Advances in Cerebrovascular Disease

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Disclaimer

- No commercial or financial relationship in the preparation of presentation that may represent a conflict of interest
Overview

- Brief review of brain aneurysms and SAH
- Advances in aneurysm treatment
- Post-hospital care following SAH
- Risk factors and management of unruptured brain aneurysms
- Be familiar with advances in acute stroke care
The Enemy
Overview

- Estimated 3% of population harbour an intracranial aneurysm
- Prevalence increases with age
- May present with CN3 (oculomotor) palsy, seizures
- Almost all are asymptomatic until rupture
  - Sudden onset severe headache, neck pain, nausea, vomiting, neurological deficit, depressed conscious state
Burden of Disease

- Subarachnoid hemorrhage accounted for 4.4% of stroke mortality but 27.3% of all stroke-related years of potential life lost before age 65

- The proportion of years of potential life lost due to subarachnoid hemorrhage was comparable with ischemic stroke (38.5%) and intracranial hemorrhage (34.2%)

- 2/3 independent

- 1/2 cognitive impairment, dissatisfied with life

- 1/3 resume work as before

- Rule of thirds
Incidence and Demographics

- Aggregate worldwide incidence of aSAH is about 10.5 cases per 100,000 person-years
  - Incidence is higher in Finland and Japan
  - Incidence increases with age
  - Mean age at presentation of 55 years

- The risk for women is 1.6 times that of men

- Risk factors: tobacco smoking, hypertension, aneurysm growth
Are We Doing Better Over the Years?

- YES

- Case fatality reduced by 17% in absolute terms in last 30 years, currently around 35%

- Largely due to
  - early detection,
  - better diagnostics,
  - advances in treatment techniques
  - Clinician attitudes – earlier treatment, more aggressive in instituting interventions
SAH in Elderly

- Improvements in outcome in elderly
- No longer fait accompli
- Carefully selected patient
- >60% returned to independence
Advances in Treatment

- Traditionally with open surgery and clip ligation of aneurysm
Advances in Treatment

- More recently
- Minimally invasive technique
- Endovascular route
  - Coiling
  - Stenting
  - Flow divertors
  - Liquid embolic agents
Coiling

- ISAT trial – international multi-centre RCT
- The RRR and ARR in dependency or death after allocation to an endovascular versus neurosurgical treatment were 22·6% (95% CI 8·9–34·2) and 6·9% (2·5–11·3)
- Stroke 2010; 41: 1743-7

**Improved Cognitive Outcomes With Endovascular Coiling of Ruptured Intracranial Aneurysms**

Neuropsychological Outcomes From the International Subarachnoid Aneurysm Trial (ISAT)

Richard B. Scott, PhD; Fiona Eccles, DPhil; Andrew J. Molyneux, MBBChir; Richard S.C. Kerr, MS; Peter M. Rothwell, FMedSci; Katherine Carpenter, Dip Psych
Are We There Yet?

- Risk of death is 25% within 10 years
- SMR 1.5
- Systemic disease vs a “one off” haemorrhage
- Also increased risk of vascular events
- In one Swedish study, the SIR 1.51 for fatal and non-fatal vascular events
# Management of aSAH

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| | | | Surveillances
ICU

This is a gun-free zone.
Case Study

- 52 yo right handed female, mother of 2
- Works as a hotel manager
- Smoker, hypertensive and hyperlipidaemia on medication but ?compliance
- Mild asthma, suffers from migraine
- Presents with a sudden onset headache, neck pain, nausea and vomiting
- Headache different to her “usual” headaches
CT Brain
In Hospital Progress

- Developed symptomatic vasospasm at day 9 post haemorrhage
- Responded to fluids, hypertension and intra-arterial nimodipine
- Discharged home day 16 post haemorrhage
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time
  - Headaches and fatigue is extremely common post-SAH
  - Worse with dehydration, excessive stimulation, sleep deprivation
  - Schedule regular breaks
  - Simple analgesia
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time

- I can’t remember a thing, I can be talking and the next minute I can’t remember what I was talking
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time

- I can’t remember a thing, I can be talking and the next minute I can’t remember what I was talking

  - 60% memory deficits, 75% executive function and language on objective testing
  
  - Very common post-SAH especially with Acomm aneurysms and following open surgery

  - 95% in subjective/self reported cognitive and or emotional complaint hampering day to day living at 3 months
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time

- I can’t remember a thing, I can be talking and the next minute I can’t remember what I was talking

- She’s really moody doc especially come the end of the day, and she’s too scared to go out
Post-Discharge

- I have a constant dull headache and I am really tired and sleep all the time

- I can’t remember a thing, I can be talking and the next minute I can’t remember what I was talking

- She’s really moody doc especially come the end of the day, and she’s too scared to go out
  - Mood disturbance is extremely common especially when tired and with excess stimulation
  - Depression, anxiety are also very common, 1/3 people reports symptoms of PTSD
Post-Discharge

- Can I drive?
  - Austroads guideline states no driving for 3 months
  - 6 months if open surgery or seizure
Post-Discharge

- Can I drive?

- Can I fly?
  - Yes, it is safe to fly
  - Clips and coils do not set off security alarms
Post-Discharge

- Can I drive?
- Can I fly?
- Is it safe to have a MRI?
  - Yes, modern clips and coils are MRI compatible
  - MRI is a common method for surveillance of coiled aneurysms
Post-Discharge

- Can I drive?
- Can I fly?
- Is it safe to have a MRI?

- Is it inherited? Does my family have to have tests?
  - In general, it is not an inherited condition
  - Screening is generally not recommended unless there are 2 or more immediate family members with SAH or aneurysms
  - Advised to consult with a neurosurgeon before embarking on screening
Post-Discharge

- Can I drive?
- Can I fly?
- Is it safe to have a MRI?
- Is it inherited? Does my family have to have tests?

**Secondary prevention**
- Cessation of tobacco smoking
- BP monitoring and treatment
- Healthy living advice: diet, exercise, moderation
Despite Eric’s best efforts, no-one guessed ‘Bangkok’
Incidental Aneurysms

- 3% harbour intracranial aneurysms
- But not all aneurysms rupture
- What is the risk of rupture?
- What are the treatment options
Risk of Rupture

- Generalised rate is about 0.5-1.5% per year
- Quoted anywhere from 0% to 10% per year
- Behaviour of aneurysm is unpredictable and non-linear
- Research is difficult to conduct, often flawed by methodology, design, selection, ethics
- >60 years
- female
- Japanese or Finnish
- >5mm, posterior circulation
- Symptomatic aneurysms
Options

- Conservative with surveillance
- Endovascular techniques
- Microsurgical options
Options

- Conservative with surveillance
- How/What and When (and Why)?
- Non invasive vs invasive monitoring
- CTA vs MRA vs DSA
- ½ yearly vs annually vs 2 yearly vs 5 ...
Options

- Conservative with surveillance
- Endovascular techniques
- Microsurgical options
Factors to Consider

- Lesional (Aneurysm) Factors
  - Size, location, morphology

- Host (Patient) Factors
  - Age, co-morbidities
  - Occupation, patient preference
  - Risk factors, previous SAH, genetics

- Technical Factors
  - Access, resource availability
Screening?

- Guidelines recommend screening
  - >=2 immediate relative with SAH or aneurysm
- Counseling is paramount prior to screening
  - Medical implications
  - Psychological implications
  - Financial implications
- How/What and When (and Why)
so if olive oil is made of olives then baby oil... OMG
Global Burden of Ischaemic Stroke

Global and regional burden of stroke during 1990–2010: findings from the Global Burden of Disease Study 2010

Valery L Feigin, Mohammad H Forouzanfar, Rita Krishnamurthi, George A Mensah, Myles Connor, Derrick A Bennett, Andrew E Moran, Ralph L Sacco, Laurie Anderson, Thomas Truelsen, Martin O’Donnell, Narayanamurthy Venkatasubramanian, Suzanne Barker-Collo, Carlene M M Lawes, Wenzhi Wang, Yukito Shinohara, Emma Witt, Majid Ezzati, Mohsen Naghavi, Christopher Murray, on behalf of the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group

Summary

Background Although stroke is the second leading cause of death worldwide, no comprehensive and comparable assessment of incidence, prevalence, mortality, disability, and epidemiological trends has been estimated for most regions. We used data from the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) to estimate the global and regional burden of stroke during 1990–2010.

• 15 million afflicted with stroke worldwide
• 6m die and 5m permanently disabled
• 2\textsuperscript{nd} leading cause of disability
• 2\textsuperscript{nd} leading cause of death >60 yo
Burden of Ischaemic Stroke in Australia

- Deloitte Access Economics
- Economic impact of stroke in Australia in 2012
- Prevalence >420,000
- 2/3 lives with a disability
- ¼ more males living with stroke
- Total burden of disease cost estimated at $49.3 billion
- Loss of productivity $3b, healthcare costs $881m, carer $222m
- >$172k per year per survival to restore to pre-stroke level of well being
Strategies for Treating Acute Ischaemic Stroke

- Traditionally, very little
- Aspirin, nursing care, secondary prevention
- Acute stroke unit
- Recanalisation with IV thrombolysis (hyperacute)
2 Things that We Know

- Recanalisation is good
  - Reperfusing the brain by unblocking the artery

- Time to recanalisation is critical
  - Concept of pneumbra – saving the at risk brain before irreversible injury has occurred
Recanalisation is Good

CONCLUSIONS:
Despite an increased incidence of symptomatic intracerebral hemorrhage, treatment with intravenous t-PA within three hours of the onset of ischemic stroke improved clinical outcome at three months.
Recanalisation is Good

Good outcome at 3 months in recanalised patients OR 4.43
Death at 3 months in recanalised patients OR 0.24
Recanalisation is Good

**CONCLUSIONS:**
These findings suggest that recanalization is an appropriate biomarker of therapeutic activity in early phase trials of thrombolytic treatment in acute ischemic stroke.
Methods of Recanalisation

- IV thrombolysis
- Sonothrombolysis
- IA thrombolysis
- Mechanical thrombectomy
  - MERCI device “corkscrew”
  - Suction
Along Came the Stent

- Lots of case series 2010-12
- 16 series, n=5-56

- Wide variation in results
  - Recanalisation 67-100%
  - mRS 0-2 at 30 or 90 days 30-100%
  - 1 study reported 100% recanalisation with 30% mRS 0-2
  - 1 study reported 100% recanalisation and mRS 0-2

- SWIFT and TREVO II studies compared stent retrieval vs MERCI device and showed superiority in clinical outcome, safety data and radiographic results
A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

Clot Retrieval

- ESCAPE
- EXTEND IA
- SWIFT PRIME
- REVASCAT

- Moving into new and very exciting era of (hyper)acute stroke intervention
- Benefits can be very satisfying for patient and medical team
Anterior Circulation Stroke

- 42 yo female, right handed
- Ictus 07:30AM, last seen at 06:30AM by children having a cup of tea
- Right hemiparesis, dysphasia
- NIHSS 12
Mechanical Thrombectomy