

**Relationship Between Matrix Metalloproteinase-9 Expression and
HUBUNGAN EKSPRESI *MATRIX METALLOPROTEINASE 9*
DENGAN PARAMETER AGRESIVITAS MELANOMA
MALIGNA**

TESIS



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Relationship Between Matrix Metalloproteinase-9 Expression and Agresivitas Melanoma Maligna

ABSTRAK

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Pendahuluan : Melanoma maligna merupakan tumor ganas yang berasal dari melanosit dan dikenal sebagai kanker kulit paling agresif dengan angka metastasis dan mortalitas yang tinggi. Parameter prognostik konvensional seperti ketebalan Breslow, ulserasi, laju mitosis, dan keterlibatan kelenjar getah bening (KGB) masih digunakan secara luas, namun belum sepenuhnya mampu memprediksi perilaku biologis melanoma. *Matrix metalloproteinase-9* (MMP9) diketahui berperan dalam degradasi matriks ekstraseluler dan membran basal sehingga memfasilitasi invasi dan metastasis sel tumor. Ekspresi MMP9 diduga berkaitan dengan derajat agresivitas melanoma maligna. Penelitian ini bertujuan untuk menganalisis hubungan ekspresi MMP9 dengan parameter agresivitas melanoma maligna.

Metode : Penelitian ini merupakan penelitian analitik observasional dengan pendekatan *cross-sectional*. Sampel penelitian terdiri atas 33 kasus melanoma maligna kulit yang diperiksa di Laboratorium Patologi Anatomi RSUP Dr. M. Djamil Padang, Sentra Diagnostik Patologi Anatomi Fakultas Kedokteran Universitas Andalas, dan Rumah Sakit Universitas Andalas selama periode Januari 2022 hingga Desember 2025. Ekspresi MMP9 dinilai menggunakan pemeriksaan imunohistokimia. Analisis bivariat dilakukan dengan uji *Chi-square*, dengan nilai p

$< 0,05$ dianggap bermakna secara statistik.

Hasil : Penelitian ini menunjukkan tidak terdapat hubungan bermakna antara ekspresi MMP9 dengan kedalaman invasi tumor berdasarkan Indeks Breslow ($p=0,243$). Namun, terdapat hubungan bermakna antara ekspresi MMP9 dengan keberadaan ulserasi ($p=0,015$) dan keterlibatan KGB ($p=0,002$).

Kesimpulan : Penelitian ini menyimpulkan bahwa ekspresi MMP9 berhubungan dengan ulserasi dan keterlibatan KGB pada melanoma maligna, tetapi tidak berhubungan dengan ketebalan tumor berdasarkan Indeks Breslow. Ekspresi MMP9 berpotensi digunakan sebagai penanda tambahan dalam menilai agresivitas melanoma maligna.

Kata kunci: melanoma maligna, MMP9, parameter agresivitas, indeks Breslow, ulserasi, keterlibatan KGB

Relationship Between Matrix Metalloproteinase-9 Expression and Aggressiveness Parameters in Malignant Melanoma

ABSTRACT

Seilla Dinta Yastina

Background : Malignant melanoma is a malignant tumor originating from melanocytes and is recognized as the most aggressive type of skin cancer, with high rates of metastasis and mortality. Conventional prognostic parameters, including Breslow thickness, ulceration, mitotic rate, and lymph node involvement, are still widely used; however, they are not yet fully capable of predicting the biological behavior of melanoma. Matrix metalloproteinase-9 (MMP9) is known to play a role in the degradation of the extracellular matrix and basement membrane, thereby facilitating tumor cell invasion and metastasis. MMP9 expression is suspected to be associated with the degree of aggressiveness of malignant melanoma. This study aimed to analyze the relationship between MMP9 expression and aggressiveness parameters in malignant melanoma.

Methods : This was an observational analytic study using a cross-sectional approach. The study samples consisted of 33 cases of cutaneous malignant melanoma examined at the Anatomical Pathology Laboratory of Dr. M. Djamil General Hospital Padang, the Anatomical Pathology Diagnostic Center of the Faculty of Medicine, Universitas Andalas, and Universitas Andalas Hospital during the period from January 2022 to December 2025. MMP9 expression was evaluated using immunohistochemical staining. Bivariate analysis was performed using the Chi-square test, with $p < 0.05$ considered statistically significant.

Results : The results showed no significant association between MMP9 expression and tumor invasion depth based on Breslow thickness ($p=0.243$). However, significant associations were observed between MMP9 expression and the presence of ulceration ($p=0.015$) as well as lymph node involvement ($p=0.002$).

Conclusion : This study concludes that MMP9 expression is associated with ulceration and lymph node involvement in Malignant melanoma, but not with tumor thickness based on Breslow thickness. MMP9 expression has the potential to be used as an additional marker in assessing the aggressiveness of malignant melanoma.

Keywords: malignant melanoma, MMP9, aggressiveness parameters, Breslow thickness, ulceration, lymph node involvement