KORELASI ANTARA RASIO INTENSITAS SINYAL TUMOR TERHADAP LEMAK DAN OTOT PADA MRI DENGAN DERAJAT HISTOPATOLOGIS PASIEN MENINGIOMA

William Sumoro[1], Bambang Supriyadi[2], Evi Artsini[2], Sudarmanta[2], Anita Ekowati[2], Abu Tholib Aman[3]

[1]Residen, [2]Staf Departemen Radiologi, dan [3]Staf Magister Ilmu Kedokteran Klinis, Fakultas Kedokteran, Kesehatan Masyarakat, dan Keperawatan Universitas Gadjah Mada
Korespondensi: William Sumoro / No. HP: 085156836258 / E-mail: wsumoro3@gmail.com

INTISARI

Latar Belakang: Meningioma merupakan tumor intrakranial primer tersering dengan spektrum derajat histopatologis luas. Penentuan derajat secara praoperatif penting untuk perencanaan terapi. Penilaian intensitas sinyal MRI konvensional bersifat subjektif, sehingga diperlukan parameter kuantitatif yang lebih objektif. Rasio intensitas sinyal tumor terhadap lemak, *tumor to fat ratio*/TFR pada T2W dan rasio intensitas sinyal tumor terhadap otot, *tumor to muscle ratio*/TMR pada T1W pascakontras diusulkan sebagai parameter kuantitatif.

Tujuan: Mengetahui korelasi antara nilai TFR dan TMR pada MRI dengan derajat histopatologis meningioma.

Metode: Penelitian observasional analitik dengan desain potong lintang menggunakan data retrospektif pasien meningioma usia >18 tahun yang menjalani MRI kepala dan pemeriksaan histopatologi di RSUP Dr. Sardjito periode September 2024–September 2025. Pengukuran TFR dan TMR dilakukan menggunakan *region of interest* pada bagian solid tumor, lemak subkutan occipitalis, dan otot temporalis. Uji reliabilitas interobserver dinilai dengan *intraclass correlation coefficient*, ICC. Analisis korelasi menggunakan uji Spearman.

Hasil: Sebanyak 66 subjek dianalisis, didominasi perempuan (91%), dengan distribusi derajat histopatologis: derajat I 55%, derajat II 40%, dan derajat III 5%. Reliabilitas pengukuran sangat baik (ICC TFR 0,977; ICC TMR 0,919; p<0,001). Tidak ditemukan korelasi bermakna antara TFR dan derajat histopatologis ($\rho = -0{,}072$; $p = 0{,}566$) maupun antara TMR dan derajat histopatologis ($\rho = -0{,}082$; $p = 0{,}514$). Analisis komparatif antara meningioma derajat rendah, WHO I dan derajat tinggi, WHO II–III juga tidak menunjukkan perbedaan bermakna baik untuk TFR ($p = 0{,}580$) maupun TMR ($p = 0{,}612$).

Kesimpulan: Nilai TFR pada T2W dan TMR pada T1W pascakontras belum menunjukkan korelasi bermakna dengan derajat histopatologis meningioma. Parameter ini belum dapat digunakan sebagai penanda kuantitatif tunggal untuk stratifikasi derajat meningioma praoperatif.

Kata kunci: Meningioma, *Magnetic Resonance Imaging*, *tumor to fat ratio, tumor to muscle ratio*

CORRELATION BETWEEN TUMOR-TO-FAT AND TUMOR-TO-MUSCLE SIGNAL INTENSITY RATIOS ON MRI AND THE HISTOPATHOLOGICAL GRADE OF MENINGIOMA PATIENTS

William Sumoro[1], Bambang Supriyadi[2], Evi Artsini[2], Sudarmanta[2], Anita Ekowati[2], Abu Tholib Aman[3]

[1]Resident, [2]Staff Radiology Department, [3]Staff of Master in Clinical Medicine, Faculty of Medicine, Public Health, and Nursing Universitas Gadjah Mada, Yogyakarta

ABSTRACT

Background: Meningioma is the most common primary intracranial tumor in adults, with a wide spectrum of biological behavior. Preoperative assessment of histopathological grade is crucial for treatment planning, yet conventional MRI evaluation of signal intensity remains largely qualitative and subjective. Quantitative signal intensity ratios such as tumor-to-fat ratio (TFR) and tumor-to-muscle ratio (TMR) have been proposed as more objective imaging biomarkers.

Objective: To determine the correlation between TFR on T2-weighted images and TMR on post-contrast T1-weighted images with the histopathological grade of meningioma.

Method: This was a cross-sectional observational study using retrospective data of adult patients with histopathologically confirmed meningioma who underwent brain MRI at Dr. Sardjito General Hospital between September 2024 and September 2025. Signal intensity measurements were performed using regions of interest placed on the solid tumor component, occipital subcutaneous fat, and temporal muscle. Interobserver reliability was assessed using intraclass correlation coefficient (ICC). Correlation between TFR, TMR, and histopathological grade was analyzed using Spearman correlation test.

Results: A total of 66 subjects were included, predominantly female (91%). Histopathological grades were WHO grade I in 55%, grade II in 40%, and grade III in 5% of cases. Interobserver reliability was excellent (ICC 0.977 for TFR and 0.919 for TMR; $p<0.001$). No significant correlation was found between TFR and histopathological grade ($\rho = -0.072$; $p = 0.566$) nor between TMR and histopathological grade ($\rho = -0.082$; $p = 0.514$). Comparative analysis between low-grade (WHO I) and high-grade (WHO II–III) meningiomas also showed no significant differences for TFR ($p = 0.580$) and TMR ($p = 0.612$).

Conclusions: TFR and TMR derived from conventional MRI do not significantly correlate with the histopathological grade of meningioma and therefore cannot yet be used as standalone quantitative biomarkers for preoperative grading.

Keywords: Meningioma, Magnetic Resonance Imaging, *tumor to fat ratio, tumor to muscle ratio*