

Correlation of Thrombus Immune cell Content and Clinical Outcome in Patients With Acute Ischemic Stroke

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Background

- Acute ischemic stroke (AIS) is caused by an arterial obstruction which reduces blood flow to a specific brain area below the critical level.
- Thrombosis is the main pathological cause of AIS, which is driven by the immune system.
- Thrombus types in stroke are currently classified into three categories and are associated with outcome prognosis.
- The immune cell content in different types of thrombi and the impact of their presence on stroke outcomes remain insufficiently studied.

Aim

1. To analyze the correlation between thrombus morphology and immune cell presence in thrombi of AIS patients due to large vessel occlusion.
2. To explore the correlation between the thrombus' immune cell content and clinical outcome and sex.

Methods

Figure 1. Patient inclusion flowchart.

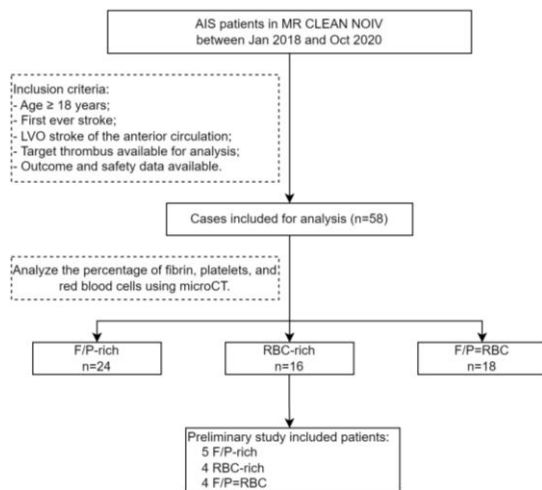
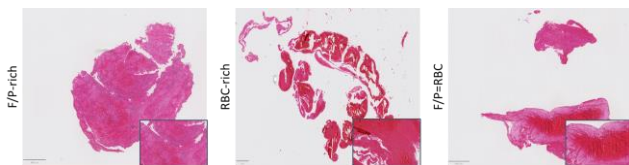


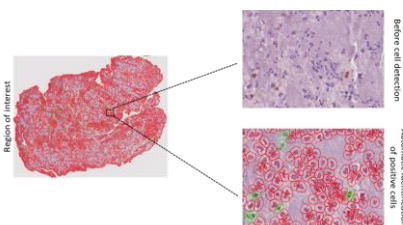
Figure 2. Thrombus Processing Procedure

Step 1. Thrombus classification by composition percentage with microCT



Step 2. Immunohistochemistry Staining

- CD3: T cells
- Congo-Red: eosinophils
- CD14: monocytes
- CD45: total leukocytes
- CD20: B cells
- Neutrophil Elastase: neutrophils



Step 3. Example of analyzing Staining Results with QuPath Software

Results expressed as density = positive cell counts / whole tissue area(µm²)

Preliminary Results

Table 1. Baseline characteristics.

	Overall (n = 58)	F/P-rich thrombus (n = 24)	RBC-rich thrombus (n = 16)	F/P = RBC thrombus (n = 18)	p Value
Age (IQR)	69.5(60.3-77.3)	69.5(59.3-76.5)	63(58-77)	72(60-79)	0.607
Male (n%)	39/58(67.2)	15/24(62.5)	13/16(81.3)	11/18(61.1)	0.372
Baseline NIHSS score (IQR)	17(13-20)	17(14-19.5)	16.5(9.5-20.8)	16(12-19.3)	0.954
Pre-stroke mRS≥3 (n%)	1/58(1.7)	1/24(4.2)	0/16(0)	0/18(0)	0.647
IVT treatment (n%)	32/58(55.2)	13/24(54.2)	6/16(37.5)	13/18(72.2)	0.126
ASPECTS (IQR)	9(7-10)	8(7-10)	9(8-10)	9(8-10)	0.420

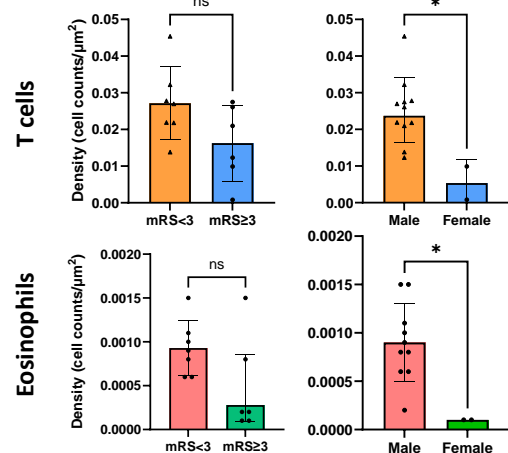
NIHSS: National Institutes of Health Stroke Scale, mRS: Modified Rankin Scale, IVT: Intravenous thrombolysis, ASPECTS: Alberta stroke programme early CT score

Table 2. Immune cell presence per thrombus type.

Cell type(Mean ± SD)	Overall (n = 13)	F/P-rich thrombus (n = 5)	RBC-rich thrombus (n = 4)	F/P = RBC thrombus (n = 4)	p Value
T cell density	0.022±0.011	0.026±0.004	0.015±0.005	0.026±0.018	0.276
Eosinophil density	0.0008±0.0005	0.0010±0.0004	0.0007±0.0007	0.0007±0.0004	0.681

12 patients enrolled in eosinophil density(F/P-rich=4, RBC-rich=4, F/P=RBC type=4)

Figure 3. Immune cell presence in relation to outcome and sex.



Conclusion

- T cells and eosinophils are found in all thrombi. There is no difference in immune cell presence among the 3 thrombi types.
- There is a higher presence of both T cells and eosinophils in thrombi from males compared to females (p=0.014 and p=0.022, respectively).
- T cells and eosinophils show a trend of being more present in thrombi from the favorable prognosis group (mRS < 3) compared to the unfavorable prognosis group (mRS ≥ 3).