How Does Targeted Induced Hypothermia Help in The Treatment of Acute Strokes

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1. tPA Utilisation Had Increased by 10 Folds But Only less than 4% of All Stroke Patients Will Benefit
2. There is An Urgent Need To Develop New Techniques That Provides Global Brain Protection For Neuronal & Non-neuronal Injured Cells

Disclosure

- Founder of Tulip Endovascular Innovation, Ireland
- Founder of Embricon Endovascular, Ireland
- Founder of Green Medical, Michigan, USA
- Research Education Grants:
  - Cordis, Medtronic, Endologix, Gore, Vascular Solutions
  - BMS, MSD, AstraZeneca, Cardiatis, Abbott, AOTT
  - Sanofi-Aventis, Pfizer, Ulbrich, Bolton Medical
  - SFI, NUIG, EI, NSAI, HRB
  - European Commission, Erasmus+

Time is Brain

- MR CLEAN, SWIFT PRIME, EXTEND-IA, ESCAPE, REVASCAT & THRACE: All Recommended Mechanical Thrombectomy For Patients With ICA or M1 Occlusion
- Better Disability Outcome At 90 Days after Mechanical Thrombectomy & Declined With Longer Time From Symptom Onset To Arterial Puncture Indicating That Each One-hour Delay To Reperfusion Was Associated With Worse Disability
- Any Delay To Mechanical Thrombectomy, Including Observing For A Clinical Response After IV Thrombolysis

Why Triple Neuroprotection?

- Its Decreases Recruitment of Penumbral Tissue Into The Ischaemic Core of Patient’s Injured Brain
- It Decreases Cerebral Oedema By Vessels Constriction & Neuronal Injury Prevention By Inhibiting Caspase Activation, Cell Apoptosis & Inflammatory Cascade & Preservation of BBB

DAWN & DEFUSE-3 Trials Showed Efficacy of Thrombectomy In Patients With ICA Occlusion & Last Known Well Time Of Up To 24 Hours
- Thrombectomy Have High Efficacy but Patient Selection Is Very Complex
**Triple Neuroprotection**

- High Narcotic-based Induction Of 500 Mcg Fentanyl, To Minimize Changes In Blood Pressure, Preventing Dislodgment Of Any Thrombi
- Barbiturate Infusion Of 250 Mg/Hour To Decrease Cerebral Metabolic Rate
- A Noradrenaline Infusion During Clamping in Order to Maintain Systemic Induced Hypertension Above 180-200mmHg

**Manipulation of Cerebral Metabolic Rate of Oxygen Consumption**

- It Allows Longer Tolerance To Energy Deprivation & Slow Brain ATP Depletion
- To Achieve Neuroprotection We Require 50% CMRO2 Reduction
- Hypothermia To 34°C Causes 20% Reduction in CMRO2
- Barbiturates Infusion Drop CMRO2 By 60% Causing EEC Iso-electricity Which Mimics Hypothermia At 27°C Without Side Effects

**Aim Of Study**

- Study Aims To Establish Initial Safety of TN In An Acute Stroke Setting, In Patients Presented Outside TPA Window
- 14 Patients Presented Between March 2015 & September 2018 Who Underwent Emergency CEA With TN After More Than 36-72 Hours Since They Last Seen Well
<table>
<thead>
<tr>
<th>Case</th>
<th>Age, y</th>
<th>Sex</th>
<th>Symptoms</th>
<th>Risk Factors</th>
<th>CTA - Duplex US Plaque Morphology</th>
<th>Surgery</th>
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<tbody>
<tr>
<td>1</td>
<td>55</td>
<td>M</td>
<td>Crescendo RIND*</td>
<td>Smoking, Hypertension, Hyperlipidaemia, Atrial Fibrillation</td>
<td>RICA 80-99% LICA occlusion</td>
<td>Endarterectomy with patch</td>
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<td>2</td>
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<td>Stroke</td>
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<td>R xCA 80-99% L xCA 70-89%</td>
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<tr>
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<td>Crescendo RIND</td>
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<td>11</td>
<td>62-65</td>
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**Emergency Carotid Eversion Endarterectomy**

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*Abbreviations: CTA - Computed Tomography Angiography, LICA - Left Internal Carotid Artery, RICA - Right Internal Carotid Artery, RICA - Right Internal Carotid Artery, xCA - External Carotid Artery.*
Results

- There were no cases of MI, stroke or death.
- No cases of cranial nerve injury, wound hematoma or procedural bleeding. Mean hospital stay was 2.43 days.
- Mean follow-up period is nine months & all cases of total neglect had resolution of neurological symptoms.
- Three patients had recurrent stenosis of less than 50% after mean follow-up of 16 months but remained totally asymptomatic.
- After two years, patients discharged to primary physician.

Results

- Emergency CEA with TN is safe, feasible & offers neuroprotection in patients with an acute ischemic brain injury post carotid event.
- It must be considered in patients who are at an increased risk of stroke preoperatively, or who have already suffered from an acute stroke after >36 hours.
- TN reduces the damage of an ischemic insult to the brain & decrease perioperative risk of stroke during carotid surgery if used wisely & appropriately.
Triple Neuroprotection in Management of Acute Carotid Strokes

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