Ischaemic stroke in young adults

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Stroke Multidisciplinary Study Day
6th October 2010
Stroke

- 3rd most common cause of mortality in UK
- Leading cause of adult disability
- Incidence increases with age
- Also occurs in young adults
  - Up to 12% of first strokes occur in patients <45 years of age
Young stroke

- Under age of 45
- Reported incidence variable
  - Annual incidence of 10 per 100000 in UK
- 50% are ischaemic (compared with 85% in older patients)
Causes of ischaemic stroke

- Older adults
  - Atherosclerosis
  - Small vessel disease
  - Cardioembolism
  - Risk factors: Hypertension, smoking, cholesterol, atrial fibrillation, diabetes

- Young adults
  - Atherosclerosis and small vessel disease less common
    - 2% 15-30 year olds; 30-35% 30-45 year olds
  - Causes of stroke more diverse
Causes

Arterial dissection
Carotid and Vertebral Artery Dissection

• 2% of all ischaemic strokes
• BUT
  – up to 10% of young adult stroke < 45 yrs
  – up to 20-25% < 30 yrs
  – (compared to ~ 2.5% in older people)
What is arterial dissection?

- Tear in the intima or media
- Bleeding within the arterial wall
- Bleeding tracks/dissects circumferentially and longitudinally
- Ischaemic stroke due to
  - Embolisation of thrombus formed at the site of the tear into an intracranial artery
  - Occlusion of the dissected artery
Case 1

• 35 year old female
• 1/52 post partum – difficult labour, C section
• 4 episodes of transient difficulty speaking, right arm/leg weakness lasting for minutes each time
• Left sided neck pain
• No other PMH; no obvious risk factors
What causes arterial dissection?

**Spontaneous**
- Genetic connective tissues disorders (1-5%) — Ehlers-Danlos, Marfan’s, osteogenesis imperfecta, polycystic kidney disease, psuedoxanthoma elasticum
- Fibromuscular dysplasia
- Cystic medial necrosis
- Possibly atheromatous risk factors (?) - BP, DM, Smoking, cholesterol

**Traumatic**
- Sports
- RTA
- Whiplash injury
- Neck manipulation chiropractor
- Minor precipitating events - painting ceiling, reversing car, yoga, coughing, vomiting
Clinical features

- Carotid artery dissection
  - Headache/neck pain
  - Horner’s syndrome
  - TIA and stroke in carotid territory
  - Cranial nerve palsies

- Vertebral artery dissection
  - Neck pain, pain in occipital region, ears
  - TIA and stroke in vertebrobasilar territory

Symptoms usually within hours/ days of dissection but there may be delay of weeks or even months
When should the diagnosis be suspected?

- Clinical features as described on previous slide
  - Head or neck pain in a (young?) patient with neurological deficit
  - High index of suspicion even in the absence of obvious trauma
Treatment

• No consensus: variation in treatment regimes used
• Current treatment is with warfarin (INR 2-3 for 3-6 mths) or antiplatelets
• CADISS (Cervical Artery Dissection in Stroke Study) – antiplatelets vs warfarin
Causes

Cardioembolism
Cardioembolism

• 20-30% of young stroke patients
• Most common cardiac lesions
  – Prosthetic heart valves
  – Infective endocarditis
  – Dilated cardiomyopathy
  – Atrial septal aneurysm (ASA)
  – Patent foramen ovale (PFO)
• Diagnosed on transthoracic echo or transoesophageal echo
Patent foramen ovale (PFO)
How might PFO cause stroke?
Atrial septal aneurysm (ASA)

- Bulging of the interatrial septum into the right or left atrium or both
- Can be present in healthy people
- Associated with increased risk of stroke especially with a co-existing PFO
PFO and ASA

• Uncertain importance as cause of stroke
• PFO prevalence higher in young stroke pts compared with controls
• However other studies suggest risk of recurrent stroke in pts is low
• Management unclear
  – Percutaneous closure vs anticoagulation vs antiplatelets
Causes

Thrombophilia
Thrombophilia in stroke

- Rare, usually familial conditions in which spontaneous and recurrent thromboses occur – usually venous
- Protein C and S deficiency, activated protein C resistance
- Lupus anticoagulant and anticardiolipin antibodies
- Weak evidence in sporadic arterial stroke
- Small studies in young stroke have suggested an association
Causes

Cerebral Venous Thrombosis
Case 2

- 24 year old nursery nurse
- Woke up 5am with severe headache, loss of vision
- GCS initially 14 on presentation
- Dropped to 9
• 2/12 history of headache
• 2/7 history of visual disturbance
• Smoker
• Overweight
• On the pill - microgynon
• Family history of deep vein thrombosis
Initial CT scan – 2 hours after onset of symptoms
Cerebral venous thrombosis

- Headache
- Raised intracranial pressure with papilloedema
- Focal neurological deficit
- Seizures
- Cranial nerve palsies

Especially in a young patient who is or has recently been pregnant, has a past history of, or risk factors for venous thrombosis e.g. thrombophilia, oral contraceptive pill
Treatment

• Limited evidence from randomised trials
• Usually treated with anticoagulation (heparin followed by warfarin), even in the presence of haemorrhage
• Prognosis often good with aggressive treatment
  – International Study on Cerebral Vein and Dural Sinus Thrombosis – 624 pts:
    • 79% complete recovery
    • 13.4% dead or dependent
Day 2: Post op scan

Day 8: 5 days after starting heparin
Differential diagnosis of ischaemic stroke in young adults

- Arterial dissection
- Haematological – thrombophilia, polycythaemia, thrombocythaemia, antiphospholipid antibody, thrombotic thrombocytopenic purpura, cancer
- Rheumatic and inflammatory – SLE, rheumatoid arthritis, sarcoid, Sjogren’s, PAN, primary CNS angiitis
- Cardiac – PFO, myocardiomyopathy, arrhythmias, endocarditis, atrial myxoma, prosthetic heart valves,
- Female hormone related – oral contraceptive pill, pregnancy, dural sinus occlusion
- Premature atherosclerosis – hypertension, diabetes, smoking, homocysteinuria, hyperlipidaemia
- Others: moyamoya, Behcets syndrome, Takayasu’s syndrome, Sneddon’s syndrome, fibromuscular dysplasia, Fabry’s disease
- Drugs – cocaine, heroin, amphetamines
- Genetic - CADASIL
- Venous stroke
Prognosis in young stroke

• Initial mortality: 2-7%
• 1-3% risk of recurrent stroke per year
• No underlying cause found in up to 40%
• Low risk of recurrence if no underlying cause found: 0.5-1% per year
• Greater potential for recovery compared with older adults
Malignant MCA infarction in young stroke

Decompressive hemicraniectomy
Case 3

- 44 year old woman
- No past medical history
- Found drowsy in bed in the morning
  - Unable to speak
  - Right sided weakness
Day 2
Malignant MCA infarction

- Gaze deviation, hemiplegia, visual field defect, aphasia or neglect
- Early/rapid neurological deterioration
- Headache
- Vomiting
- Poor prognosis – 80% mortality
  - Transtentorial herniation
  - Brainstem compression
Decompressive hemicraniectomy

- Removal of a large bone flap on the side of the stroke and dura opened to relieve pressure
- Life saving operation
- Early identification of at risk patients; operated on by a maximum of 48 hours
- Results less good with older patients
  - Current NICE guidelines <60 years
Day 4: post hemicraniectomy
Summary

• Large differential diagnosis in ischaemic stroke in young adults
• Arterial dissection and cardioembolism are important causes
• Arterial and venous strokes