

AKURASI NILAI *DIFFUSION WEIGHTED IMAGING* DAN *APPARENT DIFFUSION COEFFICIENT* PADA EDEMA PERITUMORAL DALAM MENENTUKAN DERAJAT KEGANASAN ASTROSITOMA

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INTISARI

Latar Belakang dan Tujuan. Astrositoma adalah tumor otak dari sel glial yang merupakan tumor otak kedua terbanyak dengan mortalitas tinggi. Astrositoma terdiri dari tiga bagian yaitu keseluruhan bagian tumor, bagian padat tumor dan edema peritumoral. Pengukuran akurasi nilai *Diffusion Weighted Imaging* (DWI), *Apparent Diffusion Coefficient* (ADC) dan rasio DWI/ADC peritumoral dapat menentukan derajat astrositoma. Tujuan penelitian ini untuk mengevaluasi akurasi diagnostik intensitas sinyal DWI, nilai ADC dan rasio DWI/ADC peritumoral dalam menentukan derajat keganasan astrositoma.

Bahan dan Metode. Penelitian observasional analitik retrospektif ini menggunakan data sekunder *Magnetic Resonance Imaging* (MRI) kepala sekuen DWI dan ADC dengan histopatologi astrositoma. Nilai intensitas sinyal DWI dan nilai ADC diambil dengan menempatkan *Region of Interest* teknik (ROI) *free hand* pada gambar DWI dan ADC mencakup area edema peritumoral. Akurasi diagnostik intensitas sinyal DWI, nilai ADC dan rasio DWI/ADC peritumoral untuk menentukan derajat astrositoma menggunakan analisis *Receiver Operating Characteristic* (ROC).

Hasil. Didapatkan 25 pasien astrositoma derajat tinggi dan 11 pasien astrositoma derajat rendah. Berdasarkan analisis ROC, pengukuran area edema peritumoral dari nilai intensitas sinyal DWI peritumoral menghasilkan *cutoff value* 818,462, dengan sensitivitas 48%, spesifisitas 63,6% sedangkan nilai ADC peritumoral menghasilkan *cutoff value* $1,356 \times 10^{-3} \text{ mm}^2/\text{s}$, dengan sensitivitas 84%, spesifisitas 72,7% dan rasio DWI/ADC peritumoral menghasilkan *cutoff value* 604,704 dengan sensitivitas 96% dan spesifisitas 72,7% untuk membedakan astrositoma derajat tinggi dan rendah.

Kesimpulan. Pengukuran nilai ADC dan rasio DWI/ADC area edema peritumoral pada astrositoma menghasilkan nilai diagnostik tinggi dalam menentukan derajat keganasan astrositoma.

Kata Kunci: *Diffusion Weighted Imaging*, *Apparent Diffusion Coefficient*, derajat astrositoma, akurasi diagnostik.

THE ACCURACY OF DIFFUSION-WEIGHTED IMAGING AND APPARENT DIFFUSION COEFFICIENT VALUE ON PERITUMORAL EDEMA IN DETERMINING THE DEGREE OF MALIGNANCY OF ASTROCYTOMA

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ABSTRACT

Background and Purpose Astrocytoma is a brain tumor that originates from glial cells, which is the second-largest brain tumor with high mortality rates. Astrocytoma consists of three parts, namely the entire tumor, the substantial part of the tumor, and the peritumoral edema. The accurate measurement of peritumoral Diffusion-Weighted Imaging (DWI) and Apparent Diffusion Coefficient (ADC) value can determine the degree of astrocytoma. The purpose of this study was to evaluate the diagnostic accuracy of peritumoral DWI signal intensity, ADC value and the peritumoral DWI / ADC ratio in determining the degree of astrocytoma malignancy.

Material and Method. This retrospective analytic observational study used secondary data from the DWI and ADC of head Magnetic Resonance Imaging (MRI) sequence compared to their histopathological findings of astrocytoma. The DWI signal intensity and ADC value were taken by placing the freehand Region of Interest (ROI) technique around the peritumoral edema area. The Receiver Operating Characteristic (ROC) analysis was used to estimate the diagnostic accuracy of DWI signal intensity, the peritumoral ADC values and peritumoral DWI / ADC ratio to determine the degree of astrocytoma using Receiver Operating Characteristic (ROC) analysis.

Results. There were 25 high-grade astrocytoma patients and 11 low-grade astrocytoma patients. Based on the ROC analysis, the estimation of the peritumoral edema area from DWI signal intensity yields a cutoff value of 818.462, with a sensitivity 48%, specificity of 63.6%, while the ADC value has a cutoff value of 1.356×10^{-3} mm²/s, with a sensitivity of 84% and a specificity of 72.7% and the peritumoral DWI / ADC ratio resulted in a cutoff value of 604.704 with sensitivity of 96% and specificity of 72.7% to distinguish high and low grade astrocytomas

Conclusion. Measurement of the ADC value and DWI / ADC ratio of peritumoral edema area in astrocytoma yields a high diagnostic value in determining the degree of malignancy of astrocytoma.

Keywords: Diffusion-Weighted Imaging, Apparent Diffusion Coefficient, degree of astrocytoma, diagnostic accuracy.