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Talking Heads
"This must be the *plase*"

Jim Priano, PharmD, BCPS
Emergency Medicine Clinical Pharmacy Specialist
AdventHealth Orlando
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@jim_priano

Disclosures

James Priano, PharmD has disclosed that he has no relevant financial disclosures related to this content. No one else in a position to control content has any financial relationships to disclose

Objectives

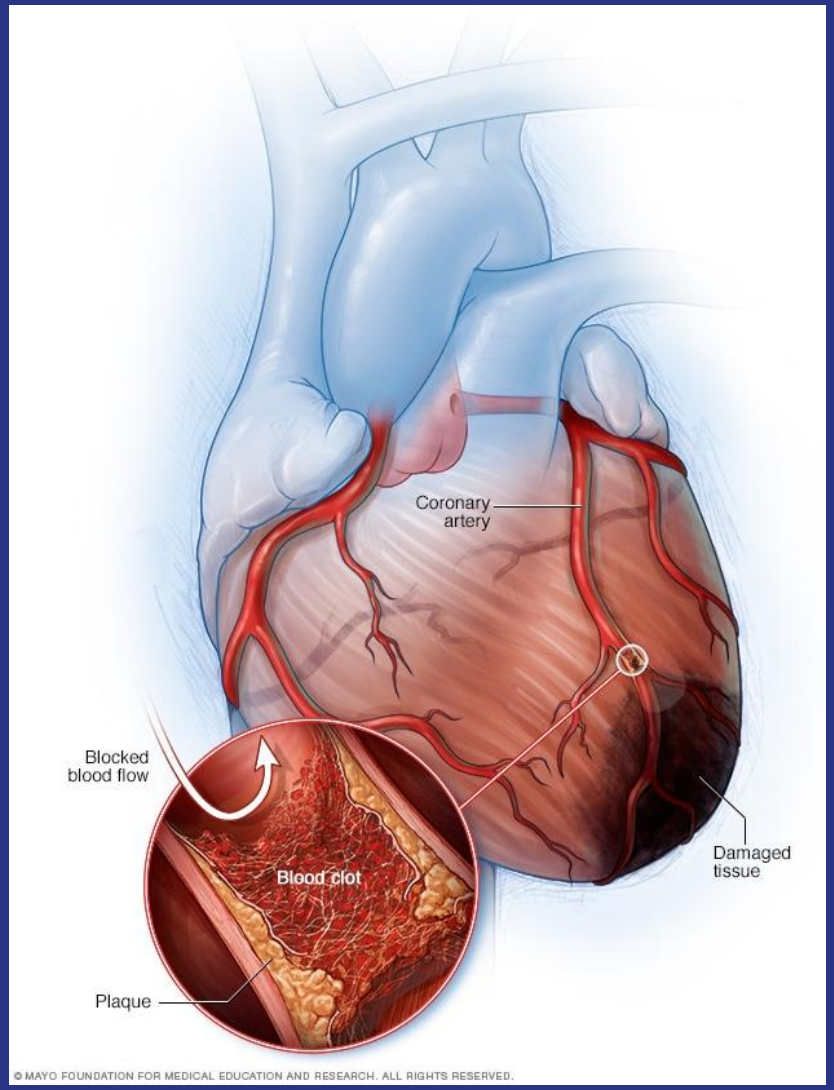
By the end of this presentation, audience members should be able to:

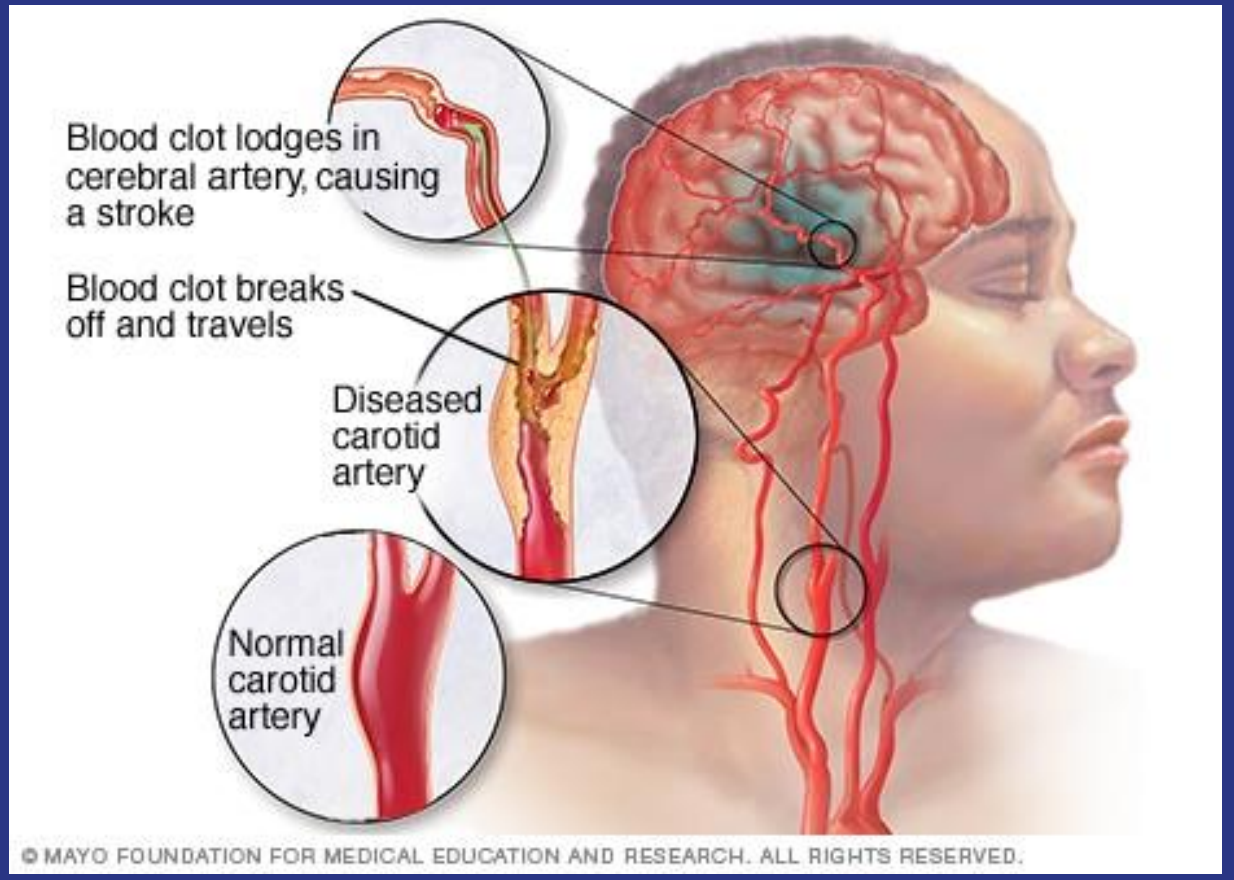
- Assess systemic fibrinolytic strategies for acute ischemic stroke
- Compare pharmacologic differences between alteplase and tenecteplase
- Evaluate literature supporting current guideline recommendations for both alteplase and tenecteplase

Abbreviations

- AIS- acute ischemic stroke
- AMI- acute myocardial infarction
- AWP- average wholesale price
- LVO- large vessel occlusion
- mRS- modified Rankin score
- MT- mechanical thrombectomy
- NIHSS- National Institute of Health Stroke Scale
- rtPA- recombinant tissue plasminogen activator (alteplase)
- sICH- symptomatic intracerebral hemorrhage
- SK- streptokinase
- TICI- thrombolysis in cerebral infarction scale
- TNKase- tenecteplase

Heart-Brain Continuum





https://www.mayoclinic.org/diseases-conditions/heart-attack/symptoms-causes/syc-20373106#dialogId25989895
https://www.mayoclinic.org/diseases-conditions/stroke/multimedia/img-20116029

History of Acute Myocardial Infarction Management

- 1800s- bed rest
- 1958- streptokinase first used to treat AMI
- 1990- GISSI-2- streptokinase vs alteplase
  - Alteplase works as well, less bleeding. Preferred.
  - SK activates plasminogen independent of fibrin- bleeding
- 1993- GUSTO-I- accelerated rtPA vs traditional rtPA has survival benefit over SK
- 1997- GUSTO-IIb- PCI vs accelerated rtPA
- 1999- ASSENT-2 – single bolus tenecteplase vs accelerated rtPA
  - Similar efficacy, less bleeding with tenecteplase

Curr Cardiol Rep. 2016 Jan;18(1):5.
Lancet. 1999 Aug 28;354(9180):716-22.

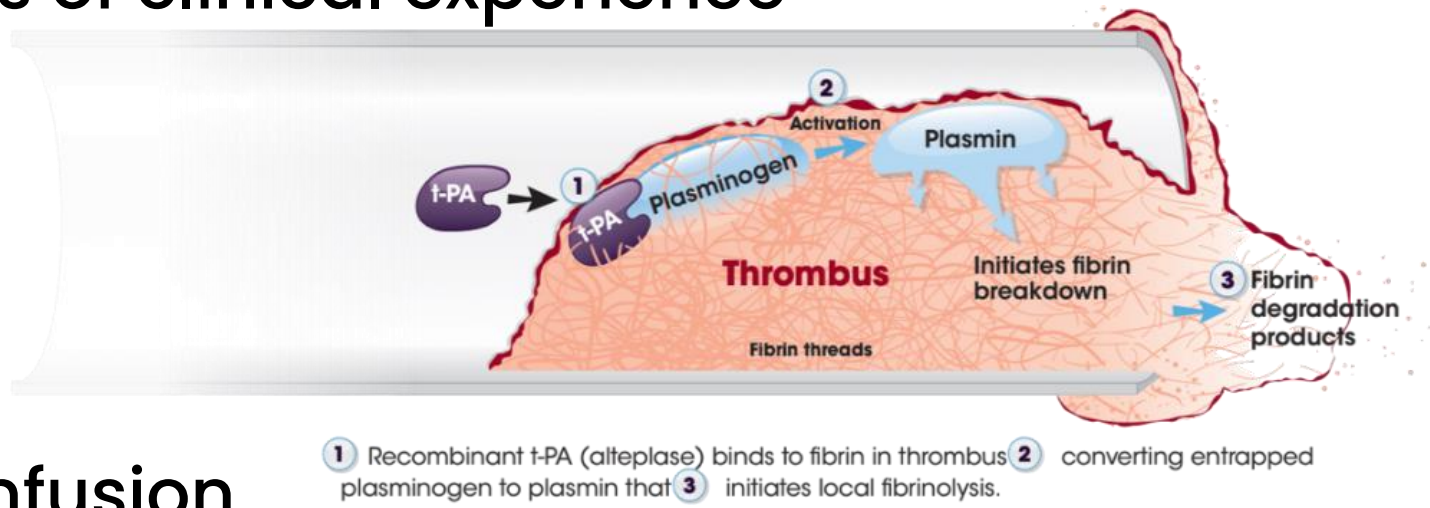
History of Acute Ischemic Stroke Management

- 1500s- Apoplexy- Stroke of God's hand
- 1992- pilot study for rtPA
  - Doses ≤ 0.85 mg/kg may improve neurologic status (higher doses significantly increase hemorrhage)
- 1995- NINDS- first demonstrated benefit of rtPA for ischemic stroke
- 1996- Streptokinase evidence failure
- 2005- Tenecteplase in AIS- dose finding for stroke
- 2015- MR CLEAN, ESCAPE, SWIFT PRIME, EXTEND-IA, REVASCAT
  - Dawn of mechanical thrombectomy

Semin Neurol. 2018 Apr;38(2):208-211. ; Stroke. 1992 May;23(5):632-40.; N Engl J Med. 1995 Dec 14;333(24):1581-7.;
Cochrane Database Syst Rev. 2014 Jul 29;2014(7) ; Stroke. 2005 Mar;36(3):607-12. ;
Ann Emerg Med. 2017 Feb;69(2):192-201.; Lancet Neurol. 2018 Dec;17(12):1121-1132

Alteplase

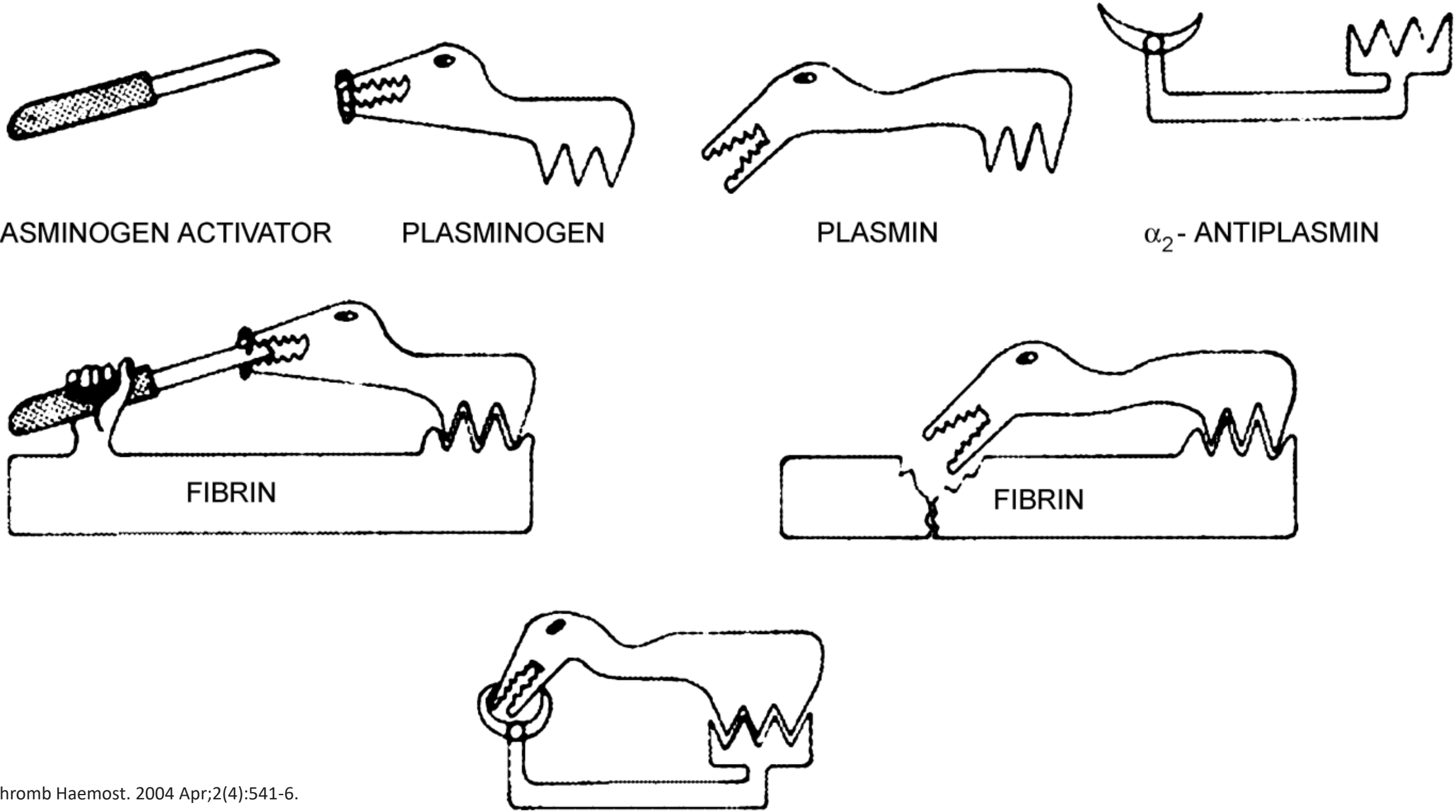
- Recombinant form of human tissue plasminogen activator
- 30+ years of clinical experience



1 Recombinant t-PA (alteplase) binds to fibrin in thrombus 2 converting entrapped plasminogen to plasmin that 3 initiates local fibrinolysis.

- Bolus + infusion
  - Plasma levels of enzyme rapidly increase, systemically activates plasminogen
  - Systemic plasmin generation causes decreased levels of circulating plasminogen, fibrinogen, and α_2-antiplasmin
    - Bleeding

Activase (alteplase) Mechanism of Action
Clinical cardiology vol. 24,9 (2001): 577-84



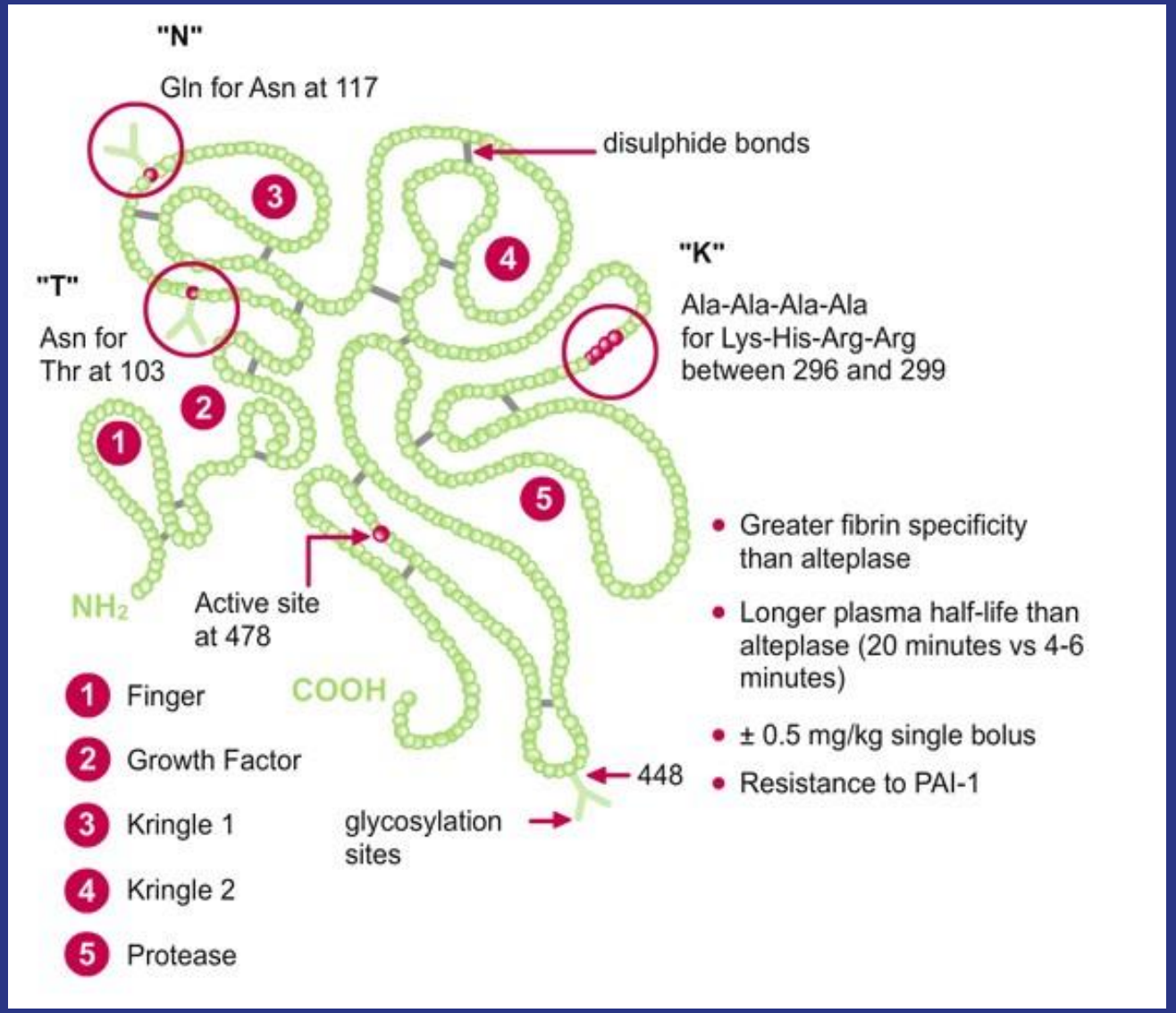
J Thromb Haemost. 2004 Apr;2(4):541-6.

Drawbacks of alteplase

- Short half life
- Bleeding risk
- Limited efficacy
  - Prolonged time to treatment, poor collaterals, and thrombus size greater than 8 mm
- Complicated dosing

Stroke. 2011;42(6):1775–1777

Tenecteplase



https://www.stemi-care.com/metalyse/biochemistry
Clinical cardiology vol. 24,9 (2001): 577-84

Background

	Alteplase	Tenecteplase
FDA-approved indications	AIS, pulmonary embolism, STEMI	STEMI
Dose (AIS)	0.9 mg/kg	0.25 mg/kg
Administration	1 min bolus + 60 min infusion	5 sec IV push
Fibrin selectivity	++	+++
Fibrinogen depletion	++	+
Half-life	~6 min	~24 min
Cost (AWP)	$10,560 per 100 mg vial	$7463 per 50 mg vial

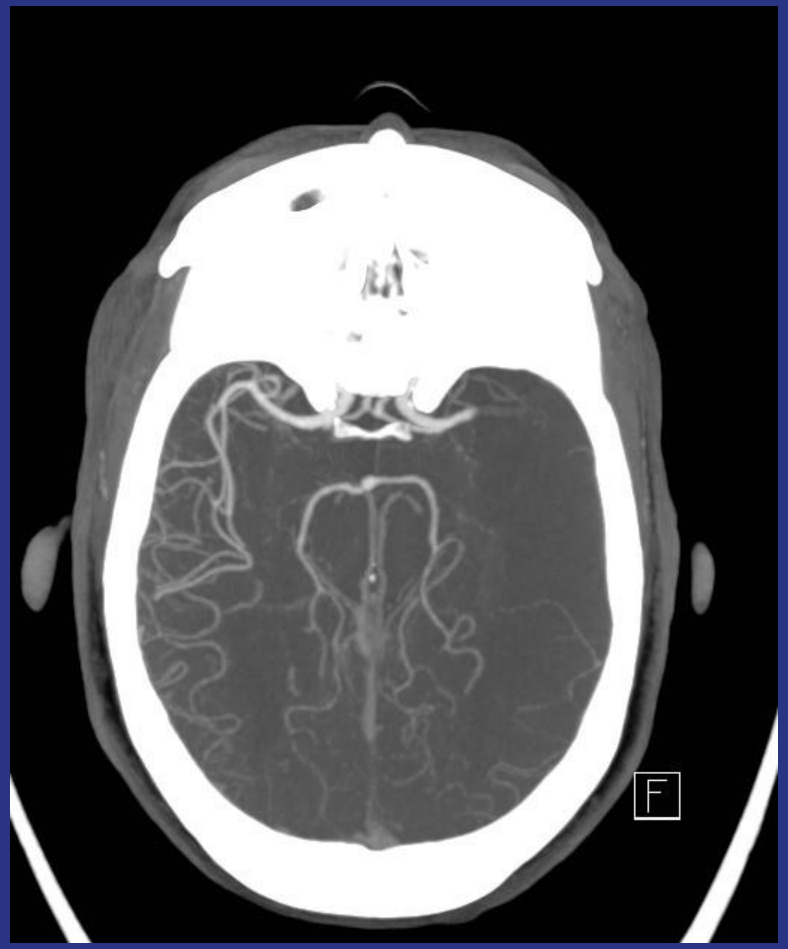
Determining Efficacy

Modified Rankin Scale	
0	No symptoms
1	No significant disability, can carry out all activities
2	Slight disability, independent ADLs
3	Moderate disability, requires some help, but can walk unassisted
4	Moderate severe disability, unable to perform ADLs or walk independently
5	Severe disability, requires constant nursing care and attention, bedridden, incontinent
6	Dead

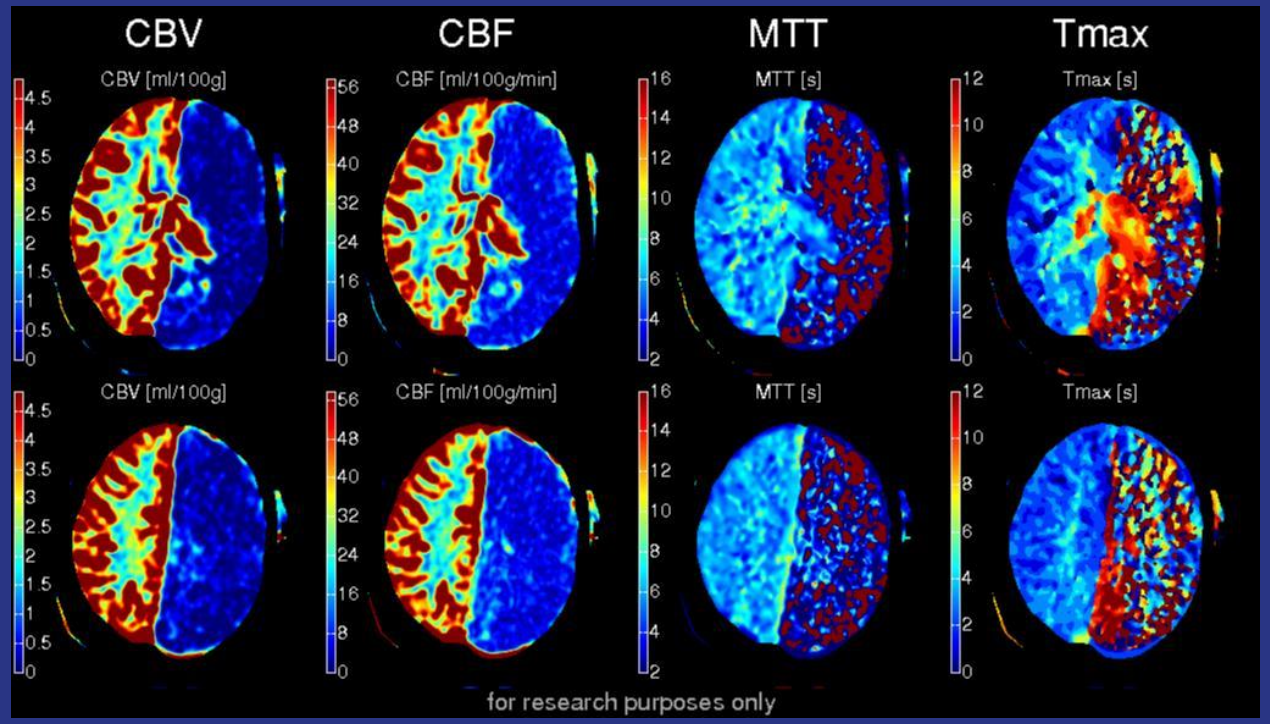
National Institutes of Health Stroke Scale score	
1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions: What is the month? What is your age?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither question correctly
1c. Level of consciousness commands: Open and close your eyes. Grip and release your hand.	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2. Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5. Motor arm 5a. Left arm 5b. Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg 6a. Left leg 6b. Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe to total sensory loss
9. Best language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute, global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction

Total score = 0–42.

Determining Efficacy

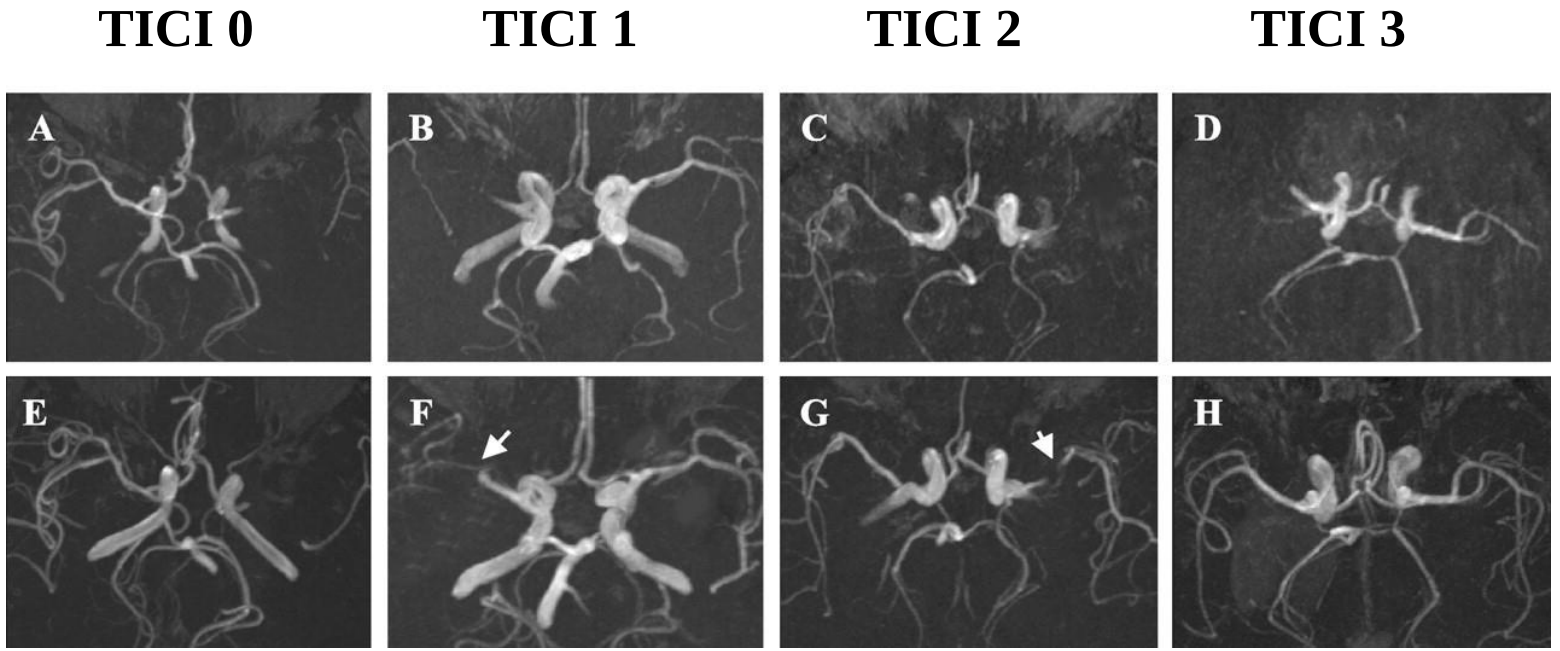


Case courtesy of Dr Francis Fortin, Radiopaedia.org, rID: 72230



Case courtesy of RMH Core Conditions, Radiopaedia.org, rID: 28678

Determining Efficacy



	NIHSS Acute	NIHSS day 7	mRS 90 days	mRS ≤2 90 Days
TICI 0	13.0 (3–23)	12.5 (1–42)	4 (0–6)	36%
TICI 1	12.5 (5–26)	7.5 (1–25)	3 (0–6)	45%
TICI 2	14.0 (4–20)	3.0 (0–25)	1 (0–5)	63%
TICI 3	14.5 (8–21)	2.5 (0–12)	1 (0–6)	60%

Stroke. 2005 Oct;36(10):2121-5
Stroke. 2004 Jan;35(1):109-14.

Alteplase for stroke

- Best case: NINDS- 30% improve mRS and NIHSS at 90 days

- ~10% reperfusion rate in LVO
- sICH ~6%

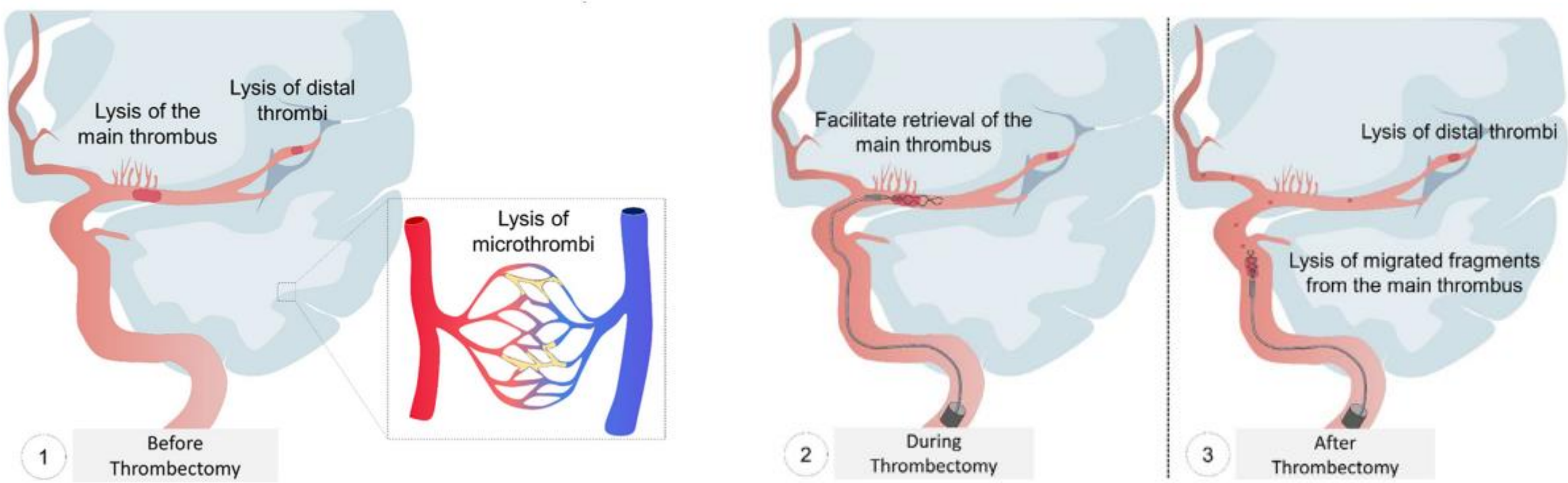
J Thromb Haemost. 2021 Jul;19(7):1618-1628.
J Thromb Haemost. 2022 Feb;20(2):280-284..
Stroke. 2018 Jan;49(1):232-235.

LVO Management

- Guidelines- offer rtPA to all eligible patients undergoing MT
  - IA recommendation
- Added benefit of rtPA to MT?
  - DIRECT-MT, SKIP- 2021
- Complications?
  - Thrombus fragmentation/migration
  - 22% in MR-CLEAN

J Thromb Haemost. 2021 Jul;19(7):1618-1628.

LVO Management



J Thromb Haemost. 2021 Jul;19(7):1618-1628.

TNK-S2B - 2010

Trial type	Phase IIB dose finding study- randomized, double-blind
Sample size	n=110
Inclusion criteria	All strokes at 10 hospitals between 2006-2008
	Median NIHSS 8-13; 7-29% LVO
Intervention	Tenecteplase 0.1mg/kg vs tenecteplase 0.25mg/kg vs tenecteplase 0.4mg/kg vs alteplase 0.9mg/kg
Outcomes	1° - Major neuro improvement at 24hr 2° - mRS 0-1 at 3 months
Results	Underpowered, 0.1mg/kg and 0.25mg/kg with improved MNI at 24hr 0.4mg/kg 15.8% sICH

Takeaway: tenecteplase <0.4mg/kg appears safe.

Stroke. 2010;41(4):707-711.

ATTEST- 2015

Trial type	Phase II randomized, open-label
Sample size	n=104
Inclusion criteria	supratentorial AIS
Intervention	0.25mg/kg tenecteplase vs rtPA 0.9mg/kg
Primary outcome	1°- CT perfusion penumbra salvage at 24-48hr
Results	Tenecteplase 68% vs rtPA 68% Any ICH 15 vs 27%, p=0.09

Takeaway: radiologic outcomes did not differ. Larger studies needed.

Lancet Neurol. 2015 Apr;14(4):368-76.

NOR-TEST - 2017

Trial type	Phase III, multicenter, randomized, open-label
Sample size	n=1100
Inclusion criteria	adults with stroke previously living independently (mostly mild stroke NIHSS 0-7)
Intervention	0.4mg/kg tenecteplase vs 0.9mg/kg rtPA
Outcomes	1°- mRS 0-1 at 3 months, improvement NIHSS 4pts in 24hrs
Results	mRS 0-1 at 3 months: 64% vs 64% sICH 24-48hr: 3 vs 2% Major clinical improvement at 24hr: 37% vs 36%

BMC Neurol. 2014 May 15;14:106

NOR-TEST – Moderate/Severe

- **Moderate stroke** (NIHSS 6-14)
  - Favorable outcome: tenecteplase 49.2%, vs rtPA 45.2%; p=0.528
  - sICH: 4.1% vs 2.2%; p=0.481
  - 90 day mortality 8.5% vs 8.3%
- **Severe stroke** (NIHSS ≥ 15)
  - Favorable outcome 23.7% vs 15.6%; p=0.41
  - sICH: 10.0% vs 3 6.4%; p=0.698
  - 90 day mortality 26.3% vs 9.1%; p=0.045

Takeaways: large proportion mild stroke. Similar rates of improvement and complications, 0.4mg/kg not necessarily worse than 0.25mg/kg

BMC Neurol. 2014 May 15;14:106

EXTEND-IA TNK - 2018

Trial type	Multicenter, prospective, randomized, open-label
Sample size	n=200
Inclusion criteria	Stroke symptoms within 4.5hrs AND CTA confirmed occlusion of ICA, M1 MCA, M2 MCA, or basilar artery
Intervention	0.25mg/kg tenecteplase vs rtPA 0.9mg/kg
Outcomes	1°- reperfusion or absence of retrievable thrombus; 2°- 90 day mRS, early neuro improvement (NIHSS reduction 8pts at 72hr)
Results	Reperfusion: 22% tenecteplase vs 10% rtPA, $p<0.05$ No difference early neuro improvement (71 vs 69%) mRS 2 vs 3 at 3 months sICH 1% in each

Takeaway: noninferior to standard rtPA in reperfusion of LVOs

N Engl J Med. 2018 Apr 26;378(17):1573-1582.

EXTEND-IA TNK pt 2- 2019

Trial type	Randomized, multicenter, open label
Sample size	n=300
Inclusion criteria	LVO of ICA, MCA, BA and eligible for thrombolysis and thrombectomy within 4.5hr
Intervention	0.4mg/kg tenecteplase vs 0.25mg/kg tenecteplase
Outcomes	1°- reperfusion or absence of retrievable thrombus 2°- 90-day mRS, early neuro improvement
Results	Reperfusion: 19.3% 0.4mg/kg vs 19.3% 0.25mg/kg No difference in mRS, early neurologic recovery No difference in sICH (4.7 vs 1.3%, p=0.12)

Takeaway: no difference between tenecteplase doses in LVO reperfusion

JAMA. 2020 Apr 7;323(13):1257-1265.

Evidence table

Study	rtPA comparator	n	LVO vs small vessel	Tenecteplase dose	1* endpoint	sICH %	Mortality %
ATTEST	Yes	104	~50% LVO	0.25 mg/kg	% penumbra salvaged	2 vs 4%	17 vs 12%
NORTEST	Yes	1100	Mostly small vessel	0.4 mg/kg	mRS at 90 days	3 vs 2%	5 vs 5%
EXTEND-IA TNK	Yes	202	LVO	0.25 mg/kg	Reperfusion prior to thrombectomy	1 vs 1%	10 vs 18%
EXTEND-IA 2	No	300	LVO	0.25 mg/kg 0.4 mg/kg	Reperfusion prior to thrombectomy	2.7% 1.3%	17% 15%

Clinical Takeaways

- Tenecteplase no worse than rtPA in mild stroke (NOR-TEST)
- Tenecteplase 0.25mg/kg better than rtPA at LVO reperfusion (EXTEND-IA TNK pt 1)
- No difference in reperfusion tenecteplase 0.25 vs 0.4mg/kg (EXTEND-IA TNK pt 2)

Guideline Recommendation - 2019

- *It may be reasonable to choose tenecteplase (single IV bolus of 0.25 mg/kg, maximum 25 mg) over IV alteplase in patients without contraindications for IV fibrinolysis* ***who are also eligible to undergo mechanical thrombectomy****.*
  - IIb LOE B
    - EXTEND-IA TNK (2018)

- *Tenecteplase administered as a 0.4 mg/kg single IV bolus has not been proven to be superior or noninferior to alteplase but might be considered as an alternative to alteplase in patients with minor neurological impairment and no major intracranial occlusion*
  - IIb LOE B
    - NORTEST

Stroke. 2019 Dec;50(12):3331-3332.

Selected Future Studies

- TIMELESS- tenecteplase in LVO **4.5-24hr**
  - NCT03785678
- ATTEST 2- tenecteplase 0.25 mg/kg vs rtPA 0.9 mg/kg
  - Primary- mRS at 90 days
  - Inclusion- **not MT eligible**
  - NCT02814409
- NOR-TEST 2- tenecteplase 0.4mg/kg vs rtPA 0.9mg/kg
  - Primary- mRS at 90 days
  - Inclusion- **NIHSS >5**
  - NCT03854500
- BRIDGE-TNK- **tenecteplase 0.25 mg/kg + MT vs MT alone**
  - Primary- mRS at 90 days
  - NCT04733742
- TEMPO-2- **tenecteplase 0.25 mg/kg vs standard of care antiplatelet**
  - Primary- mRS 90 days
  - Inclusion- NIHSS <6
  - NCT02398656

Medication Safety

- ISMP
  - Both tenecteplase and alteplase are *tissue plasminogen activators*
  - Do not use abbreviation TNK or tPA
  - Use brand **or** generic names
    - Alteplase/(Activase) and tenecteplase/(TNKase)
  - State indication on order
  - Carry two fibrinolytics?

Adv Emerg Nurs J. 2019 Jul/Sep;41(3):271-278.
FDA Advise-ERR: Avoid using the error-prone abbreviation, TPA

Operational

- Genetech spoilage
- Door to needle times
  - Consent?
- Acquisition cost
- Drip and ship to Comprehensive stroke centers
- Differentiate from tenecteplase STEMI kits

Neurol Clin Pract. 2021 Dec;11(6):e885-e889.

For Severe Weather and Impacted Delivery Alert: https://www.gene.com/contact-us/customer-service

Genentech Spoilage Program Online Submission Form

Genentech Customer Service: 800 551-2231

Only FDA approved indications will be considered for replacement.

If a Genentech medicine is purchased for use in an FDA approved indication, was spoiled, and no product was administered, the product may be eligible for replacement through the Genentech Spoilage Program. Product must be returned or Certificate of Destruction must be furnished to be eligible for the Spoilage Program.

For quality or stability-related issues, please contact Genentech Medical Communications at (800) 821-8590.

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Online Submission Form and Process

- Once complete, you will receive a **confirmation #**. Your request is not submitted until you have this number.
- An attestation is required at the end of this form by a Health Care Provider (HCP) who has signing authority for the facility.
- If approved, further instructions for returning product or completing a Certificate of Destruction will be provided within 2 business days of the form submission.
- Each Spoilage incident must be reported separately.
- To avoid any delays, ensure that the Return Authorization is included in any product being sent back.
- Send one Return Authorization per return package.
- If you have questions, please call Genentech Customer Service at (800) 551-2231.

Important program guidelines to remember

- Each instance of spoilage requires completion of this form. Replacement of a spoiled product is on a case-by-case basis.
- Please retain all original product and packaging.
- Genentech will only consider replacing spoiled product if it was intended for an FDA approved indication.
- Genentech does not ship replacement product if ANY portion of the spoiled product has been administered (including bolus) or is intended to be administered to another patient.

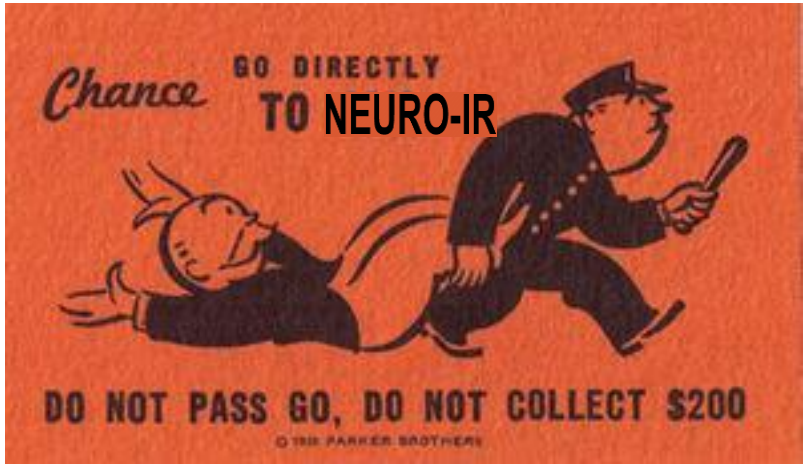
Operational - Finances

- Pharmacoeconomic analysis of EXTEND-IA TNK (n=202)
  - Total cost: tenecteplase $29,296 USD vs rtPA $33,005, p=0.125
  - Cost-effectiveness analysis: tenecteplase with lower cost and more QALYs
  - Estimation in USA: tenecteplase instead of rtPA across the United States for LVOs would save 366 million USD in acute hospital costs
    - Includes avoiding additional thrombolysis and thrombectomy for the first 3 months

Stroke. 2020 Dec;51(12):3681-3689.

Takeaways

- Large Vessel Occlusion
  - Comprehensive stroke center
    - Straight to MT (like PCI for STEMI)
  - Primary stroke center (drip and ship)
    - Tenecteplase has higher odds of reperfusion than rtPA
- Small vessel occlusion- does any fibrinolytic strategy work?
  - PRISMS 2018, TEMPO-2 (upcoming)



Assessment Question #1

True or False: Alteplase is more fibrin selective than tenecteplase.

Assessment Question #1

FALSE: Tenecteplase has 15 times more fibrin selectivity due to the molecular modification.

Assessment Question #2

MC, a 72yo F, presents to the ED via emergency medical services with a complaint of right sided arm and leg weakness, as well as slurred speech and a right sided facial droop. She was last known well 90 minutes prior to arrival when she was witnessed to slump in her dining room chair by family. MC has a PMH of hypertension and hypercholesterolemia and no neurologic deficits at baseline.

Vitals: 163/90 mmHg; HR 81; RR 16; T 98.4F; glucose 110; Wt 80kg; NIHSS 14

Home medications: amlodipine 10mg po qday; aspirin 81mg po qday; atorvastatin 40mg po qPM

Imaging: CT head-no acute intracrainial abnormality; CT perfusion- large perfusion deficit in left MCA territory, no significant ischemic core; CT angiography- abrupt occlusion of distal left M1 segment.

Stroke Neurologist is recommending fibrinolysis. Which drug and dose is most appropriate for MC?

A. Alteplase 72mg (0.9mg/kg) IVPB over 1hr
B. Tenecteplase 20mg (0.25mg/kg) IV over 5 sec
C. Tenecteplase 32mg (0.4mg/kg) IVPB over 1hr
D. Streptokinase 1.5 mU IVPB over 1hr

Assessment Question #2

Stroke Neurologist is recommending fibrinolysis. Which drug and dose is most appropriate for MC?

A. Alteplase 72mg (0.9mg/kg) IVPB over 1hr
B. Tenecteplase 20mg (0.25mg/kg) IV over 5 sec
C. Tenecteplase 32mg (0.4mg/kg) IVPB over 1hr
D. Streptokinase 1.5 mU IVPB over 1hr

Rationale:

Alteplase standard administration is a 10% bolus over 1 minute followed by 90% over 1hr (7.2mg bolus + 64.8 mg infusion)

Tenecteplase is administered over 5 sec

Streptokinase has been shown to have worse outcomes than alteplase.

References

- Smilowitz NR, Feit F. The History of Primary Angioplasty and Stenting for Acute Myocardial Infarction. Curr Cardiol Rep. 2016 Jan;18(1):5.
- Van De Werf F, Adgey J, Ardissino D, et al. Single-bolus tenecteplase compared with front-loaded alteplase in acute myocardial infarction: the ASSENT-2 double-blind randomised trial. Lancet. 1999 Aug 28;354(9180):716-22.
- Katan M, Luft A. Global Burden of Stroke. Semin Neurol. 2018 Apr;38(2):208-211. doi: 10.1055/s-0038-1649503. Epub 2018
- Brott TG, Haley EC Jr, Levy DE, et al. Urgent therapy for stroke. Part I. Pilot study of tissue plasminogen activator administered within 90 minutes. Stroke. 1992 May;23(5):632-40.
- National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. Tissue plasminogen activator for acute ischemic stroke. N Engl J Med. 1995 Dec 14;333(24):1581-7.
- Wardlaw JM, Murray V, Berge E, del Zoppo GJ. Thrombolysis for acute ischaemic stroke. Cochrane Database Syst Rev. 2014 Jul 29;2014(7):CD000213.
- Haley EC Jr, Lyden PD, Johnston KC, Hemmen TM; TNK in Stroke Investigators. A pilot dose-escalation safety study of tenecteplase in acute ischemic stroke. Stroke. 2005 Mar;36(3):607-12. Epub 2005 Feb 3.
- Miller JB, Merck LH, Wira CR, et al. The Advanced Reperfusion Era: Implications for Emergency Systems of Ischemic Stroke Care. Ann Emerg Med. 2017 Feb;69(2):192-201.
- Thiebaut AM, Gauberti M, Ali C, et al. The role of plasminogen activators in stroke treatment: fibrinolysis and beyond. Lancet Neurol. 2018 Dec;17(12):1121-1132
- Gibson, C M, and S J Marble. "Issues in the assessment of the safety and efficacy of tenecteplase (TNK-tPA)." Clinical cardiology vol. 24,9 (2001): 577-84.
- Collen D, Lijnen HR. Tissue-type plasminogen activator: a historical perspective and personal account. J Thromb Haemost. 2004 Apr;2(4):541-6.
- Riedel CH, Zimmermann P, Jensen-Kondering U, et al. The importance of size: successful recanalization by intravenous thrombolysis in acute anterior stroke depends on thrombus length. Stroke. 2011;42(6):1775–1777
- Gibson, C M, and S J Marble. "Issues in the assessment of the safety and efficacy of tenecteplase (TNK-tPA)." Clinical cardiology vol. 24,9 (2001): 577-84.
- Fischer U, Arnold M, Nedeltchev K, Brekenfeld C, Ballinari P, Remonda L, Schroth G, Mattle HP. NIHSS score and arteriographic findings in acute ischemic stroke. Stroke. 2005 Oct;36(10):2121-5
- Neumann-Haefelin T, du Mesnil de Rochemont R, Fiebach JB, et al. Effect of incomplete (spontaneous and postthrombolytic) recanalization after middle cerebral artery occlusion: a magnetic resonance imaging study. Stroke. 2004 Jan;35(1):109-14.
- Gauberti M, Martinez de Lizarrondo S, Vivien D. Thrombolytic strategies for ischemic stroke in the thrombectomy era. J Thromb Haemost. 2021 Jul;19(7):1618-1628

References

- Morrow GB, Mutch NJ. Removing plasmin from the equation - Something to chew on…. J Thromb Haemost. 2022 Feb;20(2):280-284.
- Tsivgoulis G, Katsanos AH, Schellinger PD, Köhrmann M, Varelas P, Magoufis G, Paciaroni M, Caso V, Alexandrov AW, Gurol E, Alexandrov AV. Successful Reperfusion With Intravenous Thrombolysis Preceding Mechanical Thrombectomy in Large-Vessel Occlusions. Stroke. 2018 Jan;49(1):232-235.
- Haley EC, Thompson JLP, Grotta JC, et al. Phase iib/iii trial of tenecteplase in acute ischemic stroke. Stroke. 2010;41(4):707-711.
- Huang X, Cheripelli BK, Lloyd SM, et al. Alteplase versus tenecteplase for thrombolysis after ischaemic stroke (ATTEST): a phase 2, randomised, open-label, blinded endpoint study. Lancet Neurol. 2015 Apr;14(4):368-76.
- Logallo N, Kvistad CE, Nacu A et al. The Norwegian tenecteplase stroke trial (NOR-TEST): randomised controlled trial of tenecteplase vs. alteplase in acute ischaemic stroke. BMC Neurol. 2014 May 15;14:106
- EXTEND-IA TNK Investigators. Tenecteplase versus Alteplase before Thrombectomy for Ischemic Stroke. N Engl J Med. 2018 Apr 26;378(17):1573-1582.
- EXTEND-IA TNK Part 2 investigators. Effect of Intravenous Tenecteplase Dose on Cerebral Reperfusion Before Thrombectomy in Patients With Large Vessel Occlusion Ischemic Stroke: The EXTEND-IA TNK Part 2 Randomized Clinical Trial. JAMA. 2020 Apr 7;323(13):1257-1265.
- Warner JJ, Harrington RA, Sacco RL, Elkind MSV. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke. Stroke. 2019 Dec;50(12):3331-3332.
- Dillon GM, Stevens S, Dusenbury WL, Massaro L, Toy F, Purdon B. Choosing the Correct "-ase" in Acute Ischemic Stroke: Alteplase, Tenecteplase, and Reteplase. Adv Emerg Nurs J. 2019 Jul/Sep;41(3):271-278.
- EXTEND-IA TNK Investigators. Cost-Effectiveness of Tenecteplase Before Thrombectomy for Ischemic Stroke. Stroke. 2020 Dec;51(12):3681-3689.
- Panezai S, Dubinsky I, Sahito S, Gadallah N, Suhan L, Mehta S, Kirmani J. Early Experience With Tenecteplase at a Comprehensive Stroke Center. Neurol Clin Pract. 2021 Dec;11(6):e885-e889.

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Questions?

James.Priano@adventhealth.com