Stroke Thrombectomy: Neurosciences Centre versus DGH

Andrew Sharp
University Hospital of Wales, Cardiff
Conflict of Interest

• Cardiologist!
• Even worse....
• An interventional cardiologist!!
The Question

• ‘Neurosciences centre’
• Not just a neurosciences centre, but a comprehensive neuroscience centre!
• Not seen a ‘limited, not very good neurosciences centre’ before
• Who wouldn’t want a CNC?
Versus

• ‘DGH’
I therefore (already) declare the winner of this debate to be....
But I’ll have a go...
Stroke Thrombectomy: Neurosciences centre versus DGH
• ‘The modes in which, by neglecting the rules of logic, we often fall into erroneous reasoning’
What’s all the fuss about?

Table 1. Effect of MT compared with best medical therapy on good functional outcome (mRs ≤ 2\(^8\) at 90 days).

<table>
<thead>
<tr>
<th>Trial</th>
<th>Patients (%: n/N)</th>
<th>Absolute benefit of MT (%)</th>
<th>Adjusted OR (95% CI) ITT[^d]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MT</td>
<td>Best medical therapy</td>
<td></td>
</tr>
<tr>
<td>MR CLEAN[^4]</td>
<td>33 (76/233)</td>
<td>19 (51/267)</td>
<td>14</td>
</tr>
<tr>
<td>EXTEND IA[^9]</td>
<td>71 (25/35)</td>
<td>40 (14/35)</td>
<td>31</td>
</tr>
<tr>
<td>SWIFT-PRIME[^9]</td>
<td>60 (59/98)</td>
<td>35 (33/93)</td>
<td>25</td>
</tr>
<tr>
<td>REVASCAT[^5]</td>
<td>44 (45/103)</td>
<td>28 (29/103)</td>
<td>16</td>
</tr>
<tr>
<td>THRACE[^6]</td>
<td>53 (106/200)</td>
<td>42 (85/202)</td>
<td>11</td>
</tr>
<tr>
<td>*THERAPY[^12][^+]</td>
<td>38 (19/50)</td>
<td>30 (14/46)</td>
<td>8</td>
</tr>
<tr>
<td>PISTE[^7]</td>
<td>52 (17/33)</td>
<td>38 (12/32)</td>
<td>14</td>
</tr>
<tr>
<td>EASI[^8]</td>
<td>50 (20/40)</td>
<td>38 (14/37)</td>
<td>12</td>
</tr>
<tr>
<td>DAWN[^13]</td>
<td>49 (52/107)</td>
<td>13 (13/99)</td>
<td>36</td>
</tr>
<tr>
<td>DEFUSE-3[^14]</td>
<td>45 (41/92)</td>
<td>17 (15/90)</td>
<td>28</td>
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</tbody>
</table>

Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK. Ford, James, White 2019
Why do we need stroke thrombectomy?

- NNT 2.6 for reduction in disability
- NNT 5 for functional independence
- Low procedural risks in experienced hands
Are there many suitable cases?

About 12,000 in the UK
And how many are getting thrombectomy right now?
• But we don’t see those sorts of patients!
• And we won’t really get those sorts of results!!
• And it can’t be done!!!
University Hospital of North Midlands

<table>
<thead>
<tr>
<th>Outcome</th>
<th>2010</th>
<th>2018</th>
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<tbody>
<tr>
<td>mRS ≤2 (%)</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>1-year mortality (%)</td>
<td>50</td>
<td>17</td>
</tr>
<tr>
<td>Median hospital stay (days)</td>
<td>90</td>
<td>14</td>
</tr>
<tr>
<td>Discharged home (%)</td>
<td>30</td>
<td>90</td>
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</table>

>500 patients over last 8 years
How does it all work?

• Patient comes to Emergency department with recent onset of stroke
How does it all work?

• Patient comes to Emergency department with recent onset of stroke

• Someone diagnoses stroke

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<tr>
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<th>NC</th>
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<td></td>
<td>✓</td>
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• Patient comes to Emergency department with recent onset of stroke

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• Orders CT head

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<tr>
<td>Patient</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CT order</td>
<td>✓</td>
<td>✓</td>
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How does it all work?

• Patient comes to Emergency department with recent onset of stroke

• Someone diagnoses stroke

• Orders CT head

• Ideally CT angio

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<td>✓</td>
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How does it all work?

• Patient comes to Emergency department with recent onset of stroke
  - DGH: ✓
  - NC: ✓

• Someone diagnoses stroke
  - DGH: ✓
  - NC: ✓

• Orders CT head
  - DGH: ✓
  - NC: ✓

• Ideally CT angio
  - DGH: ✓
  - NC: ✓

• ASPECTS score helpful
  - DGH: ✓
  - NC: ✓
Then what?

- Thrombolysis
Progress

• So, we all have the skills and equipment to get this far
• (With a modicum of effort and organisation)
• The stroke specialist then discusses the patient and the CT scan with the interventional specialist
Now what?
To the lab as quickly as possible
(A win for the DGH?)
Does anyone think their ‘DGH’ couldn’t get to this point?

• Mature thrombolysis services already in >80 UK centers
• Ask radiographers to run the CT angio protocol solo and send the pictures to another centre/country if necessary
Now what?

• We need.... A femoral arterial puncture
Femoral arterial access – so easy, even a cardiologist can do it!
Then what?

• A 6Fr guide to reach the neck
• Only pictures from cardiology lab I’m afraid
• (Except, being gluttons for punishment, we tend to go up the more difficult artery in the neck and then turn through 180 degrees to operate)
• 2500 PCIs per year in UK of bypass grafts
But the patient is moving around and restless

- Need good anaesthesia
- A consultant neuroanaesthetist (?)

The limited number of neuroanaesthetists is nearly as challenging as the shortage of INRs in the UK. Other teams with whom we work and speak confirm that the anaesthesia required for MT is not particularly complex, so although services should be led by a neuroanaesthetist, the procedure itself could be delivered by a general anaesthetist. This still requires support from an ODP, who are also in short supply in the UK.

Dr Don Sims
Consultant Stroke Physician and Clinical Lead for Stroke Medicine, Queen Elizabeth Hospital Birmingham, University Hospitals Birmingham NHS Foundation Trust, Birmingham
Is it possible???

• A Consultant neuroanaesthetist is either seconded, or dual appointed, or permanently appointed to work in a..... DGH?
• Trains other consultants in the subtleties?
OK, we have a 6 French guide in the neck and take a cerebral angiogram

• Digital subtraction available in most cath labs in the land

• Requires about £8k to switch it on
Next steps for stroke thrombectomy

• Wire with microcatheter
• Guide extension
• Deliver stenttriever/aspiration device
Next steps

• Couldn’t find image of cerebral intervention

• Found one of some guy who
  • Went from right radial artery across the arch
  • Up into the left subclavian
  • Accessed the LIMA
  • Advanced a guide extension
  • Wired using a microcatheter
  • Delivered a stent to a distant tortuous medium sized artery.
Anatomy is a problem

• I mean, what on earth is this?
I always thought they came like this
Learning is certainly required
And a buddy is required!
More centres means more operators needed

• Apprenticeships seem to be way of the world
  • Elective cerebral angiograms
  • ?Carotid stents
  • ?? Other neurointerventional procedures
How long would that take?

• One to two years for someone who has never handled a catheter

• How long for someone who has handled 5000 catheters and is already trained in:
  • Femoral arterial access
  • Guiding catheter handling
  • Accessing head and neck vessels
  • Wire manipulation
  • Microcatheters
  • Stents
  • Aspiration technology
  • Crossing fragile vessels (CTO)
  • Coils for small vessel perforation?
CENTRAL ILLUSTRATION: Acute Stroke Interventions by Cardiologists

70 consecutive patients with out-of-hospital strokes
- Mean baseline NIHSS: 17 points

### Technical Results

<table>
<thead>
<tr>
<th>Technical success (TICI 2b or 3)</th>
<th>n = 65 (93%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural times (mean ± SD; minutes)</td>
<td></td>
</tr>
<tr>
<td>Onset to hospital arrival</td>
<td>74 ± 58</td>
</tr>
<tr>
<td>Onset to cath lab arrival</td>
<td>144 ± 71</td>
</tr>
<tr>
<td>Door to femoral access</td>
<td>64 ± 54</td>
</tr>
<tr>
<td>Cath lab alert to operation readiness</td>
<td>13 ± 14</td>
</tr>
<tr>
<td>Onset to revascularization time</td>
<td>184 ± 53</td>
</tr>
</tbody>
</table>

### Clinical Results

- mRS at Baseline
- mRS at Discharge

Volumes, though, volumes

Waste of rare talent spreading INR fellows to DGHs when centres need robust rotas

How about those near end of careers, or perhaps from overseas?

Could they spend 2-3 days a week in DGHs doing cerebral angiograms and daytime stroke cases with other operators in a dedicated training programme?

Could then go back to the CNC for rest of week?
Part-time/daytime services don’t work!

• That’s how we started Primary PCI for STEMI
• That’s how stroke thrombectomy has started...?
Operators need 40 cases a year each!!

• When they do limited volumes of other catheter based specialities
• When they single scrub
• When simulators were useless
What is a DGH anyway?

- They are increasingly merging and growing in patient population size.
- Many service a million patients.
- Enough to sustain 150 thrombectomy procedures per year.
Why Bother?

• For every 1000 patients treated with thrombectomy, each 15 minute delay means
  • 39 patients move up one point on mRS
  • 25 patients will miss out on functional independence (mRS –2)
Why bother?

A  Functional independence (mRS 0-2) by time from emergency department arrival to actual substantial reperfusion

B  Functional independence (mRS 0-2) by time from brain imaging to actual substantial reperfusion

Time to treatment with thrombectomy, Meta analysis. JAMA 2016
How long does it take to get patients from A to B?

**PPCI Call to Balloon time**
(excluding shock/vent)

By Admission Route

53 Min Delay

- Median CTB (min)
  - Direct: 119
  - IHT: 172
  - All: 124

Better
That is with an easy mechanism of diagnosis (ECG)

• If we are VERY generous and say transferring a stroke patient delays thrombectomy by 90 minutes in rural areas, what is the cost?

Functional independence (mRS 0-2) by time from emergency department arrival to actual substantial reperfusion

- 82% functional independence
- 68% functional independence
So how bad would your DGH team have to be to make the situation worse?

• Well, they could
  • Perforate cerebral vessels
  • Dissect the carotids
  • Embolise into collaterals
  • Cause haemorrhagic transformation
  • Leave foreign bodies behind

• But...up to a third of the people living outside of cities who we can help are gone already by the time they reach the ‘mothership’

• DGH thrombectomy would have to be a LOT worse
DGH thrombectomy?
Winding up

• We need more stroke thrombectomy procedures in the UK
• That needs more operators and more teams
• We could train them from scratch but
  • People retire
  • Are there enough people signing up?
  • Is core work an issue?
• We need shorter travel times for thrombectomy
How could we do it?

• Train people who do similar stuff and then run outreach links to maintain audit and CME
• Adapt the service spec to geography and facility
• The effect size is so big, that safe, acceptable standard of service is likely to be better than no service, or a faraway centre of excellence
• When we are uncertain about the safety of a potentially helpful new intervention/strategy, we usually test it in a clinical trial
• We don’t usually decline to consider it on the basis of consensus
Now, I would like to introduce you to the winner of today’s debate:
Thanks!