Association Between Systemic Immune-Inflammation Index with Hypercoagulable State in Primary Brain Tumor : a Retrospective Study in Dr. Cipto Mangunkusumo Hospital Jakarta Indonesia

Anak Agung Ayu Agung Pramaswari[1,2], Henry Riyanto Sofyan[1], Irma Savitri[1], Jessica Herlambang[1], Tiara Aninditha[1]

[1]Departement of Neurology, Faculty of Medicine, Universitas Indonesia, Dr. Cipto Mangunkusumo Hospital, Indonesia

[2]Departement of Neurology, Faculty of Medicine, Udayana University, Udayana University Hospital, Indonesia

BACKGROUND

Hypercoagulable state considered a common complication in brain tumors, which increases the risk of thromboembolic events, leading to mortality and morbidities. Detecting hypercoagulability typically requires expensive tests, such as D-dimer, which are not accessible in many healthcare facilities in Indonesia. The Systemic Immune-Inflammation Index (SII) known as inflammation marker that contribute to hypercoagulability in many condition, more affordable and widely available, but there is still not much study that investigate association between SII and hypercoagulable state in primary brain tumor. This preliminary study aimed to find an association between SII with hypercoagulable state in primary brain tumor

METHODS

We collected data from inpatients diagnosed with primary brain tumors from 2021-2023 in Dr. Cipto Mangunkusumo Hospital. Hypercoagulable states were established from high D-dimer serum testing (>660 µg/L). SII was calculated by the following formula: neutrophil counts × platelet counts/lymphocyte counts. Both D-dimer and SII were collected at first admission to hospital. The receive-operating characteristic (ROC) curve were used to determine the SII cut-off value. Bivariate and multivariate logistic analyses were performed to confirm the association with the incidence of hypercoagulable state.

RESULTS

Table 1. Characteristic of Participant

Variabel		Total (N=65)
Hypercoagulable state	Yes	48 (73,8%)
	No	17 (26,2%)
Age (Mean 47,54±2,02)	≥60 years	22 (33,8%)
	<60 years	43 (66,2%)
Sex	Male	25 (38,5%)
	Female	40 (61,5%)
Severity of Brain Tumor	High Grade	35 (53,8%)
	Low Grade	30 (46,2%)
Type of Brain Tumor	Glioma	26 (40%)
	Non Glioma	39 (60%)
Duration of Tumor	< 6 month	45 (69,2%)
	≥ 6 month	20 (30,8%)
Functional state	Helped	22 (33,8%)
	Independent	43 (66,2%)
History of Tumor Treatment	Chemotherapy – Radiotherapy	10 (15,4%)
	No Treatment	55 (84,6%)
History of Tumor Surgery	Yes	41 (63,1%)
	No	24 (36,9%)
Concurrent Infection	Yes	34 (52,3%)
	No	31 (47,7%)
Thromboembolic Event	Yes	6 (9,2%)
	No	59 (90,8%)

Table 2. Characteristic of Laboratory Marker

Variabel	Total	Hypercoagulable State 48 (73,8%)	Non Hypercoagulable State 17 (26,2%)
D-dimer (µg/L) (Mean)	1441,82±181,53	1740,59±213,13	353,43±25,80
Neutrophile (10^3/µL) (Mean)	9,79±0,64	9.91±0.76	9.38±1.07
Lymphocyte (10^3/µL) (Median)	1,16	1,06	1,86
Trombocyte (10^3/µL) (Mean)	273,38±12,40	264,37±14,27	306,2±23,59
SII ($x10^9$/L) (Mean)	1855,78±170,99	2009,03±204,20	1297,50±230,21

Table 3. Bivariate Analysis of SII with Hypercoagulable State in Primary Brain Tumor

Variable		Hypercoagulable State Yes (N = 48)	Hypercoagulable State No (N = 17)	P value	OR (CI 95%)
SII	High	28 (80%)	7 (20%)	0,223[1]	2,00 (CI95% 0,65-6,15)
	Low	20 (66,7%)	10 (33,3%)		

[1]*Pearson Chi-Square*

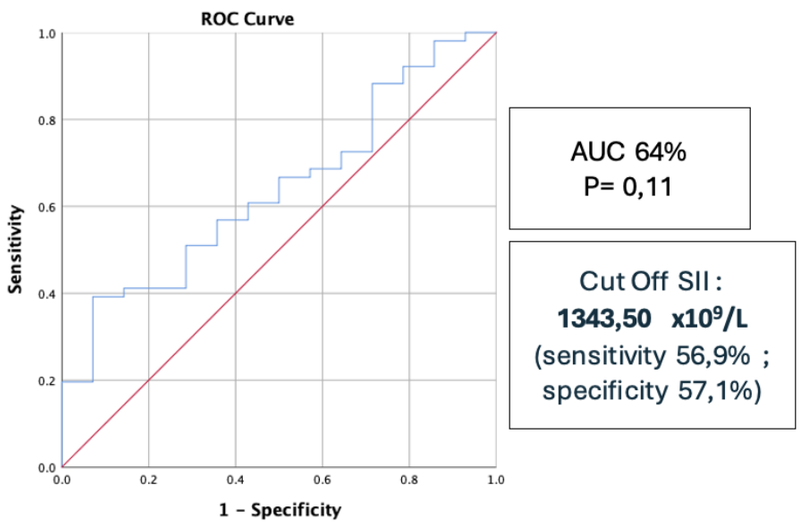

Image 1. ROC cut off SII

Table 4. Bivariate Analysis of Other Factors That Associated with Hypercoagulable State in Primary Brain Tumor

Variable		Hypercoagulable State Yes (N = 48)	Hypercoagulable State No (N = 17)	P value	OR (CI 95%)
Age	≥60 years	19 (86,4%)	3 (13,6%)	0,100[1]	3,06 (CI 95% 0,77–12,09)
	<60 years	29 (67,4%)	14 (32,6%)		
Sex	Male	18 (72%)	7 (28%)	0,789[1]	0,86 (CI 95% 0,28–2,65)
	Female	30 (75%)	10 (25%)		
Type of Tumor	Glioma	17 (65,4%)	9 (34,6%)	0,205[1]	0,49 (CI 95% 0,16–1,50)
	Non Glioma	31 (79,5%)	8 (20,5%)		
Severity of Tumor	High Grade	27 (77,1%)	8 (22,9%)	0,514[1]	1,45 (CI 95% 0,48–4,40)
	Low Grade	21 (70%)	9 (30%)		
Duration of Tumor	<6 months	36 (80%)	9 (20%)	0,090[1]	2,67 (CI 95% 0,84–8,46)
	≥ 6 months	12 (60%)	8 (40%)		
Functional state	Helped	18 (81,8%)	4 (18,2%)	0,296[1]	1,95 (CI 95% 0,55–6,90)
	Independent	30 (69,8%)	13 (30,2%)		
History of Tumor Treatment	Chemo-radiotherapy	6 (60%)	4 (40%)	0,434[2]	0,46 (CI 95% 0,11–1,90)
	No Treatment	42 (76,4%)	13 (23,6%)		
History of Tumor Surgery	Yes	34 (82,9%)	7 (17,1%)	0,029*[1]	3,47 (CI 95% 1,10–10,95)
	No	14 (58,3%)	10 (41,7%)		
Concurrent Infection	Yes	28 (82,4%)	6 (17,6%)	0,102[1]	2,567 (CI 95% 0,81–8,09)
	No	20 (64,5%)	11 (35,5%)		

* stastistically significant p < 0,05

[1] Pearson Chi-Square

[2] Fisher's Exact Test

Table 5. Multivariate Analysis of Other Factors That Associated with Hypercoagulable State in Primary Brain Tumor

Variabel	OR	CI 95%	P value
Duration of Tumor	5,08	1,38–18,69	0,035*
History of Tumor Surgery	4,20	1,11–15,94	0,015*

* stastistically significant p < 0,05

CONCLUSION

We find 73,8% subjects with hypercoagulable states in primary brain tumor. No significant relationship between high SII and hypercoagulable states, but significant association of duration brain tumor before 6 months and history of brain tumor surgery with hypercoagulable state in primary brain tumor. We suspect determination of hypercoagulable state based on one parameter (d-dimer serum only) caused no significant relationship between SII and hypercoagulable state in this study.