GAVIN PUBLISHERS

Journal of Neurology and Experimental Neural Science

Ghosh TK, et al. J Neurol Exp Neural Sci 2016: JNENS-113.

Review Article

DOI: 10.29011/JNNS-113. 100013

Muscle Wasting

Dr Tarit Kanti Ghosh

The University of Melbourne, Australia.

*Corresponding author: Dr Tarit Kanti Ghosh, MBBS,MSc in Internal Medicine and Neurology (England), Fellow, Clinical Neurology, UCL (UK), Masters (9th grade in Australia), Specialist, Research Clinical Neuroscience, The University of Melbourne, Australia. E-mail: tarit12_7@yahoo.com.

Citation: Ghosh TK (2016) Muscle Wasting. J Neurol Exp Neural Sci 2016: JNENS-113. DOI: 10.29011/JNNS-113. 100013

Received Date: 22 November, 2016; **Accepted Date:** 23 December, 2016; **Published Date:** 30 December, 2016

Abstract

The loss of muscles either completely or partially is known as muscle wasting. This is also known as muscle atrophy. Muscle wasting is very familiar with various other stages of the diseases and common factors that cause the weaknesses in accordance with the related diseases such as inactivity, burns, heart failures, disuse, cancer, denervation, cachexia and dystrophies in muscles. Muscles are maintained by the proper increasing and decreasing levels of proteins. Clearer views and details have been evolving about various pathways of molecules as well as the expanse of the ways that participates in the analyzing of different types of disorders that are related to wasting away of muscles. Lack of exercising also leads to muscle atrophy in many people. Some certain signs and symptoms are there that helps a layman to identify muscle atrophy in him or her and others such as flabby muscles, weak limbs, stooped posture and longer period of inactiveness. Muscle wasting or atrophy decreases the quality of life of the person who is suffering from it. The main reasons behind people getting into this disease is the weightlessness and unable to move muscles and also few incurable dangerous diseases that one inherits. If muscle wasting is not chronic or not found in aged people then it tends to be curing. Doctors suggest few important health tests and put emphasis on knowing the patients history for better supervision and prescribe the medicines accordingly. The treatment of the disease may seem easy but it is time consuming. Patients may get cured by therapies and exercises along with some medications.

Background: In the present era, muscle wasting or muscle atrophy is a common disorder and disease among the people of the world. It results from many illnesses, such as, cancer, congestive heart failure, chronic obstructive pulmonary diseases, severe burns and AIDS. One main reason of muscle atrophy or muscle wasting is starvation. There is huge rise in the number of people now days who are suffering from muscle atrophy or muscle wasting because of their habit and a daily routine structure. This disease occurs to various ages of people like in teenagers, adult, and elderly people and is not restricted to just a specific ages of people (Bloch, 2016).

Summary of the study

This study is done by the research to get a clear view and conception about muscle wasting which is a familiar disease in the present time among all the ages of people. The researcher has done various researches to study in dept about muscle atrophy or muscle wasting. A proper definition about muscle wasting along with its symptoms has been studied by the researcher to give an impact on the specific study. Various diagnostics and treatment is required in treating muscle wasting which has also been studied by the researcher. At the end of the study and the research, the researcher has given a proposal to conclude the whole study and to create a critical vision about the article and the research (Ebneret al. 2015).

What is muscle wasting?

Muscle wasting can also be termed as muscle atrophy which is explained as the loss of muscle mass. These muscles can either waste completely or partially which is basically experienced when a person suffers from temporary disabling situations such as movement restriction or someone has been hospitalized and confined to bed. Muscle wasting leads to weakness in muscle as because the exertion of force is related to mass (Jurdana, 2009). According

to modern medicine's understanding, muscle wasting quick onset can be eliminated if the hospitalized patients can be taken out of the bed and make them active as quickly as possible, inspite of having wounds, fractured bones, pains, and sutures. Muscle wasting is mainly caused because of co-morbidity of several other diseases such as AIDS, cancer, heart failures, renal failures, severe burns, chronic obstructive pulmonary disease (COPD) and cancer. Patients suffering from cachexia as a setting of this disease have a poor prognosis. Muscle wasting or muscle atrophy also causes because of starvation. When a muscle remains unused even for a few days, immobilization occurs in the muscle tissues which results in disuse of muscles which mainly happen when a primary injury occurs such as immobilized broken bones (Lynch, 2011). Muscle atrophy is also known as neurogenic atrophy which occurs by the damaging of nerves that stimulates the muscles that causes a shriveling around the limbs has a similar effect. Living in an environment or atmosphere where exercising is not in practice also causes atrophy. It partly occurs because of least quality of working is required for the movement but not doing exercises fails to maintain the muscle posture. A patient with a broken leg joint undergoes a month of plaster can cause the decrease in the amount of mass in the back as well as the buttocks and also decreases the strength of the muscles. The particular patient faces difficulty in sitting without support and faces pain and burning after it goes to exposing for more or less ten minutes at the time of recovery when such positioning is strained (Moylan and Reid, 2007).

Mechanism

Muscle wasting takes place when there comes a change in the regular balance of the composition and destruction of the normal protein level. During muscle wasting, there seems a decrease in pathways of the composition and degradation of protein. The decrease of the protein is responsible for the loss in the muscle that is undergoing atrophy which is dependent of Adenosine triphosphate (ATP) of ubiquitin or proteasome pathway (Mielcarek and Isalan, 2015). In this process, some proteins are aimed at the destruction of tying up somewhat a copy of four peptide, which is known as ubiquitin onto a protein substrate. It is when the poly-ubiquinated protein substrate that it aims on the destruction by proteasome. In between the pathway of proteasome as well as ubiquitine, particular enzymes that gives way to ubiquitination which is substituted to several proteins but not all. Particularity is obtained in this regard by joining the E3 ubiquitine with that of the focused protein supplement in which every ligase ties up with a specific collection of substrates that leads to ubiquitination (Tisdale, 2007).

Signs and symptoms

Muscle atrophy normally occurs because of weak and flabby muscles which are characterized by the non-utilization of the muscles. The signs and symptoms of muscle wasting or muscle atrophy are easy to spot in oneself and others as well. Non exercising muscles become weak and are prone to atrophy. The signs and symptoms of neurogenic muscle atrophy are bit difficult to identify quickly for the layperson. Postural muscle weakness is one of the important symptoms which are enlisted in medical dictionaries (Assiset al. 2015). Postural muscles are also known as antigravity muscles which helps a person to stand erect. Stooped posture is one of the first signs of neurogenic muscle atrophy or muscle wasting. There are other symptoms as well that includes pain in the back, problem in walking, contractures in ham string ,failure of heart, Achilles tendon contractures, a rigid spine and motion of the neck in a limited range. The heart is a muscle and it is also mostly prone to fail (Jurdana, 2009). Some other symptoms of muscle atrophy are as follows:

- In case the either of the legs or arms appear smaller in comparison to the other, then the person can be prone to muscle atrophy.
- Marking weakness in one limb is also a symptom of muscle atrophy or muscle wasting.
- Physically inactiveness for a very long period of time also results in muscle wasting or atrophy.

Muscular atrophy or wasting decreases the quality of life of the sufferer and he or she becomes unable to perform certain tasks and works which enhances and increases the possibilities of facing an accident in the way of trying to walk and other such activities. Wasting of muscles also enhances the possibility that in some cases like body myositis, muscle wasting, etc. the elderly persons are more attacked (Sahebjamee, 2012).

Reasons of Muscle Wasting

Inactivity can lead to the wasting away of the not in use muscles in the body. After this starts occurring, it can be controlled by regular exercise and well maintained diet. Muscle wasting can occur due to various severe medical conditions or if the person is bedridden. For example, astronauts, even they can also experience the wasting of muscles due to weightlessness. Various reasons of muscle wasting are also listed below:

- Lacking or no such physical movements for over an extended period of time.
- Increasing age
- Alcohol-associated myopathy is caused by over drinking. It causes pain and extreme weakness in the mass of the muscles.
- Wounds, such as a torn rotator cuff or fractured bones

- Unhygienic diet.
- Backbone or peripheral nerve wounds.
- Heart attack
- Long-term corticosteroid therapy

Another important aspect of muscle wasting is the severe long term diseases that makes motion problematic (Tintignacet al. 2015). These are:

- Amyotrophic lateral sclerosis (ALS), commonly known with the name of Lou Gehrig's disease, this attacks the nervous system and the nerve cells that are responsible for voluntary motions of the muscles..
- Dermatomyositis causes mass weakness and skin rash
- Guillain-Barre syndrome, this causes the swelling of the nerves as well as weajness of the muscles.
- Multiple sclerosis, it is a disease that helps cures itself, in which the body destroys the protective coverings of nerves.
- Muscular dystrophy, this disease is responsible for the weaknesses in the muscles.
- Neuropathy, it damages a particular group of nerve that causes in sensation loss as well as loss of the functioning of the body.
- Osteoarthritis affects the joints and reduces the movements.
- Polio, affects the tissues that ultimately results in paralysis.
- Polymyositis is a swelling disease.
- Rheumatoid arthritis, a chronic inflammatory illness that affects the joints.
- Spinal muscular atrophy, this illness causes the wastage of the muscles in the person's arm or leg.

The most affected persons are those who are bed ridden and have office works of continuously sitting jobs and have some health issues that results in the decreased movements or the lesser amount of activity practiced or the people having some brain related illness (Hickey, 2009).

Diagnosisof Muscle wasting

The increase in the diagnostic criteria for muscle atrophy in elder people is no significant as the muscles automatically start decreasing with the increase in age. The decreasing amount of muscles backbone muscles depends on the increasing age and it can progress accordingly (Ebneret al. 2015).

The doctor shall ask about the complete medical history, or recent injuries and previously diagnosed medical conditions. He should have complete knowledge about what medications and supplements the patient is taking for his treatments. The doctor has to learn about your physical problems and certain symptoms that your body is facing. The doctor may prescribe few important and vital tests for helping in the diagnosis process as well as to get rid of certain illnesses. There are specific tests that are needed to regulate these diseases, like X-rays, CT scans, several important blood tests, MRI, EMG, muscle biopsy, and studies related to nerve retreatment.

On the basis of such tests, the doctor may suggest the patient to a specialist (Fearonet al. 2011). The process of CT scan can differentiate between the various other tissues from that of the muscle tissues hence can count the exact amount of mass tissue in the body. The loss of fat in the muscles can result from the count of urea in the urine. Moreover, 1 gram of nitrogen is equal to that of 6 grams of protein, and loosing 1 gram of protein is equal to the loosing of 4 grams of muscle tissues. Therefore, the loosing of the muscles is amounting from that of the excessive flow of urea in the urine.

Due to the increase in age, the muscle tissue deceased and the functioning of muscles start malfunctioning. This disease is known as "sarcopenia". In context of the normal degradation of the muscles or due to aging, this can be the cause of other diseases that may be developing due to the swelling reactions of the body and the muscles (John and Larner, 2015).

Treatments of Muscle Wasting

The patient of muscle wasting will be treated on the basis of his reports and diagnosis and the amount of muscle loss he has faced till the date. The usually used treatments for recovering from these diseases are severe surgery, exercises, physiotherapies, nutritious diet and ultrasound therapy.

Recommended therapies might include water exercises to help make movement easier. Physiotherapists are able to show the exact and proper way of physical workout and exercises. A therapist can also help in the movement of the limbs of the person and slowly make it flexible.

The therapy of ultrasound is the process by which waves of electronic sounds are used to help in healing. This therapy is necessary only if the muscles are too stiff and are not moveable (Pietrangelo, 2016). This stiffness of the muscles is known as contracture deformity.

With the help of the surgery we can cure the contracture deformity of the muscle wasting if it is caused by non-nutritional diet. And a tendon may cause muscle atrophy, but surgery may also be able to correct it.

The welcoming of the physical exercises for at least thirty minutes a day can reduce the wasting of muscles. The workouts may be like swimming, jogging, walking and other exercises.

HMB, is a dietary supplement that has proved itself to be the most effective preventive for the muscle wasting in several situations in human and is called as sacropenia (Rüegg and Glass, 2011). The testing of HMB has proved to be the best treatment for the developing disease of muscle wasting and increasing in muscle strengths in hyper catabolic diseases conditions like cancer cachexia; in accordance to that of June 2016, doctors prescribe the use of HMB as a dietary product and regular exercise as well as a well maintained protein diet. This use of HMB in prescribed as the best resulting supplement in conserving the muscle tissues in the adults. Several other studies are required to answer the requirements of the use of HMB in restoring the strength and muscle functioning of adults.

Studies denotes that the muscle atrophy is caused by the lesser amount of amino-acids, therefore, the amino-acid therapy results to be very helpful in recovering the wasted tissue of muscles (von Haehlinget al. 2015). The branched-chain amino acids or BCAA are critical to this process.

In examining the most extreme cases of muscle wasting, the using of a very high designated steroid like that of methandrostenolone is regarded as a useful treatment. A very important section of medicine known as SARM is being investigated with promising results (Waning et al. 2016). This may have few or no side effects and helps in building the muscle and bone strength and tissues. These results are still required to be assured in bigger experiments.

The use of the functional electrical stimulator to increase the functioning of the muscles can also help in the reduction of the muscle wasting. This procedure of treatment has been successful in the recovery of the paraplegic patients.

Conclusion

Muscle wasting has become of the most occurring diseases in today's world. There have been many therapies and exercises that have been introduced to reduce the occurring of this disease. This is curable if it is not severe and even if it is severe in its stages it can be controlled but not stopped. It is a progressing disease that mainly occurs in the aged people and mostly in people above 25 years of age. There has been many technical and highly ethical introductions of various medicines and drugs as well as other medical supplements that helps in the controlling of the muscle wasting. This needs more study and more research on the exact causes of the disease. The effective therapies and exercises must be practiced in order to regain strength and muscle building tissues. If it is not chronic this is curable.

References

1. Assis, E, Gavioli, F, Ribeiro, F, Correa C, Caetano V (2015) Association between signs and symptoms subclinical of stress, fatigue and muscle pain in workers of garment industry.Physiotherapy, 101: 94-95.
2. Bloch W (2016) Tumour muscle crosstalk more as regulation of muscle wasting - role of exercise. ActaPhysiol (Oxf) .
3. Ebner, N, Sliziuk V, Scherbakov N, Sandek A (2015) Muscle wasting in ageing and chronic illness. ESC Heart Failure 2: 58-68.
4. Jurdana M (2009) Cancer cachexia-anorexia syndrome and skeletal muscle wasting. Radiology and Oncology 43(2).
5. Lynch G. (2011) Sarcopenia- age-related muscle wasting and weakness. Dordrecht: Springer Science+Business Media B.V.
6. Mielcarek M, Isalan M (2015) A shared mechanism of muscle wasting in cancer and Huntington's disease. ClinTransl Med 4: 34.
7. Moylan JS, Reid MB (2007) Oxidative stress, chronic disease, and muscle wasting. Muscle Nerve 35: 411-429.
8. Rennie M (2008) Muscle Wasting in the Muscular Dystrophies. Developmental Medicine & Child Neurology 27: 524-527.
9. Sahebjamee M (2012) Poster 95: Effect of Progressive Muscle Relaxation Therapy on Improving Signs and Symptoms of Patients With-Myofacial Pain Dysfunction Syndrome. Journal of Oral and Maxillofacial Surgery70: e100.
10. Tisdale M (2007) Is there a common mechanism linking muscle wasting in various disease types?.Current Opinion in Supportive and Palliative Care 1: 287-292.
11. Ebner N, Sliziuk V, Scherbakov N, Sandek A (2015) Muscle wasting in ageing and chronic illness. ESC Heart Failure 2: 58-68.
12. Fearon K, Evans WJ, Anker SD (2011) Myopenia-a new universal term for muscle wasting. J Cachexia Sarcopenia Muscle 2: 1-3.
13. John L and Larner A. (2015) Muscle wasting, bone pain and cognitive decline: a unifying diagnosis.British Journal of Hospital Medicine 76: 602-603.
14. Nunes T, Isabel LF, Machado XR (2012) mechanism in muscle wasting in sarcopenia. [online] p.251. Available at: http://www.scielo.br/pdf/rbr/v52n2/en_v52n2a09.pdf [Accessed 3 Oct. 2016].
15. Pietrangelo A (2016) Muscle Atrophy: Causes, Symptoms, and Diagnosis. [online] Healthline.com. Available at: http://www.healthline.com/symptom/muscle-wasting [Accessed 3 Oct. 2016].
16. Hickey J (2009) The clinical practice of neurological and neurosurgical nursing. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.
17. Rüegg M and Glass D (2011). Molecular Mechanisms and Treatment Options for Muscle Wasting Diseases. Annu. Rev. Pharmacol. Toxicol., 51: 373-395.
18. Tintignac L, Brenner H, Rüegg M (2015) Mechanisms Regulating Neuromuscular Junction Development and Function and Causes of Muscle Wasting. Physiol Rev 95: 809-852.
19. vonHaehling S and Springer J (2015) Treatment of Muscle Wasting: An Overview of Promising Treatment Targets. Journal of the American Medical Directors Association 16: 1014-1019.
20. Waning et al. Bone factors implicated in cancer-related muscle wasting. (2016). IBMS BoneKEy, 13, p.786.