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Pharmacological Treatment of Arterial Hypertension with the Viscometer as a Measurement Parameter

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Abstract Based on the knowledge of the cause of essential arterial hypertension, a measurable parameter blood viscosity that guides the ideal pharmacological treatment of this disease. Five pharmalogical groups are presented whose mechanism of action corresponds to what occurs in the artery when blood pressure increases. An example of how to treat a hypertensive crisis with the help of a blood micro viscometer is detailed, as a measuring instrument to specify that medications to be used, and some considerations to take into account in the treatment, opening the door to future research aimed at defining the pharmacological treatment.

Keywords arterial hypertension, hypertensive urgency, viscometer, pharmacotherapy

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Introduction

In 2011, an article was published, where the cause of primary arterial hypertension was exposed and the way in which certain antihypertensive drugs act at the level of the arteries was explained.[1]

For the treatment of arterial hypertension there are several pharmacological groups. The most widely used today are diuretics; converting enzyme inhibitors (IECA); anticalcium drugs; angiotensin receptor blockers (ARA II) and beta blockers. In the guidelines for the drug treatment of hypertension of the Working Group of the European Society of Cardiology and the European Society of Hypertension, these pharmacological groups are recommended based on evidence demonstrated in several studies and confirmed by metaanalisis.[2]

The choice of a certain type of drug should be individualized for each patient and will be based on the existence of associated clinical disorders, other risk factors or concomitant diseases.[3,4]

Guidance, based on evidence review and expert opinion containing recommendations, appears in the appointed panel members report to the Eight Joint National Committee (JNC 8).[5]

Blood viscosity has long served as an indicator for understanding and treating the condition; and the advent of modern viscometers has made it possible to measure them with ever-increasing clinical convenience. Understanding blood flow and its relationship to cellular properties and interactions can lead to considerable advances in biomedical applications.[6]

Isaac Newton (1642-1727) first described fluid viscosity in his Mathematical Principles of Natural Philosophy (1687) and classified liquids into Newtonian and non-newtonian. Blood is a non-newtonian liquid, given its laminar flow.[7] In 1884 Jean Leonard Marie Poiseuille created Poiseuilles Law, which is strictly valid for laminar flow.[8]

Discussion

To know the ideal pharmacological treatment in order to face high blood pressure, it is necessary to specify exactly what happens in the artery when blood pressure figures are high. This can occur for two reasons, namely, either due to an increase in blood viscosity, or due to a decrease in the elasticity of the arterial walls.[1] To achieve this precision, the viscometer can be used.

Blood viscosity is a key indicator for treating certain diseases. In clinical practice it is determined by viscometers. Today there are different types of viscometers for various applications serving various application purposes.

In 2015 Nadim Morhell develop in his Doctoral Thesis a blood microviscometer similar to glucose meters in diabetics, which will be used in Argentina for the diagnosis and monitoring of blood hyperviscosity related to neonatal polycythemia.[9]

Beta-blocker drugs and anti-calcium drugs increase the elasticity of the arterial wall, while diuretics, IECA inhibitors and ARA II decrease blood viscosity.[1]

Until now, it has not been possible to measure the elasticity of the arterial wall when someone has hypertensive crises. To deal with this situation, it is suggested for the time being that, after questioning, examining the patient and deciding on a specific treatment, the aforementioned blood viscosity test (microviscometer) be performed.

In a hypertensive urgency, if the viscosity is high, a 25-miligrams Captopril sublingual tablet (IECA) should be indicated. In cases of normal viscosity, a sublingual tablet of Nifedipine (anti-calcium) of 10 milligrams should be indicated. With this, the disappearance of clinical symptoms and the normalization of blood pressure figures can be expected.

Patients, who are diagnosed with the disease for the first time, must undergo a blood viscosity test, to specify which medication to indicate. In those previously diagnosed as hypertensive and who already have their treatment, it will be necessary to specify whether their hypertension is due to increased blood viscosity or decreased elasticity of the arterial wall.

Another important aspect to point out is that IECA inhibitors and ARA II should not be prescribed together in people over 60 years of age, because they reduce the blood flow to the organs and, therefore reduce their size and accelerate the aging process.[10]

On the other hand, in patients with treatment based on diuretics, IECA inhibitors or ARA II (which should be used in cases of increased blood viscosity), there is a possibility that is within normal parameters and cannot be know exactly if this is explained by virtue of the treatment, since the elasticity of the arterial wall has not been measured.

Likewise, it is also possible that certain patients consume two medications; one to decrease blood viscosity and another to increase the elasticity of the arterial wall.

With the above arguments, it is about opening doors to future research, aimed at seeing how the drug treatment of arterial hypertension is outlined.

General Considerations.

It is likely that in hypertensive patients over 50 years of age, the etiology of their primary condition is due to a decrease in the elasticity of the arterial wall, since the atherosclerotic plaque affects the middle layer of the artery made up of fibers, with its growth and produces structural damage, with the consequent damage to its functions.[1]

The increase in pressure, which is the functional damage of the artery, can also have its origin in the increase in blood viscosity.

Everything that is measurable is valid and reliable. Hence the importance of the use of measuring instruments. The viscometer, to determine whether high blood pressure is a consequence of blood viscosity, is a faithful example of this.

An instrument to measure the level of elasticity of the arterial wall is still awaited.

It is important to specify the clinical symptoms of the patient, in order to confirm the location of the affected arteries. For example, if the patient has only headache, this means that the affected arteries are located in the brain; if he has only chest pain, the affected arteries are in the heart; if the pain is only in the lumbar fossa, the affected arteries are the interlobar and arcuate. When there is more than one clinical symptom, it is necessary to know how to interpret it, before performing the physical examination to complete the clinical procedure.

A subsequent step would be to rule out secondary hypertension and guide complementary tests in attention to the affected arteries; perform an electrocardiogram and echocardiogram, to pinpoint possible structural damage to the heart and perform any other tests that may be necessary for each particular patient.

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References

Espinosa Álvarez RF, Montero García JL. El exceso de calcio como causa de aterosclerosisy de la hipertensión arterial primaria. Rev Cont Quim 2011;6(4):14-15.

Williams B, Mancia G, Spiering W, M et al. Guidelines for the management of arterial hyper-tension. The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). Eur Heart J 2018; 39(33):3021-3104.

Gorostidi Pérez M, Marin Iranzu R. Cuán debe iniciarse el tratamiento antihipertensivo y hasta qué niveles debe disminuirse la presión arterial sistólica. Nefroplus 2009;2(2):55-57.

Pérez Caballero MD. Guía para diagnóstico y tratamiento de la hipertensión arterial en el siglo XXI. Rev Cubana Med 2013;52(4):286-294.

James PA, Oparil S, Carretero BL et al. Evidence-Based Guidance for the management of high blood pressure in adults. Report of the panel members appointed of the Eight Joint National Committees (JNC 8). JAMA 2014;311(5):507-520.

James Fedosov B, DA, Wenxiano P. Caswell B, Coppery G, Karniadakis GE, Predicting human blood viscosity in silico. PNAS Early Edition 5;2010. Disponible en: http://www.pnas.org/content/108/29/11772

Hamilton G, Disharoon Z, Sanabria H. Revisiting viscosity from macroscopic to manoscale regimes. Rev Mex Fis 2018:64(2). Disponible en: http//www.scielo.org.mxselo.php?script=sci_attext&pid=S1870-35422018000200222

Sonco Suture RF. Relación del flujo presión sanguínea y resistencia vascular en la circulación sistémica. Monografía técnica para optar por el título de Licenciado en Física. Lima: Universidad Nacional Mayor de San Marcos. Facultad de Ciencias Físicas; 2009.

Morhell N. Viscosímetro digital para precisar la viscosidad sanguínea en la policitemia vera. Tesis Doctoral, 2015. Disponible en: http://patgonianorte.concet.gov.ar/tres-cientificos-argentinos-del -balseiro-a-la-singularity-university/

Espinosa Álvarez RF, Montero Garcia JL. About two basic causes of human aging. J Agriculture Life Sci 2022;9(1):29-31