Endovascular Treatment for Acute Ischemic Stroke

Provincial Review Presentation

by

Dr Grant Stotts
Dr Timo Krings

On behalf of the OSN Endovascular Treatment Implementation Planning Group

February 3 & 5 2016
Pre-presentation Instructions

• Please keep microphone on mute unless you are asking a question
• The ppt will be available at www.ontariostrokenetwork.ca
• There will be a question and answer period at the end of the presentation
• This presentation is being webcasted and will be archived at: http://webcast.otn.ca
Presenters:

• Dr Grant Stotts, Stroke Neurologist, Champlain Regional Stroke Medical Director, Co-Chair

• Dr Timo Krings, Interventional Neuroradiologist, University Health Network-TWH, Co-Chair

Objectives:

• Provide a brief overview of the draft Endovascular Treatment recommendations for Ontario

• Provide an opportunity to discuss and provide input on implementation considerations to inform planning.

• Provide an opportunity for discussion and Q&A
EVT Background

Dr Grant Stotts
Background - Acute Stroke

• Stroke is the 3rd leading cause of death
• ~170,000 Ontarians are experiencing the effects of stroke
• In Ontario > 20,000 patients have a stroke or TIA every year - one stroke every 10 minutes
• Stroke costs Canadian economy $3.6 billion
• Each hour in which treatment does not occur, the brain loses as many neurons as it does in almost 3.6 years of normal aging
• Outcomes:
  o Death (15%)
  o Moderate to Severe Impairment (40%)
  o Severely Disabled (10%)
  o Minor Impairment or Disability (25%)
  o Recover Completely (10%)
Acute Ischemic Stroke (AIS) and its Rx

- Pre-2015, standard of care for acute ischemic stroke was **intravenous (IV)** tissue Plasminogen Activator (tPA) thrombolysis
- IV tPA – 11% absolute benefit compared to placebo (NNT = 9)
- **BUT** benefit is significantly less in large artery occlusions
- Some patients unable to receive IV tPA due to contra-indications (e.g. bleeding risk, recent surgery)
- # Ontarians with AIS receiving IV tPA has plateaued at 12%
- Limitations of IV tPA prompted study of endovascular treatment (EVT) with mechanical embolectomy
Chain* of Stroke Treatment

- Detection
- Transfer to a stroke centre
- Medical evaluation
- Imaging
- Acute treatment
- Post-acute treatment care
- Rehabilitation
- Prevention

Patient Education
EMS/Ambulance
ED/Neurology
Neuroradiology
Neurology/Neuro-Interventional teams
Stroke Unit
Rehab Centre
Stroke Prevention Clinic

*The chain is as strong as its weakest link
• Mr. Claude Corneau was the first patient treated in the ESCAPE trial in Ottawa

• He is 70 years old and presented unable to speak or move his right side

• After EVT, he was able to return to work as a mechanic within a few days and celebrated his 50th wedding anniversary that summer with his wife.
Endovascular Treatment
What is it and what is the evidence?

Dr Timo Krings
### Acute Stroke Rx until 2011

<table>
<thead>
<tr>
<th>Study</th>
<th>mRS 0-2</th>
<th>mRS 3-5</th>
<th>mRS 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penumbra Pivotal 125</td>
<td>25</td>
<td>42</td>
<td>33</td>
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<tr>
<td>Penumbra Pilot 23</td>
<td>45</td>
<td>10</td>
<td>45</td>
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<tr>
<td>MultiMERCI</td>
<td>36</td>
<td>30</td>
<td>34</td>
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<tr>
<td>Clot Removal (pooled)</td>
<td>35</td>
<td>34</td>
<td>31</td>
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<tr>
<td>IMS II</td>
<td>46</td>
<td>38</td>
<td>16</td>
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<tr>
<td>IMS I</td>
<td>43</td>
<td>41</td>
<td>16</td>
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<tr>
<td>PROACT II Pro-UK</td>
<td>40</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>PROACT II control</td>
<td>25</td>
<td>48</td>
<td>27</td>
</tr>
<tr>
<td>NINDS rt-PA</td>
<td>39</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>NINDS placebo</td>
<td>28</td>
<td>48</td>
<td>24</td>
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</tbody>
</table>

Functional outcome scale:  
- mRS 0-2 = independent  
- mRS 3-5 = disability  
- mRS 6 = dead
Impact of Artery Recanalization
Review of Published Papers (1985-2002, N=2066)

Rha & Saver. Stroke 2007

OR: 4.43
(CI: 3.32-5.91)

OR: 0.24
(CI: 0.16-0.35)

Percentage patients

<table>
<thead>
<tr>
<th>Condition</th>
<th>Recanalized</th>
<th>Non-recanalized</th>
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<tbody>
<tr>
<td>Good outcome</td>
<td>58.1%</td>
<td>24.8%</td>
</tr>
<tr>
<td>Mortality</td>
<td>14.4%</td>
<td>41.6%</td>
</tr>
<tr>
<td>Intracerebral Hemorrhage</td>
<td>13.7%</td>
<td>12.5%</td>
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Rha & Saver. Stroke 2007
The New Standard of Care for Large Artery AIS in 2015 – Mechanical Embolectomy with or without IV tPA

Procedure involves using a catheter and stent, inserted through an artery in the groin to grab the clot and pull it out.

*Stent retrievers*

SLIDE COURTESY OF DR. T. KRINGS AND DR. C. LUM
One of the Clots Extracted
Evidence from Other Trials

**Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection**


**Stent-Retriever Thrombectomy after Intravenous t-PA vs. t-PA Alone in Stroke**


**MR CLEAN**

**ESCAPE**

**EXTEND-IA**

**SWIFT PRIME**
<table>
<thead>
<tr>
<th>Effect Size for Intervention</th>
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<tr>
<td>Common OR* (&quot;shift&quot;)</td>
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<tr>
<td>3.1 (2.0-4.7)</td>
</tr>
<tr>
<td>NNT** ~ 3 for improvement on mRS</td>
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<tr>
<td>mRS 0-2</td>
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<tr>
<td>29.3% → 53.0%</td>
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<tr>
<td>NNT = 4 for independence</td>
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<tr>
<td>Death HR*</td>
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<tr>
<td>19.0% → 10.4%</td>
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<tr>
<td>0.4 (0.2-0.8)</td>
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*Adjusted for age, sex, baseline NIHSS score, baseline ASPECTS score, IV alteplase use, baseline occlusion location

** NNT = number needed to treat for one to have an excellent recovery
Perspective

- Antibiotics for ear infection  \( \text{NNT} = 8 \)
- Intravenous thrombolysis (stroke)  \( \text{NNT} = 9 \)
- Cardiac stenting (STEMI)  \( \text{NNT} = 9 \)
**ESCAPE Trial Results**

**MEDICAL TREATMENT**
(No endovascular treatment)

- 29% Positive
- 52% Disability
- 19% Death

**ENDOVASCULAR TREATMENT**
(With medical treatment)

- 53% Positive
- 37% Disability
- 10% Death

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[UNIVERSITY OF CALGARY]
[ESCAPE]
Who Is Eligible for EVT?

- 20% of ischemic stroke patients
- With or without IV tPA
- Disabling stroke
- Stroke symptoms within 6 hours of time last seen normal
- Large blood vessel blockage with a reachable clot
- Brain tissue that is still alive
Key Factors for Success

• Similar to other acute treatments for acute ischemic stroke: TIME and SPEED!

• Imaging (CTA) is key to identification of target arterial occlusion and extent of infarct with enough brain to save

• Ensure minimal time lapse between brain imaging and recanalization, which includes:
  ✓ no delay in initiating IV thrombolysis when appropriate
  ✓ rapid access to and assessment of all relevant imaging (via Telestroke/ENITS) by neurology and/or interventional teams
  ✓ rapid coordinated transfer to endovascular site/suite in consultation with Stroke Neurologist and neurointerventionalist
  ✓ minimize time from groin puncture to recanalization
Implementation Planning Working Group

To develop an implementation strategy to:

• Estimate patient volumes at provincial, LHIN, stroke centre and facility levels to inform planning/impact

• Identify facility capacity (focus on physicians and staff expertise and imaging resources)

• Determine role of Provincial Telestroke Program

• Determine impacts to Emergency Medical Services and current Provincial Paramedic Acute Stroke Protocol

• Develop protocols for treatment and transfer

• Identify strategies for knowledge translation

• Evaluate processes/outcomes (with minimum data set)
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<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Role</th>
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<tbody>
<tr>
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<td>Dr Sachin Pandey</td>
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<td>Dr Victor Yang</td>
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<td>Neurosurgery</td>
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<td>Dr Vitor Pereira</td>
<td>University Health Network</td>
<td>Neurosurgery</td>
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<td>Dr Walter Montanera</td>
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<td>Stroke Neurologist</td>
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<td>Dr Frank Silver</td>
<td>University Health Sciences</td>
<td>Stroke Neurologist (Telestroke)</td>
</tr>
<tr>
<td>Dr Jennifer Mandzia</td>
<td>London Health Sciences</td>
<td>Stroke Neurologist</td>
</tr>
<tr>
<td>Dr Al Jin</td>
<td>Kingston General Hospital-</td>
<td>Stroke Neurologian</td>
</tr>
<tr>
<td>Dr Jason Prpic</td>
<td>Chair EHS MAC</td>
<td>Base Hospital Medical Director, Emergency MD,</td>
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<td>Beth Linkewich</td>
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<tr>
<td>Jacqueline Willem</td>
<td>South East Toronto</td>
<td>Regional Program Director</td>
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<tr>
<td>Rhonda McNicoll-Whiteman</td>
<td>Hamilton Health Sciences</td>
<td>Clinical Nurse Specialist- Stroke Best Practice Coordinator</td>
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<tr>
<td>Caterina Kmll</td>
<td>North West Ontario Stroke Network</td>
<td>Regional Program Director</td>
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<tr>
<td>Denise St. Louis</td>
<td>Windsor Regional Hospital</td>
<td>District Stroke Coordinator</td>
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<tr>
<td>Gina Tomaszewski</td>
<td>Acute Care Best Practice Coordinator</td>
<td>SWO Stroke Network</td>
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<tr>
<td>Linda Kelloway</td>
<td>Best Practice Leader</td>
<td>Ontario Stroke Network</td>
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Current EVT Centres

WITH 24/7 COVERAGE
1. London Health Sciences
2. Ottawa Hospital
3. St Michael’s Hospital
4. Sunnybrook Health Centre
5. Toronto Western Hospital

WITHOUT 24/7 COVERAGE
1. Hamilton Health Sciences
2. Kingston General Hospital (pending)
3. Thunder Bay Regional Health Centre
4. Trillium Health Partners
5. Windsor Regional Hospital
Progress to Date

• EVT Working Group launched and meeting monthly since February 2015
• Provided input and expertise to OHTAC on mechanical thrombectomy evidence review
• Environmental scan to determine provincial capacity conducted:
  o Collecting: availability of CT angiography (CTA), current capacity, gaps, education needs
• Task groups established:
  o Imaging
  o EMS/Patient Transport
  o Data/Monitoring
• **OHTAC recommends publicly funding stent retrievers and thromboaspiration devices for mechanical thrombectomy in patients with acute ischemic stroke**

• Summary of the Health Technology Assessment:
  
  o High quality evidence showed a significant difference in functional independence among patients who received mechanical thrombectomy compared to intravenous thrombolysis

  o After 5 years follow-up, mechanical thrombectomy was associated with an incremental cost effectiveness ratio of just under $12,000 per QALY gained
Draft EVT Recommendations

Aligned with Canadian Stroke Best Practice Recommendations for Endovascular Therapy 2015

Dr Grant Stotts
An Endovascular Treating Centre should have:

- Access to a stroke team including a stroke neurologist and neurointerventionalist 24/7/365 days
- Biplane angiography suite, retrievable stents +/- thromboaspiration devices
- Access to a designated critical care and/or Stroke Unit and stroke interprofessional team for post-procedure care

Neurointerventionalists should have ≥ 1 year experience in stroke interventions and supra-aortic procedures

- A minimum of >20 cases/year/centre is recommended to maintain level of expertise

The EVT centre should have expertise with stroke imaging interpretation

Establish strong repatriation agreements with referring hospitals
Referring Centre Requirements and Protocols

- Centres treating with tPA should follow Canadian Best Practice Recommendations for hyperacute stroke care

- The Stroke Protocol assessment should be completed within < 1 hour of arrival in ED including multiphase CTA as standard of care

- Implementation of telestroke should be considered to facilitate access to EVT for acute stroke patients

- Patients that meet the following criteria should be considered for CTA:
  - Patient presenting with potentially disabling, acute neurological symptoms suggestive of an acute stroke within 4.5 hours of symptom onset. Patient is considered to be a potential candidate for IV thrombolyis and/or endovascular therapy
  - Door to CT/CTA < 25 minutes

- Establish communication process with CritiCall Ontario (Life or Limb)
  - Request Stroke Endovascular Team
    - Stroke Neurologist and Neurointerventionalist
Post Procedure Care

• Endovascular Treating Centres should admit patients who have received Endovascular Treatment and/or thrombolysis administration to a Stroke Unit/ICU/step-down unit/ level 2 bed

• Referring centres, receiving patients for post EVT care should have a stroke unit to which the patient is admitted for post EVT stroke care and after the need for intensive monitoring is no longer necessary
Imaging Selection Criteria

• Improved access to multi phase CT/CTA:
  • *is essential and aligned with CBPR 2015*
  • *recommended for all acute stroke codes*
  • *small to moderate ischemic core is defined by an ASPECTS score of >6 on non-contrast CT*

• Patients are eligible for EVT with an occluded proximal intracranial artery, which is a target lesion amenable to endovascular treatment including:
  • *ICA terminus, M1, M2-M1 equivalent, basilar artery*

• The presence of good collaterals on multiphase CTA

• Creation of a CT/CTA protocol that can be viewed across all sites
• **Proposed change** to symptom onset time-to-arrival to 4.5 hours

• **Proposed change** to unilateral facial droop “in combination with speech or motor symptoms”

• Exclusion criteria revision:
  - Blood sugar < 3mmol/l – add “with deficits that resolve after blood sugar correction”

• All processes/decisions between referring and EVT centres to transport a stroke patient eligible for EVT via land or ORNGE will be **facilitated via CritiCall Ontario**

• **Proposed** maximum transport time to EVT centre should be <90 minutes
System Evaluation/Monitoring

• No current active provincial database (Ontario Stroke Registry, funding expired Mar. 31/14)

• Ontario-wide data collection **imperative** for monitoring and performance measurement, and for system planning

• Support of Stroke Quality-Based Procedures (QBP) through data collection and monitoring
EVT Implementation
• Currently no funding for EVT

• Given rapid change in standard of care, there is pressure on Regional Stroke Centres already to provide this care
  
  ○ Creation of any new centres (if needed) would require an understanding of population need (geographically) and additional funding needs

• Supporting capacity building - Neurointerventional expertise required

• In consultation with stakeholders and MOH, development of a capacity building plan

• Ensuring optimal access to Ontarians
Additional Considerations

- Determination of maximum time for an ambulance to be unavailable should be determined locally

- Development of provincial standardized protocols:
  - Patient monitoring during transport
  - Post-procedure care protocol

- Development and implementation of education/knowledge translation strategies/tools including:
  - Clinician education: CTA interpretation, patient eligibility, post care
  - Algorithm/decision-making tools for referring sites
  - Patient and Family education resources

- Communication plan re. Stroke Endovascular Team (via Locating)
Challenges

• Access to appropriate imaging and endovascular treatment 24h/7d/365d
• Patient flow: transfer to endovascular centres, repatriation and follow-up
• Financial constraints on hospitals providing endovascular treatment
• Requirement for access to Neurointerventional teams to cover geography
• System evaluation and monitoring, essential for successful implementation
Next Steps

- Finalize Working Group Recommendations (Feb/16)
- Finalize patient volume estimates for planning (Feb16)
- Work with ENITS: Pilot testing of minimum CTA images set (Feb/Mar16)
- Identify/develop KT strategies/tools for dissemination in collaboration with Ontario Regional Educators Group (OREG) (Feb16)
- Present final draft recommendations to stakeholders (Feb 3 & 5/16)
- Work with MOH re. strategies for implementation (Dec/15-Mar/16)
  - QBP Expert Panel – to amend Clinical Handbook
- Submission of OSN EVT recommendations to MOH (Mar/16)
Questions

• What are your thoughts about the recommendations?

• What additional implementation considerations should be identified?

• What else can we do to help?
Additional questions can be emailed to Linda Kelloway OSN Best Practice Leader at lkelloway@ontariostokenetwork.ca