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SHORT COMMUNICATION

Historical perspective: visceral obesity and related comorbidity in Joannes Baptista Morgagni's 'De Sedibus et Causis Morborum per Anatomen Indagata'

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In recent years, advances in epidemiological approaches and laboratory technology, along with the availability of sophisticated imaging methods to evaluate body fat distribution, made it possible to define the close correlation between visceral fat accumulation and the occurrence of metabolic abnormalities, cardiovascular diseases and respiratory disturbances in obese patients. Some 250 y ago, JB Morgagni with the help of only a knife for anatomical dissection, an acute mind, and an observational skillfulness was able to identify the intra-abdominal and mediastinal fat accumulation in android obesity. He clearly described the association between visceral obesity, hypertension, hyperuricemia, atherosclerosis and obstructive sleep apnea syndrome, long before the modern recognition of this syndrome.
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Introduction

In the 18th century, JB Morgagni introduced the mechanistic concept in human physiology and pathology.[1] According to Morgagni, health was the result of a vital harmony resulting from a well-balanced function of the various organs. Thus, any disease was the result of specific damage of tissues. This organic interpretation of human pathology is still largely accepted in the contemporary scientific approach to the disease.

The strength of Morgagni's philosophy was his rigorous observational approach through macroscopic anatomy in a successful attempt to relate the anatomical findings to the clinical presentation of the diseases. The ponderous publication, '*De Sedibus et Causis Morborum per Anatomen Indagata*' (*The seats and causes of diseases investigated by anatomy*), identified JB Morgagni as an international scientist. *De Sedibus* consisted of five books (*libri*), each of them dedicated to five different foreign scientific academies. *De Sedibus* was a collection of anatomo-clinical records, in the form of medical letters ('*epistola anatomo clinica*'). In two of these letters, Morgagni specifically reported on the association between obesity and other pathological findings, describing also the visceral accumulation of fat.

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Morgagni's anatomo-clinical records

The '*Epistola anatomo clinica XXI*' *liber primus* [1] deals with a 74-year-old female patient who died from an ictal event with severe obesity and android aspect (*valde obesa et virili aspectu*). The abdomen is described as prominent and filled by a large amount of fat. Fat accumulation is reported in the intra-abdominal spaces and at the mediastinal level, with the diaphragm raised in the thorax in the supine position (*Sternum sublatum spatii tamen non modicam cor occupabat propter pinguedinem magnum hinc in thorace ea copia apparuit ut mediastinum operiret inde in ventre quanta esset ex eo licebat intelligere, quod diaphragma altius in thoracem compulsum supini cubent*).

In the '*Epistola anatomo clinica IV*' *liber primus,*[1] the clinical history of a patient named Valerius Zanius is reported. Zanius is described as a very corpulent flabby man, with a short and large neck and a reddish face, devoted to literary studies, sedentary life-style and abundant meals, 'as it is

convenient for a noble person' (*habitu corporis obeso, carnibus mollibus, collo toroso et brevi, facies valde rubente, vitae sedentariae et assiduis litterarum studiis, in lauta, victus ratione deditus ut nobiles viri solent*). At 40 y of age, Zanius started developing bladder stones of pink-orange color, which he passed with the urine. At 61 y, Zanius started complaining of headache and feeling sleepy (*Cum annum ageret sexagesimum primum … dolores vexare coeperunt caput gravantes et sensus hebetudo*). At 63 y, in the autumn, the feet became edematous and he was later found without the use of speech and with the right side of the body almost unmovable. (*Autumno adveniente oedemato pedes intumuerunt … et sine loquela inventus est, partem autem dextera fere immobili*). Few days later Zanius died. At necropsy, stones were found in the bladder (*ventre aperto … sana vescica inventur, quamquam lapidem continebat)*. The lungs were reddish, the heart enlarged and the carotid and vertebral arteries showed in their walls several bodies of cartilaginous or bony consistency (*Torace recluso, pulmones rubebant et cor magnum reperti sunt … Arteriae denique tum carotides tum vertebrales in tunica ubique corpusula ostendebant pleraque ad cartilagineum, aliqua ad osseam accedebant).*

Discussion

Morgagni's approach to human diseases focused on mechanistic concepts of the human body. The basis of this approach was macroscopic observation of anatomical deterioration of the organs in a search for anatomical–clinical correlates. This philosophy is clearly summarized in the title of his publication, *De Sedibus et Causis Morborum per Anatomen indagatis* (*the seats and causes of diseases investigated by anatomy*).[1]

In the two letters reported here, his powerful clinical analytical ability is evident. The clinical implications of visceral obesity, also defined as android obesity, was identified 200 y later by John Vague. ([2–4]) Since then, a large body of observations have been published, confirming the association between visceral obesity and metabolic abnormalities, and in turn predicting the increased risk of cardiovascular diseases, namely heart failure and stroke. ([5–9]) The first case report (*Epistola anatomo clinica XXI*) is mainly devoted to an anatomical description of the patient, rather than to the clinical correlates: the abdominal prominence, now quantified by the waist circumference, the diaphragm raised into the thorax, the mediastinal occupation by fat and the masculine aspect of the patient fully depicts the visceral type of obesity. Similarly, the correlation reported by JB Morgagni between the size of the intra-abdominal and the mediastinal fat depots has now been validated by statistical analyses. Obviously, in the 18th century computed tomography and regression analysis were not known!

In the second case-report (*Epistola anatomo clinica IV*), four aspects of visceral obesity are identified. The frequent complaint of headache, heart failure and enlargement, pulmonary edema and stroke strongly suggest arterial hypertension. The lesions described in the carotid and vertebral arteries are consistent with atherosclerotic vascular disease, possibly related to dyslipidemia. The diurnal sleepiness, the red face and the short and large neck [10] are quite consistent with obstructive sleep apnea syndrome. Finally, the occurrence of renal stones could be related to hyperuricemia.

In conclusion, despite the fact that blood chemistry and computed tomography were not available in the 18th century, the anatomical and clinical records written by JB Morgagni seem to be an '*ante litteram*' description of visceral obesity and related comorbidity.

Acknowledgements

This paper is devoted to Professor Jean Vague, who first drew our attention to the Morgagni's *epistolae anatomo-clinicae* dealing with visceral obesity.

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