

NILAI DIAGNOSTIK *DIFFUSION WEIGHTED IMAGING* DAN *APPARENT DIFFUSION COEFFICIENT* DALAM MENENTUKAN DERAJAT ASTROSITOMA *SUPRATENTORIAL*

Pramiadi¹, Yana Supriatna², Evi Artsini²

¹ Residen Bagian Radiologi Fakultas Kedokteran, Kesehatan Masyarakat dan Keperawatan
Universitas Gadjah Mada

² Staf Pengajar Bagian Radiologi Fakultas Kedokteran, Kesehatan Masyarakat dan Keperawatan
Universitas Gadjah Mada

INTISARI

Latar belakang dan Tujuan. Astrositoma merupakan tumor *supratentorial* kedua terbanyak dengan mortalitas yang tinggi. Pengukuran nilai *Apparent Diffusion Coefficient* (ADC) dan intensitas sinyal *Diffusion Weighted Imaging* (DWI) sangat berguna dalam menentukan derajat astrositoma. Tujuan penelitian ini untuk mengevaluasi nilai diagnostik DWI dan ADC dalam menentukan derajat astrositoma *supratentorial*.

Bahan dan Metode. Penelitian observasional analitik retrospektif ini menggunakan data sekunder citra *Magnetic Resonance Imaging* kepala sekuen DWI dan ADC dengan histopatologi astrositoma. Nilai minimum, maksimum dan rerata dari DWI dan ADC diambil dengan menempatkan *Region of Interest* teknik *free hand* pada gambar DWI dan ADC *map* mencakup keseluruhan tumor dan daerah tumor padat. Korelasi antara DWI dan ADC dengan derajat histopatologi menggunakan uji *Mann-Whitney* dan *Spearman*. Nilai diagnostik DWI dan ADC untuk menentukan derajat astrositoma menggunakan analisis *Receiver Operating Characteristic* (ROC).

Hasil. Didapatkan 9 pasien astrositoma derajat rendah dan 27 pasien astrositoma derajat tinggi. Terdapat korelasi antara nilai ADC minimum ($\rho = -0,664$), intensitas sinyal DWI maksimum ($\rho = 0,429$) dan rasio DWI/ADC rerata ($\rho = 0,509$) dengan derajat astrositoma. Berdasarkan analisis ROC, pengukuran pada bagian padat tumor dari nilai ADC minimum, intensitas sinyal DWI maksimum dan rasio DWI/ADC rerata masing-masing menghasilkan *cutoff value* pada $0,639 \times 10^{-3} \text{ mm}^2/\text{s}$, 1.511.000, 1.044.085, dengan sensitifitas 100%, 59,26%, 88,89%, dan spesifisitas 85,19%, 100%, 77,78% untuk membedakan astrositoma derajat rendah dan tinggi.

Kesimpulan. Kombinasi pengukuran nilai ADC minimum, intensitas sinyal DWI maksimum dan rasio DWI/ADC rerata pada bagian padat tumor menghasilkan nilai diagnostik yang tinggi dalam menentukan derajat astrositoma *supratentorial*.

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

DIAGNOSTIC VALUE OF DIFFUSION WEIGHTED IMAGING AND APPARENT DIFFUSION COEFFICIENT TO DETERMINE GRADE OF SUPRATENTORIAL ASTROCYTOMAS

Pramiadi¹, Yana Supriatna², Evi Artsini²

¹ Resident of the Radiology Department, Faculty of Medicine, Public Health and Nursing,
Universitas Gadjah Mada

² Teaching Staff of the Radiology Department of the Faculty of Medicine, Public Health and
Nursing, Universitas Gadjah Mada

ABSTRACT

Background and Purpose. Astrocytoma is the second most common supratentorial tumor with high mortality. Measurement of Apparent Diffusion Coefficient (ADC) value and Diffusion Weighted Imaging (DWI) signal intensity are very useful to determine grade of astrocytoma. The purpose of this study is to evaluate the diagnostic value of DWI and ADC to determine grade of supratentorial astrocytomas.

Materials and Methods. This retrospective observational analytic study uses secondary data from DWI and ADC sequences of brain magnetic resonance imaging with astrocytoma as histopathological diagnosis. Minimum, maximum and mean of DWI and ADC values were taken by placing region of interest with free hand technique covering area in both total and solid portion of tumors on DWI and ADC map image. Correlation between DWI and ADC with histopathological grade was done using Mann-Whitney and Spearman tests. Diagnostic value of DWI and ADC to determine grade of astrocytoma using Receiver Operating Characteristic (ROC) analysis.

Result. There were 9 patients with low-grade astrocytoma and 27 patients with high-grade astrocytoma. There is significant correlation between minimum ADC value ($\rho = -0.664$), maximum DWI signal intensity ($\rho = 0.429$) and mean DWI/ADC ratio ($\rho = 0.509$) with grade of astrocytoma. According to ROC analysis, measurements on the solid portion of the tumor from minimum ADC value, maximum DWI signal intensity and mean DWI/ADC ratio respectively obtained cutoff value at $0.639 \times 10^{-3} \text{ mm}^2/\text{s}$, 1.511.000, 1.044.085, with sensitivity 100%, 59,26%, 88,89%, and specificity 85,19%, 100%, 77,78% for distinguishing low-grade and high-grade astrocytomas.

Conclusion. The combination of measuring minimum ADC value, maximum DWI signal intensity and mean DWI/ADC ratio in the solid portion of the tumor obtained a high diagnostic value to determine grade of supratentorial astrocytomas.

Keywords: Diffusion Weighted Imaging, Apparent Diffusion Coefficient, grade of astrocytoma, diagnostic value