

Decompression & CVA

Feeling the pressure?

Nepean WTET summary 9/6/20

Background and Rationale

- Despite advances in stroke management, patients with MCA (middle cerebral artery) infarct who have a seemingly good response to treatment may go on to deteriorate neurologically and die or be severely disabled
- Malignant MCA (mMCA) syndrome is life threatening space-occupying brain oedema following a large MCA territory infarct (CT, perfusion or MRI) usually occurring day 2-5 post stroke. The patient develops focal or global raised pressures secondary to this oedema → reduced focal or global perfusion → increased morbidity and mortality despite optimal medical therapy (mortality up to 88% with medical therapy alone). Untreated main mode of death is brain death from herniation
- Early decompressive craniectomy (<48h of CVA) may improve perfusion of infarct and penumbra due to reduced effect on pressures of local oedema → improved survival and neurological recovery (aim is good functional survivors)

Advantages and Disadvantages

- Advantages;
 - Improved survival, reduced morbidity (higher extended Glasgow outcome scale -GOS E and lower modified rankin scale – mRS) in selected cases
 - Neurosurgery may potentially be indicated anyway e.g. if haemorrhagic transformation and indications for clot evacuation present
- Disadvantages;
 - Highly invasive; associated risks (in particular if thrombolysis recently)
 - Resource intensive (neurosurgical center), associated skill and cost, if survive require further surgery to replace bone
 - Evidence potentially weak – potential controversies / conflicting opinion
 - May increase survival of heavily disabled individuals in unselected groups

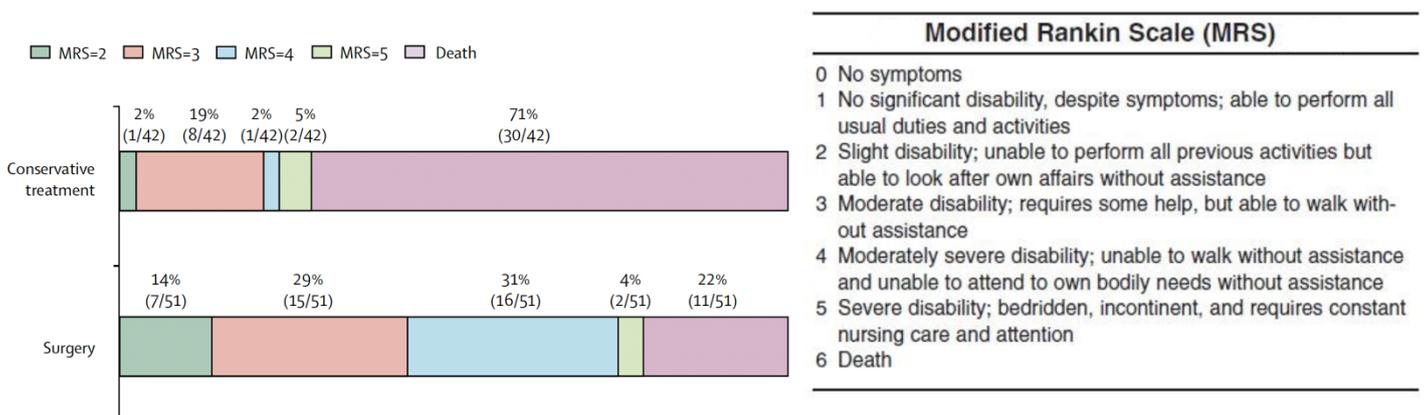
Key studies

- Animal studies and case reports suggested substantial benefit with decompression ... hence;
- DESTINY: Stroke 2007
 - German MC RCT, n=32 (power calc 188); hemicraniectomy vs conservative for >1/3 MCA territory infarct in 18-60y/o, symptoms >12h but <36h after stroke with associated drop in conscious level
 - 88% surgical vs 47% conservative survival at 30d (P=0.01, almost all died <8d); mRS (modified rankin score) at 6m showed positive results in favour of surgery
 - Higher NIHSS (24 vs 21 P<0.01) and more dominant hemisphere stroke (73% vs 53% P<0.23) in the conservative arm
 - Stopped early due to interim analysis for mortality at 30d
- DECIMAL: Stroke 2007
 - French MC RCT, n=38, 18-55y/o, <24h mMCA, infarct volume >145cm³ on MR DWI
 - Craniectomy as large as possible (temporal, frontal, parietal +/- occipital)
 - Primary outcome (mRS =/<3 at 6m) 25% in surgical group vs 5.6% in non-surgical group (P=0.18), and at 12m 50% and 22.2% respectively (P=0.10)

- Large mortality difference (absolute reduction 52.8% with surgery); brain death from herniation main modality in non-surgical group. Life worth living all/most of the time in 8/10 interviewed craniectomy patients at 1y
- Stopped early for; slow recruitment, high difference in mortality and meta-analysis results
- **HAMLET: Lancet Neurol 2009**
 - Dutch MC RCT, n=64 (of 112); 18-60y/o with CVA >2/3 MCA territory, drop in GCS to =/<13
 - Wanted to look at later decompression (up to 4d) MCA infarct with life threatening oedema
 - Primary outcome mRS good (0-3) vs poor (4-6) at 1y. Poor outcome in 75% of both arms (P=1.0), death however 22% in surgical group vs 59% in medical group at 1y (P=0.002)
 - ?Worse outcomes than Decimol and destiny as median time to randomisation 41h (longer)
 - Stopped early, due to poor likelihood of reaching statistical significance of primary outcome
- **Meta-analysis: Lancet Neurol 2007**
 - Pooled analysis of all 3 studies led to them being stopped early
 - <48h of 16-80y/o with space occupying MCA infarction treated within 48h; n=93
 - Primary outcome; mRS 0-4 (favourable) vs 5-6 (unfavourable) at 1 year; favourable outcome in surgical grp vs control grp 75% vs 24% (ARR 51%, CI 34-69)
 - Secondary outcome (more in keeping with trial designs!) mRS 0-3 vs 4-6; 43% vs 21% (ARR 23%, CI 5-41), and survival 78% vs 29% (ARR 50%, 33-67). No specific subgroup differences
 - NNT=2 for survival and mRS =/<4, NNT=4 for survival and mRS =/<3, survival alone NNT=2
- **DESTINY 2: NEJM 2014**
 - German MC RCT non-blinded, >60y/o (median 70y) mMCA <48h, n=112; craniectomy compared to standard (ICU) care. Stopped early (for efficacy of primary endpoint)
 - Primary outcome; survival without severe disability (mRS 0-4) at 6m; 38% (surgical) vs 18%, P=0.04, however this was predominantly from improved mortality (33% vs 70%) -no patients had mRS 0-2, 7% vs 3% mRS=3, 32% vs 15%, mRS=4 28% vs 13%
 - Increased survival with hemicraniectomy but substantial disability at 6 and 12 months

Summary (my practice)

- Decompressive hemicraniectomy should be considered early (<48h) in the young (<60y/o) at risk mMCA population, with a reasonable chance of a good functional neurological outcome. Medical consensus on this should involve consultation and consensus between neurosurgeons (risks re doing the procedure), neurology (treating team; rehabilitation potential) and intensive care (impact of global morbidity). Should there be consensus that this is a reasonable treatment to offer this should discussed with patient and/or family and a personalised decision made in the interests of the patient around realistic functional recovery.



Taken from Vehadi et al (meta analysis, Lancet Neurol 2007)