

# **Craniectomy Reduced Mortality and Improved GOS among Large MCA Infarctions Patients with Middle Line Shifting More than 10mm**

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# Malignant Cerebral Infarction

- Infarct volume on DWI  $> 145$  cm<sup>3</sup> (DECIMAL)
- Brain CT ischemic changes  $\geq 2/3$  of the MCA territory with space-occupying edema (HAMLET).
- Brain CT ischemic changes  $>2/3$  MCA territory and including the basal ganglia (DESTINY).

\* DECIMAL trial: Stroke 2007; 38:2506-17

\*\* HAMLET trial: Lancet Neurology 2007; 6 215-22

\*\*\* DESTINY trial: Stroke 2007; 38: 2518-25

# When to Arrange Decompressive Craniectomy ?

# Objects

- To compare the results of conservative treatment and craniectomy in malignant MCA infarction patients
- To determine when to arrange surgical decompression

# Materials and Methods

- From 2004 Jan to 2010 Oct.
- 353 patients was diagnosed as MCA territory infarction by CT or MRI
- 43 patients suffered from MCA infarction with midline shift
- 3 patients excluded (2 bilateral MCA infarction and 1 expired due to septic shock)

# Midline Shift

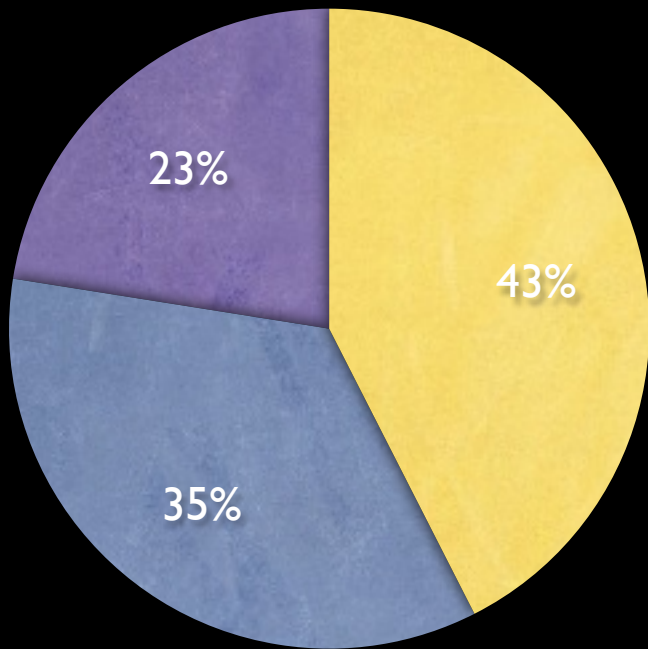
- Easily detectable in CT image.
- Be quantifiable.
- Reflect the severity of mass effect.

# Two Groups

- A: Mild mass effect group (Midline shift less than 1cm)
- B: Moderate to severe mass effect group (Midline shift more than and equals to 1cm - B1: Without operation B2: With operation)

# Two groups

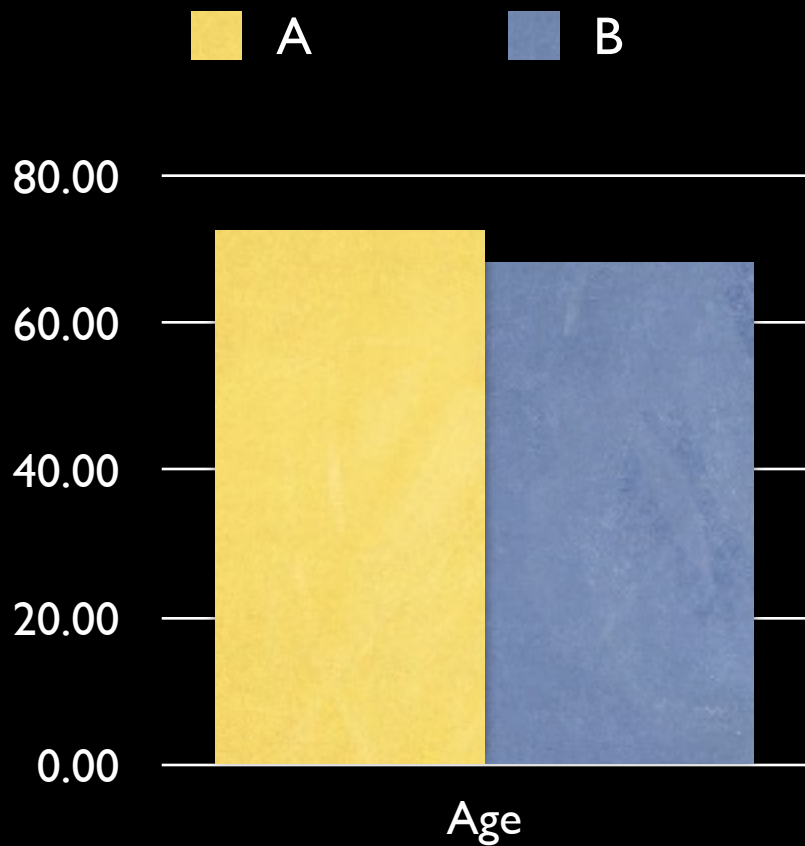
● A   ● B1   ● B2



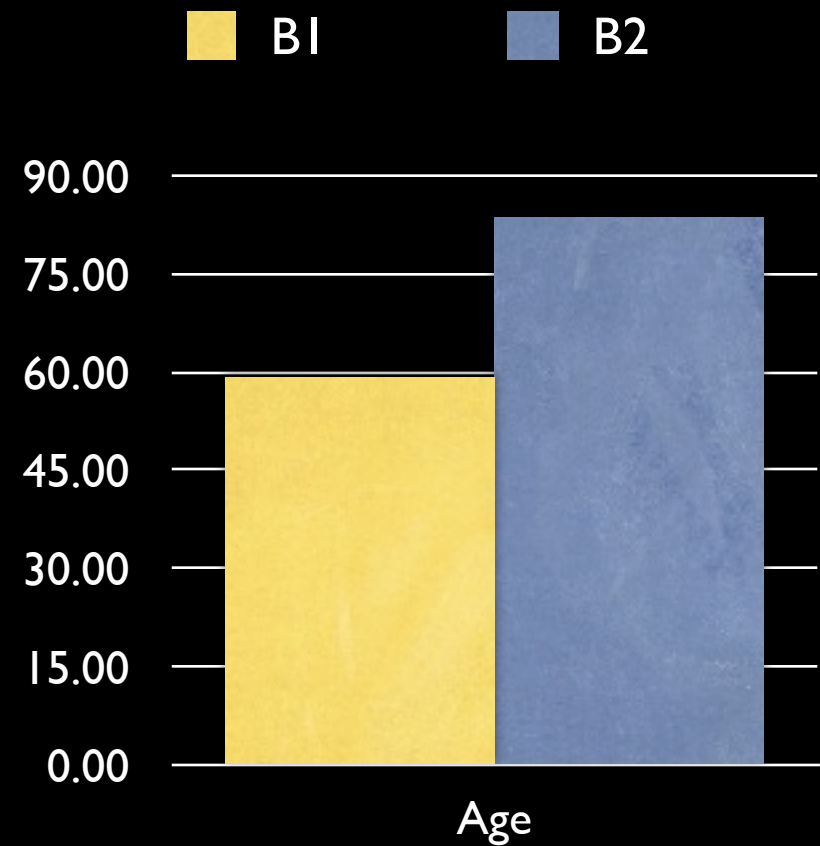
A group = 17  
B group = 23  
B1:9 B2: 14

$n = 40$   
A: 43% B:57%

# Age in Two Groups

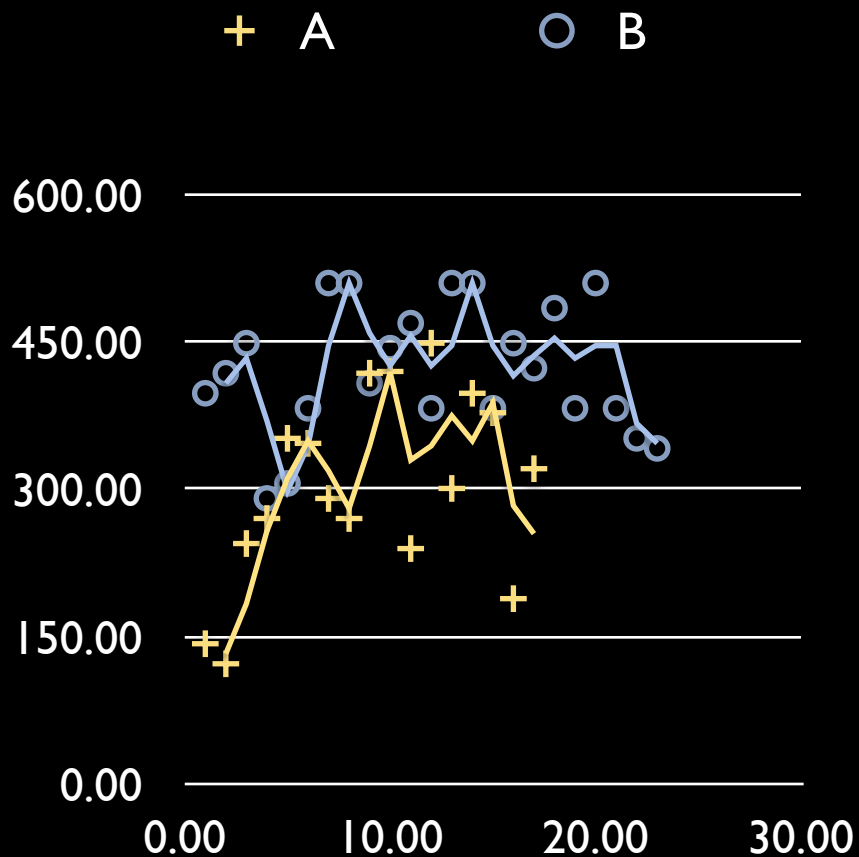


$p = 0.21$

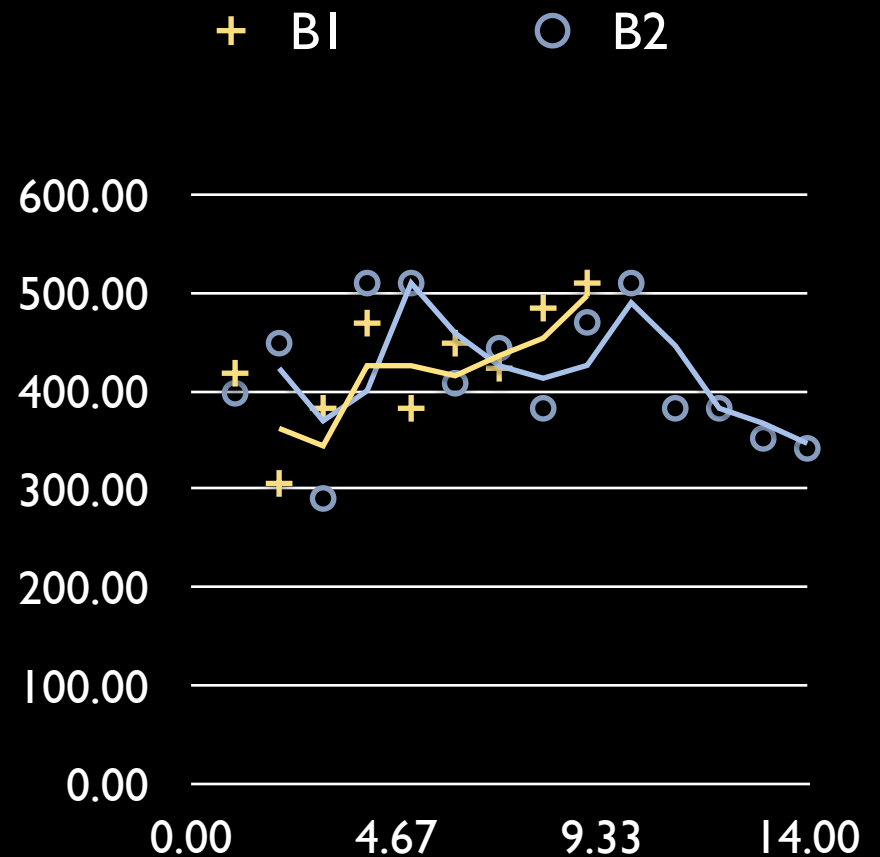


$p < 0.0001$

# Infarction Volume

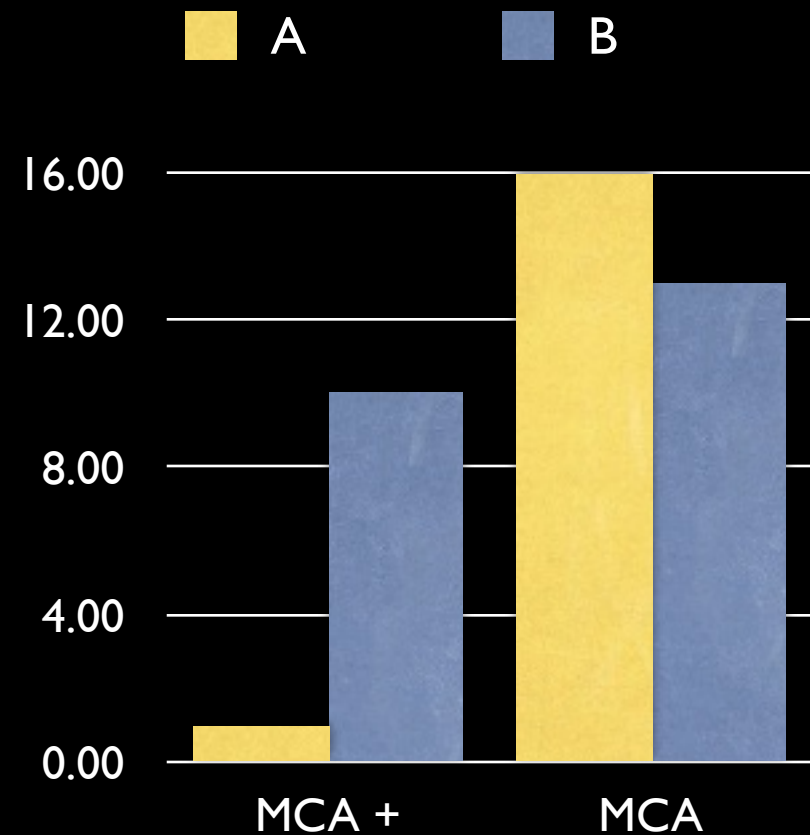
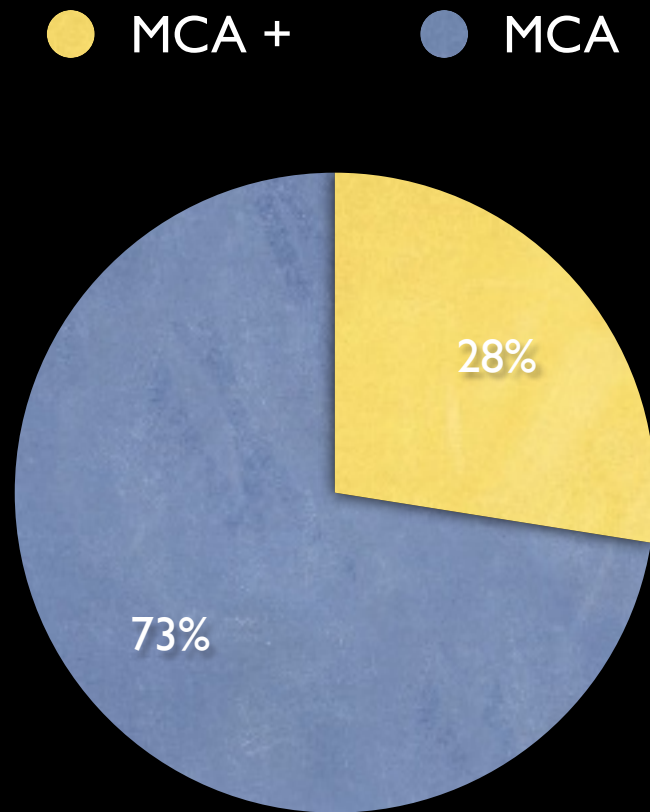


Average infarction volume: B > A  
( $p < 0.0001$ )



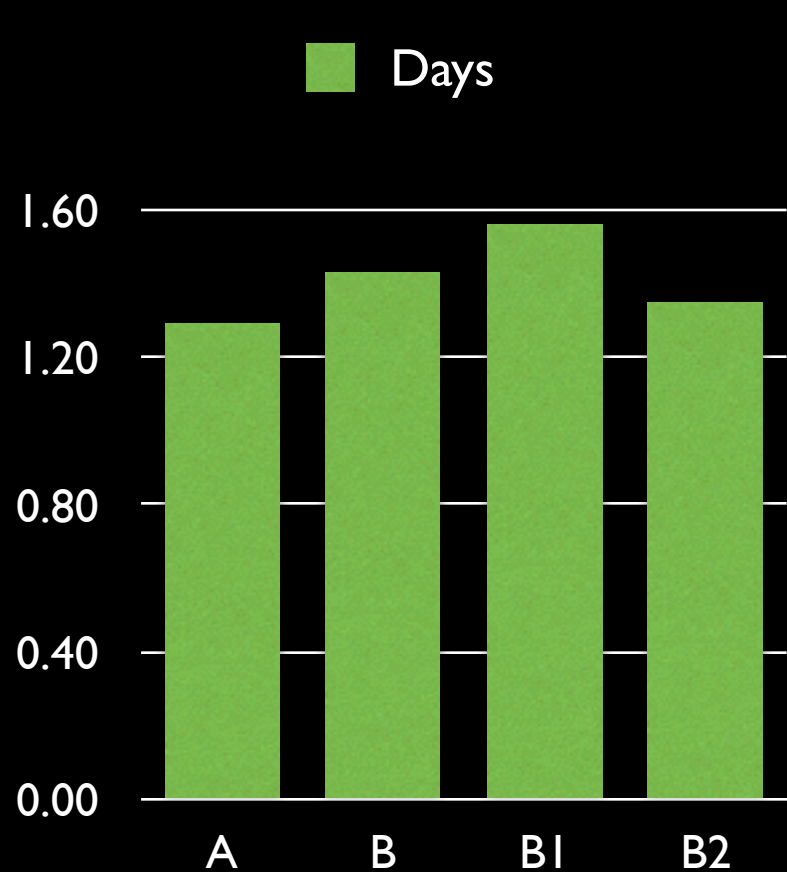
Infarction Volume between B1 and B2 had no significant difference  
( $p = 0.3$ )

# Infarction Territory

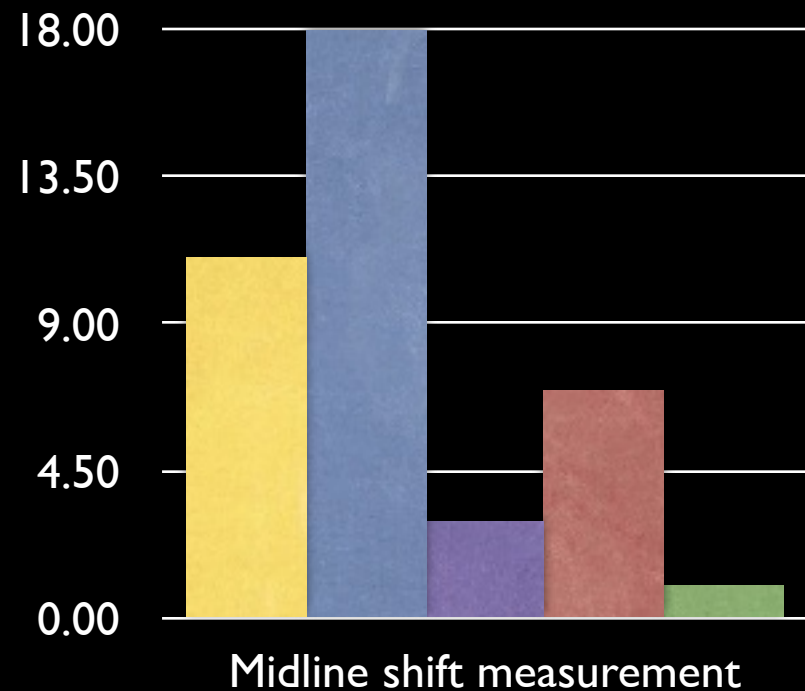


MCA+ territory infarction showed more severe mass effect ( $p < 0.001$ )

# Time to Midline Shift Measurement



$p = 0.35$

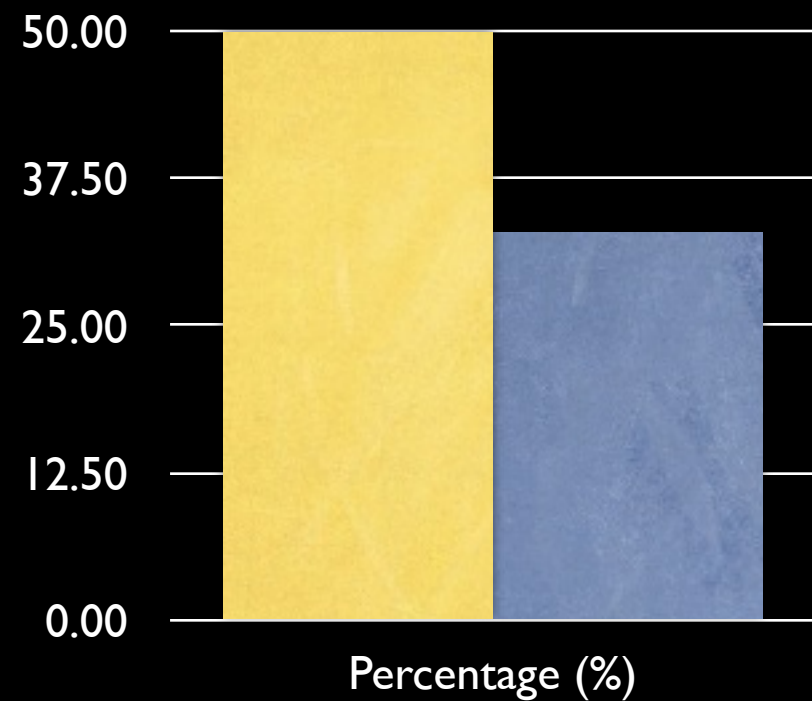
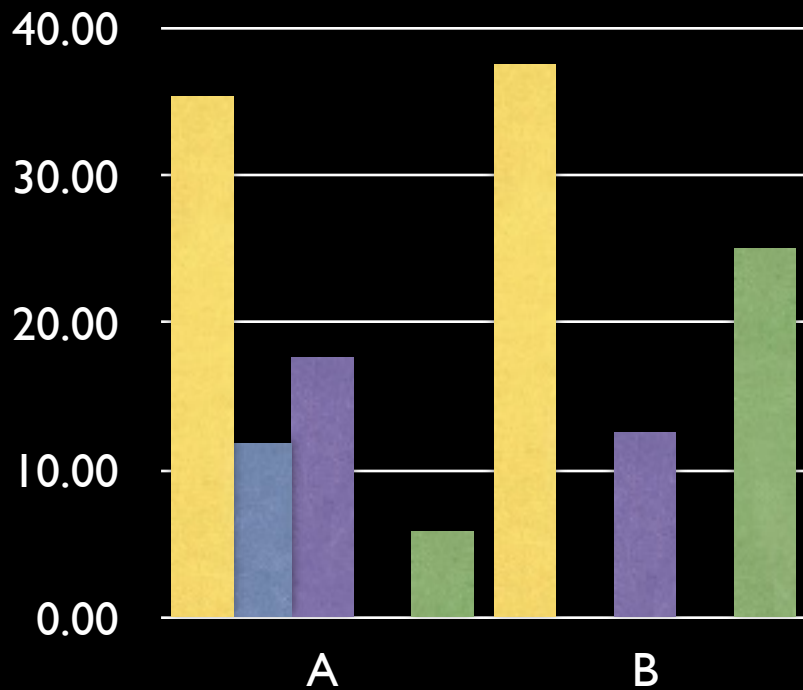
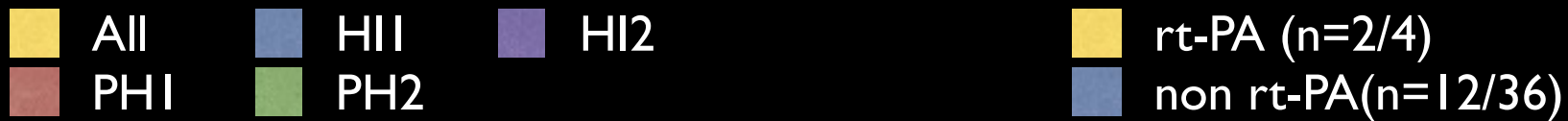


Symptom progression most onset < 48 hours  
( $P < 0.001$ )

# ECASS Classification of Hemorrhagic Transformation

- HI 1: small petechiae along the margin of the infarct
- HI 2: confluent petechiae within the infarcted area but no space-occupying effect
- PH 1: Blood clots in 30% of the infarcted area.
- PH 2: > 30% of the infarcted area.

# Hemorrhagic Transformation and r-tPA

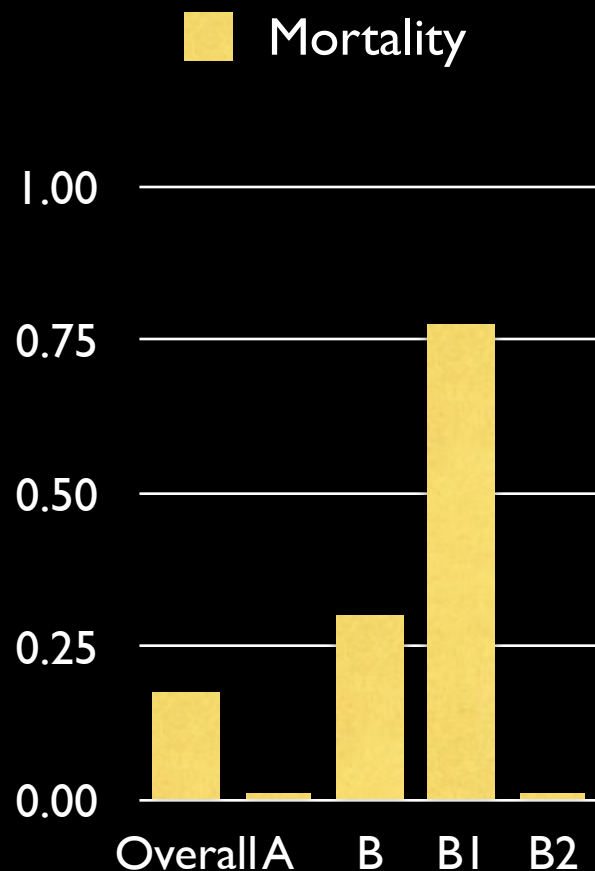


There is difference in the ratio of PH2 between A and B group

$P = 0.03$

$p = 0.3$

# Mortality



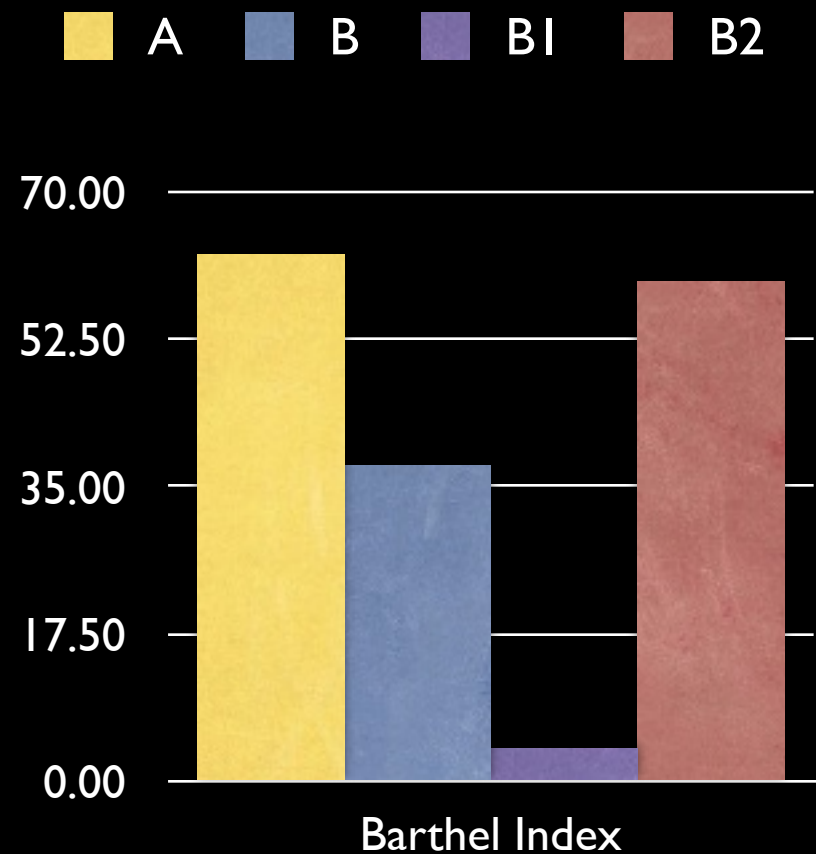
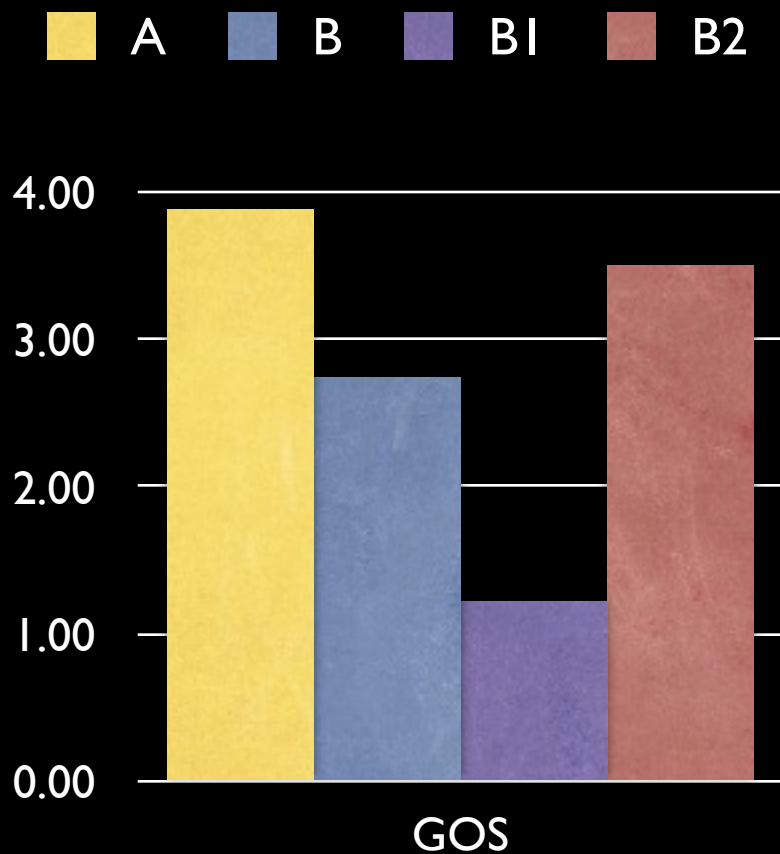
All mortality = 17.5% (7/40)

No mortality in A and B2 group

High mortality in B1 group (7/9)

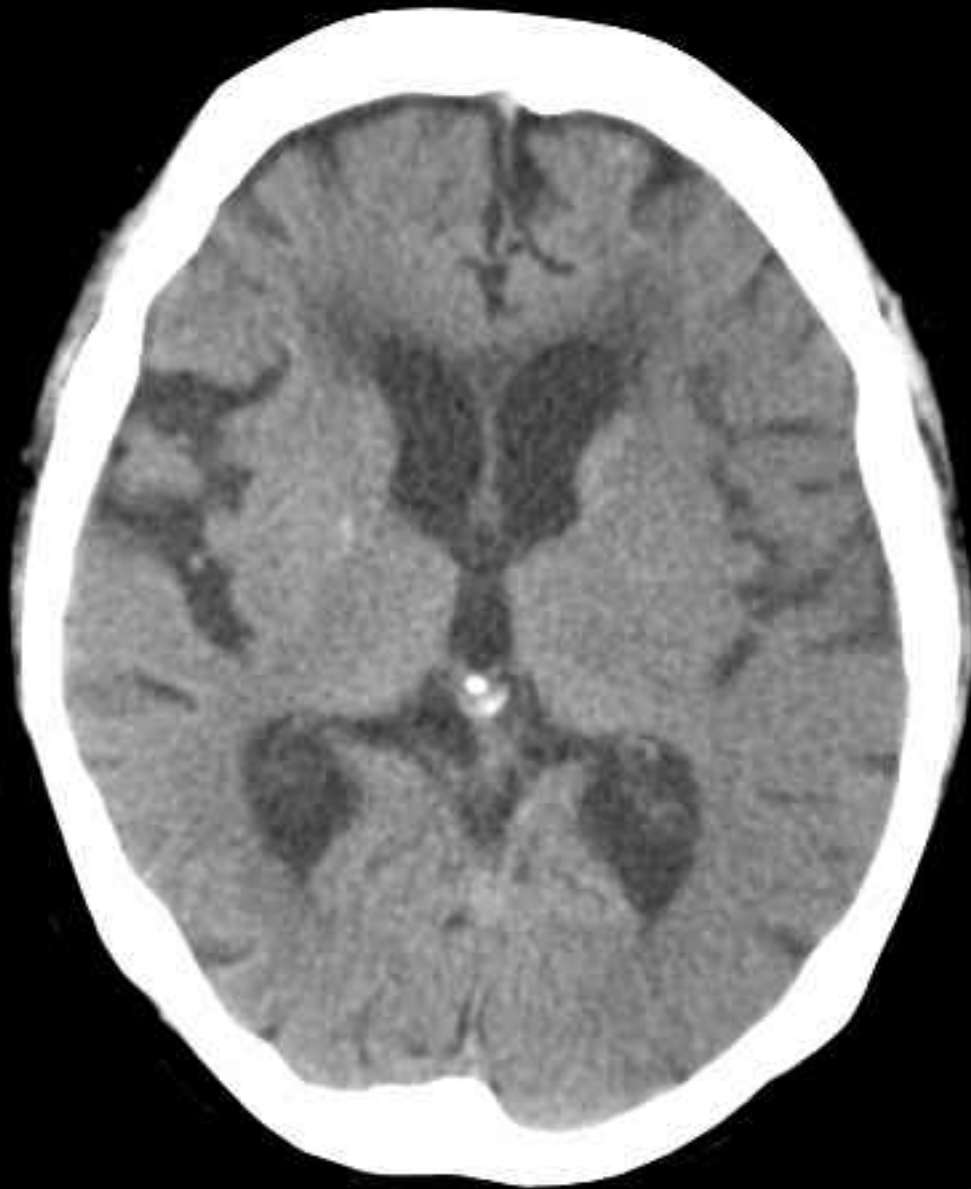
In B group, significant different mortality between operation (B2) and non-operation group (B1) ( $p < 0.0001$ )

# Morbidity - Glasgow Outcome Scale and Barthel Index



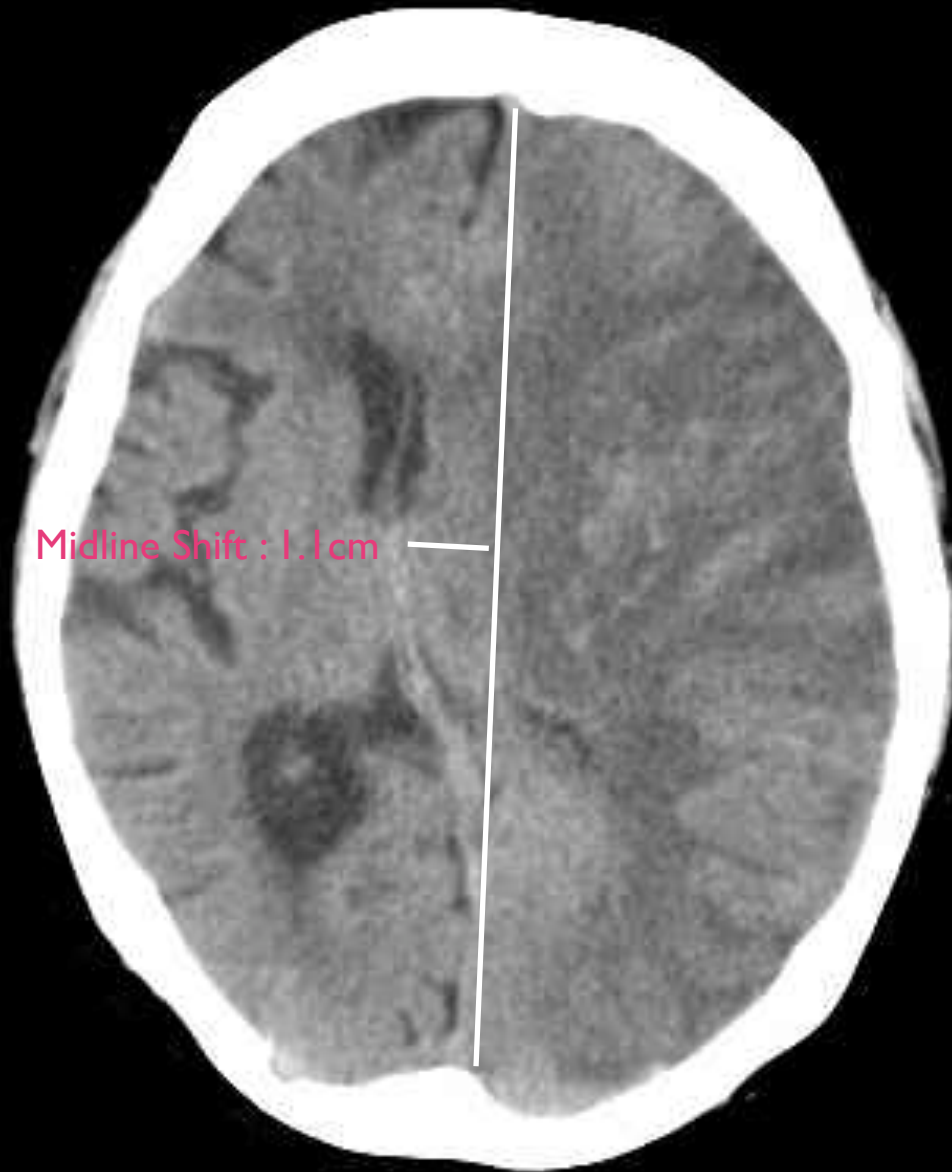
# Case 1

- 91 years old female
- Left MCA infarction with right side weakness and aphasia.



Initial GCS = E3VaM6  
NIHSS = 10  
Right side weakness

Onset



Midline Shift : 1.1 cm

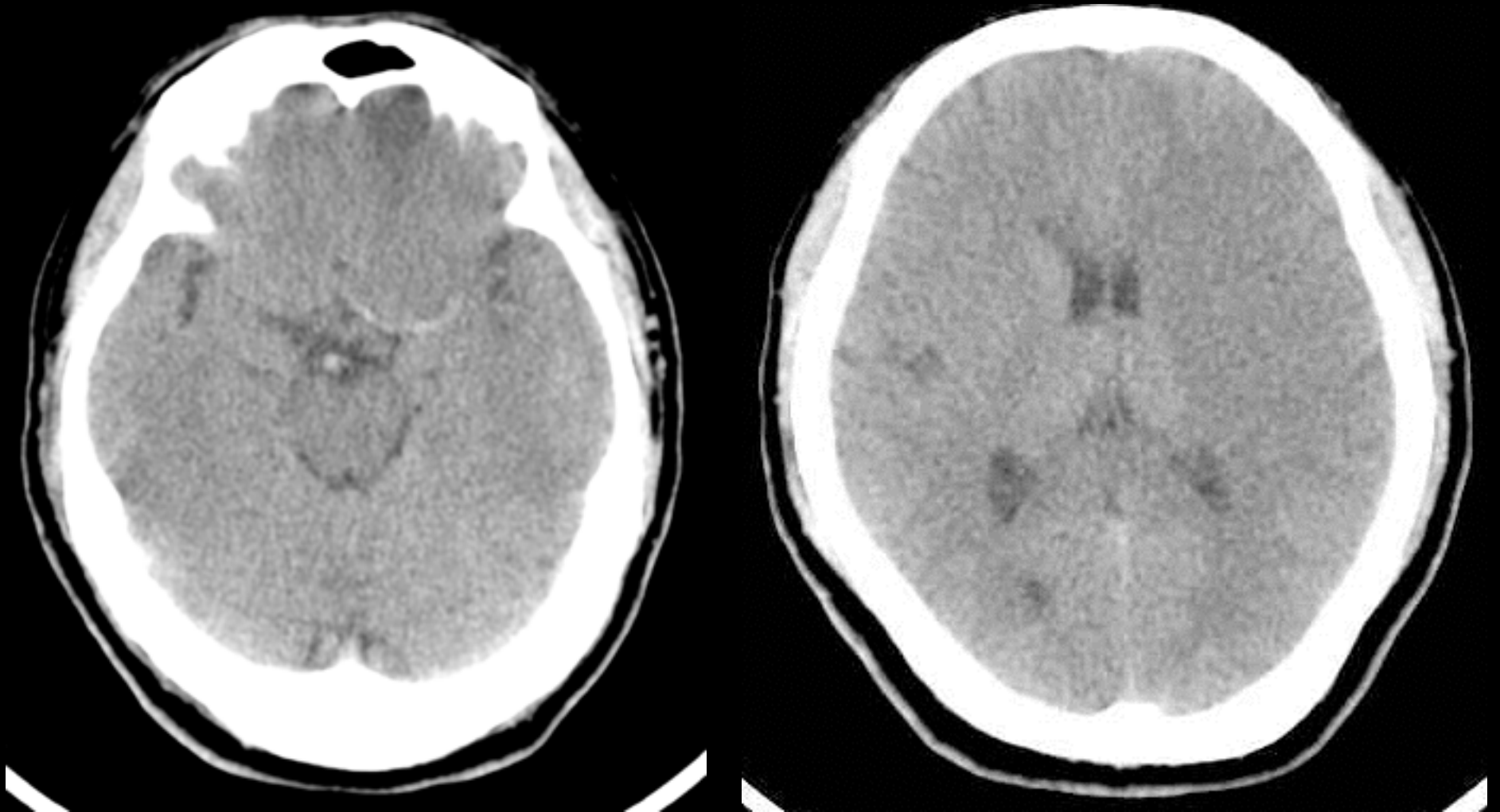
Initial GCS = E3V1M2  
Right side hemiplegia  
Hemorrhagic Transformation (+)

24 hours later

# Case 2

- 48 years old male
- Left MCA + ACA territory infarction
- Consciousness: E4VaM6
- Right hemiplegia + Aphasia
- NIHSS = 15

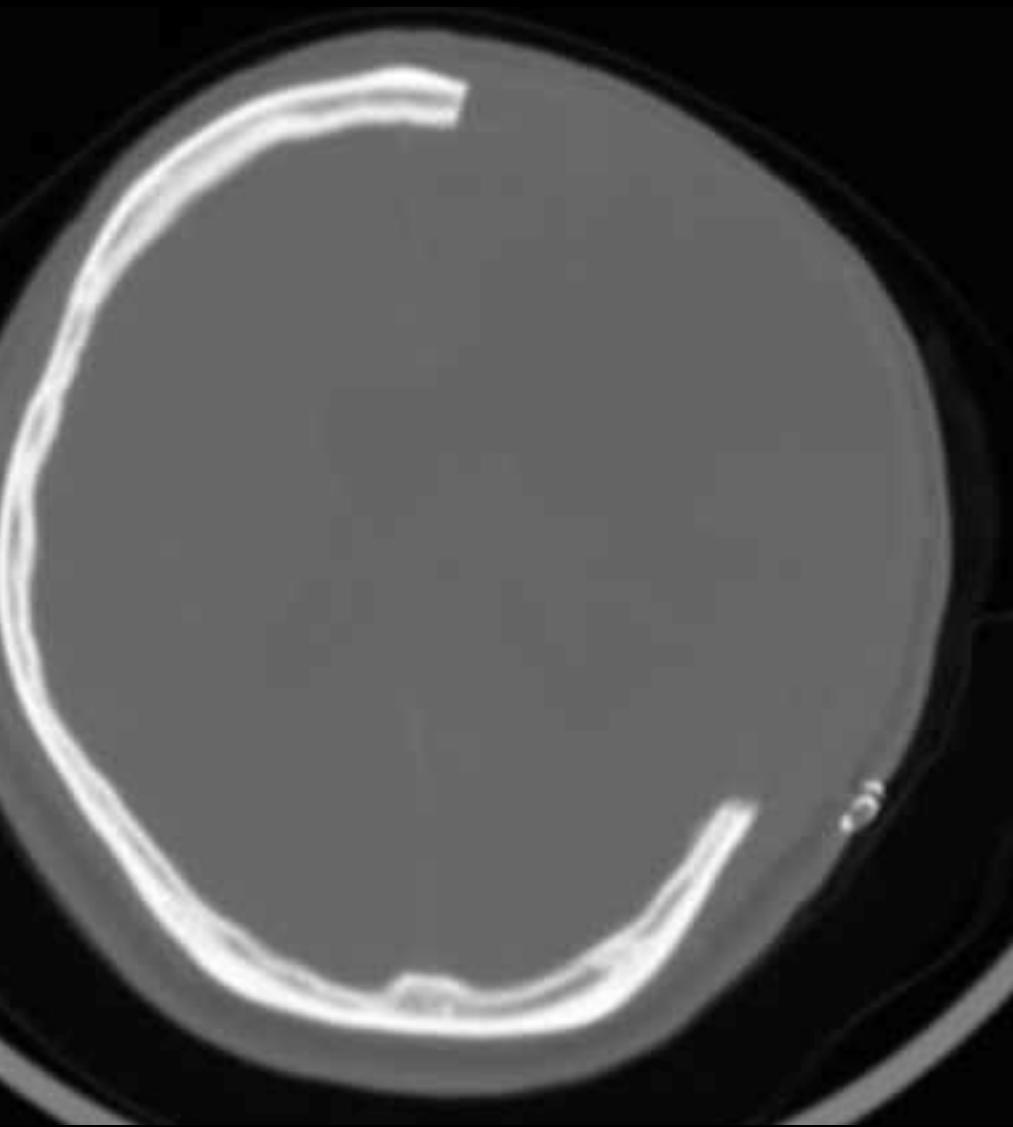
# Initial Brain CT



# 24 Hours Later



- GCS: E2VaM4
- Left pupil reflex (-)
- NIHSS: 25



Post Operation  
23

# Discussion - I

- Malignant MCA territory infarction would cause high mortality without adequate treatment.
- MCA with extra-MCA territory infarction was a high risk factor for mass effect and cerebral edema.
- In young aged patients, large cerebral infarction would cause more severe mass effect. They could get more benefit in decompressive craniectomy
- Surgical decompression can highly reduce the mortality in high ICP patients, whether in previous studies and our study.
- Decompressive craniectomy did not cause “vegetative survivor”

Postgrad Med J 2010;86:235-242  
Neurosurgery Focus 8(5): Article 3, 2000

# Discussion - II

- Hemorrhagic transformation was common in natural course of acute infarction (36.5%)
- Large hemorrhagic transformation (PH2) would increase mass effect and cause poor prognosis
- r-tPA related to increasing incidence of large hemorrhagic transformation. Not obvious in our series.

# Limitation of Studies

- Retrospective studies
- Not true random trial. Age is an important factor affecting the families' choice.

# Conclusion

- Malignant cerebral infarction could cause high mortality and morbidity
- Surgical decompressive craniectomy could reduce the mortality
- We should consider surgical treatment in malignant MCA infarction when mass effect presented with midline shift more than 1cm.

# Thank You For Your Attention

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五月十一日  
2018



XXI

Symposium  
Neuroradiologicum

March 19-24, 2018 Taipei Taiwan



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See You in 2018!

