PREHOSPITAL TRIAGE OF LARGE VESSEL OCCLUSION. WHERE ARE WE NOW?

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DISCLOSURE

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LVO scales

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LARGE VESSEL OCCLUSION

- Without intervention
  - NIHSS >13 predicts living in facility or death
  - NIHSS >17 predicts mRS ≥3, high PPV
  - High mortality in young

- Commonly unexpected from new onset AFib

Muir. Stroke 1996
Frankel et al. Neurology 2000
Vahedi et al. Lancet Neuro 2007
REVASCULARIZATION LVO

- IV tPA – 15-20% recanalize by 2 hours post tPA
- Avg 90 day outcome with IV tPA, mRS 4
- Acute endovascular
  - Benefit strongest with reperfusion before until 6 hours
  - Majority with IV tPA first

Alexandrov et al. NEJM 2004
TIME IS BRAIN

- Typical Anterior Circulation large stroke
  - Quantitative analysis estimated majority stroke completion is 10 hours
  - Neuron loss:
    - Per Hour, 120 million
    - Per Minute, 1.9 million
- Endovascular – Every 30 min delay to reperfusion reduces likelihood of good outcome

Saver. Stroke 2006
Ribo et al. Stroke 2016
Evaluated reliability of 15 elements of NIHSS in MCA strokes to determine severity
- Most reliable: Language, Motor Arm & Leg
- Least reliable: ataxia, neglect, LOC, face

Helicopter EMT: PPV of 84% for LVO (NIHSS > 12) with full NIHSS with high correlation with neurologist

Tirschwell et al. Stroke 2002
Kesinger et al. Stroke 2015
CINCINNATI PREHOSPITAL STROKE SCALE

- Developed to assist EMS detect stroke
- High correlation between neurologist assessment & pre-hospital
- Initial Results
  - Stroke specificity, 87%
  - All stroke sensitivity, 66%
  - Anterior Circulation stroke sensitivity, 88%

1. Facial Droop
   - 0) Normal: Both sides of face move equally
   - 1) Abnormal: One side of face does not move at all

2. Arm Drift
   - 0) Normal: Both arms move equally
   - 1) Abnormal: One arm drifts compared to the other

3. Speech
   - 0) Normal: Patient uses correct words with no slurring
   - 1) Abnormal: Slurred or inappropriate words or mute

In 2009, study to assess training found lack of continued accuracy in prehospital triage for stroke detection

- Sensitivity, 71%
- Specificity, 52%

Does implementation reflect and maintain level seen in studies?

- Melbourne Ambulance Stroke Screen (MASS) - include face, grip and speech, demonstrated sustained specificity/sensitivity at 3 years

Frendl et al. Stroke 2009
Bray et al. Stroke 2010
CINCINNATI PREHOSPITAL STROKE SEVERITY SCALE (CPSSS)

- Used NINDS & IMS III to develop scale with NIHSS ≥ 15 correlating with LVO
- Score ≥2 correlate with LVO (included basilar)
  - Sensitivity, 83%
  - Specificity, 40%

2 pts – conjugate gaze deviation
1 pt – incorrect LOC question AND does not follow 1 of 2 commands
1 pt – can not hold arm for 10 seconds

Range: 0-4

*results for validation of score, no results yet for implementation

Katz et al. Stroke 2015
LA MOTOR SCALE (LAMS)

- Initially LAPSS to detect stroke
- In 2001, assigned values to scale to compare to NIHSS and sNIHSS, became LAMS
- Correlates with stroke severity and mRS outcome at 3 months
- Validated <30 seconds

- Facial droop
  - Absent 0
  - Present 1

- Arm drift
  - Absent 0
  - Drifts down 1
  - Falls rapidly 2

- Grip strength
  - Normal 0
  - Weak grip 1
  - No grip 2

Kidwell et al. Prehosp Emerg Care 1998
Llanes et al. Stroke 2001
LAMS - LVO

- UCLA data, NIHSS used to assign LAMS score with confirmation of LVO on imaging
  - Anterior circulation only
  - Median NIHSS 14
- Prediction based on NIHSS ≥ 11
- LAMS ≥ 4 determined predictor of LVO
  - Sensitivity, 81%
  - Specificity, 89%
- Note mimics excluded by design. Lack of evidence in practice for predicting LVO.

Bijen Nazliel et al. Stroke. 2008
Figure. Receiver operating curve showing specificity (asterisks) and sensitivity (open circles) of LAMS Scores in predicting persisting large vessel occlusion.
PROPOSED TRIAGE

- CPSS or FAST screening – determine stroke
- Perform LAMS vs CPSSS for severity
  - Suspect LVO bypass to CSC
  - If CSC >30 min away and/or no easy helicopter
    - Consider PSC then CSC transfer

Impact on PSC and Prehospital Services
- Suspect low
- 70% of stroke patients have NIHSS <5

IST-3. Lancet 2012
Khatri et al. Stroke 2012
TRANSFER SYSTEM

- Interhospital Transfer (Madrid study) – 41% do not receive endovascular treatment
  - 48% revascularized with IV tPA
  - 32% lost penumbra
  - Interhospital transfer time median: 60 minutes, larger variance in times on futile transfers without statistical difference
- 3 month outcome mRS <2:
  - Endo at facility (no transfer) 61%
  - Transfer w/ endo 58%
  - Transfer w/o endo 40%
  - Futile for transfer (ASPECT <7) 33%

Fuentes et al. Stroke 2015
ACCEPTABLE MISSES? FALSE POSITIVE?

- LAMS – sensitivity 81%, specificity 89%
- CPSSS – sensitivity 83%, specificity 40%

- Benefit of IV tPA first, then transfer – avg 40% unable to intervene with worse outcome
- Inter-facility transfer time issues vs EMS directed by-pass
POSTERIOR CIRCULATION STROKES?

- Most of our scales exclude posterior strokes
- **22% missed** in ED, 26% in community hospitals
  - 16% AC strokes missed
- Highest predictive signs – horner's syndrome, crossed sensory, quadranopsia, oculomotor nerve palsy
  - Low sensitivity overall
- Hemiplegia, 53% (75% in AC)
- Facial involvement, 41% (62% in AC)
- Hemisensory, 36% (34% in AC)

Arch et al. Stroke 2016
Tao et al. Stroke 2012
Thank you!

Questions?