



ORIGINAL REPORT

Reliability of radiologic evaluation of abdominal aortic calcification using the 24-point scale[☆]



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KEYWORDS

Plain-film X-rays of the lumbar spine; Calcification of the abdominal aorta; Atheromatosis; Risk factors; Reliability

Abstract

Objective: Calcification of the abdominal aorta is associated with increased cardiovascular morbidity, so a reliable method to quantify it is clinically transcendent. The 24-point scale (AAC-24) is the standard method for assessing abdominal aortic calcification on lateral plain films of the lumbar spine. The aim of this study was to determine the intraobserver and interobserver agreements for the AAC-24, taking into account the heterogeneity of the distribution of the calcifications in the design of the statistical analysis.

Material and methods: We analyzed the intraobserver agreement (in plain films from 81 patients, with a four-year separation between observations) and the interobserver agreement (in plain films from 100 patients, with three observers), using both intraclass correlation and Bland–Altman plots.

Results: The intraobserver intraclass correlation coefficient was 0.93 (95% confidence interval [CI 95%]: 0.6–0.9), and the interobserver intraclass correlation coefficient was 0.91 (CI 95%: 0.8–0.9) with an increase in the coefficient in the tercile with the greatest discrepancy. The difference in means ranged from 0.3 to 1.2 points, and the distance between the limits of agreement ranged from 4.7 to 9.4 points. These differences increased significantly as the calcification progressed.

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PALABRAS CLAVE

Radiografía de columna vertebral lumbar;
 Calcificación de la aorta abdominal;
 Ateromatosis;
 Factores de riesgo;
 Fiabilidad

Conclusions: Using the AAC-24 on lateral plain films of the lumbar spine is a reliable and reproducible method of assessing calcification of the abdominal aorta; both intraobserver and interobserver agreement are higher during the initial phases of calcification.

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Fiabilidad en la evaluación radiológica de la calcificación aórtica abdominal mediante la escala de 24 puntos

Resumen

Objetivo: La calcificación de la aorta abdominal se asocia a un incremento en el riesgo de morbilidad cardiovascular, y disponer de un método de cuantificación de la misma es clínicamente trascendente. La escala de 24 puntos (AAC-24) es el método estándar para su evaluación en la radiología simple lateral de columna lumbar. El objetivo del estudio ha sido conocer el nivel de acuerdo intra e interobservador que aporta esta escala, teniendo en cuenta la heterogeneidad de la distribución de las calcificaciones en el diseño del análisis estadístico.

Material y métodos: Se analizó la concordancia intraobservador (sobre radiografías de 81 pacientes, con una separación de 4 años) y la concordancia interobservador (sobre radiografías de 100 pacientes, con tres evaluadores), utilizando simultáneamente la correlación intraclass y el método gráfico de Bland-Altman.

Resultados: El coeficiente de correlación intraclass fue de 0,93 (intervalo de confianza al 95% [IC95%]: 0,6-0,9) y 0,91 (IC95%: 0,8-0,9), intra e interobservador, respectivamente, con un incremento del coeficiente en el tercil de mayor discrepancia. La diferencia de medias osciló entre 0,3 y -1,2 puntos. La amplitud entre los límites de acuerdo, entre 4,7 y 9,4 puntos. Se observó un aumento significativo de las diferencias en relación con el aumento progresivo de la calcificación.

Conclusiones: La valoración de la calcificación de la aorta abdominal en radiología simple lateral de columna lumbar mediante la escala AAC-24 es un método fiable y reproducible, observándose un mayor grado de concordancia intra e interobservador en las fases iniciales de la calcificación.

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Introduction

The presence of calcifications in the aorta has been associated with an increase in the risk of cardiovascular morbimortality.¹⁻⁴ Specifically, calcification of the abdominal aorta has been associated consistently with an increase of the risk of myocardial infarction,⁵ heart failure,⁶ peripheral disease⁷ and strokes,⁸ which makes it a variable of undeniable clinical interest.

Computed tomography (CT), which allows a volumetric quantification of the calcium deposits, is the reference pattern for the detection and assessing of the degree of abdominal aortic calcification.^{9,10} However, simple lateral radiology of the lumbar spine has proven useful in the diagnosis of aortic calcifications,⁷ it is a way cheaper modality than CT, entails less exposure to radiation and has shown good correlation with the presence and magnitude of calcification in the coronary arteries when assessed through CT.^{11,12} The semi-quantitative scale AAC-24 (*Abdominal Aortic Calcification*), is a 24-point scale developed by Kauppila et al.¹³ and used by the Framingham Study group,^{4,6} it is the routine evaluation modality used in the assessment of abdominal aorta calcified plaques obtained through simple X-rays or lateral densitometry of the spine.^{14,15} In

comparison with the AAC-24 scale, the MACD (*Morphological Atherosclerotic Calcification Distribution*) index by Nielsen et al.,¹⁶ based on the morphology of the calcifications, seems to better identify the risk of mortality of cardiovascular origin.¹⁷ On the other hand, the AAC-24 scale has also been compared to the 8-point scale (AAC-8), developed by Schousboe et al.¹⁵ Although both are very well correlated,¹⁸ a prior study aimed at knowing the degree of concordance with both scales has proven that concordance with the AAC-8 scale despite being good did not reach the high level evidenced with the AAC-24.¹⁹

According to all the works published, the degree of agreement with the AAC-24 scale is almost perfect. It is not unusual to observe concordance figures over 0.90 both intra-observer (between 0.93 and 0.98^{13,20}) and inter-observer (between 0.90 and 0.96^{13,21}). Nevertheless, all these analyses were carried out using the interclass correlation coefficient (ICC) as the only statistic coefficient and we need to remember that one of the limitations of this coefficient is its strong dependence on the variability of data. That is it rises significantly with the presence of extreme values and, in general, in view of heterogeneous distributions, regardless of the degree of concordance obtained.^{22,23}

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