

# A CASE REPORT OF DIETARY INTEGRATION THERAPY BASED ON HAIR MINERAL ANALYSIS SLOWS THE PROGRESSION OF MULTIPLE SCLEROSIS. IMPLICATION FOR CANCER PREVENTION

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**ABSTRACT: Background:** *Magnetic Resonance Imaging (MRI) is currently used for Multiple Sclerosis (MS) monitoring. Stop in the disease progression is revealed by negative MRI; the disappearance of the old lesions is considered by neurologists an event almost impossible.*

*Dietary intervention based on knowledge of mineral requirements, nutritional status, and genotype (i.e., “personalized nutrition”) can be used to prevent cancer and mitigate chronic disease.*

**Case presentation:** *Male, 34 years old, European ethnic. He started having symptoms in 1999 while the Relapsing-Remitting MS was diagnosed in 2004. In May 2007, the patient underwent his first Hair Mineral Analysis, showing mercury and aluminium excess. After the first 6 months of dietary integration based on Hair Mineral Analysis (HMA) results, the patient noticed increasing of the strength, physical endurance, more energy, beside the disappearance of headache and other symptoms. Evaluation by MRI reported the reduction of the “amount of encephalic lesions” and of the “extension of the lesion located in the left near-trigonus white matter”; as well, “numerous plaques within the periventricular white matter in front-parietal region, bilaterally” disappeared. To date, symptoms are slowly but constantly decreasing. Concomitant HMA control shown a clear decreasing of mercury.*

**Conclusions:** *Neurologists and researchers agree on the fact that the disappearance of plaques in follow up MRI examinations is very unlikely and rare. Our result could be related to the decreasing of mercury in HMA, since many studies show a possible link between MS and mercury. According to our opinion, this report indicates that effort in research should be implemented to better understand possible links between heavy metals intoxication, MS and cancer events. Furthermore, based on a reliable test HMA and on a specific vitamin and mineral integration, we expect that more studies will be performed on this new field.*

**KEY WORDS:** *Multiple sclerosis (MS), Magnetic Resonance Imaging, Hair, Minerals, Mercury, Cancer prevention.*

## INTRODUCTION

Multiple Sclerosis (MS) is a very consistent neurological disease, slowly progressive and characterized by the demyelination plaques situated in the encephalon and medulla. Many different clinical signs and symptoms are possible, depending on the

location of the plaques, and the clinical course presents alternation of remissions and relapses. MS causes are not well known, but an immunological mechanism is believed to be involved; main hypotheses are: infection by a latent virus (possibly a human Herpes virus such as Epstein-Barr virus) and genetic susceptibility (suggested by increased inci-



dence among certain families with increased presence of typical human leukocyte antigen allotype)<sup>1</sup>.

Even though there is no a single test that is diagnostic of MS, the most important test is MRI. The principles of the MS diagnosis are based on showing dissemination of white matter lesions in space and time. Even though the lesions detected with MRI are pathologically non-specific (other white matter diseases can have similar appearances on MRI). To date, MRI is the most sensitive method for detecting asymptomatic dissemination of lesions in space and time<sup>2</sup>.

The sensitivity of MS diagnosing within the first year after a single attack is 94%, with a specificity of 83%. The pattern and evolution of MRI lesions, in the appropriate clinical setting, have made MRI abnormalities invaluable criteria for the early diagnosis of MS and for the disease monitoring, by studying the dissemination of the lesions in space and time. Furthermore, MRI enhanced of Gadolinium provides useful information about new lesions activity being an important evidence for dissemination in space and time. What normally happens in patients affected by MS is that new lesions appear in following MRI examinations; some of them are usually visible only after Gadolinium infusion and these lesions are interpreted as new and active lesions, likely to lead to clinical symptoms<sup>3</sup>.

So, MRI is currently used for disease monitoring, searching for new “pre-clinical” lesions, while the old lesions do not disappear. If MRI shows no new lesions, it is considered a very good therapeutic result that indicates a stop in the progression of the disease; the disappearance of the old lesions is considered by neurologists an event nearly impossible. To our knowledge, no data are available on this chance.

In this report, we describe the clinical history of a MS patient who showed the disappearance of old lesions in a consequential MRI examination. After he had started a new adjuvant therapeutic approach, consisting in a dietary integration protocol calibrated on results of the specific HMA. To further understand this case, we also describe two more cases of patients affected by MS who showed a stop in the progression of the disease, after they had started the same treatment protocol.

In the discussion heading, we'll deeply examine the plausibility application of this therapeutic approach against MS and cancer prevention.

## MATERIALS AND METHODS

### Case report

Male, 34 years old, European ethnic with Multiple Sclerosis evaluated by current guidelines (see more

in the next session). A written authorization was obtained from the patient for publication of this case report and attached images.

### Hair samples

Hair (after 24 hours washing with shampoo and drying) was sampled from nape of the neck. Hair was digested and afterwards underwent multi-elemental analysis with ICP-AES.

### Digestion of samples

Hair samples were digested in Microwave Digestion System ETHOS ONE (Milan, Italy) in closed Teflon bombs. Hair (0.500 g) was mineralized with concentrated nitric acid (69%).

The reagent and digestion conditions were chosen in order to achieve complete mineralization and decomposition of solid phase into liquid phase. All the reagents used were of trace pure grade (from Merck). After digestion, the solutions were filled up to 25 ml with deionized water and filtered with filter 0.45  $\mu\text{m}$ , hydrophilic PTFE, 25 mm.

### Analytical methods

The concentrations of 39 elements: Ca, Mg, Na, K, Cu, Zn, Fe, P, Se, B, Mn, Cr, Co, Mo, Ge, Si, S, V, Sb, Ba, Au, Li, Ni, Pt, Ag, Sr, Sn, Ti, W, Zr, Hg, Cd, Pd, Be, Al, As, U, Pd, and Rh in hair were determined.

Multielemental analysis of digested hair samples was analyzed with inductively coupled plasma-atomic emission spectrometry (ICP-AES – 710 Variant, USA) connected with ultrasonic nebulizer CETAC (USA).

Hair Metal Assay (HMA) tests were performed in the same laboratory, nationally accredited (n. 0352) and internationally Certificated (UNI-EN-ISO 9001:2000; Certification Nr: 50 100 3134 – Rev. 02, 2009-07-14; Certification Body: TUV Italia Srl)

### Case profile and results

He started to have symptoms in 1999, consisting in a paresthesia in his left hand and tiredness. First hypothesis of MS diagnosis was made on 2001 by MRI and lumbar withdrawal. Corticosteroid treatment produced a disappearance of the symptoms and no progression of the disease was detected in the following two years, neither in clinical symp-

toms nor in radiological pattern (MRI February 2002). On August 2004 a new paresthesia began in lower limbs and rapidly involved the upper limbs too, especially on the right side. MRI in 2004 showed lesions in the cortical area and the diagnosis of relapsing remitting MS was stated. In 2005, after new symptoms (disambiguation and coordination problems), MRI showed more progression of lesions in matter of time and space.

He underwent MRI control on July 2006. The medical report was:

“The investigation of magnetic resonance of encephalon was done with T1 and T2 weighed sequences, FLAIR and after intravenous injection of contrast medium.

The examination has highlighted many lesions in T2 weighted sequences, in particular in the white matter in periventricular (Figure 1 A), frontal and parietal sub-cortical (Figure 1 C) level radiate crowns (Figure 1 E). No evidence of lesions in the posterior fosse. No signs of space occupying lesions.

After the injection of the paramagnetic contrast medium there were variations in the signal compared to the pre-contrast imaging and this is a direct sign of activity at a number of plaques in the parietal, occipital and frontal areas, bilaterally. Two bulbar lesions are also visible.

In comparison to the previous similar examination of January 2005, there was a marked worsening of the lesions amount, despite of the different methods of examination.

The exam at the level of cervical and proximal dorsal spinal cord was conducted with T1 and T2 weighted sequences on sagittal plane, even after the injection of the paramagnetic contrast medium. Abnormal signals are shown at the section from C1 to C5 and at D6 (Figure 1 G). After the injection of the intravenous contrast medium, abnormal signal changes were detected, with comparison to the pre-contrast images.

Conclusions: clear increase of lesions load with activities of numerous plaques in the brain and spinal cord”.

During these years the disease was well controlled by medical treatment. In 2006, the patient removed all mercury amalgams in his mouth (safe protocol). After that, he started to feel better and less tired. Anyway, in 2007, new ocular symptoms appeared and they were treated by cortisone.

In May 2007, the patient was visited for the first time by our team and underwent HMA. Herby are reported the results (only impaired values of heavy metals are shown):

Heavy metal	mg/100 g
Mercury (Hg)	0.172
Aluminium (Al)	0.696

After that, he started, on May 2007, a personal dietary integration based on HMA results. Integration schedule was:

Copper:	1.5 mg/die
Selenium:	0.05 mg/die
C Vitamin:	1000 mg/die

Integration protocol has being followed for three months. The patient noticed increasing of the strength, physical endurance, more energy; he had headache often, but other symptoms (body pains, eye problems, coordination problems) became very light and paresthesia was limited to the fingers.

On November, the patient repeated the MRI examination. Hereby is medical report:

“Encephalon and medulla MRI: examination carried out within coronal, sagittal and axial sections, 5 mm thick, before and after administration of paramagnetic contrast in veins (2 cc/10 kg of body weight). Images related to T1 and T2, obtained with FLAIR and FSE techniques.

The examination was compared with a previous one, run on July 2006, compared to which the encephalic lesion load is reduced. In particular, the extension of the lesion located in the left near-trigonus white matter (Figure 1 F) results reduced and numerous plaques disappeared from the periventricular white matter (Figure 1 B) in front-parietal region, bilaterally (Figure 1 D). Characteristic signals of the lesions in T1 and T2 are the same. The size of the furrows, ventricles and cisterns is not changed, nor the thickness of the “corpus callosum”.

After the administration of contrast medium, there are no images related to demyelinating lesions in the phase of activity.

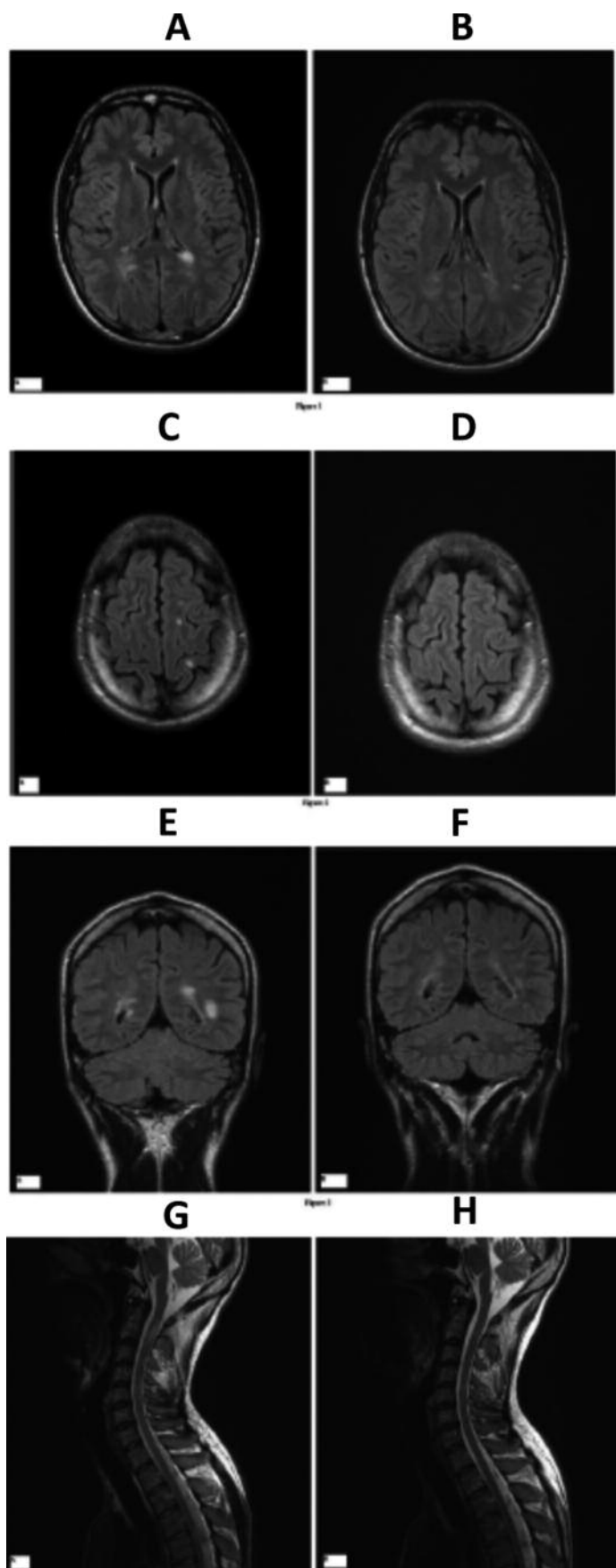
Column MRI: examination with axial and sagittal sections of 3 and 4 mm thick, before and after the administration of paramagnetic contrast in veins (2 cc/10 kg of body weight). Images related to T1 and T2, were obtained by the ESF and technical TFE.

The examination of the cervical portion was compared with a previous one, run on July 2006, compared to which the spinal cord lesions load was reduced. In particular, the C2 lesion disappeared and the size of the lesion located at C4-C5 (Figure 1 H) resulted significantly reduced.

After the administration of contrast medium, there are no images related to demyelinating lesions in the phase of activity. The dorsal tract examination shows no abnormal signals in parenchymal marrow, either before or after contrast.

There is no significant deteriorative arthritis.

After the administration of contrast medium there are no pathological changes. The examination of the lumbosacral section does not show abnormal arthrosis related images nor a disk hernia nor protrusions.



**Figure 1.** Magnetic resonance imaging of periventricular (A-B), frontal and parietal sub-cortical (C-D) level radiate crowns (E-F) and cervical and proximal dorsal spinal cord (G-H).

After administration of contrast there are no pathological changes”.

Control HMA was performed on March-2008, showing the following results:

Heavy metal	mg/100 g
Mercury (Hg)	0.035
Aluminium (Al)	0.198

Currently the patient is reporting that symptoms are slowly but constantly decreasing and he’s feeling better and better.

In 2009 he underwent a new MRI control, which unfortunately showed a small progression in matter of space and time, and a new HMA control (March 2009), showing the following results:

Heavy metal	mg/100 g
Mercury (Hg)	0.014
Aluminium (Al)	0.673

To support the description of the case above, we are adding two more brief descriptions of similar interesting cases. First one is a female, 47 years old. She started to have symptoms in 1988, when she got affected by paresis in the right side of the body. Diagnosis of relapsing/remitting MS was done in 1996, through the MRI examination and the interpretation of clinical symptoms. In February 2006, she met our team and underwent her first HMA, showing mercury (Hg) impairment (0.0315 mg/100 g). After mineral integration protocol, her clinical situation improved: muscular strength and endurance increased and the patient could start walking autonomously, without any aid. HMA control was performed on October-2006, showing no mercury. After second food integration cycle, the clinical progression of the disease was stopped during the following years and both neurological examinations and MRI imaging confirmed clinical results.

During this period, the patient got two more HMA control tests, on July 2007 and on February 2008, both showing no mercury.

The second case is a female, 59 years old. She started showing symptoms in 2000 with pain in the right knee, followed by imbalance problems. Diagnosis of secondary progressive MS was done in 2001, through the MRI examination. First treatment was cortisone, but symptomatology worsened during years and imbalance problems caused dangerous falling episodes; in one falling (November 2004) she got a fracture of the skull. Walking became very difficult and unstable.

On June 2005 she started HMA based integration and the treatment has being followed for many years so far. Here is the sequence of MRI examinations reports from 2004:

December 2004: “No changes of previous lesions and no changes in ventricular dimensions.”

May 2005: “Many hyper-intensity areas in the white matter, particularly in semi-oval centres and periventricular area bilaterally. Similar lesions in the temporal area, bilaterally. After the injection of contrast medium t, no enhancement lesions are found. Comparison with previous imaging is not possible because radiograms are not available”.

July 2006: “No changes of previously found hyper-intensity areas in the white matter particularly in semi-oval centres, periventricular area, temporal area, bilaterally. After injection of contrast medium, no enhancement lesions are found.

In the cervical medulla, tissue is thinner, probably for scar producing from previous lesions. In the posterior cords at C6-C7 level, hyper-intensity area (9 mm diameter). No enhancement after injection of contrast medium.”

January 2008: “Important multifocal leukoencephalopathy with no changes from previous examination and no visible enhancement lesions after the injection of contrast medium.”

Here is the sequence of medical examination reports from 2001:

October 2001: “...The patient noticed to have less strength and less sensitivity in the legs than 18 months ago and that these symptoms got worse: now, walking is very difficult. Neurological examination shows clinical signs referred to lesions in the pyramidal system...”

May 2004: “...during last year, clinical conditions slowly worsened, even though the patient followed a cortisone treatment...”

November 2004: “...Patient reports an increasing fatigue. Neurological examination shows bilateral arm-leg pyramidal syndrome with spasticity (especially in the left side). Sensitivity is lowered in many body districts...”

May 2005: “...Neurological examination shows spastic paresis, more evident in the left side.”

August 2005: “...Patient reports an improving of the muscular strength in lower limbs (she can now lift the left leg up by 30° instead of 5° and the right leg by 40° instead of 30°). There is still weakness in the upper limbs, but less pain.”

March 2006: “Patient reports no improvement of the strength in lower limbs compared to previous examination (she can now lift both legs up by 30°). There is still weakness in the upper limbs, but pain is getting better.”

## DISCUSSION

We have shown three clinical cases, along with clinical documentation, of patients affected by Multiple Sclerosis (MS): in these cases, the progression of the disease was stopped after the pa-



tients had started a particular treatment protocol, consisting in a food integration with trace minerals and vitamins, based on HMA results. In one case, MRI lesions disappeared, when compared to a previous MRI examination.

Neurologists and researchers agree on the fact that the disappearance of the plaques in follow up MRI examinations is very unlikely and rare; in common medical practice it is considered possible that during the remission stage of a relapsing/remitting type MS, the lesion(s) will be less prominent but, unless their size can be very small, they should not disappear completely and some scar tissue is always left behind. When the myelin is lost, a neuron can no longer effectively conduct electrical signals<sup>4</sup>. A repair process, called remyelination, takes place in early phases of the disease, but the oligodendrocytes cannot completely rebuild the cell's myelin sheath<sup>5</sup>. Repeated attacks lead to successively fewer effective remyelination, until a scar-like plaque is built up around the damaged axons<sup>5</sup>. Anyway, since the plaques are always in a dynamic state, even though it's unlikely that they ever really disappear, from an MRI perspective they can certainly come and go, depending on the type and quality of images one obtains; that's why follow up imaging should be performed in the same radiology unit and with similar devices. That is what happened in our cases. Furthermore, in our cases, MRI plaques stability or disappearance is connected to a simultaneous clinical improvement.

So we can say that reported cases are definitely uncommon. But can we find a relationship between trace minerals-vitamins integration schedule and MS clinical symptomatology improving? Is it only a chance? Of course, we don't have elements to completely answer this question, but we are able to discuss this issue. First of all, mineral and vitamin integration is used, in this method, as a chelation therapy to eliminate toxic metals and mineral imbalance from patients. Use of C Vitamin as a chelation for toxic metals has been studied for a long time and its use for this purpose is confirmed in the literature<sup>6-9</sup>. Besides, scientific community is also very interested in further understanding the importance of trace elements balance in the human body<sup>10-16</sup> and many papers have been written on strategies and therapies for mineral re-balancing and micronutrient supplementation<sup>17-23</sup>. Finally, many studies have been carried out in the last four decades investigating a connection between heavy metal intoxication (especially mercury) and MS<sup>24</sup>. Exposure to mercury can be professional or not. Other than professional exposure, the main sources of chronic exposition from this element are dietary intake of polluted fish and dental amalgam fillings, used in dentistry since the 19th century; many stud-

ies show a possible link between MS and mercury amalgams<sup>25-29</sup>. Mercury can lead to neurological damage by different mechanisms: Cancer developments due to decreasing detoxification mechanism<sup>30</sup>, glutathione peroxidase and superoxide dismutase inhibition<sup>31</sup>, intracellular Ca<sup>2+</sup> releasing<sup>32</sup>, immune system damage<sup>33</sup>.

One more issue has to be discussed: how reliable is HMA? Shall we trust HMA results? First of all, we have to say that some doubts have been put by scientists on the interpretation of this method. French researchers Lamand, Favier and Pineau, investigated if HMA can be considered a reliable method for nutritional status evaluation; they showed that HMA results are poorly correlated to the nutritional status and it is necessary to be very careful when interpreting results coming from isolated samples. For the investigation of nutritional intake imbalance, an epidemiological use of samples, obtained from a wide population may provide more useful information<sup>34</sup>. Wilhelm and Idel, in their review, evaluated the relationship between HMA results and environmental exposure; they state that hair analysis is impaired by the difficulty to distinguish between endogenous and exogenous sources of metals in hair and, except for methylmercury; there are no critical limit values for trace elements in hair available. However, for assessment of some metal exposure, hair analysis is suitable as a screening method, if based on large populations<sup>35</sup>. On 12-13 June 2001, the Agency for Toxic Substances and Disease Registry (ATSDR) convened a seven-member panel in Atlanta, Georgia (USA), to review and discuss the current state of the science related to hair analysis. The principal lesson learned from the meeting was that, for most substances, before hair analysis can be considered a valid tool for assessing exposure and health impact of a particular substance, research is needed<sup>36</sup>. So, HMA cannot be considered, yet, a valid tool for assessing exposure and health impact, because it doesn't give reliable information about the causes of the results. However, even though interpretation of HMA is difficult, this is not very important with respect to the aim of our work: regardless of the source of exposure, what we need to know is if HMA results give reliable information on heavy metal intoxication. The answer to this question seems to be related to the reliability of the single laboratory. Barrett<sup>37</sup> sent hair samples from two healthy teenagers (under assumed names) to 13 commercial laboratories performing multi-mineral hair analysis: the reported levels of most minerals varied considerably between identical samples sent to the same laboratory and from laboratory to laboratory. A recent challenge to the validity of head hair analysis was published in the Journal of the American Medical Association<sup>38</sup>. Specialists

have noted that there are three general reasons to contest the blanket rejection of head hair analysis on the basis of evidence which, at most, shows that some laboratories are unreliable: first, the problem of quality control and potential confounding factors characterizes many laboratory procedures, and is especially serious in tests of lead levels in capillary blood; second, properly conducted head hair analyses have the benefits of measuring long lasting excretion of a wide variety of toxins in a cost-effective manner and hence have a valuable place in conjunction with other environmental and diagnostic testing; finally, but most important, these advantages have been amply demonstrated by the excellent diagnostic and treatment results of the Pfeiffer Treatment Centre, where a sophisticated research has shown the role of chemical imbalances in the diagnosis and treatment of such diverse conditions as autism<sup>39</sup> and assaultive young males<sup>40</sup> and cancer events<sup>41</sup>. The World Health Organization, the International Atomic Energy Agency and the U.S. Environmental Protection Agency have all recommended hair analysis for determination of heavy metals in certain instances. The EPA stated in a report that "...if hair samples are properly collected and cleaned, and analyzed by the best analytic methods, using required standards and blanks, within a clean and reliable laboratory by experienced personnel, the data too come reliable"<sup>43</sup>.

## CONCLUSIONS

Our report focus attention of researchers on new and interesting fields of research on MS and the new emergence in cancer nutrition field<sup>42</sup>.

First of all, our case series indicates that effort in the research shall be implemented to better understand possible connections between heavy metal intoxication and MS, particularly with mercury. Furthermore, we introduced a new possible support treatment, based on a reliable test (HMA) and on a specific vitamin and mineral integration. We hope that this approach could be further investigated within more reliable epidemiological studies, either in MS or in cancer risk patients.

## COMPETING INTERESTS

The authors state they have no competing interests.

## AUTHORS' CONTRIBUTIONS

Dr. Rossi followed the patients, interpreted HMA results and administered minerals-vitamins supplementation. Dr. Raggi and Dr. Vallesi analyzed and interpreted the patient's data and gave major contribution to the manuscript Dr. Giustozzi made from analytical data supervisor.

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