Spinometric analysis of patient affected by scoliosis, treated with acupressure

Sergio Palandri (danaskully@bl1036.org)
AO Ordine Mauriziano - Turin - Italy https://orcid.org/0000-0001-9776-3618

Case Report

Keywords: Posture, Postural Analysis, Formetric, Acupressure, Shiatsu

Posted Date: February 2nd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-194088/v1

Abstract

Introduction Much has been written about how the Traditional Chinese Medicine Meridians (TCMs) are closely related to Myofascial Chains (MCs) and then, as a logic consequence, to the Posture. However, there are still few studies that operatively verify these concepts by performing acupressure treatments (like Shiatsu) on subjects groups, of which is performed a postural analysis, before and after.

The aim of the present work is to promote these studies, starting from a pilot one and analyzing results thereof.

Materials and Methods The study, intended as a case report, enrolled a single, 12 year-old, female subject affected by double curve, low degree scoliosis for just a clinic confirmation, for 10 consecutive modules spaced about a week (range 5-10 days) from each other and consisting of a postural analysis before and after an acupressure treatment (Shiatsu) without time gaps between analysis and treatment. The analysis was made with a DIERS Formetric 4D.

Results While observing selected parameters relating their pre- and post-treatment values, is is possible to understand how the lumbar arrow (LA) is systemically reduced, the cervical arrow (CA) is progressively ameliorated, the Antero-Posterior Flexion (APF) and the Hemipelvis Torsion (HT) are progressively harmonized.

After all the performed treatment, the subject refers the perception of his psycho-emotional state, better than the initial one, even though it was already good or very good.

Discussion The series of treatments has shown his efficiency in the variation of morpho-structural parameters in the acute. Due to its configuration, the study didn't consider long term effects, an interesting aspect to be investigated dedicated studies with bigger sample size.

Conclusions From an interdisciplinary and transdisciplinary perspective, the stimulation of "tsubo" according to the Fascial Neuromodulation model can represent a treatment integrated with the manipulation of peripheral entries in the correction of postural-type morpho-structural alterations.

Introduction

Over the past twenty years, several Authors made articles that even more confirm the closely relation and inter-dependence between Traditional Chinese Medicine Meridian (MTCs) and Myofascial Chains (CMs), as cited by renowned works of Langevin in 2002 [1-2], Dorsher in 2009 [3], Stecco C. in 2010 [4], Myers in 2016 [5], Stecco L. in 2017 [6] and Bianco in 2019 [7], effectively building a bond between the Posture and the Meridians.

A strong support for this thesis could be find, in a completely aseptic way, already in 1977 in the writings of Masunaga [8], in 2004 in those of Berensford-Cook [9] and in 2017 of Ricciotti [10].

However, there are not many studies that, starting from this literature, document its effective results, applying its principles on a group of subjects.

The aim of this work is to fond preliminary supports that can promote a scientific study on the effectiveness of acupressure techniques, in the ameliorating of the Posture in subject affected by deformities of vertebral column, like scoliosis.

Materials And Methods

The criteria of inclusion selected to enroll subjects adapted to participate in the present study were the following:

- age < 18 years-old

- presence of untreated scoliosis (low degree, Cobb's angle <25°)

- no concomitant orthodontic treatment, that is concluded for at least 6 months

- no further declared or remarkable pathology upon the enrollment.

The criteria of exclusion were uniquely identified in the non-compliance with one or more criteria of inclusion.

The enrollment was defined on voluntary bases, without rewards for the candidates, in any form and exempt from charges against them, except for the arriving, in autonomous manner, at the place wherein measurements and treatments would be performed.

The participation in the study was made official by means of affixing signature on purposely-made informed consents, also considering the involvement of not of age subjects, for both the adhesion to the study and the acupressure treatment and the processing of personal data in compliance with applicable laws (UE's Regulations 2016/679).

Based on above cited, it enrolled a single female, subject, BE00 of 12 years old affected by low degree scoliosis for just a clinic confirmation, with double right thoracic and left lumbar curve.

The study was structured in 10 identical modules, with weekly frequency (range 5-10 days), each consisted of a starting postural analysis, followed by the acupressure treatment, performed by a Professional Operator confirmed by the Federazione Italiana Shiatsu Insegnanti e Operatori (FISIEO), at the end of which it was performed a new postural analysis, equal to the starting one. Each single module was studied and organized in order to completely cancel the "pre/post-treatment postural analysis" and "post-treatment postural analysis/treatment" latency times, by performing the treatments in the same equipped room for the postural analysis.

Generally, the acupressure treatment was conducted according to the teachings of Masunaga School, to which it is allowed, as unique exception, to have structured the treatment always on the postural meridians (Bladder, Gallbladder and Stomach). The treatment was integrated with a work, aimed to relaxing, on hands, feet and face.

The postural analysis system was identified based on its ability to completely and concurrently meet some fundamental requirements, such as the non-invasiveness, the availability, the fast execution time and the validation in the current field of literature.

The full-spine X-ray was firstly discarded due to his invasiveness as sustained by the articles on the matter [11-15]. The analysis of the literature, in particular [16-26], has therefore lead to choose as the postural analysis system for this study the DIERS *Formetric 4D* provided with the measuring protocol *4D Average* able to perform a dynamic analysis capable to compensate for possible unintended movements of the subject, taking 12 pictures in 6 s.

Multiple parameters are detected from this system. Therefore, it's been needed a selection of the most useful of them for the study.

In order to describe the posture of the examined subject in the three planes of space in an easy, but reliable, manner and considering the indications provided on the matter, from the above cited researches in literature, it has come to be considered the parameters, graphically shown in figs. 1-6, (figures processed from material kindly provided by Hakomed Italia) and described in table 1. Instead, the table 2 shows a legend of references used in figs. 1-6. Finally, table 3 shows the accuracy limit of the Diers Formetric system (data kindly offered by Hakomed Italia):

The data obtained from the postural analyses were derived and directly stored by the system DIERS Formetric, while the data relating to the acupressure treatments were collected with proper form wherein it was also written the value of VAS (Visual Analogue Scale), shown in Fig. 7, in a wider version to adapt it to the needs of the study, whereby the subject was asked to evaluate his own perception of the psycho-physique condition, before and after each single treatment, to complement the obtained instrumental data.

Results

The study was conducted since September 2018 until to December 2018.

The subject completed the expected cycle of 10 modules with the expected frequencies.

Graphs in fig. 8 show the trend of each single parameter across 10 modules, with the comparison between the pre- and post-treatment value.

Instead, another series of graphs, shown in figg. 9-10, shows the trend of all parameter in the context of every single module, with the comparison between the pre- and post-treatment value, the comparison

between the start and the end of treatments and between the start of treatments and 2 months after their end.

Finally, the following graph shows the comparison among VAS' values (scale adapted to the needs of the study) relating to before and after treatment in each of 10 modules consisting the study.

Discussion

The parameters that can be considered in a postural analysis are multiple, especially when integrated by digital systems like that used in this study. It results a non-unique determination of a unique pool of parameters to be considered in the analysis itself, able to characterize it in a complete and exhaustive manner, with related ranges of physiology.

It should be also considered that the used parameters are linked with each other and consequently the detriment of one of these doesn't necessarily imply a negative aspect, because it can correspond to the improvement of another one.

Maybe, also for these reasons, there are not many available article in literature for helping in this sense. One of the few found is thanks to Guigui *et al*. [27] which in their study in 2003 indicated the range of most common values for some parameters of postural analysis, one of which (angle of pelvic antero-retroversion) was selected in this studio as well, but insufficient for an acceptable evaluation of obtained results.

For these reasons, the present discussion will be based on generic consideration that can be derived from the comparison of above presented graphs.

Firstly, it is highlighted how, generally, at 2 months from the end of the last treatment, the value of each parameter tends to redirect itself towards the starting value before the 1st treatment.

Further, it is evident how at least one third of the considered parameters has a considerable variation, approximately >10% in the pre-/post-treatment comparison.

In particular, relating to the graph that compares the values of pre-1st treatment and post-10th treatment parameters, it is possible to concretely suppose a re-harmonization of the posture on the sagittal plane, with reduction of cervical lordosis, increase of lumbar lordosis and net reduction of antero-posterior flexion.

Indirectly, it is important to observe that, in each module, the subject indicates a post-treatment VAS value corresponding to a perception of his own psycho-physique wellness, an important component in the determination of the postural asset, better than that declared pre-treatment. This aspect takes a particularly important meaning if it is understood that the pre-treatment values indicate that the subject presents himself with an already good, and often also very good, perception of his own state, but that in every case the treatment can still improve.

Finally, it's important highlight one consideration about the study, as a whole,

Being understood the non-referential nature of the study, it still further highlighted the close bond between Posture and Acupressure, because, at the end of each treatment, at least one of the detected postural parameters becomes changed.

Conclusions

The conducted study, although within the limits of its design, reasonably permits to affirm that an acupressure treatment (like the Shiatsu treatment) is able to influence the posture of the receiving subject, by basically re-harmonizing it, by acting on both physical and, even more often and efficiently, psycho-emotional aspects that contribute to determine it and this brings to sustain the idea of encourage the development and the implementation of bigger studies with the use of Fascial Neuromodulation, to bring to clinically useful results.

Declarations

Acknowledgement

I really feel to thank Gianluca Bianco MD, Master Degree in Posturology, for his constant and precious scientific and experience support.

Conflicts of Interest

The Author declare to have no conflicts of interest

References

1. Langevin HM, Yandow JA. Relationship of acupuncture points and meridians to connective tissue planes. Anat Rec. 2002 Dec 15;269(6):257-65. PubMed PMID:12467083.
2. Langevin HM, Churchill DL, Wu J, Badger GJ, Yandow JA, Fox JR, Krag MH. Evidence of connective tissue involvement in acupuncture. FASEB J. 2002 Jun;16(8):872-4. Epub 2002 Apr 10. PubMed PMID: 11967233.
3. Dorsher PT. Myofascial Meridiansas Anatomical Evidence of Acupuncture Channels. Medical Acupuncture. 2009: 21(2). DOI:10.1089=acu.2009.0631
4. Stecco C, Day JA. The fascial manipulation technique and its biomechanical model: a guide to the human fascial system. *Int J Ther Massage Bodywork*. 2010;3(1):38–40. Published 2010 Mar 17.
5. Myers T. Meridiani Miofasciali. Terza edizione italiana Tecniche Nuove. 2016
6. Stecco L. Manipolazione Miofasciale: parte pratica. Piccin – Nuova Libreria. 2007
7. Bianco G. Fascial neuromodulation: an emerging concept linking acupuncture, fasciology, osteopathy and neuroscience. Eur J Transl Myol. 2019 Aug 27;29(3):8331. doi:

10.4081/ejtm.2019.8331. eCollection 2019 Aug 2. PubMed PMID: 31579478; PubMed Central PMCID: PMC6767840.

8. Masunaga S. Zen Shiatsu. Edizioni Mediterranee. 1977
9. Beresford-Cooke C. Teoria e Pratica Shiatsu. UTET. 2004
10. Ricciotti A. Shiatsu Ryu Zo I principi della cura. Edizioni Shiatsumilano.it s.r.l.. 2017
11. Doody MM, Lonstein JE, Stovall M, Hacker DG, Luckyanov N, Land CE. Breast Cancer Mortality After Diagnostic Radiography. Findings From the U.S. Scoliosis Cohort Study. . SPINE 2000 Volume 25, Number 16, pp 2052–2063
12. Ronckers CM, Doody MM, Lonstein JE, et al., Multiple Diagnostic X-rays for Spine Deformities and Risk of Breast Cancer. . Cancer Epidemiol Biomarkers Prev 2008;17:605-613.
13. Knüsli C, Walter M. Update - health risks induced by ionizing radiation from diagnostic imaging. Ther Umsch. 2013 Dec;70(12):746-51. Doi: 10.1024/0040-5930/a000474. Review. German. PubMed PMID: 24297861.
14. Arthurs OJ, Bjørkum AA. Safety in pediatric imaging: an update. Acta Radiol. 2013 Nov;54(9):983-90. doi: 10.1177/0284185113477399. Epub 2013 Apr 30. Review, PubMed PMID: 23550188.
15. Richardson DB, Cardis E, Daniels RD, Gillies M, O'Hagan JA, Hamra GB, Haylock R, Laurier D, Leuraud K, Moissonnier M, Schubauer-Berigan MK, Thierry-Chef I, Kesminiene A. Risk of cancer from occupational exposure to ionising radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS). BMJ. 2015 Oct 20;351:h5359. doi: 10.1136/bmj.h5359. Erratum in: BMJ. 2015;351:h6634. PubMed PMID: 26487649; PubMed Central PMCID: PMC4612459.
16. Drerup B. Rasterstereographic measurement of scoliotic deformity. Scoliosis. 2014 Dec 12;9(1):22. doi: 10.1186/s13013-014-0022-7. eCollection 2014. PubMed PMID: 25520745; PubMed Central PMCID: PMC4268794.
17. Tabard-Fougère A, Bonnefoy-Mazure A, Hanquinet S, Lascombes P, Armand S, Dayer R. Validity and Reliability of Spine Rasterstereography in Patients With Adolescent Idiopathic Scoliosis. Spine (Phila Pa 1976). 2017 Jan 15;42(2):98-105.doi: 10.1097/BRS.0000000000001679. PubMed PMID: 27172281.
18. Frobin W, Hierholzer E. Rasterstereography: a photogrammetric method formeasurement of body surfaces. J Biol Photogr. 1983 Jan;51(1):11-7. PubMed PMID:6853417.
19. Drerup B, Hierholzer E. Objective determination of anatomical landmarks on the body surface: measurement of the vertebra prominens from surface curvature. J Biomech. 1985;18(6):467-74. PubMed PMID: 4030803.
20. Knott P, Sturm P, Lonner B, Cahill P, Betsch M, McCarthy R, Kelly M, Lenke L,Betz R. Multicenter Comparison of 3D Spinal Measurements Using Surface Topography With Those From Conventional Radiography. Spine Deform. 2016 Mar;4(2):98-103.doi: 10.1016/j.jspd.2015.08.008. Epub 2016 Feb 2. PubMed PMID: 27927552.

21. Guidetti L, Bonavolontà V, Tito A, Reis VM, Gallotta MC, Baldari C. Intra-and interday reliability of spine rasterstereography. Biomed Res Int.2013;2013:745480. doi: 10.1155/2013/745480. Epub 2013 Jun 2. PubMed PMID:23819119; PubMed Central PMCID: PMC3684097.
22. Schülein S, Mendoza S, Malzkorn R, Harms J, Skwara A. Rasterstereographic evaluation of interobserver and intraobserver reliability in postsurgical adolescent idiopathic scoliosis patients. J Spinal Disord Tech. 2013 Jun;26(4): E143-9.Doi:10.1097/ BSD.0b013e318281608c. PubMed PMID: 23249884.
23. Mangone M, Raimondi P, Paoloni M, Pellanera S, Di Michele A, Di Renzo S, Vanadia M, Dimaggio M, Murgia M, Santilli V. Vertebral rotation in adolescent idiopathic scoliosis calculated by radiograph and back surface analysis-based methods: correlation between the Raimondi method and rasterstereography. Eur Spine J. 2013 Feb;22(2):367-71. doi: 10.1007/s00586-012-2564-9. Epub 2012 Nov 8. PubMed PMID: 23135792; PubMed Central PMCID: PMC3555624.
24. Frerich JM, Hertzler K, Knott P, Mardjetko S. Comparison of radiographic and surface topography measurements in adolescents with idiopathic scoliosis. Open Orthop J. 2012;6:261-5. doi:10.2174/1874325001206010261. Epub 2012 Jul 27.PubMed PMID: 22888376; PubMed Central PMCID: PMC3414720.
25. Degenhardt B, Starks Z, Bhatia S, Franklin GA. Appraisal of the DIERS method for calculating postural measurements: an observational study. Scoliosis Spinal Disord. 2017 Sep 26;12:28. doi: 10.1186/s13013-017-0134-y. ECollection 2017. PubMed PMID: 28975159; PubMed Central PMCID: PMC5613330.
26. Bassani T, Stucovitz E, Galbusera F, Brayda-Bruno M. Is rasterstereography a valid noninvasive method for the screening of juvenile and adolescent idiopathic scoliosis? Eur Spine J. 2019 Jan 7. doi: 10.1007/s00586-018-05876-0. [Epub ahead of print] PubMed PMID: 30617835.
27. Guigui P, Levassor N, Rillardon L, Wodecki P, Cardinne L. Physiological value of pelvic and spinal parameters of sagital balance: analysis of 250 healthy volunteers. Rev Chir Orthop Reparatrice Appar Mot. 2003 Oct;89(6):496-506.French. PubMed PMID: 14593286.

Tables

PARAMETERS	Description	Notes
Antero-posterior flexion [mm]	Distance between VP e DM measured on sagittal plane	A positive value indicates front flexion, while a negative value indicates back flexion (Fig. 1)
Lateral flexion VP-DM [mm]	Distance between DM and the perpendicular to the floor passing through VP measured on coronal plane	A positive value indicates a shift of VP to the right of DM, while a negative value indicates a shift of VP to the left of DM (Fig. 2)
Pelvic inclination DL-DR [mm]	Difference of height respect to the horizontal between DL and DR	A positive value indicates that DR is higher than DL, while a negative value indicates that DR is lower than DL (Fig. 4)
Hemibasin torsion DL-DR [°]	Angular shift in the plane of maximum curvature, respect to Cartesian axis, of normals to the surface in DL and DR points	A positive value indicates that the right iliac wing is placed before the left one, while a negative value indicates that the left iliac wing is placed before the right one (Fig. 3)
VP[mm]	Distance of VP from an external vertical passing through KA	(Fig. 6)
Pelvic tilt [°]	Angle of pelvic rotation on sagittal plane	A positive value indicates anteroversion. While a negative value indicates retroversion (Fig. 6)
CA [mm]	Distance of CA from an external vertical passing through KA	(Fig. 5)
LA[mm]	Distance of LA from an external vertical passing through KA	(Fig. 5)

Table 1 Parameters description

REFERENCES	Description
CA	Cervical apex, point of maximum curvature of cervical lordosis
DL	Left lumbar dimple (distinct from left SIPS)
DR	Left lumbar dimple (distinct from right SIPS)
DM	Point located on the surface of the back in a symmetric position respect to DL e DR
KA	Apex of kyphosis, point of maximum curvature of thoracic kyphosis
LA	Apex of lordosis, point of maximum curvature of lumbar lordosis
VP	Vertebra prominens (normally the spinous process C7)

Table 2 Symbols description

3° on the rotation vertebral movement
± 2 mm on the determination of the position of vertebral center
± 1 mm on the determination of the position of landmarks

Table 3 Formetric accuracy

Figures

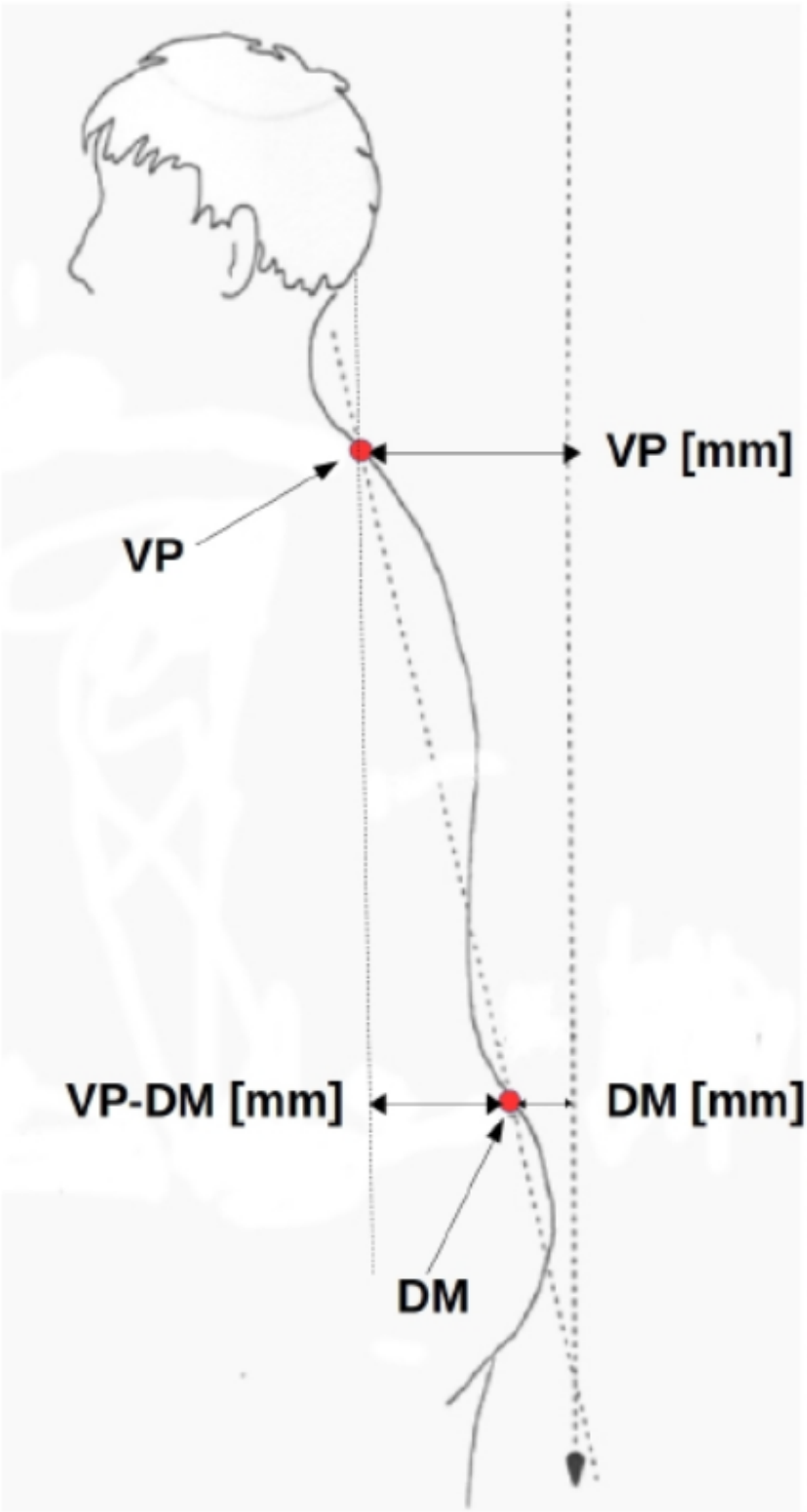

Figure 1

Antero-posterior flexion

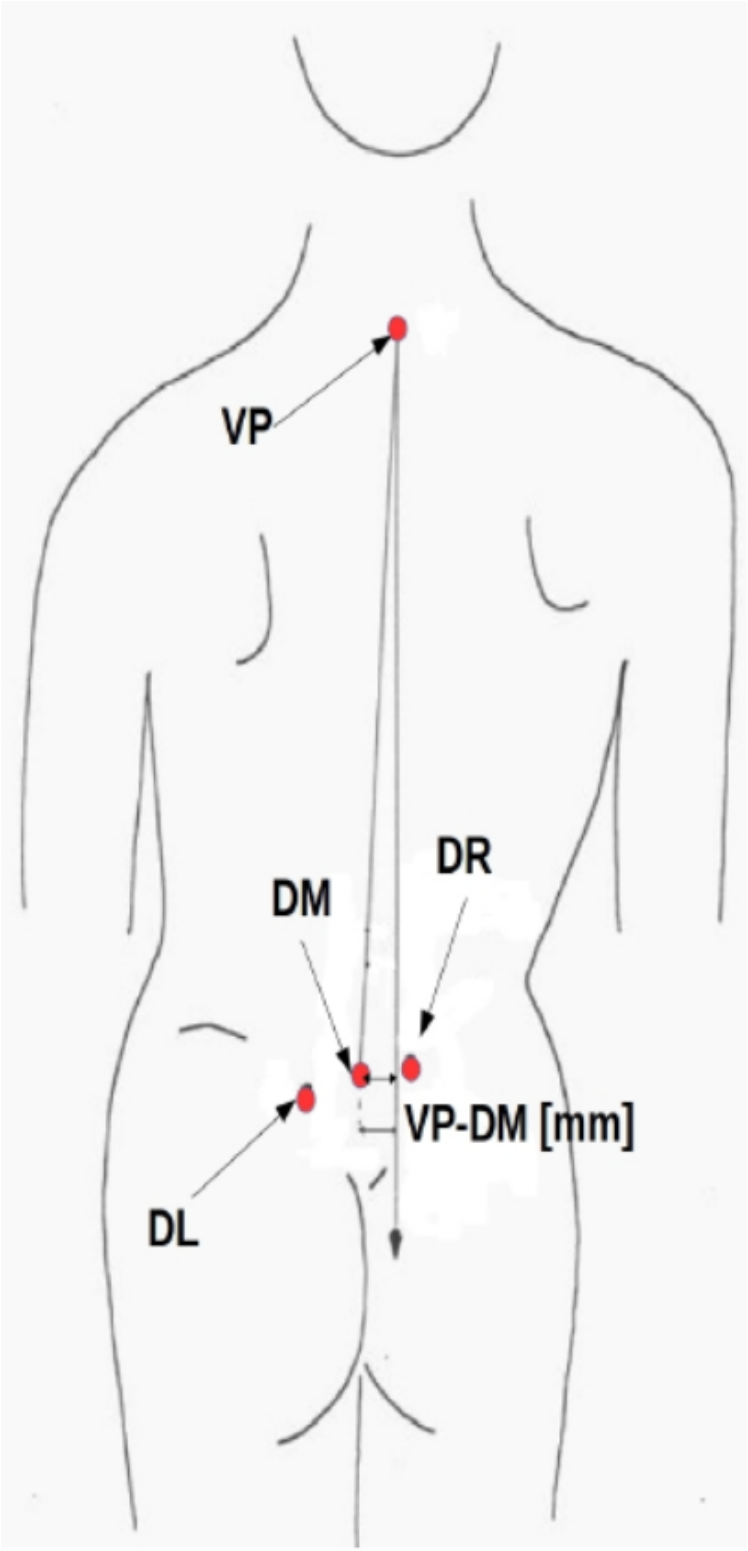

Figure 2

Lateral flexion VP-DM

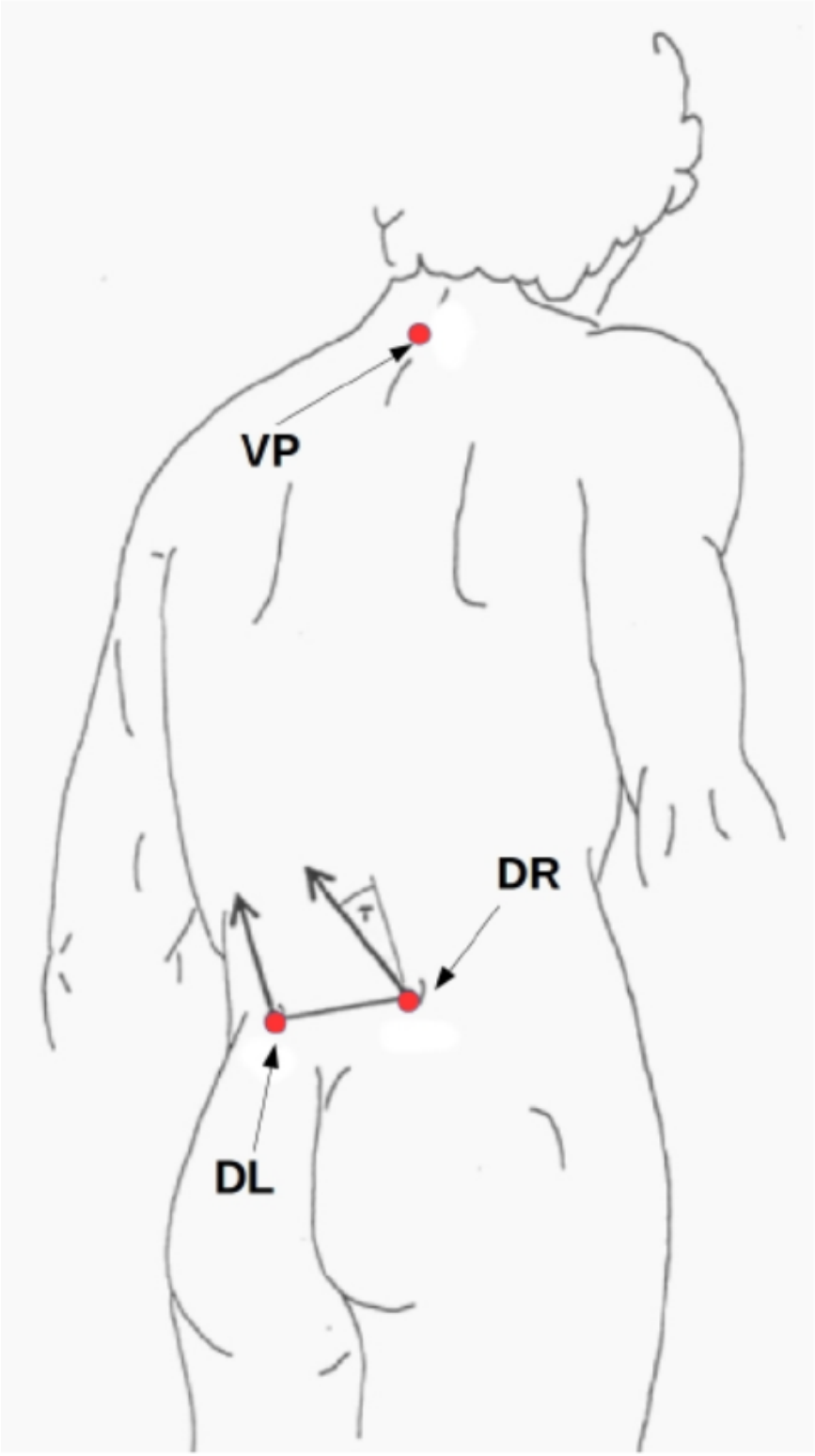

Figure 3

Hemibasin torsion DL-DR

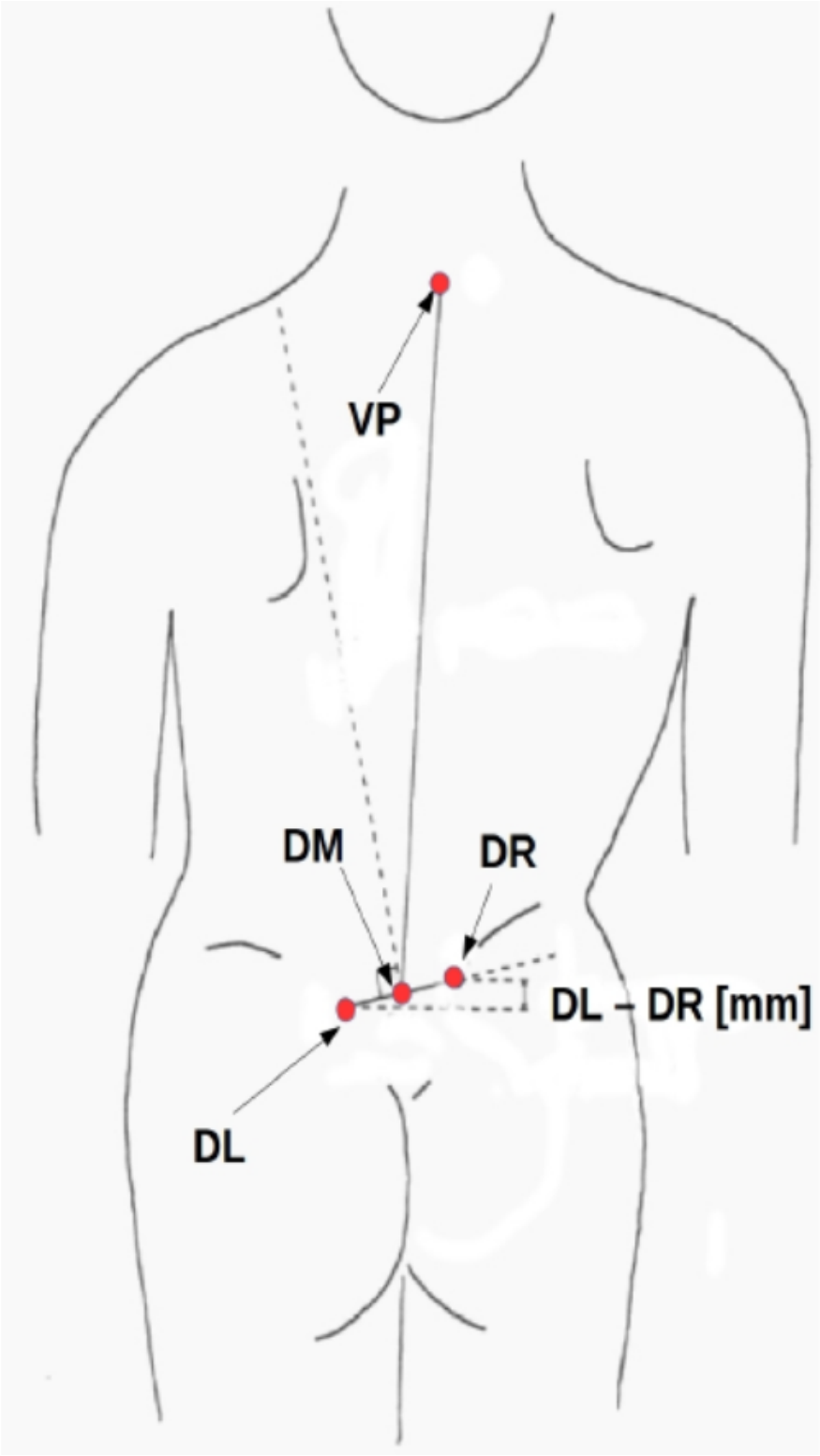

Figure 4

Pelvic inclination DL-DR

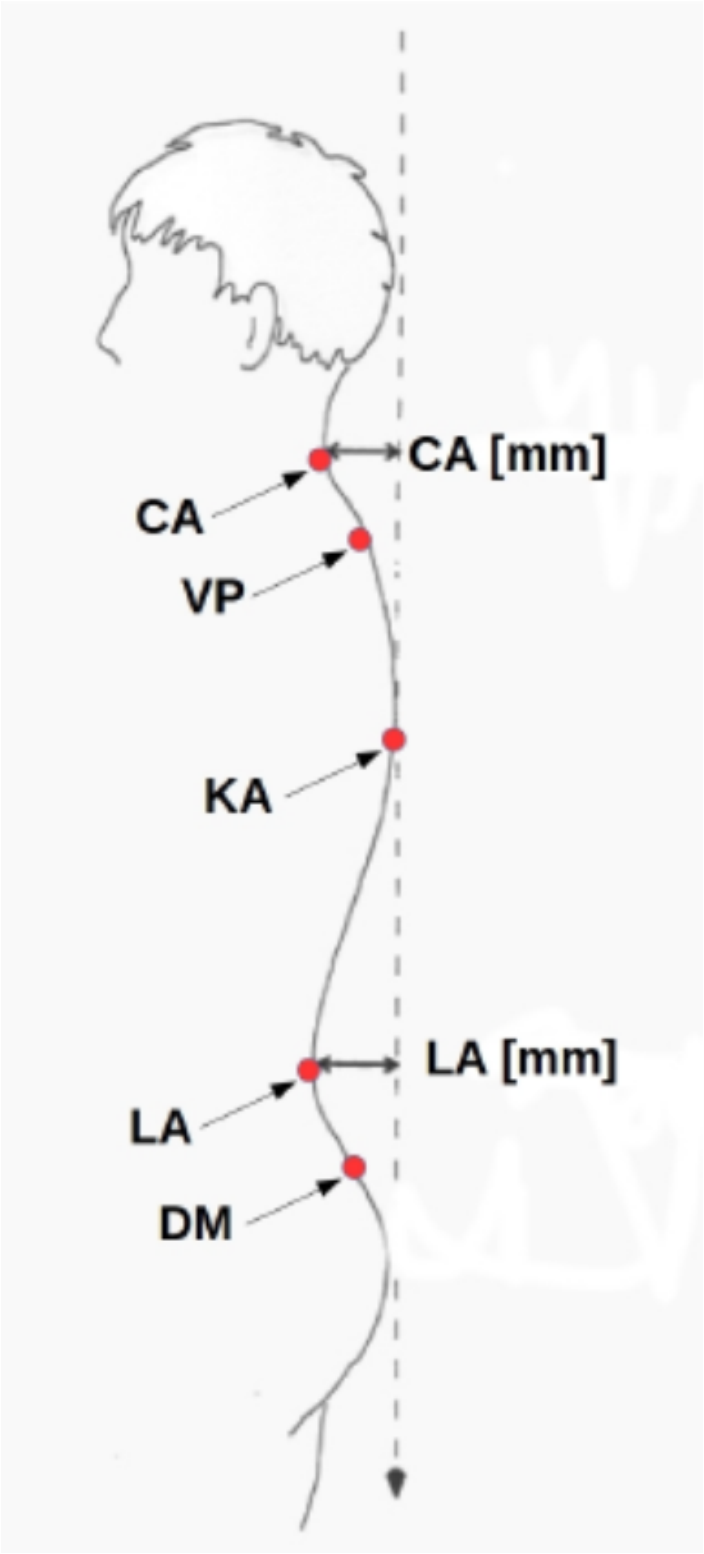

Figure 5

Cervical Apex (CA)

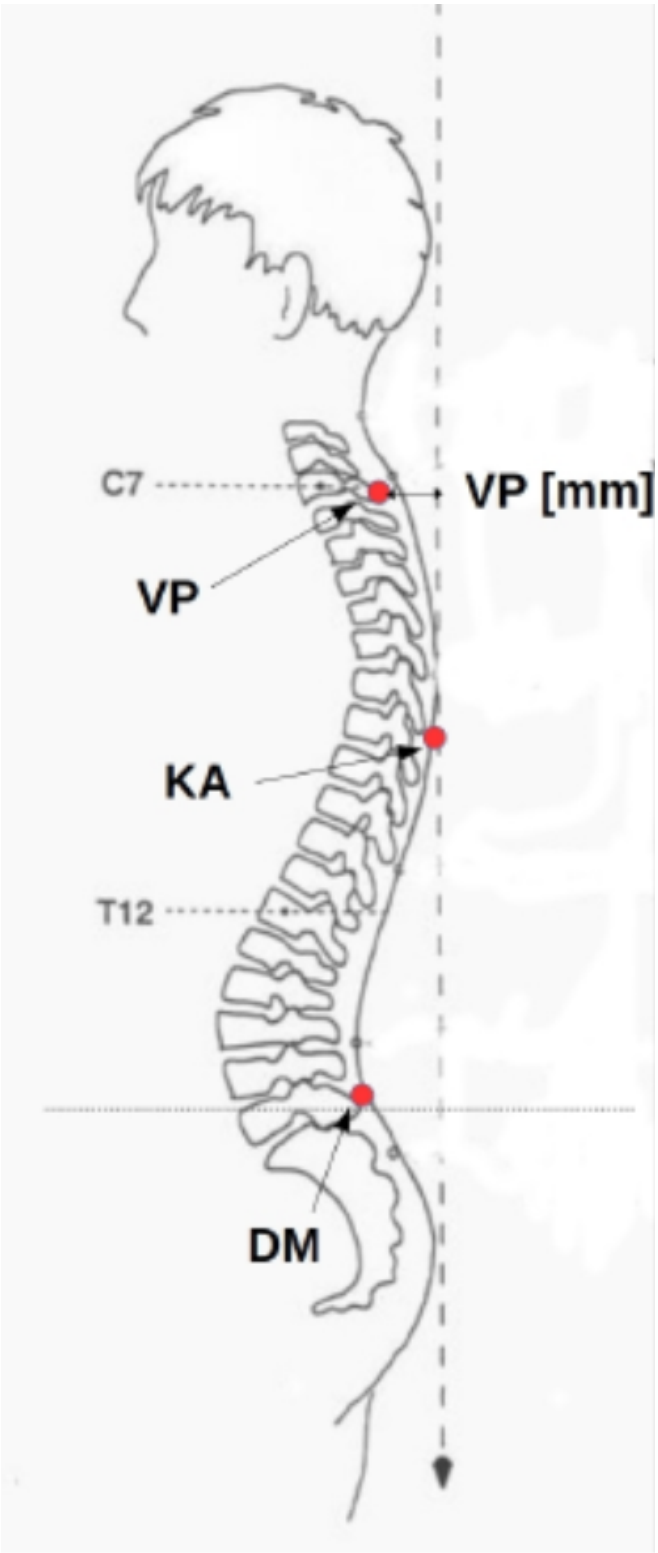

Figure 6

Cervical vertebra C7 (VP)

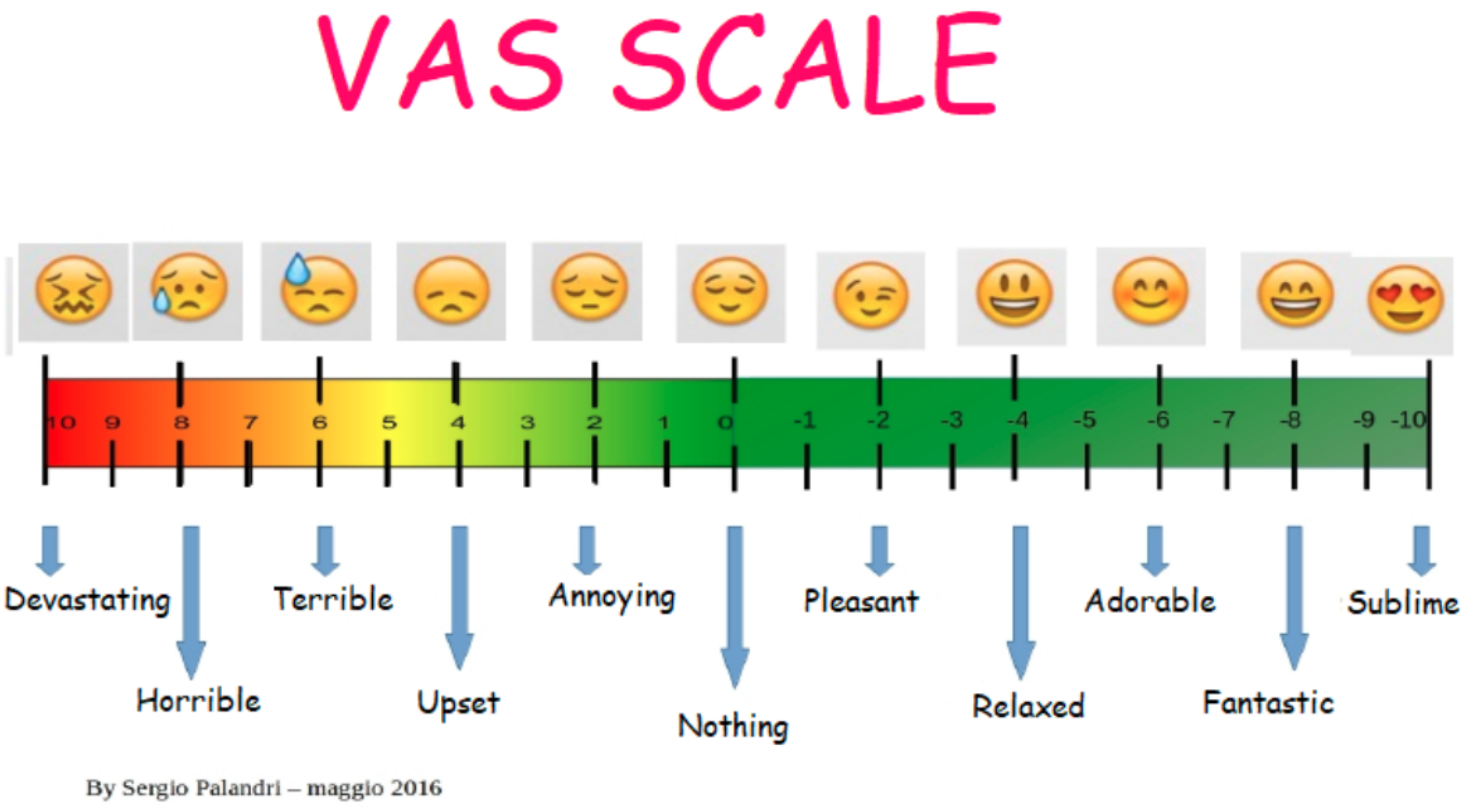

Figure 7

VAS scale adapted

Figure 8

Treatments vs Parameter graphs

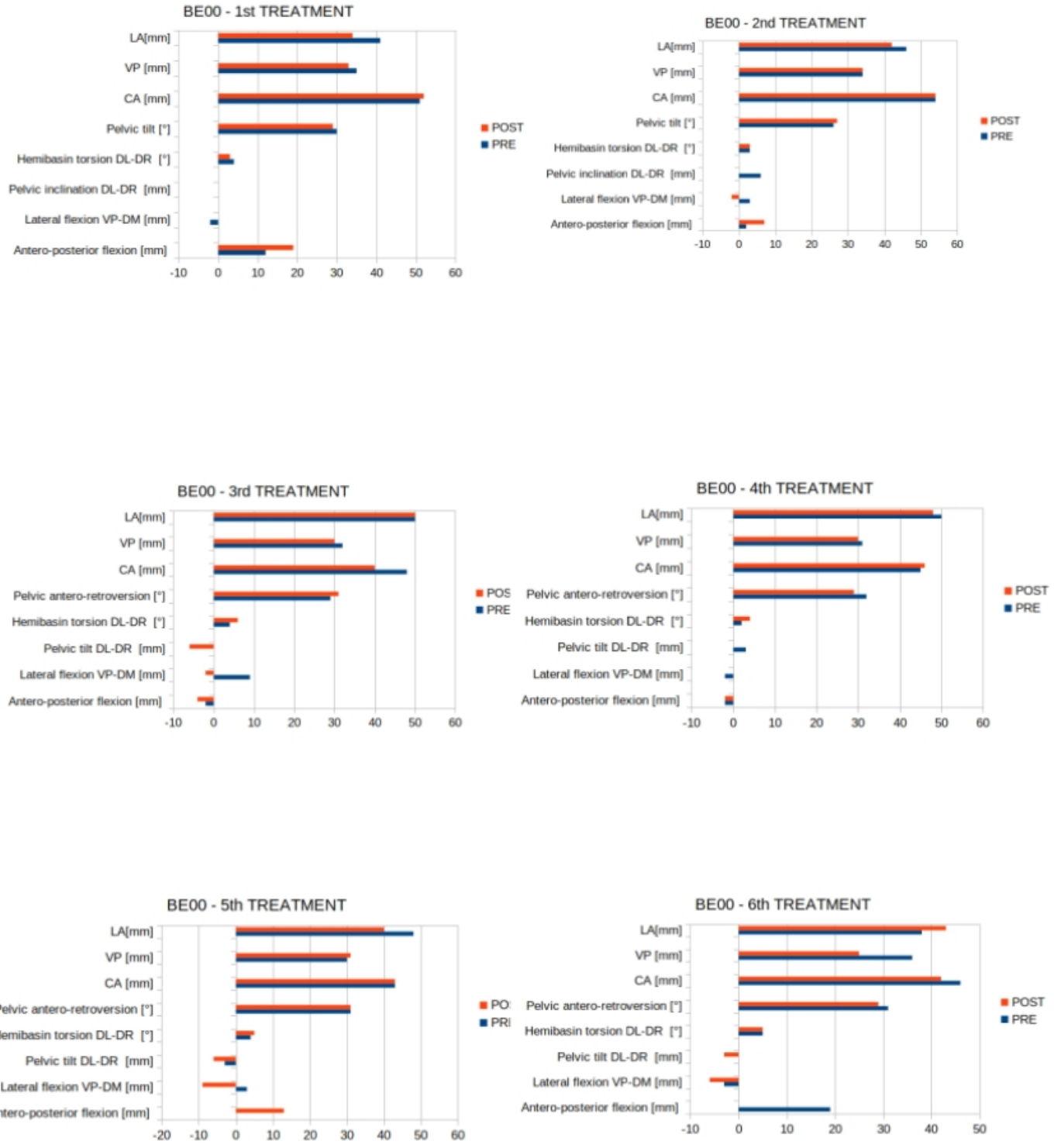

Figure 9

Parameters vs Treatments graphs

Figure 10

Parameters vs Treatments graphs