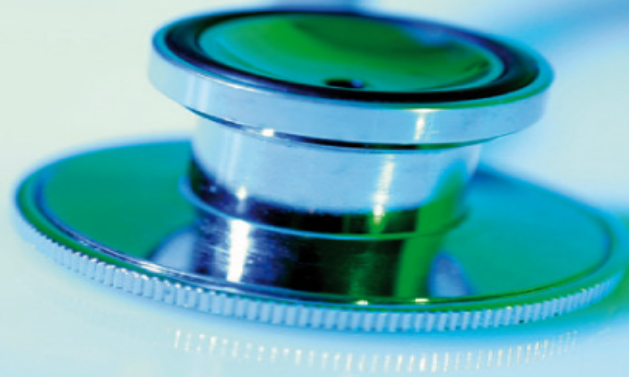


Aeromedical Decision Making (ADM) following a Cerebro-Vascular Accident (CVA); a case study

Dr Ian Cheng

ICASM 2012 – Melbourne

Dr Peter Clem, Dr Michael Drane, Dr David Fitzgerald, Dr Arpana Hegde, Assoc Prof Pooshan Navathe, Dr Doug Randell



safe skies for all

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

Treating Clinician

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

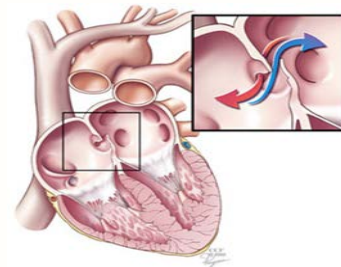
- **Aviation environment** – hypobaric hypoxia, valsalva, etc
- **Human performance** – acute or gradual onset total/partial incapacitation

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**”



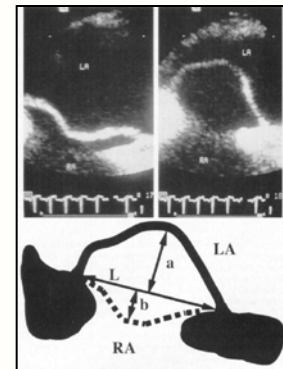
→ Medical 5m post-event: BMI 30, BP 135/90

- Further information requested

→ Medical 10m post-event: BMI 30, BP 145/85

- Further information requested

→ Medical 18m post-event: BMI 28, BP 130/73, OGTT 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 Ix
- Preclinical or subclinical cerebro-vascular disease
- Inflammatory processes

Cryptogenic Stroke



Clinical
Condition

→ 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. Borron, MD, MS; V. Surget, MD; D. Sordelet, MD; C. Lapandry, MD; and F. Adnet, 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 embolus.
NEUROLOGY 2003;60:1983-1985

Cryptogenic Stroke



Likelihood
of Clinical
Event

- **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



Likelihood
of Clinical
Event

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)

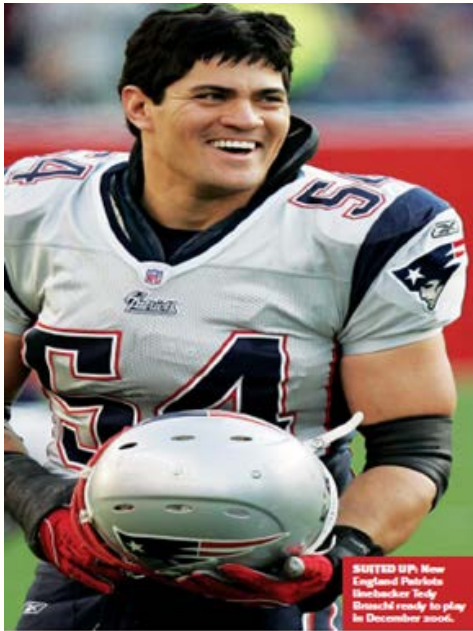
Risk of Recurrence & Seizure Post-CVA

- 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
3. Bladin et al, Arch Neurol 2000
4. Myrint et al, Postgrad Med J 2006



SUITED UP. New England Patriots linebacker Tedy Bruschi ready to play in December 2006.

TEDY BRUSCHI

Back in Play

Tedy Bruschi's Post-stroke Return to the NFL.

BY TODD FARLEY

his head ached. Still, because pain was part of Bruschi's life as a professional athlete, he tried to shrug off the discomfort.

"I thought it was from the Pro Bowl two days before," Tedy remembers. "It never occurred to me something was really wrong."

He took some Tylenol and tried to fall back asleep. But when Heidi spoke to her father (a physician's assistant in Arizona) at 10 a.m., Bruschi was getting scared. He had "the worst headache ever," and when his son entered the bedroom, Bruschi couldn't see the boy until he appeared on Bruschi's right side. When Heidi's father said to get help immediately, Bruschi didn't argue.

SEVEN HOURS IS A LONG TIME

Hearing a diagnosis of stroke, Heidi burst into tears, imagining it would debilitate her husband. Bruschi was equally pessimistic. "I thought I'd never be the same again," he says. "When I thought of stroke, I didn't think of a full recovery."

Those fears were not unfounded. Most people don't know it, but stroke is the third-leading cause of death in the United States (behind heart disease and cancer) and the leading cause of disability. A stroke, or "brain attack," occurs when a blood vessel carrying oxygen and nutrients to the brain bursts or is clogged, preventing the brain from getting the blood it needs.

By the time Bruschi's stroke was diagnosed, at 11 a.m., nearly seven hours had passed since its onset. Patients suffering from an ischemic stroke—cause by a vessel being clogged by a blood clot—can be given the clot-busting drug tissue plasminogen activator (tPA) within three hours of its first symptoms. But because Bruschi's had begun much earlier, Dr. Greer couldn't administer the drug.

Until February 15, 2005, Tedy Bruschi was as blissfully ignorant of the risks of "brain attack" as most of us are. In fact, when David Greer, M.D., told the New England Patriot linebacker that he'd suffered a stroke, Bruschi was incredulous.

"I didn't think I heard him correctly," Bruschi recalls. "The only place I'd heard the word stroke was on the golf course."

Thirty-one years old, Bruschi was happily married to his college sweetheart, Heidi, and raising three young boys. His football season had just culminated with the Patriots winning their third of the previous four Super Bowls and Bruschi being selected to his sport's all-star game, the Pro Bowl. At the peak of his physical powers, the linebacker never imagined he was a candidate for stroke.

THE STROKE OF DAWN

But Bruschi awoke in the early morning hours of February 15th with his fists clenched and arms raised, experiencing an "odd" feeling in his left arm and leg. Trying to get out of bed, Bruschi fell down and had to crawl to the bathroom. His equilibrium was off, his left side was numb, his muscles were weak, and

APPENDIX 15.1N

Decision Making

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Closure or Medical Therapy for Cryptogenic Stroke with Patent Foramen Ovale

APRIL 19, 2012 | NEUROLOGY TODAY | 35

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

Restrict Procedures to Clinical Studies, Stroke Specialists Say

uggests 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

Administrative Appeals Tribunal (AAT), 40m post-event

- 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.