

The MOAN (Musculo-Osteo-Arthro-Neuropathic) syndrome

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Abstract

We share the concept of a multisystemic syndrome which affects the muscle, bone, joints and nerves, in varying manners. The MOAN (musculo-osteo-arthro-neuropathic) syndrome highlights the close relationship between these four organ-systems, and their contribution to each other's health and disease. The mnemonic MOAN also underscores the discomfort and pain associated with the condition and encourages health professionals to address these patients in a holistic manner, rather than just addressing one of the components.

Keywords: Arthritis, Diabetes, Type 2 diabetes, Endocrinology, Geriatrics, Neuropathy, Osteoarthritis, Osteoporosis, Peripheral neuropathy, Sarcopenia.

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Introduction

The various components of the musculoskeletal system are intertwined with each other: bones, muscles and joints. The relationship of osteoporosis with muscle strength/ function and joint health, is well known.¹ This is described as the osteo-arthro-muscular system.² Neuropathy, too, can be associated with bone and muscle damage, as in Charcot's osteoarthropathy.³ The brief communication describes the various ways in which MOAN (musculo-osteo-arthro-neuropathic) syndrome presents, and suggests pragmatic ways of approaching this.

Associations

Osteoporosis is associated with sarcopenia and osteoarthritis. Common causative factors such as calcium and vitamin D deficiency, may lead to associated metabolic neuropathy and myopathy.⁴

Sarcopenia, or loss of muscle mass/ strength/ function, can occur as a primary condition. However, it can be

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secondary to other diseases including osteoporosis and arthritis. Chronic underlying disorders (eg hypogonadism, hypopituitarism, hypothyroidism, obesity etc) can cause sarcopenia and could be associated with neuropathy and well.⁵⁻⁹

Arthritis, due to varying etiologies, is known to lead to bone and muscle damage.¹⁰ The symptoms of arthritis overlap those of painful neuropathy, and may mimic those of bone or muscle inflammation.

Neuropathy can limit functionality in various ways. Painful neuropathy may impair capacity to exercise, and thus lead to bone/muscle damage. Charcot's arthropathy is a well-known syndrome of bone and joint damage that occurs due to primary nerve disease.³

Common environmental exposures may also influence the development of MOAN syndrome. This is especially true in tropical countries.⁹

Evolving Importance

While these associations have been described individually, the MOAN syndrome needs to be addressed as a single entity. Common etiologic and risk factors, overlapping symptoms and signs, mutual worsening of disease, and need for comprehensive care; all these support a unified approach to MOAN. This is in concordance with the multi-morbidity approach that has been applied to several non-communicable diseases.¹¹

Pragmatic Suggestions

- All people presenting with any component of MOAN should be screened at first visit for presence of the other components
- All patients with MOAN should be monitored at regular intervals for all the 4 components
- Those with refractoriness of any component of MOAN should be investigated for presence of other components
- Therapeutic strategies for any component of MOAN should aim to optimize all components of the syndrome
- Preventive and promotive health strategies should incorporate activities to target all components of MOAN
- The MOAN syndrome should be addressed in health care delivery as a multimorbidity model of health system.

Summary

Inline with the multimorbidity systems approach for many chronic disorders, it has increasingly been recognized that the same individual may be suffering from multiple symptomatically distinct but interrelated diseases. We propose the use of MOAN syndrome, to address the complex interplay of Muscle, Bone, Joint and Nerve disorders. This will enable a more comprehensive screening, evaluation and management of these diseases.

References

1. Alonso Pérez JL, Martín Pérez S, Battaglino A, Villafañe JH, Alonso-Sal A, Sánchez Romero EA. An Up-Date of the Muscle Strengthening Exercise Effectiveness in Postmenopausal Women with Osteoporosis: A Qualitative Systematic Review. *J. Clin. Med.* 2021; 10:2229.
2. 7th World Congress on Controversies, Debates & Consensus in Bone, Muscle & Joint Diseases (BMJD), Taipei, Taiwan, 17-19 October 2019. *Int. J. Rheum. Dis.* 2019; 22 Suppl 4:3-30.
3. Mascarenhas JV, Jude EB. The Charcot foot as a complication of diabetic neuropathy. *Curr. Diab. Rep.* 2014; 14:561.
4. Rawat KJ, Sabnis NH, Saraf U, Surana G. Myopathy: Effect of Vitamin D Deficiency Beyond Bones. *J Assoc Physicians India* 2016; 64:86-7.
5. Oh TJ, Song Y, Moon JH, Choi SH, Jang HC. Diabetic Peripheral Neuropathy as a Risk Factor for Sarcopenia. *Ann Geriatr Med Res.* 2019; 23:170-5.
6. Kalra S, Kapoor N, Bhattacharya S, Aydin H, Coetzee A. Barocrinology: The Endocrinology of Obesity from Bench to Bedside. *Med. Sci.(Basel)* 2020; 8:51.
7. Kalra S, Kalhan A, Dhingra A, Kapoor N. Management of late-onset hypogonadism: person-centred thresholds, targets, techniques and tools. *J R Coll Physicians Edinb.* 2021; 51:79-84.
8. Kapoor N. Thin Fat Obesity: The Tropical Phenotype of Obesity. In: Feingold KR, Anawalt B, Boyce A, Chrousos G, de Herder WW, Dungan K, et al., editors. *Endotext*. South Dartmouth (MA): MDText.com, Inc. Copyright © 2000-2021, MDText.com, Inc.; 2000.
9. Kalra S, Kapoor N. Environmental Endocrinology: An Expanding Horizon. In: Feingold KR, Anawalt B, Boyce A, Chrousos G, de Herder WW, Dungan K, et al., editors. *Endotext*. South Dartmouth (MA): MDText.com, Inc. Copyright © 2000-2021, MDText.com, Inc.; 2000.
10. Tanaka Y. Managing Osteoporosis and Joint Damage in Patients with Rheumatoid Arthritis: An Overview. *J. Clin. Med.* 2021;10.1241-1253
11. Prathapan S, Fernando GVMC, Matthias AT, Charuni YBMA, Abeygunawardhana HMG, Somathilake BGGK. The rising complexity and burden of multimorbidity in a middle-income country. *PLoS one.* 2020; 15(12):e0243614.