White Matter Hyperintensity, Cerebral Microbleeds and risk of Hemorrhagic Transformation with intravenous rt-PA

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Objective

- To determine if the degree of chronic white matter hyperintensity on Fluid Attenuated Inversion Recovery (FLAIR) and the presence of cerebral microbleeds (MB) on Gradient Recalled Echo (GRE) sequences on MRI was associated with increased risk of hemorrhagic transformation following intravenous rt-PA.

Background

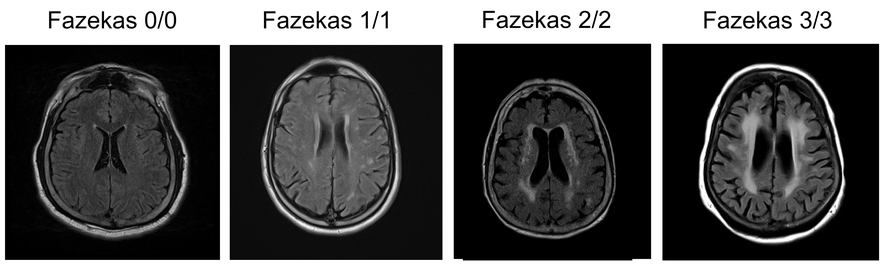
- Intravenous rt-PA is associated with increased risk of hemorrhagic transformation. Weather CM is associated with hemorrhagic transformation remains to be determined given the conflicting data in the literature on the risk of symptomatic intracranial hemorrhage in presence of CM and the number of CM. Previous studies suggest that white matter disease maybe a risk for sICH after tPA.

Methods

- Acute ischemic stroke patients admitted to University of Iowa Hospitals and Clinics between 1/1/2009 and 12/31/2013 were included in the study if they – 1) Received intravenous rt-PA, 2) had MRI brain with Diffusion Weighted Imaging (DWI), GRE and FLAIR sequence within the first 48 hours of stroke onset, and 3) had CT head or MRI at 20-36hr post rt-PA to evaluate for hemorrhagic transformation.

- Diffusion Weighted Imaging was evaluated independently by one person (NT) to identify the presence or absence of diffusion restriction lesion suggestive of stroke, laterality, location and vascular territory.

- Chronic white matter changes was independently evaluated on FLAIR by one of the two raters (NT or AS) using a semi-quantitative Fazekas rating scale. Hyperintensity in the deep white matter was graded on a scale of 0-3 with 0 - no lesion, 1- punctate foci, 2-beginning of confluent foci and 3- confluent changes. Similarly, the FLAIR hyperintensity in the periventricular white matter were graded on a scale 0-3 with 0- no changes, 1-caps or pencil-thin lining, 2-smooth halo and 3- irregular changes extending to the deep white matter. FLAIR changes corresponding to the acute DWI lesion was not considered for evaluating the white matter hyperintensity.



- MB were evaluated on GRE by one rater (NN). CMs were identified by small round or oval homogenous hypointense lesion < 10mm in diameter. One of more certain microbleed on Brain Observer Micro Bleed Scale (BOMBS) scale was considered as CM present. CT or MRI head performed at 20-36 hours after rt-PA was evaluated (by NT or AS) for presence of hemorrhagic transformation. If present it was classified as HI 1, HI 2, PH 1 and 2 based on ECASS I criteria.

Results

- A total of 366 patients met the study criteria among 607 patients screened.
- Mean age was 67±15 years, with 46% women and 88% whites.
- Hemorrhagic transformation was seen in 24% (n=87) of the study population and 31% of these were parenchymal hematoma, PH 1 or 2.

	All patients	Hemorrhagic Transformation		P
	(n=366) %	Yes (n=87) %	No (n=279) %	
DWI Ischemic Stroke Present (+DWI)	86.6	97.7	83.1	0.0005
FLAIR				
Deep White Matter Rating				
0 - No lesion	24.7	21.8	25.6	0.76
1 - Punctate foci	53.0	57.5	51.6	
2 - Beginning of confluent foci	11.3	11.5	11.2	
3 - Confluent changes	11.0	9.2	11.5	
Periventricular White Matter Rating				
0 - No changes	9.6	8	10.1	0.36
1 - Caps or pencil-thin lining	48.6	48.3	48.7	
2 - Smooth halo	26.1	32.2	24.2	
3 - Irregular changes extending to deep white matter	15.7	11.5	17	
Cerebral Microbleeds				
Present (All had 1-5 CM except 2 patients in 6-10 range)	26	36.8	22.6	**0.008** (OR 1.99; 95%CI 1.1-3.3)

Conclusions

- In our sample presence of one of more microbleeds was associated with increased risk of hemorrhagic transformation following administration of intravenous rt-PA.
- Chronic white matter hyperintensity was not associated with increased risk of hemorrhagic transformation after rt-PA.
- In current practice MRI is usually not available at the time of making the decision regarding the rt-PA which make our results of limited use in daily practice and CM were read on post t-PA MRI.
- We looked at only radiographic evidence of hemorrhagic transformation. We did not have 24h NIHSS to evaluate symptomatic intracerebral hemorrhage.
- Hemorrhagic transformation was evaluated on CT in all except 37 patients that had MRI only at 24-36h post t-PA.

References

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