Aeromedical Decision Making (ADM) following a Cerebro-Vascular Accident (CVA); a case study

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Case Study

- 72 yo male Class 2 (private pilot).
- Flying Hours: 750
- Right arm numbness; seconds - minutes
- Word finding difficulty; most of the day
- Difficulty using keyboard; persisted > 3wks
- Ex-smoker (1992), “modest” alcohol
- Medical 18m prior to event: BMI 30, BP 140/80
- BP 160/90 (3wks post-event). Neuro & CVS exam; Normal. Rx Clopidogrel
Cerebro-Vascular Accident

Clinical Condition
- CVA ("Stroke") – Residual functional impairment?
- Risk Factors – H/T, AF, CVD, Coagulopathy, Diabetes, etc
- Ischaemic / Haemorrhagic / Cryptogenic

Likelihood of Clinical Event
- Incidence / prevalence data – Risk of CVA recurrence, risk of post-CVA seizure
- Prognostic data – Treatable causes?

Likelihood of Aviation Event
- Aviation environment – hypobaric hypoxia, valsalva, etc
- Human performance – acute or gradual onset total/partial incapacitation

Treating Clinician

Aeromedical Assessment
• Cerebral CT: No evidence of pathology
• Carotid Doppler: Nil significant
• Echocardiogram: Normal
• Cerebral MRI: left posterior frontal cortical stroke
• Holter: Nil significant
• Thrombophilia screen: Negative
• T. Chol 5.6, HDL 1.7, LDL 3.4, Ratio 3.3
• BP: 6m post-event, 150/90 (Neuro1). 8m post-event, 140/100 (Neuro2)
TOE (TEE): Patent Foramen Ovale (PFO) + Atrial Septal Aneurysm (ASA)
  • Neuro1; Dx “Cryptogenic Stroke”

Medical 5m post-event: BMI 30, BP 135/90
  • Further information requested

Medical 10m post-event: BMI 30, BP 145/85
  • Further information requested

Medical 18m post-event: BMI 28, BP 130/73, OGGT normal, Ex Stress Test –ve, Rx Olmesartan
Cryptogenic Stroke

Possible mechanisms:

- Occult cardiac embolism

- Paradoxical embolism
  - Onset; after a shower when dressing

- Thrombophilia
  - 10hrs/day on PC with little breaks, but no DVT symptoms or lx

- Preclinical or subclinical cerebro-vascular disease

- Inflammatory processes
Cryptogenic Stroke

- Cryptogenic stroke
  - 30 - 40% of ischaemic stroke
  - Subclinical AF >10%
  - Is PFO alone or PFO+ASA risk factors?

Press Release

EMBARGOED FOR RELEASE UNTIL 4 PM ET, JUNE 23, 2003
Rare Stroke Risk Related to Air Travel

Stroke associated with pulmonary embolism after air travel

F. Lapostolle, MD; S.W. Berren, MD; M.S. V. Surget, MD; D. Sardalet, MD; C. Lapandry, MD; and F. Astre, MD, PhD

Abstract—Prolonged air travel is associated with an increased incidence of thromboembolic events. The occurrence of stroke was studied in patients with pulmonary embolism after air travel in a review of all flights arriving at Charles de Gaulle Airport in Paris during an 8-year period. Thromboembolic stroke and patent foramen ovale were diagnosed in four patients with pulmonary embolism.
Cryptogenic Stroke

Cryptogenic stroke - *Initial*
- PFO alone: 25 - 30% general population
- Case Control Studies; PFO higher in cryptogenic stroke, but not in cohort studies
- Increased prevalence of PFO+ASA

Cryptogenic stroke – *Recurrent*
- Prospective studies: PFO alone *not* a RF
- Prospective studies: PFO+ASA ~ RF yes/no
Risk of Recurrence & Seizure Post-CVA

Pilot’s specialist opinions;
- Neuro1: <5% in 1st yr then 3 - 5% pa (not ref), but in 2012 opined 3%pa
- Neuro2: 5 - 7% pa with 1% risk reduction for Rx H/T, but not less than 3% (not ref, except.....)
- Cardio: PFO+ASA not clinically significant (not ref)
Risk of Recurrence & Seizure Post-CVA

CASA Neuro1: i) 15.2% recurrence risk over 4yrs in those with PFO+ASA,¹
   ii) 11.5% risk of sgl or recurrent seizure between 1m and 5yrs in first 5yrs post-CVA, 3% in those independent after 1m,²
   iii) Seizure risk, 8.9% (haemorrhagic) and 8.6% (ischaemic) CVA over 34m³

CASA Neuro2: post-CVA epilepsy in 2 - 4% all pts, peaking around 2yrs.⁴

“Seizure risk comparable to general population”. But didn’t address CVA recurrence risk.

1. Mas et al, NEJM 2001
2. Burn et al, BMJ 1997
Does repair of a PFO+ASA reduce the risk of recurrence?

Is the PFO+ASA relevant as a recurrence risk in this case?

- Data for those <55yo suggests so (but this pilot is now 76yo)

Closure or Medical Therapy for Cryptogenic Stroke with Patent Foramen Ovale

Devices for Closure of Patent Foramen Ovale Are Not Found Superior to Medical Therapy for Preventing Recurrent Stroke

Suggests not (Furlan et al, NEJM 2012)
Aeromedical Decision Making

Is the recurrence risk of a CVA or risk of post-CVA seizure acceptable for certification?

- 73yo, Cryptogenic stroke, PFO+ASA, CVA recurrence risk 3 ~ 4%pa, post-CVA seizure risk 2 ~ 4%pa
- 18m post-CVA medical → Complex Case Meeting:
  - Class 2, 12m certification, With Safety Pilot restriction and ongoing specialist reports
The prospect of the applicant suffering a further stroke at the controls of an aircraft in flight in the Tribunal’s view presents as a real and substantial and not a remote or fanciful risk.

The fact that the risk in percentage terms of the applicant actually having a stroke whilst at the controls may be relatively small, is largely irrelevant - what is to the point is the very real possibility that the applicant remains at greater risk than the rest of the aviator population of suffering from a stroke.

Also of relevance in any risk assessment is the nature of the incapacity which might be caused by suffering from a stroke. Such an event would clearly lead to a degree of incapacity which could be totally destructive of the applicant’s ability to control an aircraft in flight.