# State-of-the-Art Treatment for Acute Ischemic Stroke


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# State-of-the-Art Endovascular Treatment of Acute Ischemic Stroke

Scientific evidence

Guidelines

Protocol

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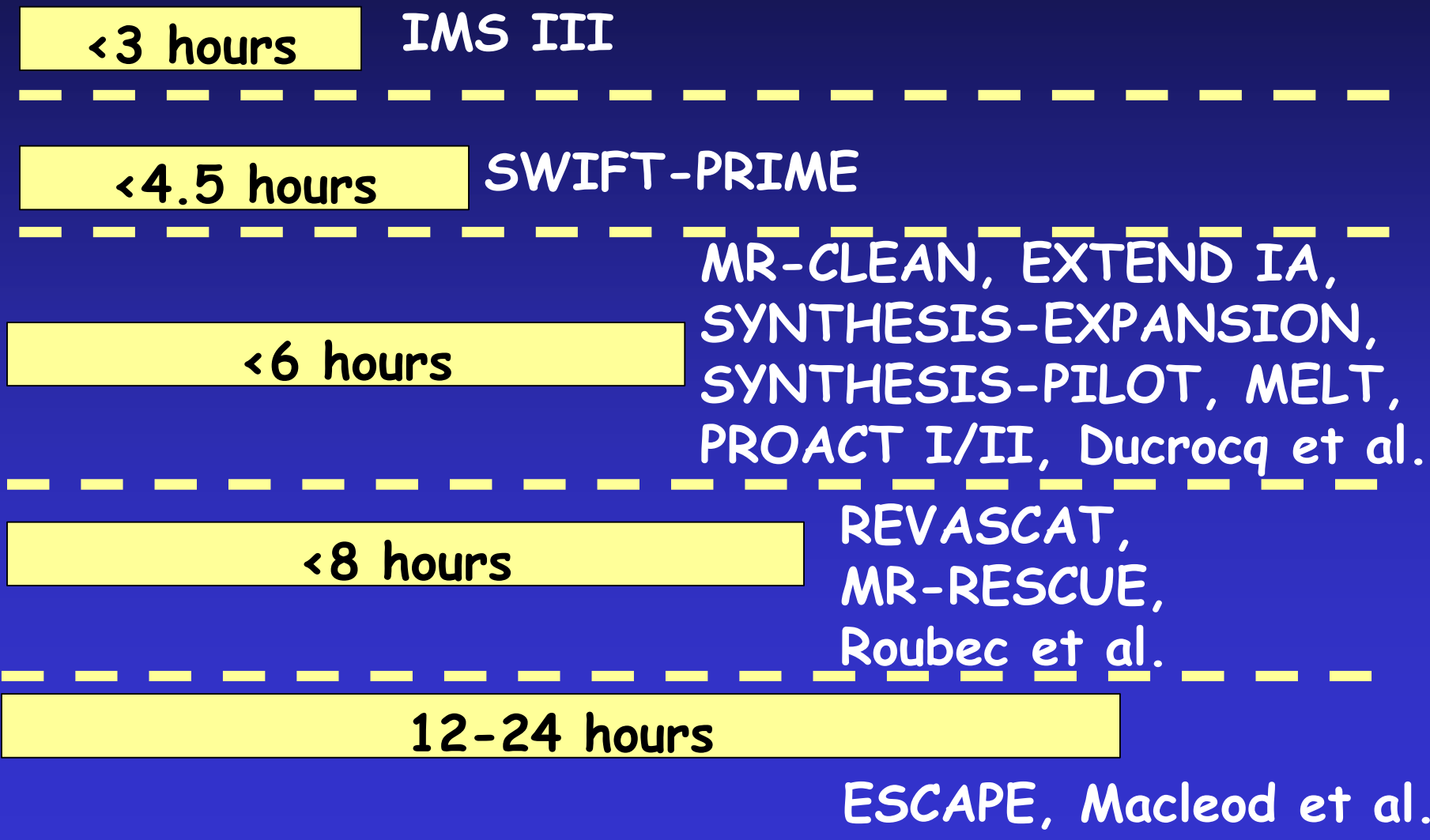
# Endovascular treatment versus medical treatment [including IV rt-PA]

## Time window for recruitment in 15 trials

Re: Qureshi AI. Am J Neuroradiol 2016: 37:1068-73

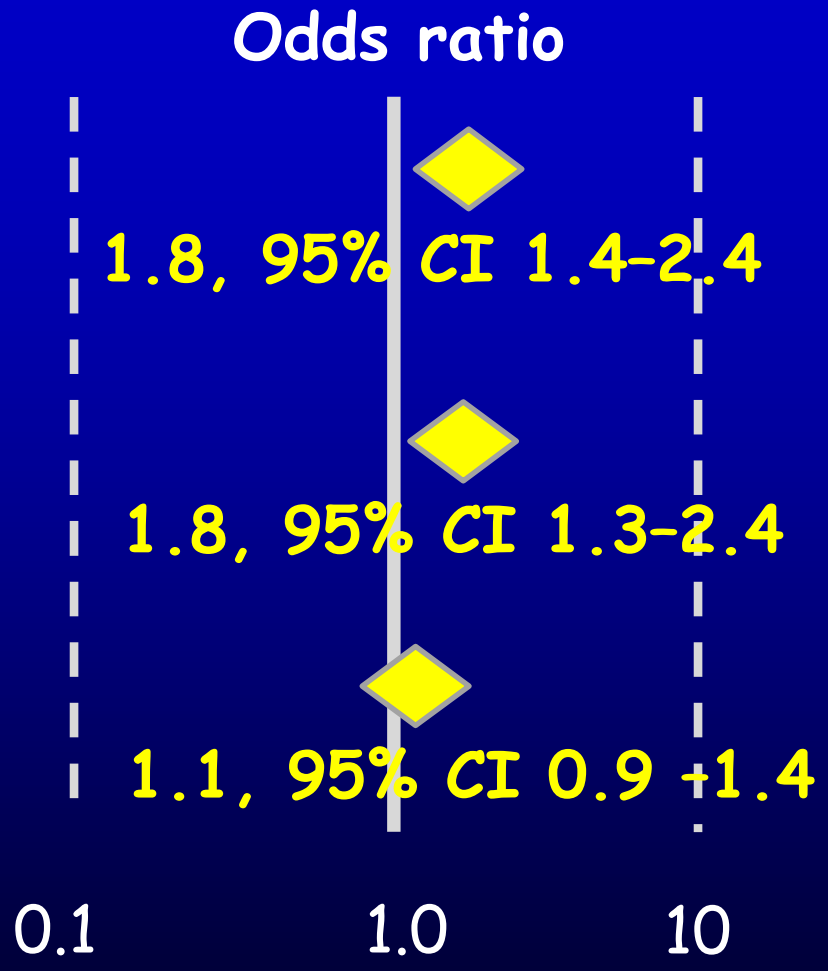


# Meta-analysis: 15 trials 2949 subjects analyzed—90 d outcomes

**Modified Rankin scale [0-2]**
0 (no symptoms),
1 (no significant disability),
or 2 (slight disability)

**Modified Rankin scale [0-1]**
0 (no symptoms),
1 (no significant disability)

**Survival**

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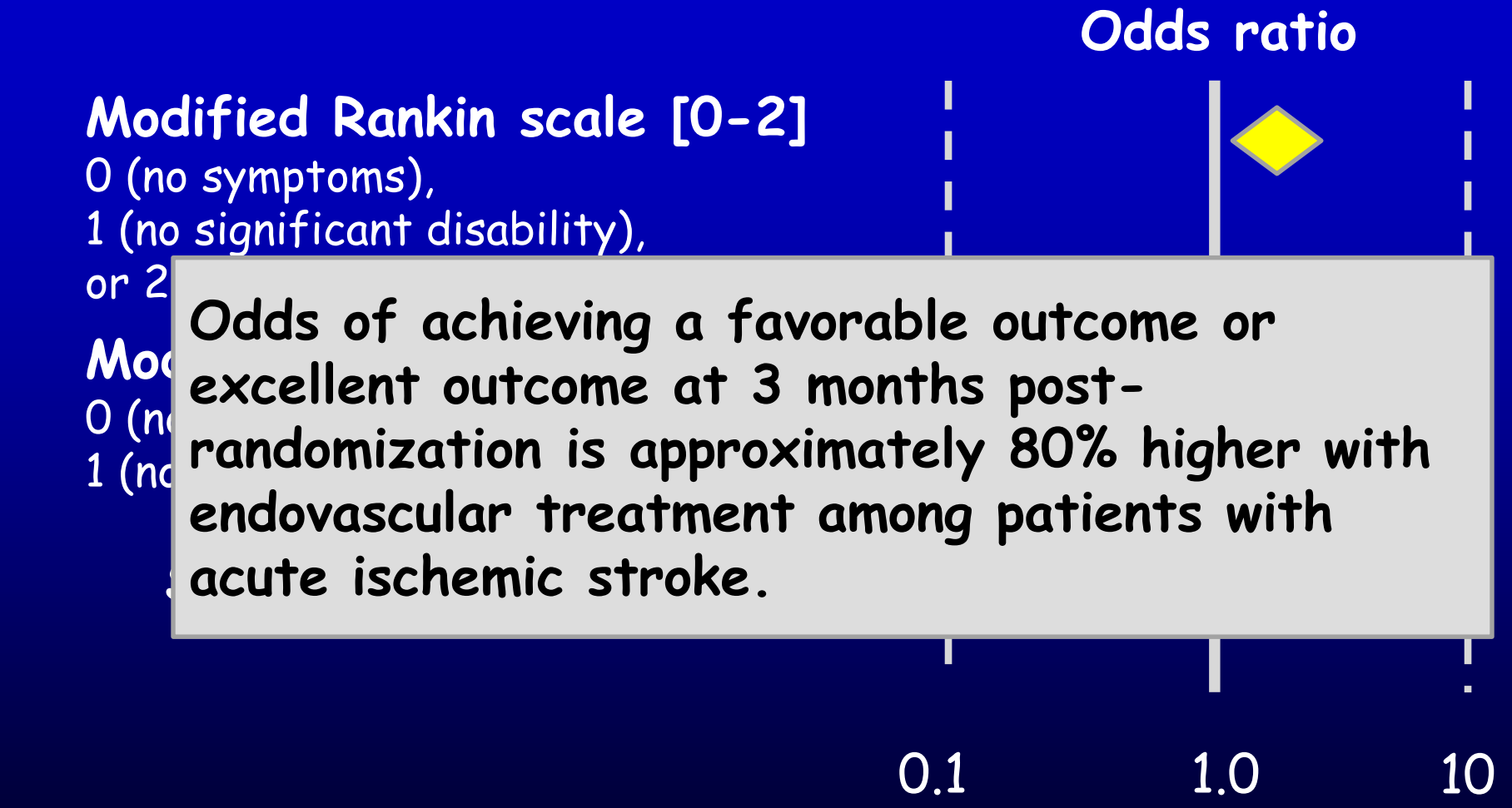
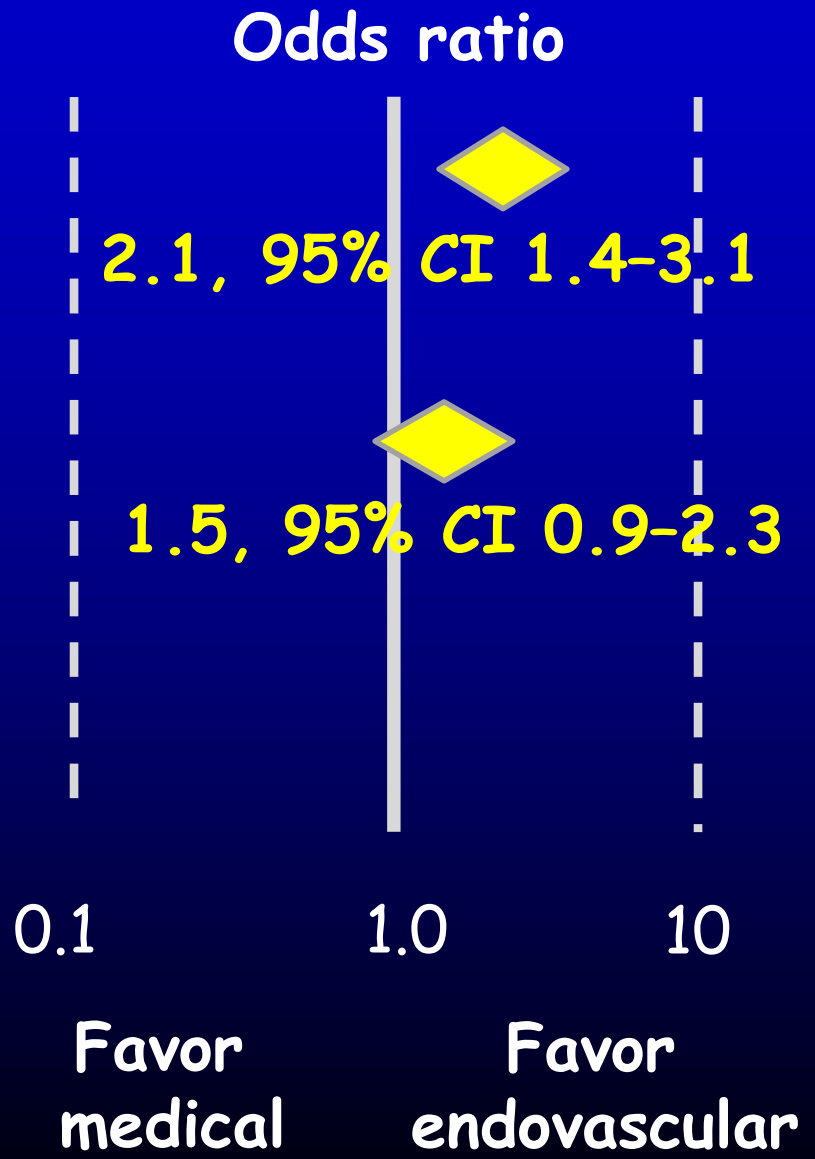



Re: Qureshi AI. Am J Neuroradiol 2016: 37:1068-73

# Meta-analysis: 15 trials
## 90 d outcomes-modified Rankin Scale 0-2

Permitted IV rt-PA prior to endovascular Rx

Did not permit IV rt-PA prior to endovascular Rx

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# Meta-analysis: 15 trials
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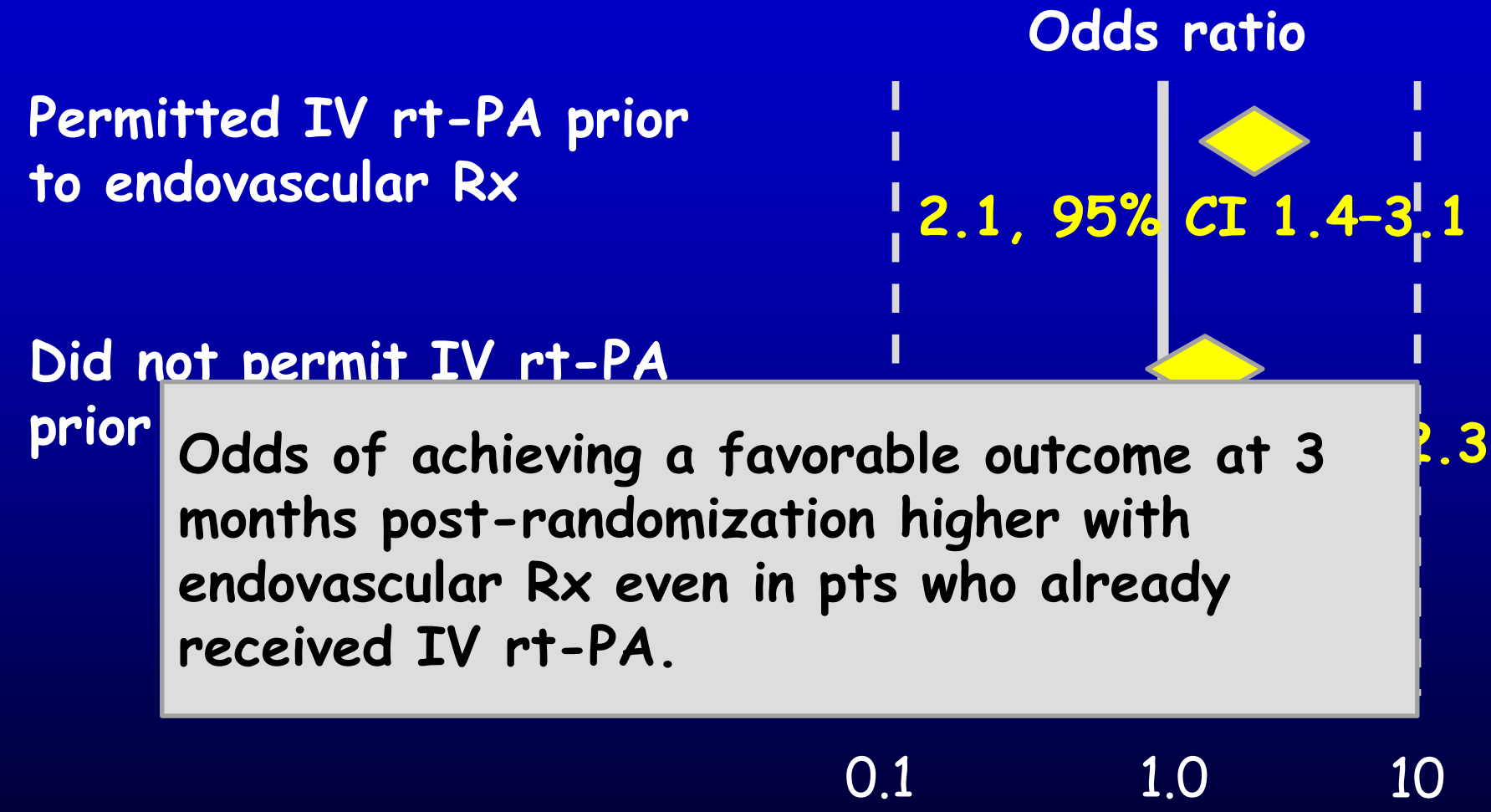
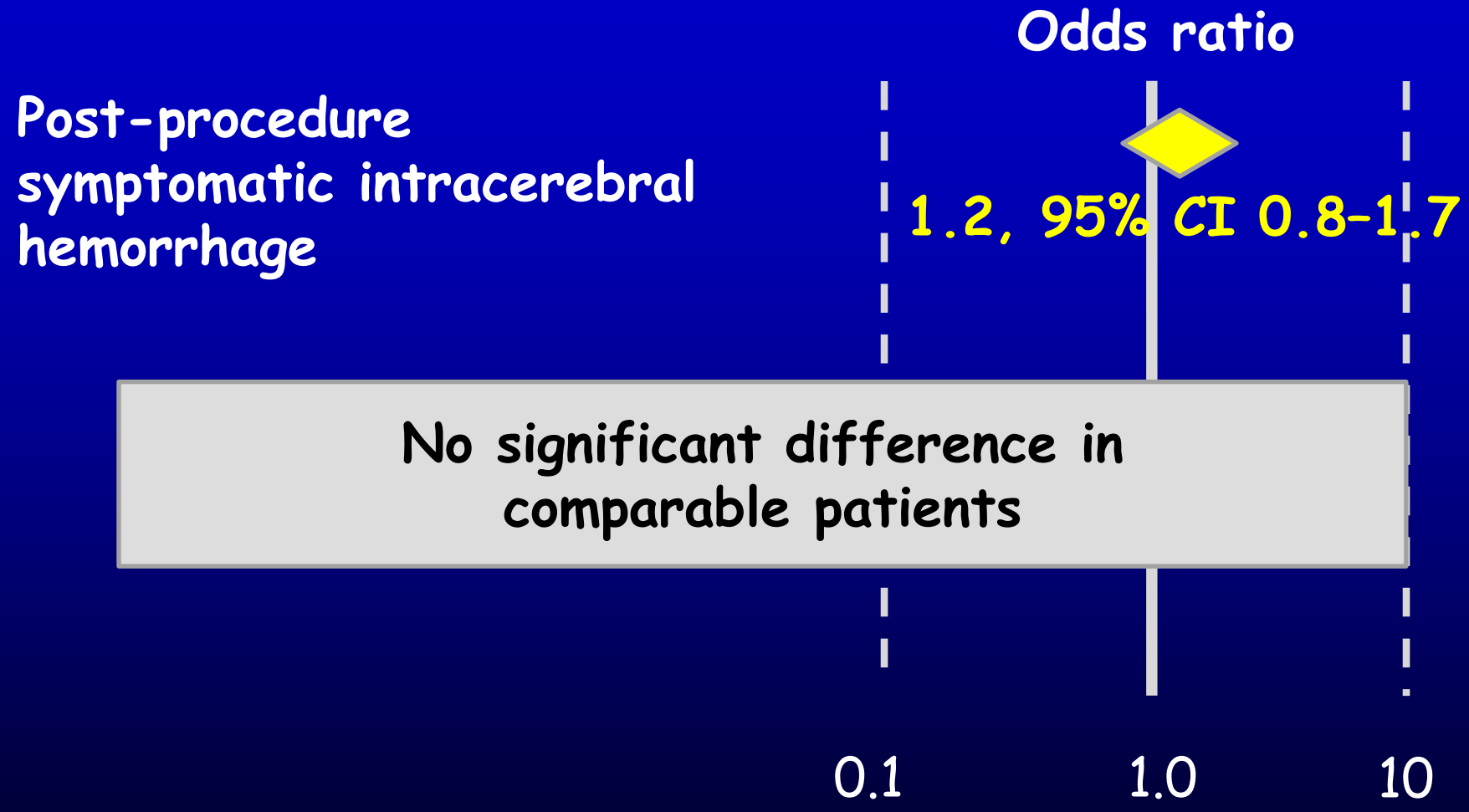



Re: Qureshi AI. Am J Neuroradiol 2016: 37:1068-73

# Meta-analysis: 15 trials 2906 subjects analyzed—Safety endpoints




Re: Qureshi AI. Am J Neuroradiol 2016: 37:1068-73

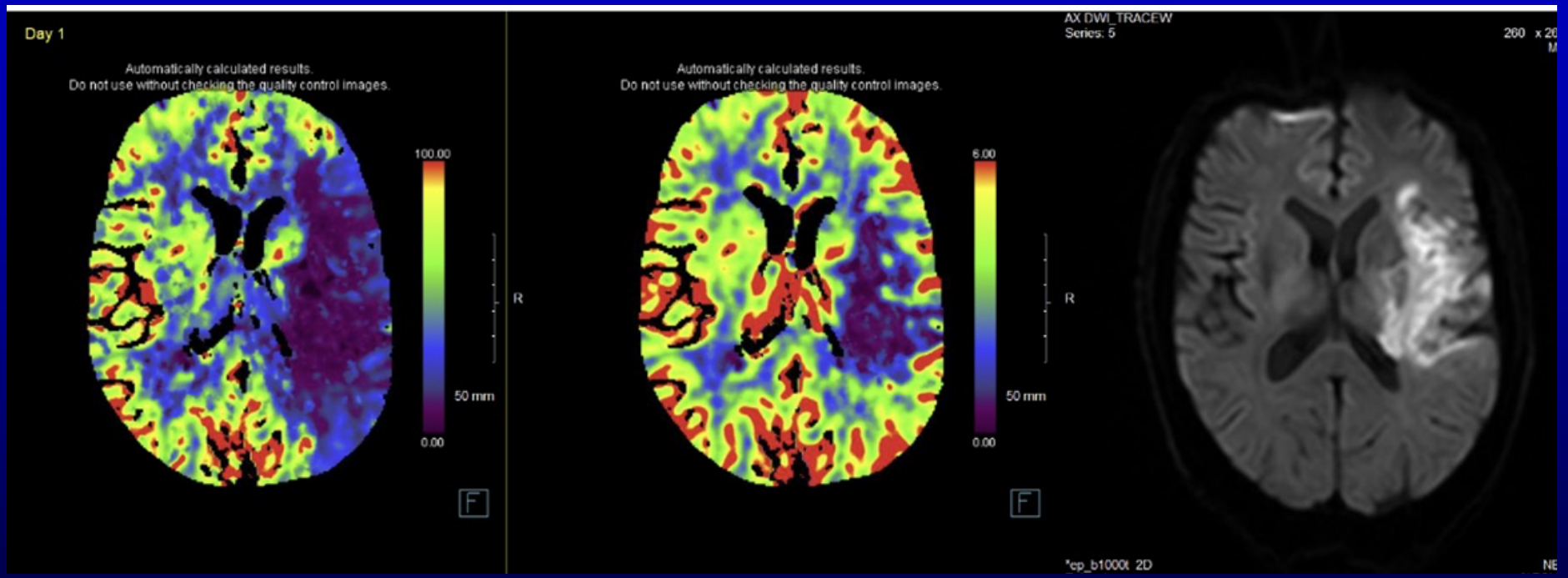
# Time window for mechanical thrombectomy

- The 2015 American Heart Association (AHA)/American Stroke Association (ASA) focused update:

"**Acute ischemic stroke patients should receive endovascular treatment with a stent retriever if treatment can be initiated (groin puncture) within 6 hours of symptom onset**".

- *Almost all data is derived from clinical trials that recruited patients within 6-8 hours of symptom onset.*

# Assessment of tissue viability on CT/MR perfusion images




rCBF

rCBV

DWI-/MRI

# DAWN Trial (6-24 hrs symptom onset)

Nogueria RG. N Engl J Med 2018;378:11-21

| | | |
|---|---|---|
| Large artery occlusion+ CT/MR perfusion | Age≥80yrs NIHSS≥10 | Infarct core <21 ml |
| | Age<80yrs NIHSS≥10 | Infarct core <51 ml |
| | Age<80yrs NIHSS≥20 | Infarct core 31-49 ml |

| | Mechanical Thrombectomy N=107 | Control Group N=99 |
|---|---|---|
| *Modified Rankin Scale 0-2 at 3 m* | 48.6% | 13.1% |

# DAWN Trial (6-24 hrs symptom onset)

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| | Mechanical Thrombectomy N=107 | Control Group N=99 |
|---|---|---|
| mRS 0-2 at 3 m | | |
| Overall | 48.6% | 13.1% |
| 6-12 hrs | 55.1% | 20.0% |
| 12-24 hrs | 43.1% | 7.4% |

# DEFUSE 3 Trial (6-16 hrs symptom onset)

Albers GW. N Engl J Med 2018;22;378:708-718

| | |
|---|---|
| Large artery occlusion+ CT/MR perfusion | Infarct size < 70 ml |
| | Ratio of the volume of ischemic tissue on perfusion imaging to infarct volume >1.8 |

| | Mechanical Thrombectomy N=92 | Control Group N=90 |
|---|---|---|
| mRS 0-2 at 3 m | 45% | 17% |
| Mortality at 3 m | 14% | 26% |

# DEFUSE 3 Trial (6-16 hrs symptom onset)

Albers GW N Engl J Med 2018;22;378:708-718.

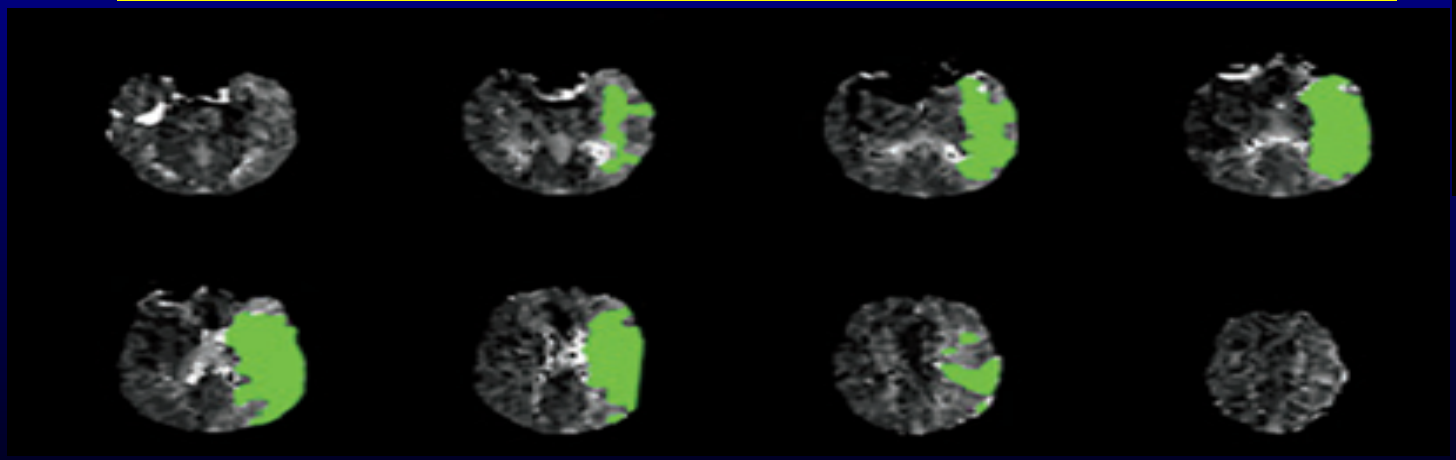
| | |
|---|---|
| Large artery occlusion+ CT/MR perfusion | Infarct size < 70 ml |
| | Ratio of the volume of ischemic tissue on perfusion imaging to infarct volume >1.8 |

mRS 0-2 at 90 d

| | Mechanical Thrombectomy N=92 | Control Group N=90 |
|---|---|---|
| <9 hrs | 40% | 28% |
| 9-12 hrs | 50% | 17% |
| >12 hrs | 42% | 7% |

# Quantitative/automated assessment of salvageable tissue (infarct/penumbra)

Volume of ischemic core, 23 ml



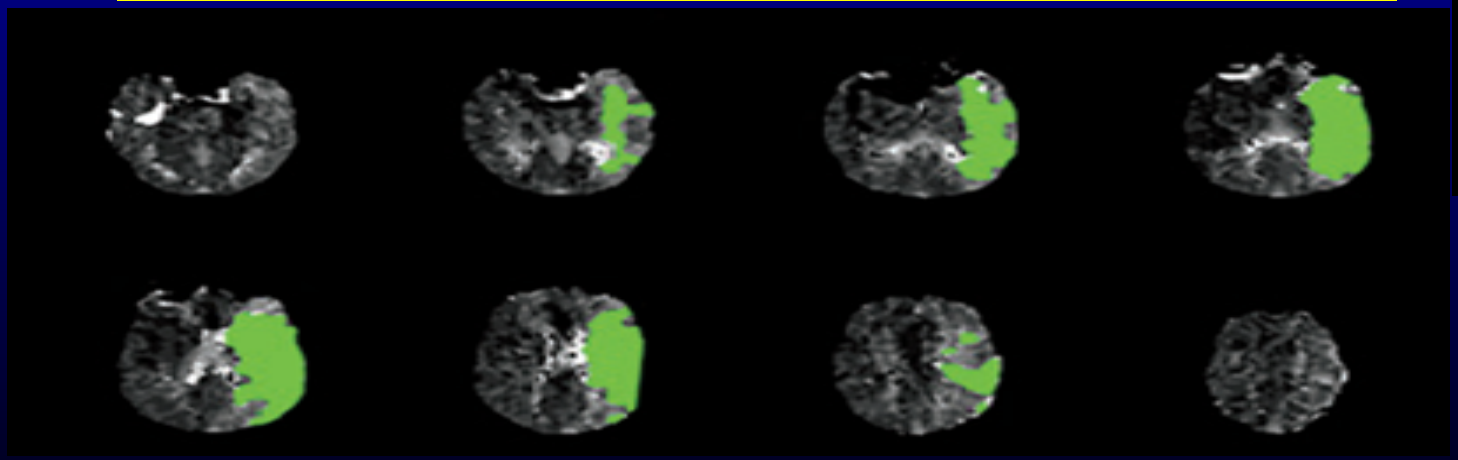
Volume of perfusion lesion, 128 ml

- Mismatch volume, 105 ml
- Mismatch ratio, 5.6

# Quantitative/automated assessment of salvageable tissue (infarct/penumbra)

Quantitative/automated assessment and avoidance of intra-arterial thrombolytics is key to success

Volume of ischemic core, 23 ml



Volume of perfusion lesion, 128 ml

- Mismatch volume, 105 ml
- Mismatch ratio, 5.6

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# 2013 American Heart Association/American Stroke Association Guidelines for the Early Management of Patients With Acute Ischemic Stroke:

(*Stroke. 2013;44:870-947*)

| | |
|---|---|
| Patients eligible for intravenous rt PA should receive intravenous rt PA even if IA treatments are being considered. | Class I; Level of Evidence A |
| IA fibrinolysis is beneficial for treatment of carefully selected patients with major ischemic strokes of <6 hours' duration caused by occlusions of the MCA | Class I; Level of Evidence B |

# 2015 American Heart Association/American Stroke Association Focused Update

(*Stroke. 2015; 46: 3020-3035*)

| | |
|---|---|
| Patients eligible for intravenous rt PA should receive intravenous rt PA even if IA treatments are being considered. | Class I; Level of Evidence A |
| Patients should receive endovascular therapy with a stent retriever if:<br>a.Prestroke mRS score 0 to 1,<br>b.Receiving intravenous r-tPA<4.5 hrs,<br>c.Causative occlusion of the ICA or proximal MCA (M1).<br>d.Age ≥18 years,<br>e.NIHSS score of ≥6,<br>f.ASPECTS of ≥6, and<br>g.Treatment can be initiated (groin puncture) within 6 hours of symptom onset | Class I; Level of Evidence A |

# 2018 American Heart Association/American Stroke Update (*Stroke. 2018;49:e46-e99*)

| | |
|---|---|
| Patients eligible for intravenous rt PA should receive intravenous rt PA. | Class I; Level of Evidence A |
| Patients should receive endovascular therapy with a stent retriever if meet criteria specified in 2015 guidelines | Class I; Level of Evidence A |
| Mechanical thrombectomy in selected acute stroke patients within 6-16 hours of last known normal who have a large vessel occlusion in the anterior circulation and meet other DAWN/DEFUSE 3 eligibility criteria, | Recommend |
| Mechanical thrombectomy with stent retriever in selected acute stroke patients within 6-24 hours of last known normal who have large vessel occlusion in the anterior circulation and meet other DAWN eligibility criteria | Reasonable |

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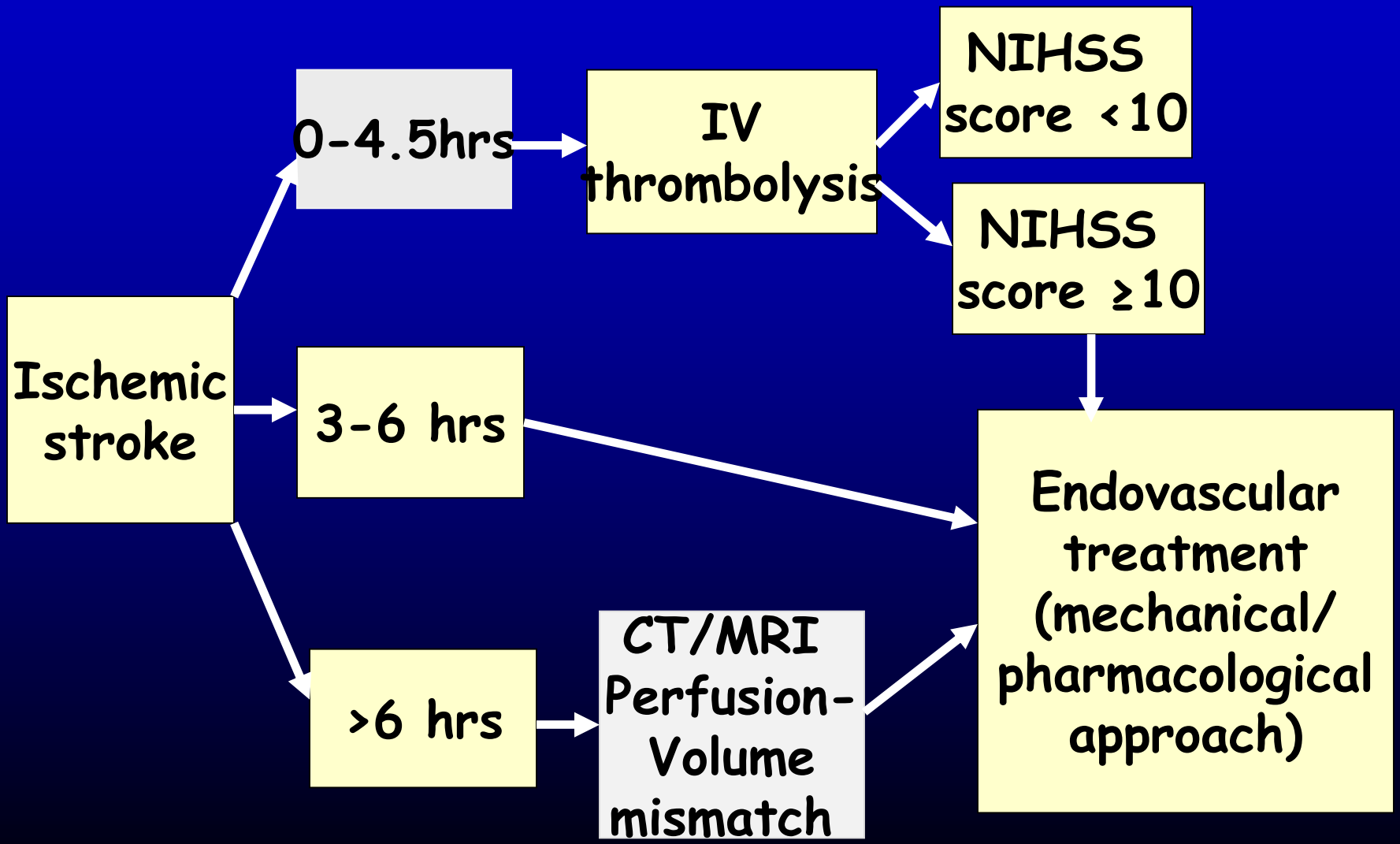
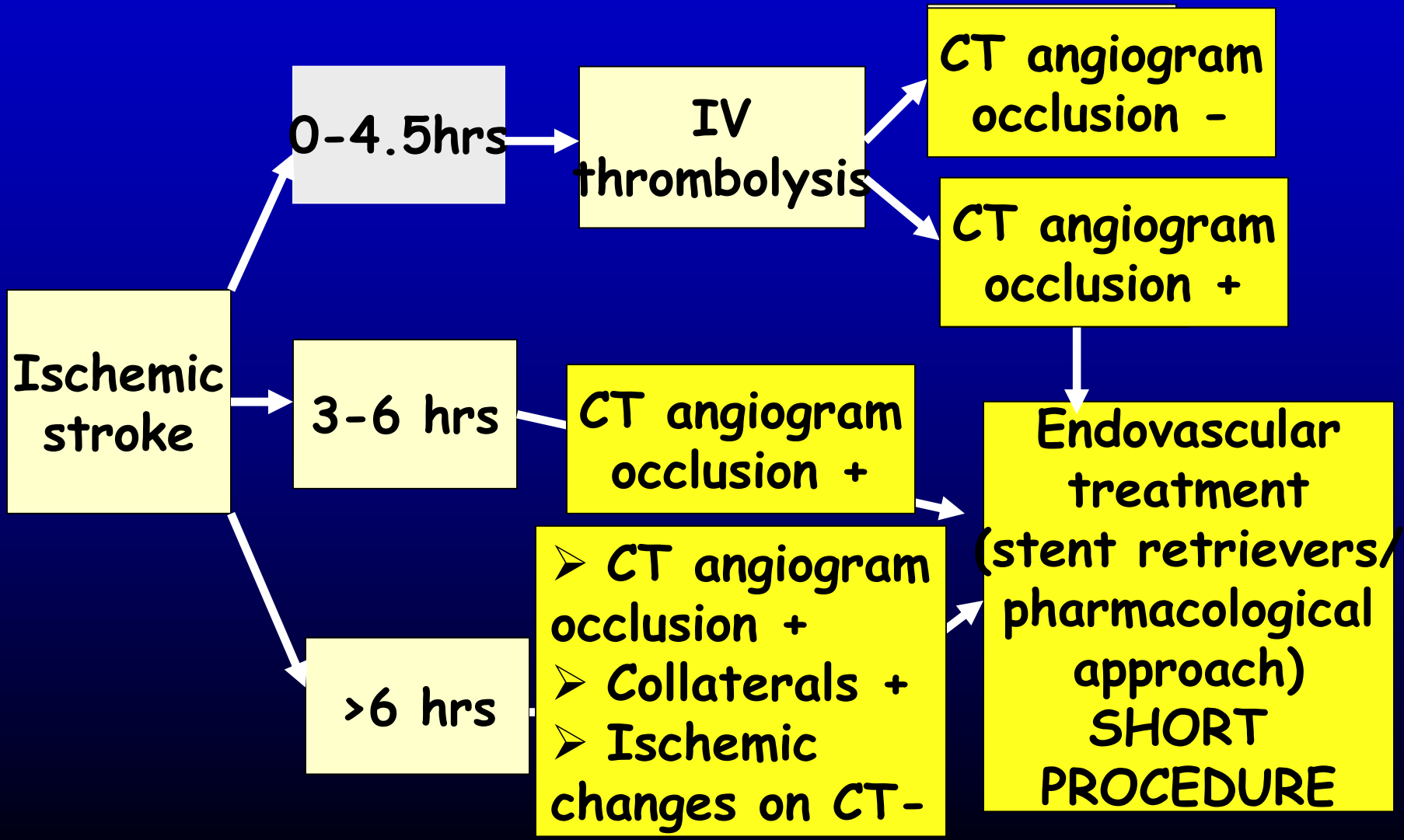
# Protocol for acute ischemic stroke treatment

Qureshi AI, Georgiadis AL: Textbook of Interventional Neurology 2011: Cambridge, UK

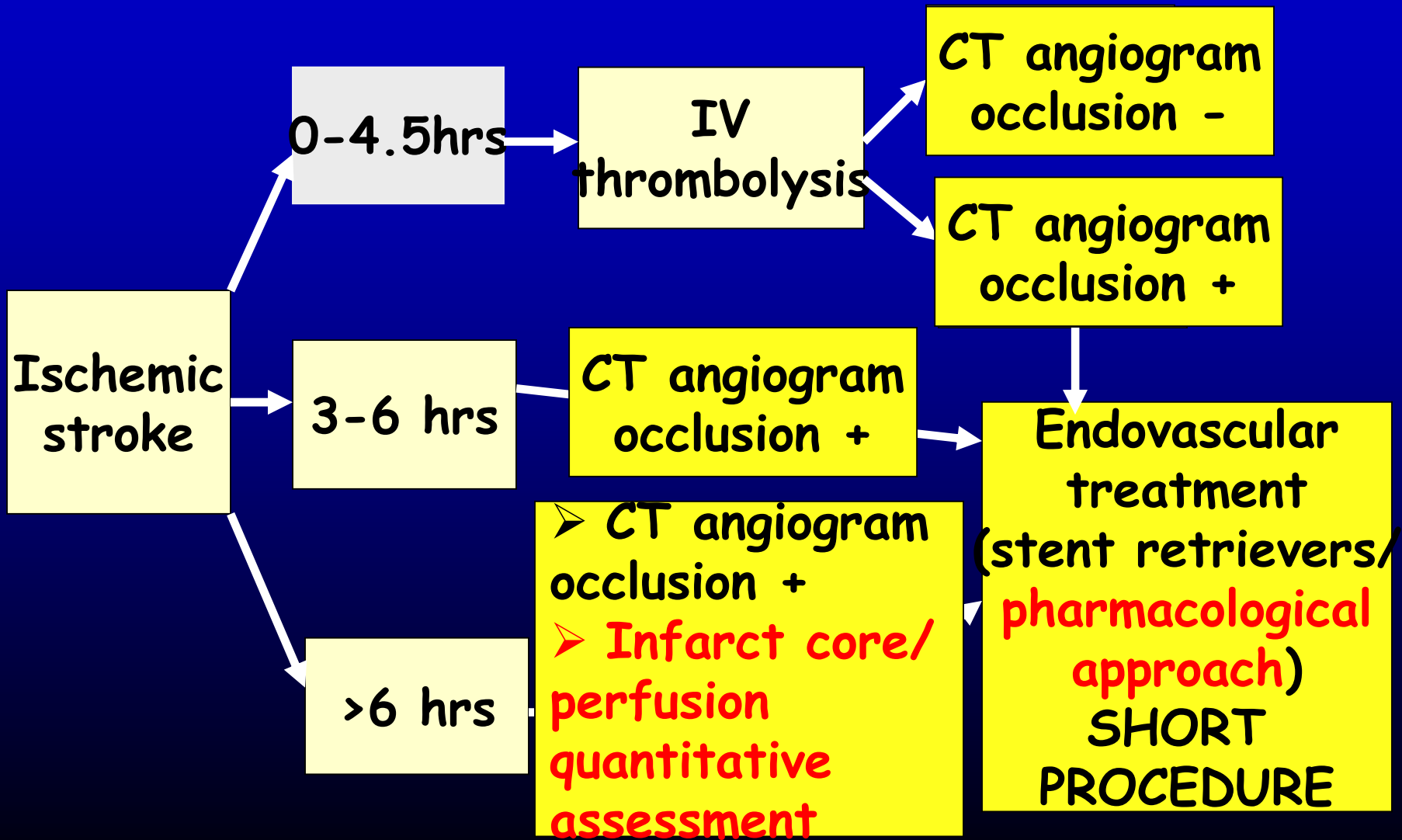


# Protocol for acute ischemic stroke treatment

## New protocol--2016



# Protocol for acute ischemic stroke treatment
# Newest protocol--2018



# Conclusions

- Recent clinical trials have demonstrated a significant benefit with endovascular treatment in patients with acute ischemic stroke using unique patient selection criteria and treatment paradigms.
- Large magnitude benefits can be expected with implementation of "parameter optimized endovascular treatment (RAPID TIME TO TREATMENT+FAST PROCEDURE TIME+HIGH RECANALIZATION RATES)" in patients with ischemic stroke who are candidates for IV thrombolytics.
- Large magnitude benefits can be expected with implementation of "selection based on quantitative assessment of penumbra/ infarct core" in patients with ischemic stroke 6-24 hrs after symptom onset.

# Zeenat Qureshi Institutes 2021—Thank you

St. Cloud, Minnesota, USA

Firat University, Elasig, Turkey

Donka National Hosp, Conakry, Guinea

Xuan Wu Hosp, Beijing, China