness.²⁸ After the achievement of the necessary correction, the brace should be gradually removed, increasing progressively the daily number of hours free from brace, thus accustoming the trunk to self sustain. During brace wearing, the relative role of exercises grows up progressively, since they determine the efficiency of trunk extensor muscles. When the HK is more relevant, more than $65^{\circ} \pm 5^{\circ}$ up to $75^{\circ} \pm 5^{\circ}$, there is indication for a plaster cast,² that will be later replaced by plastic braces whose timing will be progressively reduced. Some authors⁵ suggest that for HK more relevant, over $75^{\circ} \pm 5^{\circ}$, there is an indication for a surgical treatment, but there is no shared consensus about this indication.

In our experience, we can report pretty good results with rigid braces and a good exercise program even in really serious HK, thus progressively reducing the need for plaster casts.

SPINOMETRIA FORMETRIC

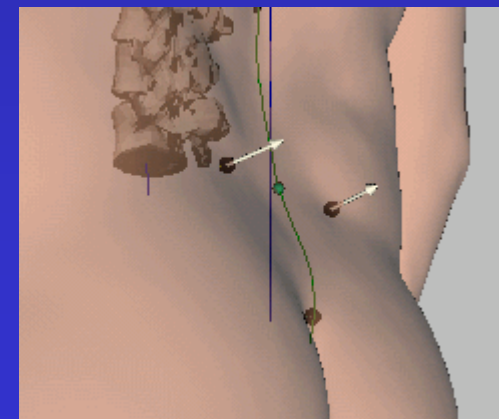
INDICAZIONI

- diagnosi precoce atteggiamenti scoliotici in età evolutiva
- valutazione posturale in rachialgie
- elementi diagnostici per disturbi cranio-cervico-mandibolari
- miglioramento performance sportiva
- individuazione adattamenti posturali scaturiti da condizioni dolorose muscolo-scheletriche
- valutazione degli effetti di procedure riabilitative
- valutazione degli effetti di plantari

SPINOMETRIA FORMETRIC

Limiti della Metodica: Errori di Rilevazione

- 3° sul Movimento di Rotazione Vertebrale
- ± 2 mm sulla Determinazione della Posizione del Centro Vertebrale
- ± 1 mm sulla Determinazione della Posizione dei Punti di Repere



SPINOMETRIA FORMETRIC

Perché la spinometria?

1. indispensabile misurare la postura del bacino e del tronco qualunque sia il sospetto diagnostico e la soluzione terapeutica progettata

SPINOMETRIA FORMETRIC

Perché la spinometria?

2. le misure manuali hanno limiti evidenti:

- time spending
- possono alterare la statica
- l'errore di misurazione determina una variabilità della misurazione inaccettabile specie nelle valutazioni seriali

SPINOMETRIA FORMETRIC

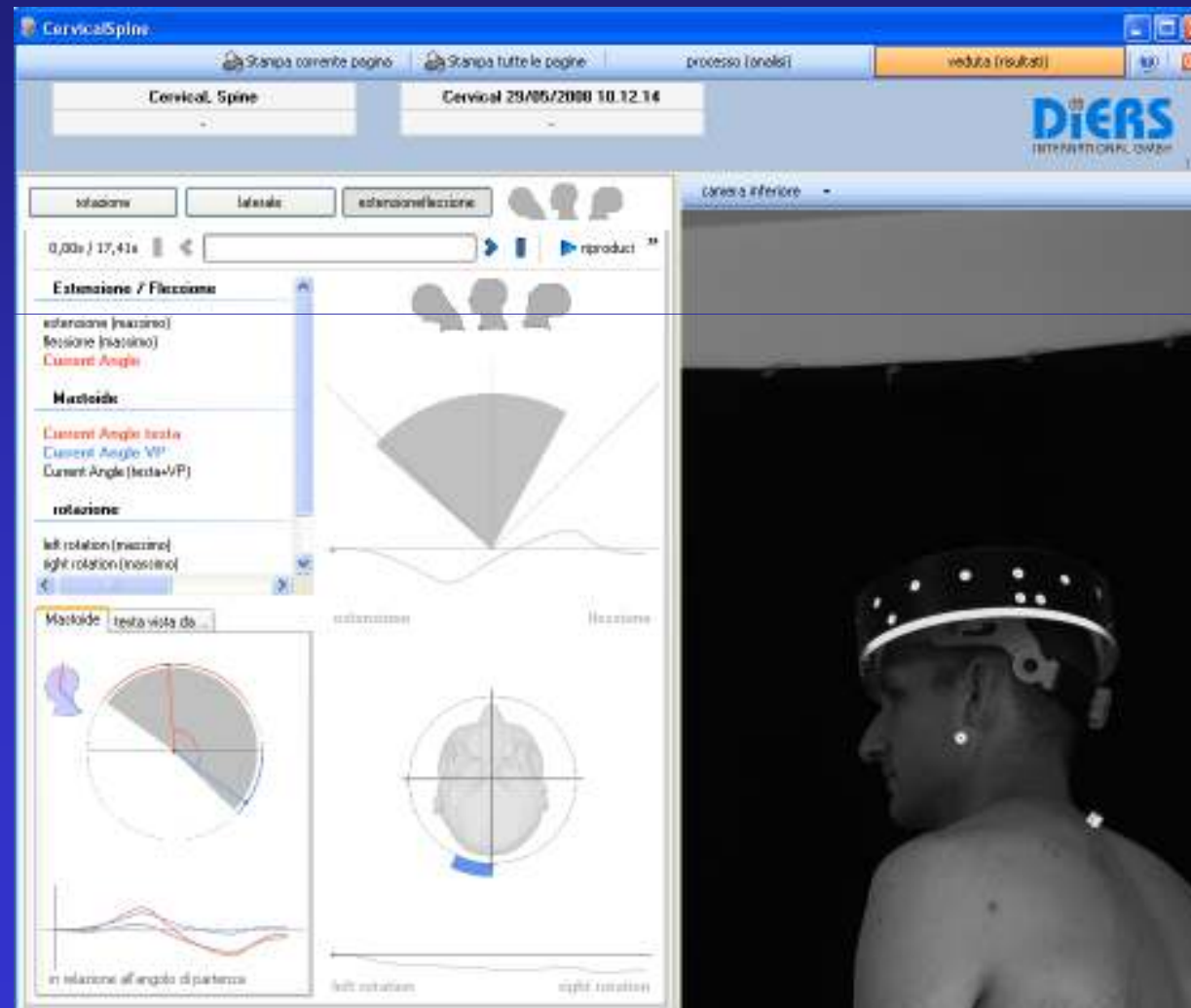
perché la spinometria?

3. la rx ha limiti inaccettabili:

- bidimensionalità
- bi....temporalità
- errore di misurazione sulle variabili angolari e lineari
- assenza di "dinamicità"
- invasività

SPINOMETRIA FORMETRIC

Integrazioni della Metodica: *Cervical Spine*



SPINOMETRIA FORMETRIC

Integrazioni della Metodica: Pedoscan

Sincronizzazione nell'Analisi Dinamica con altra strumentazione:

Pedana Baropodometrica Capacitiva

correlazione tra piede e postura:

- interpretazione del piede (causativo, adattativo, compensatorio, ecc.)
- studio dei piedi
- studio dei difetti di asse



SPINOMETRIA FORMETRIC

Integrazioni della Metodica: *SIM*



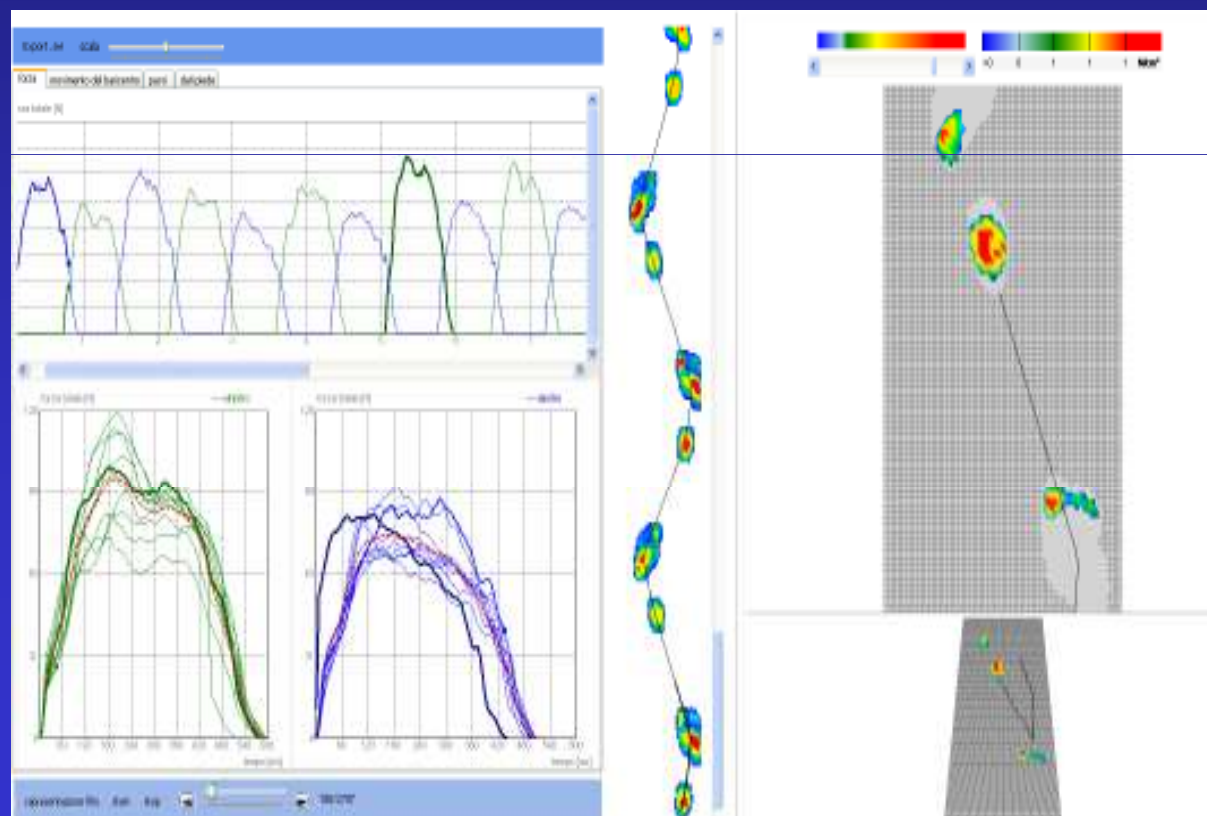
reattività del sistema
tonico posturale alle
variazioni di appoggio

SPINOMETRIA FORMETRIC

Integrazioni della Metodica: *pedogait*



Analisi sincrona del comportamento dinamico
del rachide e del passo su tapis roulant
studio del piede a doppia componente

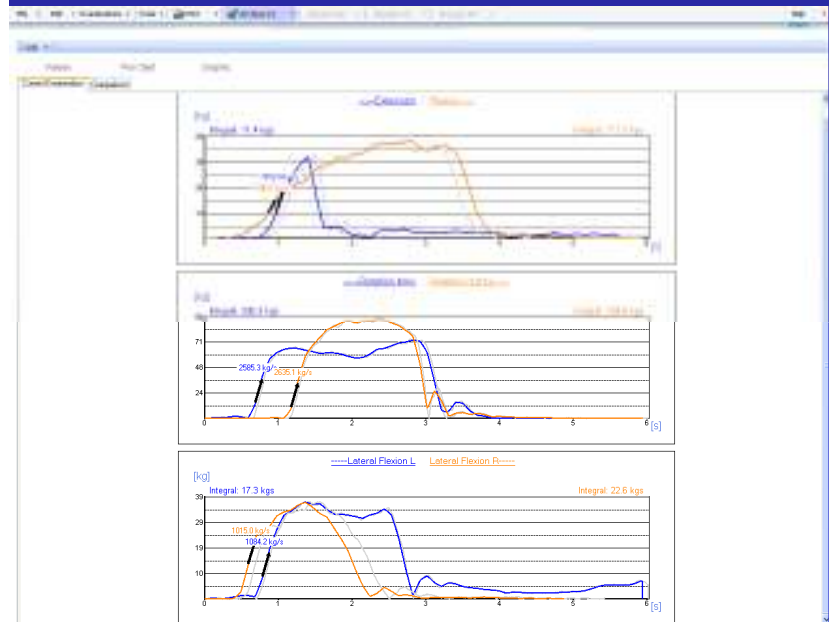


SPINOMETRIA FORMETRIC

Integrazioni della Metodica: Myoline



Sistema Multifunzionale di Misurazione Isometrica simultanea di più gruppi muscolari



SPINOMETRIA FORMETRIC

Integrazioni della Metodica: Myoline



SPINOMETRIA FORMETRIC

Integrazioni della Metodica: Body Balance



+



SPINOMETRIA FORMETRIC

Integrazioni della Metodica: Body Balance

Con un progetto di ricerca realizzato presso l'Università di Amburgo è stato realizzato un software che riesce ad abbinare in tempo reale dati del formetric e del myoline e proporre un programma terapeutico individuale per ogni paziente.

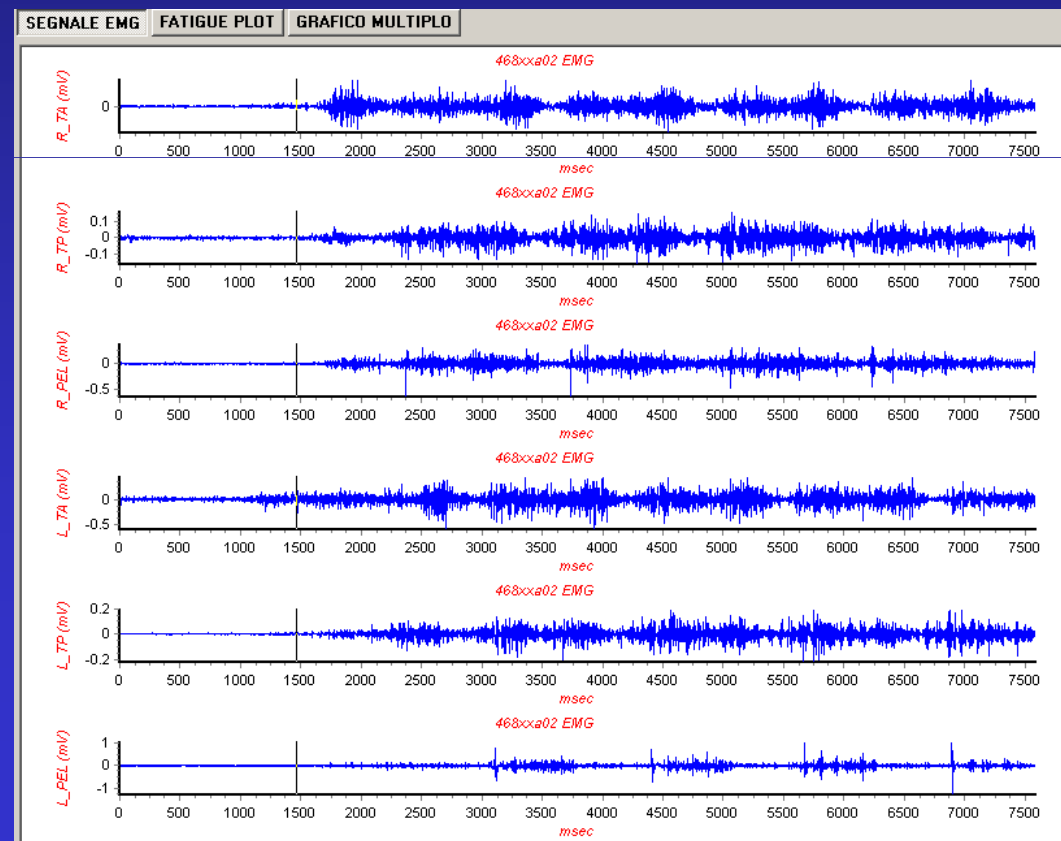


SPINOMETRIA FORMETRIC

Sviluppi della Metodica

Sincronizzazione nell'Analisi Dinamica con altra strumentazione:

- EMG di superficie

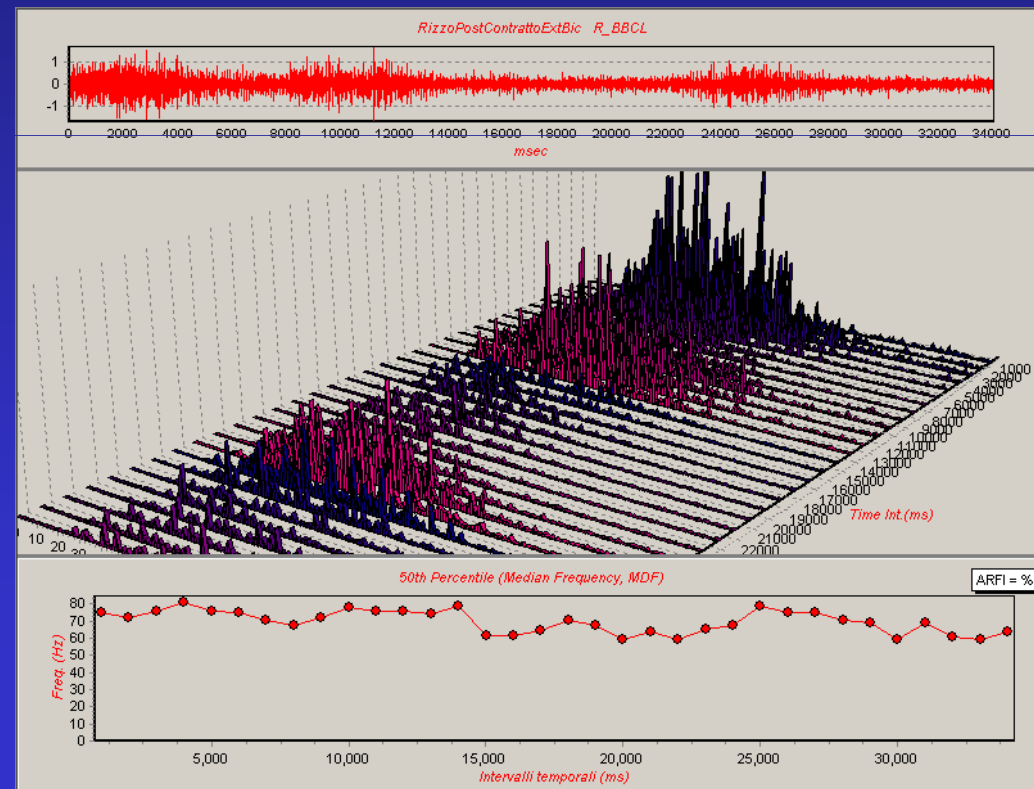


SPINOMETRIA FORMETRIC

Sviluppi della Metodica

Sincronizzazione nell'Analisi Dinamica con altra strumentazione:

- Indice di Fatica



CHELT THERAPY



LASERTERAPIA EXAND

- modalità emissione E²C (Energy Emission Control)
- potenza 10W
- lunghezza d'onda 1064 nm

LASER ABSORPTION AND TISSUE PENETRATION

