

## A case report on charcot marie tooth disease, and the role of vitamin C in this disease

Madeeha Subhan\*; Waleed Sadiq

\***Madeeha Subhan**

Department of Medicine, CDA Hospital Islamabad, Pakistan

Email: madeehas99@gmail.com

### Abstract

Charcot Marie tooth is a heredity disease. There is peripheral nerve demyelination, weakness and impaired motor function. No current medications improve neuropathy in subjects with Charcot-Marie-Tooth disease type 1A. We present to you a case of young Asian male with Charcot Marie tooth showing no improvement with three months treatment with ascorbic acid and folate.

### Keywords

charcot marie tooth; polyneuropathies; pescavus; ascorbic acid

### Abbreviations

CMT: Charcot marie tooth

### Introduction

Charcot Marie tooth disease or hereditary motor and sensory neuropathy is the most common inherited disease of the peripheral nervous system. It affects approximately 1/2500 individuals [1]. The typical phenotype of an individual suffering from Charcot Marie tooth includes sensory and motor polyneuropathies along with variable sensory manifestations, decreased or absent tendon jerks and skeletal abnormalities such as *pescavus*, hammer toes and scoliosis [2,3,4]. In severe cases the patients become wheelchair bound and respiratory insufficiency occurs, but usually it is a slowly progressive disease compatible with life although the quality of life is always compromised.

### Case Presentation

A previously healthy 23 year old male presented to the emergency department with one week history of headache and dizziness. The headache was gradual in onset, sharp in character, involving complete head, persisted throughout the day and was relieved with painkillers. There was no associated photophobia, phonophobia, nausea or aura. He also had dizziness which aggravated with movement. It was sudden in onset and occurred along with headache. It was relieved when he lied down and closed his eyes. The patient reported progressive bilateral weakness of lower limbs that later involved bilateral upper extremities as well for 7 months. Nothing aggravated the weakness and it was relieved by rest. He also had speech difficulty but comprehension was fine. He reported multiple falls since three years. He also complained of tremors in all the extremities. Tremors affected the lower left extremity the most.

Moreover, he had needle like sensations involving umbilicus, upper left limb and fingers. Regarding past medical history he had undergone laparoscopic appendectomy and septoplasty two years back and recovered fine. His father reported that at times he also had involuntary grinding of teeth and squinting since birth. His vaccination history is up to date and he is a nonalcoholic and a nonsmoker. He is a shopkeeper by profession. His mother is diabetic and his parents had a consanguineous marriage. His siblings are fine. On examination his blood pressure was 120/80 mmHg, pulse was 78 beats per minute. On cardiovascular and respiratory exam heart sounds were normal with normal vesicular breathing and no sign of respiratory compromise was noted. Abdomen was nontender without hepatosplenomegaly. On Nervous system exam; he was alert and oriented to time place and person. His score on MMSE was 30/30. Cranial nerves were grossly intact. Romberg sign was positive. Fine touch and two point discrimination was impaired throughout bilaterally in upper and lower extremity. The gait was broad based gait and feet had hammer toe deformity. Dysdiadochokinesia was negative. Motor power in lower limbs was 3/5 bilaterally and 5/5 in both upper extremities. Reflexes were 2+ in the lower extremities and + in the upper extremities. He has pes cavus (Figure 1).

Appropriate investigations were ordered, CT Brain was normal, nerve conduction studies and electromyography were consistent with CMT. He was started on 1 mg cobalamin, 1 gram folic acid and Vitamin C 2gram/day for three months. Upon follow up three months later, nerve conduction studies and electromyography were repeated and there was no improvement.

#### Laboratory workup at presentation

Hemoglobin	14.8 g/dl
RBC	3.7 X10 <sup>6</sup> /uL
WBC	13.7 X 10 <sup>3</sup> /uL
Platelets	156 X10 <sup>3</sup> /uL

Urine R/E: Normal

#### Complete Metabolic Profile:

Sodium	136 mmol/l
Potassium	4.4 mmol/l
Chloride	103 mmol/l
Urea	36 mg/dl
Creatinine	0.9 mg/dl
Glucose	120 mg/dl
ALT	26 U/l
Alkaline Phosphatase	407 U/l
Total bilirubin	0.6 mg/dl

**Nerve Conduction Studies:** Hereditary sensory and motor neuropathy.

**MRI:** Abnormal linear vertical, symmetrical, high T2/PD and low T1 signal area involving the posterior horn of the internal capsule bilaterally. A well-defined, high T1 and T2 signal abnormality measuring approximately 1.5cm X 1.5cm X 1.3cm in right petrous apex, possibly suggestive of cholesterol granuloma. Bilateral maxillary sinusitis.

**CPK:** normal

**Antinuclear antibody:** negative

**Blood Lipid Profile:**

Cholesterol	126 mg/dl
Triglycerides	79 g/dl

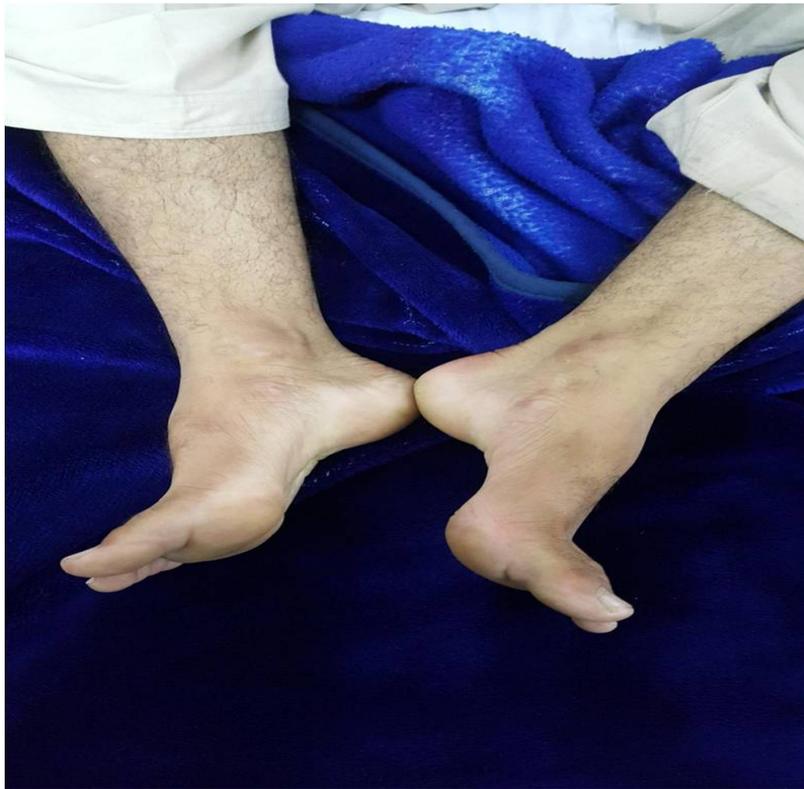
## Discussion

The prevalence of CMT ranges from 10-30/100,000, depending on the region of origin [5,6]. Symptoms usually appear at infancy or early adulthood and include tremors, unsteady gait and deformity of the feet. The patient may have cramps after exercise. Positive sensory alterations are extremely rare. Foot drop can be seen on physical examination. Previous studies have documented that Charcot Marie tooth has a negative impact on life both psychologically and physically [7]. A study shows Ascorbic acid ameliorates neuropathy in CMT-1A mice [8]. This paper shows treating a mouse model of CMT1A with ascorbic acid thus showing the use of Vitamin C in CMT. European multicenter studies are underway to check the use of high doses of ascorbic acid in people suffering from CMT. A trial conducted in Italy and the United Kingdom of 138 adults receiving 1.5-g/d AA compared with 133 adults receiving placebo for 2 years showed no effect of Ascorbic acid on patients with Charcot Marie tooth [9]. This is in concordance to our patient who received high dose Vitamin C and folate but showed no improvement in nerve conduction. It states that high dosages of Vitamin C improved function and increased the numbers of myelinated peripheral nerve axons in mouse models of Charcot Marie tooth [10]. A small Dutch study of 2-g/d AA and an Australian trial of 30-mg/kg/d AA in children showed no change in nerve conduction velocity in Charcot Marie tooth [11, 12]. Hence vitamin C or folate plays no role in treatment of Charcot Marie tooth. Two hypotheses exist that how vitamin C plays role in Charcot Marie tooth disease. In vitro experiments show culture media are deficient of vitamin C; consequently when exogenous vitamin C is given it replenishes the stores and then exerts the biological effects [13,14]. The second one states that upon vitamin C transporters, which are saturable, vitamin C can enter cells both in its reduced as well as oxidized form, ascorbic acid and dehydroascorbate, utilizing sodium-dependent transporters, also necessary for the uptake of vitamin C by the Schwann cells [15] or glucose transporters (GLUT) [16].

## Conclusion

CMT is a heterogeneous disease both clinically and genetically. Clinical and electrophysiological data are insufficient for performing efficient molecular diagnoses of this entity. It is crucial to provide good symptomatic treatment, counseling, effective diagnosis of family members and valid prognosis to decrease morbidity as well as mortality. There's currently no cure for this disease. However treatments can help relieve symptoms, aid mobility and increase quality of life for people with the condition but more studies should be done for finding out the effective treatment for it.

## Figures



**Figure 1**

## References

1. Skre H. (1974) Genetic and clinical aspects of Charcot–Marie–Tooth's disease. *Clin Genet* 6:98–118.
2. Thomas PK, Marques W Jr, Davis M, Sweeney MG, King RH, Bradley JL, Muddle JR, Tyson J, Malcolm S, Harding AE (1997) The phenotypic manifestations of chromosome 17p11.2 duplication. *Brain* 120:465–478.
3. Marques WJ, Freitas MR, Oliveira ASB, Calia L, Melo A, Lucena R, Rocha V, Barreira AA (2005) 17p duplicated Charcot–Marie–Tooth 1A: characteristics of a new population. *J Neurol* 252:972–979.
4. Patzko A, Shy ME (2012) Charcot–Marie–Tooth disease and related genetic neuropathies. *Continuum Lifelong Learning Neurol* 18:39–59.
5. J. Berciano and O. Combarros, Hereditary neuropathies, *Current Opinion in Neurology*, vol. 16, no. 5, pp. 613–622, 2003.
6. AEH Emery, Population frequencies of inherited neuromuscular diseases—a world survey, *Neuromuscular Disorders*, vol. 1, no. 1, pp. 19–29, 1991.
7. Arnold A, Entagardt M, Younger DS (2005) Psychosocial issues that face patients with Charcot–Marie–Tooth disease: the role of genetic counselling. *J Genet Couns* 14:307–318.
8. Passage E, Norreel JC, Noack-Fraissignes P, et al.: Ascorbic acid treatment corrects the phenotype of a mouse model of Charcot-Marie-Tooth disease. *Nat Med* 2004, 10:396–401.
9. Pareyson D, Reilly MM, Schenone A, et al. CMT-TRIAAL Group; CMT-TRAUK Group. Ascorbic acid in Charcot-Marie-Tooth disease type 1A (CMT-TRIAAL and CMTTRAUK): a double-blind randomised trial. *Lancet Neurol*. 2011;10(4):320–328.

10. Passage E, Norreel JC, Noack-Fraissignes P, et al. Ascorbic acid treatment corrects the phenotype of a mouse model of Charcot-Marie-Tooth disease. *Nat Med*. 2004;10(4):396–401.
11. Verhamme C, de Haan RJ, Vermeulen M, Baas F, de Visser M, van Schaik IN. Oral high dose ascorbic acid treatment for one year in young CMT1A patients: a randomised, double-blind, placebo-controlled phase II trial. *BMC Med*. 2009;7:70.
12. Burns J, Ouvrier RA, Yiu EM, et al. Ascorbic acid for Charcot-Marie-Tooth disease type 1A in children: a randomised, double-blind, placebo-controlled, safety and efficacy trial. *Lancet Neurol*. 2009;8(6):537–544.
13. Smith AR, Visioli F, Hagen TM. Vitamin C matters: increased oxidative stress in cultured human aortic endothelial cells without supplemental ascorbic acid. *FASEB Journal*. 2002;16:1102–1104.
14. Halliwell B, Whiteman M. Measuring reactive species and oxidative damage in vivo and in cell culture: how should you do it and what do the results mean? *British Journal of Pharmacology*. 2004;142:231–255.
15. Gess B, Lohmann C, Halfter H, Young P. Sodium-dependent vitamin C transporter 2 (SVCT2) is necessary for the uptake of l-ascorbic acid into Schwann cells. *Glia*. 2010;58:287–299.
16. Michels A.J., Hagen T.M., Frei B. A new twist on an old vitamin: human polymorphisms in the gene encoding the sodium-dependent vitamin C transporter 1. *American Journal of Clinical Nutrition*. 2010;92:271–272.

**Manuscript Information:** Received: August 16, 2017; Accepted: December 06, 2017; Published: December 28, 2017

**Authors Information:** Madeeha Subhan<sup>1\*</sup>; Waleed Sadiq<sup>2</sup>

<sup>1</sup>Department of Medicine, CDA Hospital Islamabad, Pakistan

<sup>2</sup>Department of Medicine, Shifa International Hospital Islamabad, Pakistan

**Citation:** Subhan M, Sadiq W. A case report on charcot marie tooth disease, and the role of vitamin C in this disease. *Open J Clin Med Case Rep*. 2017; 1351.

**Copy right statement:** Content published in the journal follows Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>). © Subhan M 2017

Journal: *Open Journal of Clinical and Medical Case Reports* is an international, open access, peer reviewed Journal focusing exclusively on case reports covering all areas of clinical & medical sciences.

Visit the journal website at [www.jclinmedcasereports.com](http://www.jclinmedcasereports.com)

For reprints and other information, contact editorial office at [info@jclinmedcasereports.com](mailto:info@jclinmedcasereports.com)