Editorial

How to assess the glomerular filtration rate in the obese patient

Cómo evaluar el filtrado glomerular en el paciente obeso

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Obesity, defined as a body mass index > 30, represents one of the main health problems of modern societies, not only because this condition damages health, but also due to its strong association with important comorbidities, such as high blood pressure, diabetes mellitus, heart disease, chronic nephropathy and cancer.[1-3]

The correct evaluation of the glomerular filtration rate becomes necessary in this population, not only because of its association with chronic kidney disease, but also because of the need for dose adjustment in view of the prescription of various drugs, such as oral glucose lowering drugs and chemotherapeutic agents, among others.[4] However, the marked discrepancy between the actual weight and the theoretical weight of obese patients, as well as the sarcopenia they usually suffer, make that both the measurement (creatinine clearance) and the estimation (equations) of the glomerular filtration rate based on serum creatinine are strongly biased.[4,5] So, based on current evidence, the following recommendations can be given regarding the most appropriate way to determine the glomerular filtration rate in the obese patient:[4-9]

- Measurement of the glomerular filtrate: given that creatinine comes from creatine from muscle mass, which is decreased in the obese patient, the most reliable measurements of the glomerular filtrate are those not based on serum creatinine, such as those obtained by "gold standard" procedures (iothalamate, iohexol, EDTA). In addition, the measurements of the absolute glomerular filtration are more reliable than those adjusted to body surface, height, or extracellular fluid in the obese patient, since such adjustment leads to a significant underestimation bias.

- Estimation of glomerular filtration rate (equations): for the reason mentioned above, in obese individuals, the classic equations based on serum creatinine are less reliable than those based on serum cystatin C, of which CKD-EPI based on cystatin C stands out. Nevertheless, in the case that only the classic serum creatinine-based equations can be used, one way to optimize them, that is, to partially reduce their biases, is in the case of the Cockcroft-Gault creatinine clearance equation, to use for its calculation the lean weight instead of the theoretical or actual weight. (Table 1)

In the case of the MDRD and CKD-EPI equations based on serum creatinine, performing their deindexation, since the calculation carried out according to the standard equation includes such indexation. (Table 1)

However, there are two equations based on serum creatinine that have been validated in obese population, so they must be taken into account:[10,11] (Table 1)

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Table 1. Glomerular filtration rate equations based on creatinine (and complementary) applicable in obese people.

Cockcroft-Gault equation (lean weight)	**CrCl** = (140-age x lean body weight) / SCr x 72
Lean weight equation (Kg)	**Lean weight (male)** = (9270 x weight) /(6680+216 x BMI) **Lean weight (woman)** = 9270 x weight) /(8780+244 x BMI)
Body mass index (BMI)	**BMI** = weight [kg]/height [m²]
MDRD – (creatinine) deindexed (MDRDd)	**MDRDd** = MDRD x BSA of the patient /1.73
CKD-EPI (creatinine) – deindexed (CKD-EPId)	**CKD-EPId** = CKD-EPI x BSA of the patient /1.73
Body surface area (m2)	BSA = height (cm) x weight(Kg)/3600
Mayo Clinic Quadratic equation (MCQ)	**MCQ** = exp (1.911 + 5.249/SCr [mg/dl] – 2.114/SCr [mg/dl] – 0.00686 x age (years) – 0.205 if is a woman).
Salazar-Corcoran equation	**CrCl (man)** = [137 – age] x [0.285 x weight] + (12.1 x H)(51 x SCr) **CrCl (woman)** = [146 – age] x [0.287 x weight] +(9.74 x H)(60 x SCr)

CrCl: creatinine clearance (ml/min), **SCr**: serum creatinine (mg/dl), **H**: height (meters), **BMI**: body mass index, **BSA**: body surface area.

- Salazar-Corcoran equation (validated in animal model and in humans)
- Quadratic equation (MCQ) combined with CKD-EPI (CKD-MCQ) (validated in humans)

In accordance with the above, we conclude that, in obese patients, the most appropriate way to measure the glomerular filtration rate would be to do it with any of the non-creatinine-based methods considered "gold standard" but expressing its value in absolute form (without adjusting it to body surface), and regarding the estimation of the glomerular filtration rate, the most appropriate would be the use of equations based on cystatin C or those based on creatinine but validated in the obese population.

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