

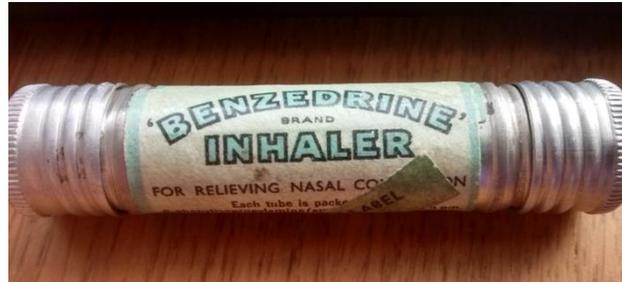
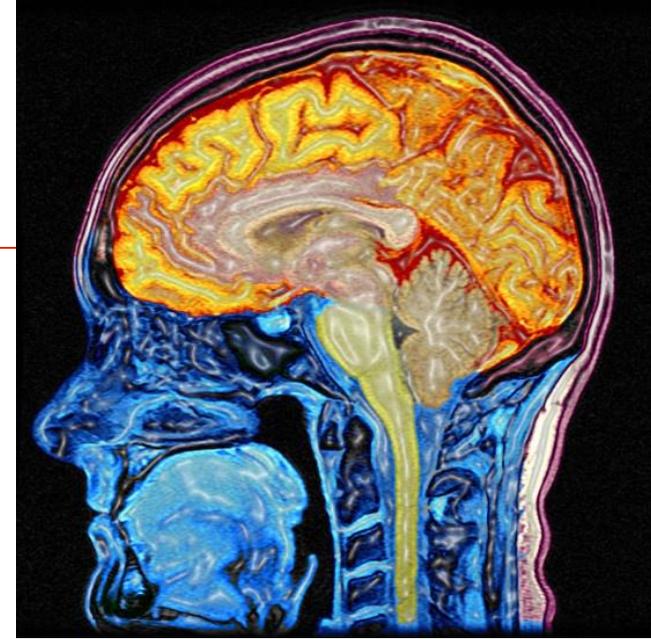


## Stroke and methamphetamine use in young adults

**Dr Julia Lappin, School of Psychiatry and NDARC, UNSW**

# Methamphetamine & Stroke

- Young people (<45years)
- Types of stroke
- History of amphetamine-related stroke
- Outcomes following stroke
- Mechanisms of stroke in methamphetamine users
- Signs to look out for



# Stroke and methamphetamine use in young adults: a review

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## ABSTRACT

**Background** Methamphetamine use and stroke are significant public health problems. Strokes among people aged below 45 years are much less common than in older age groups but have significant mortality and morbidity. Methamphetamine is a putative cause of strokes among younger people.

**Methods** A review of methamphetamine-related strokes was conducted. Bibliographic databases were searched until February 2017 for articles related to methamphetamine and stroke. Both haemorrhagic and ischaemic strokes were considered.

**Results** Of 370 articles screened, 77 were selected for inclusion. There were 81 haemorrhagic and 17 ischaemic strokes reported in case reports and series. Both types were approximately twice as common in males. Route of administration associated with haemorrhagic stroke was typically oral or injecting, but for ischaemic stroke inhalation was most common. Haemorrhagic stroke was associated with vascular abnormalities in a third of cases. One quarter of individuals completely recovered, and a third died following haemorrhagic stroke. One-fifth completely recovered, and one-fifth died following

a substantial global increase in the availability and use of high potency, crystalline methamphetamine.<sup>1 3 9</sup> Routes of methamphetamine administration include oral, inhalation (smoking), intranasal and intravenous use.<sup>7</sup>

Stroke too is a major public health problem, with high mortality rates and high levels of subsequent disability.<sup>10 11</sup> Between 1990 and 2010, stroke has risen from the fifth to the third leading cause of disability-adjusted life years, with increase of 19%.<sup>10</sup> Moreover, the incidence of stroke has been rising among younger persons.<sup>12</sup> While stroke incidence rises with age and is less common in people aged below 45 years, stroke among young people has significant health sequelae and societal costs.<sup>12</sup>

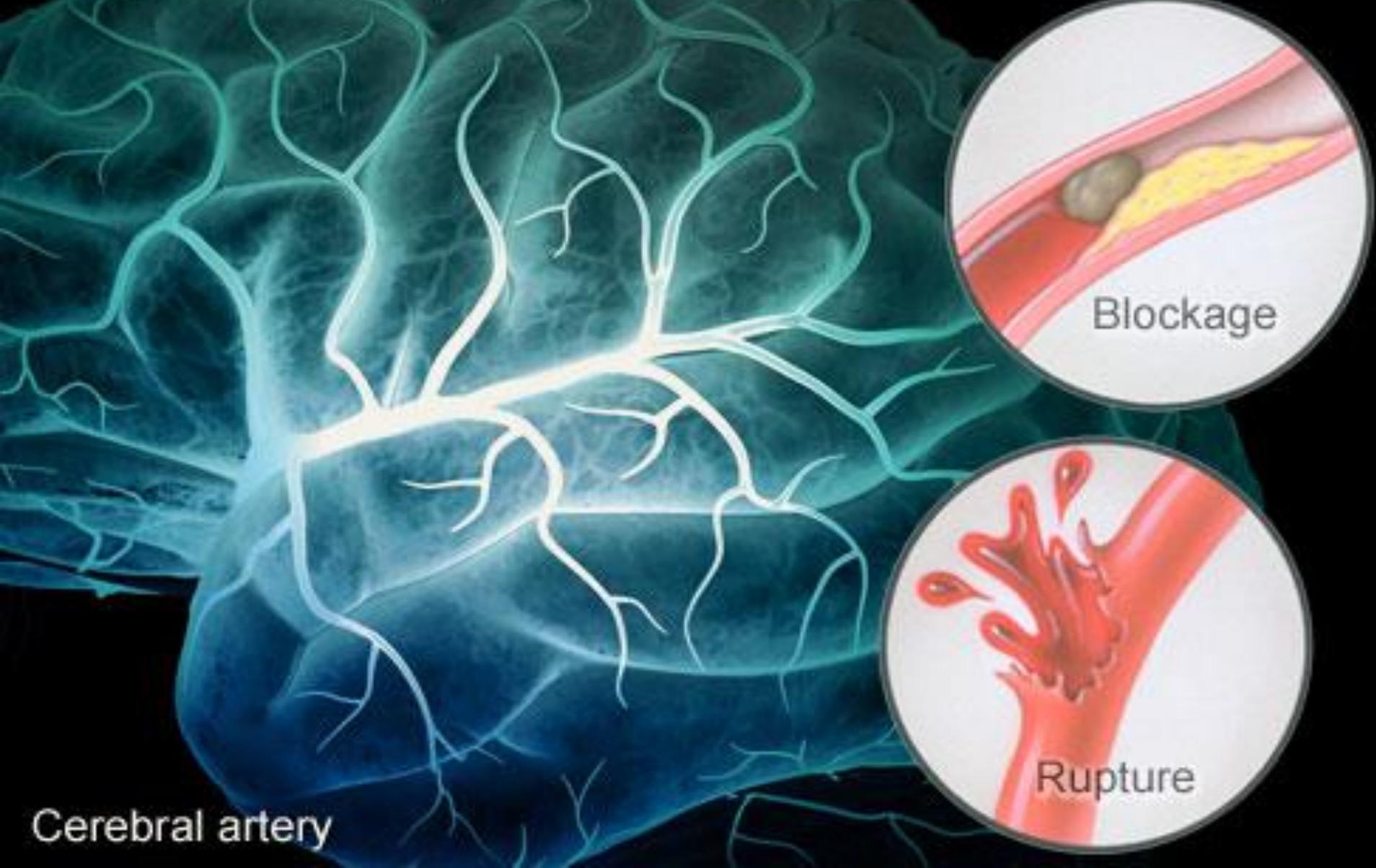
## Stroke in young people

In all-age stroke populations, ischaemic strokes (cerebral infarction) are more common.<sup>13</sup> In younger people (<45 years), this remains the case, but a greater proportion are haemorrhagic (eg, 33.5% in those 20–44 years vs 23.1% in those 45–54 years).<sup>13</sup> Haemorrhagic strokes in those aged

# Methods

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- A systematic review of methamphetamine-related strokes
- Bibliographic databases searched from origin until Feb 2017
- Limited to young adults: aged 16-44
- Both haemorrhagic and ischaemic strokes considered



Blockage

Rupture

Cerebral artery

# Evidence from case series

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- 81 haemorrhagic (bleed) strokes
- 17 ischaemic strokes
- Can occur with all forms of administration

# Historical use of methamphetamine

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1945: first case report of methamphetamine-related stroke



he will use it to bend at the proximal interphalangeal joint, leaving the distal joint straight—or nearly so: moreover, the distal joint can be freely waggled by the surgeon and to him feels flail. If, however, the sublimis is paralysed or weak, the profundus bends the finger at both interphalangeal joints; in consequence the terminal joint is bent and not flail.

The explanation is as follows. In a normal hand the flexor profundus tendon usually acts *en masse*, to bend all fingers at all joints. In the test position described above the surgeon's hand prevents the mass action of the profundus; only the sublimis is available to flex the finger, and consequently the terminal joint remains almost straight and flail. If the sublimis is weak, the patient employs what is, in effect, a trick movement, using the profundus to the affected finger as an isolated muscle, and therefore the terminal joint will be bent and rigid.

The efficiency of this test is demonstrated in the photographs.

## Medical Memoranda

### Two Cases of Amphetamine Poisoning

Amphetamine is easily obtainable by the public in the form of "benzedrine" inhalers, which can be bought freely without prescription. The ingestion of the contents of such inhalers is a practice which appears to be increasing owing to the widely known stimulant action of the drug. The public at large, however, is unfortunately not aware of the dangerous hypertensive properties of amphetamine and of the possible sequelae. The two cases reported below illustrate the grave dangers accompanying benzedrine over-

consequent cerebral haemorrhage, was then considered, and a review of the literature strongly supported this hypothesis.

Four days later the patient was transferred to Atkinson Morley's Hospital for neurosurgical investigation. He at first refused ventriculography, but when, after the lapse of a few days, he realized that his condition was not improving he finally agreed. By this time bilateral papilloedema had developed. Ventriculography suggested a posterior parietal parasagittal lesion indenting the body of the right lateral ventricle and the mid-part of the corpus callosum. Operation was performed and 40 ml. of clotted blood was aspirated, after which the patient quickly improved. He returned to St. Mary Abbots Hospital five days later and continued to make rapid progress. At the end of five weeks the facial weakness had disappeared and the affected arm had completely recovered. There was still a spastic weakness of the left leg, but the plantar response became flexor, and the patient was able to walk unaided. The retinal picture was returning to normal.

The makers of benzedrine inhalers, Messrs. Menley & James Ltd., inform us that each tube contains 325 mg. of free amphetamine, and about 100 mg. of natural aromatics in the form of lavender oil, this latter constituent being pharmacologically inert. From the patient's story it is probable that he ingested the entire amphetamine content. While it is possible that he might have had a pre-existing aneurysm (carotid arteriogram will be performed at a later date to exclude this), we nevertheless consider that the haemorrhage was initiated by this high dose of amphetamine. We were unable to take his blood pressure until two days after the event, as he did not come under our care until that date, but the fact that the blood pressure can be raised to high levels in such a situation is well illustrated by Case 2.

### CASE 2

This patient was not observed personally by us, and we

A stage artist aged 42 was admitted to a medical ward under the care of Dr. Gainsborough in May, 1955. Two days previously he had felt very tired just before he was due to appear on the stage, and had decided to take some benzedrine. He had never taken the drug previously, but had learnt of the practice from his associates. The contents of a benzedrine inhaler were dissolved in a glass of "coca-cola," and he drank the resultant mixture. Fifteen minutes later he felt extremely well and very wide awake, but after half an hour he began to feel weak and confused, and developed an intense occipito-frontal headache. He became unable to walk, and was taken home. A doctor who was called two days later found that the patient had a left hemiplegia, and referred him to hospital.

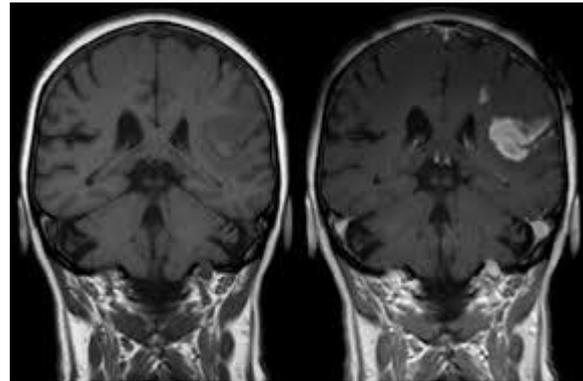
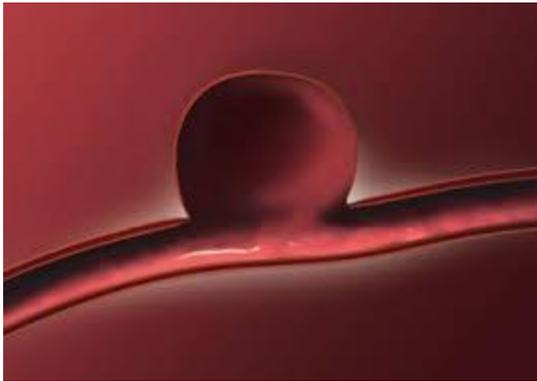
# Evidence from population studies

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- Highly increased risk of stroke associated with methamphetamine
- Much more marked for haemorrhagic stroke
- Some evidence that stroke rates rise with increasing population use of methamphetamine

# Types of methamphetamine-related stroke

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# Haemorrhagic Stroke

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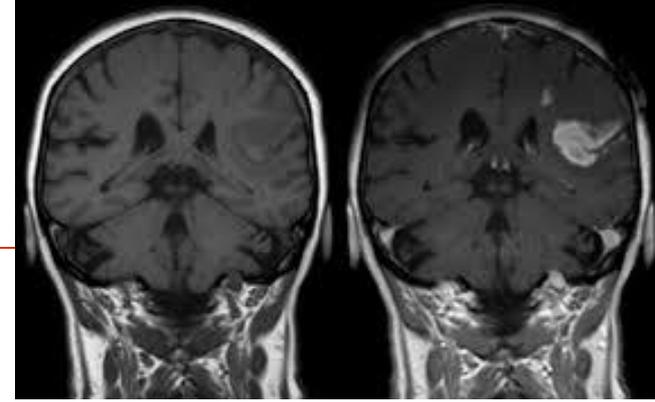
- 2:1 Male: Female
- Risk of haemorrhagic stroke very high compared to general population: approx. 5 times more likely
- Much more common than ischaemic in young MA users
- Route of administration: all but typically oral or injecting



# Ischaemic Stroke

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- 2:1 Male: Female
- Risk only mildly raised compared to general population
- Less common than haemorrhagic stroke in young MA users
- Route of administration: all but inhalation most common



# Outcomes of MA-related Stroke

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- Haemorrhagic
  - One quarter completely recovered
  - One third died
- Ischaemic
  - One fifth completely recovered
  - One fifth died
- Remainder suffer permanent disability such as one-sided weakness, speech and visual impairments

# Clinical Implications

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- There is a preponderance of haemorrhagic (bleed) strokes associated with methamphetamine use in young people
- Methamphetamine-related haemorrhagic strokes are often fatal or lead to significant lifelong disability
- Methamphetamine users and communities should be made aware of risk of strokes and signs to look out for

# References

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