Alcohol & Drug Related Brain Injury

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The nature of alcohol related brain injury over the whole lifespan

Which illicit drugs cause brain injury

How can we predict who is likely to sustain substance-related brain injury

Practical approaches to management of alcohol & drug related brain injury currently

Moving forwards, what approaches to management of alcohol and drug related brain injury we need to be working towards
Alcohol and Other Drugs (AOD) and Brain Injury: indirect direct
AOD and Indirect brain injury

- Hypoxia
  (profound sedation > loss of consciousness: limited oxygen to brain)
- Other trauma (falls, road trauma etc)
- Assaults (while intoxicated)
Alcohol and Other Drugs (AOD) and Brain Injury: direct
Alcohol related brain injury over the lifespan
FASD – fetal alcohol spectrum disorder

The leading known preventable cause of brain injury

Alcohol in pregnancy (c.f. other drugs) unequivocally associated with brain injury
Threshold level unknown:
single binge drinking episode shows brain cell ‘drop out’ in rat studies
As the boy/girl gets older get problems with:

- Concentration (problems at school when can’t learn easily)
- Controlling emotions & behaviour (problems with police & law)
- Making decisions
- Memory
- Learning new things (need extra support at school & in community)
- Later on, problems with alcohol and drugs
Chronological Age 18 with FAS/FAE

<table>
<thead>
<tr>
<th>Skill</th>
<th>Developmental Age Equivalent</th>
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<tbody>
<tr>
<td>Emotional maturity</td>
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<tr>
<td>Comprehension</td>
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<tr>
<td>Social Skills</td>
<td>7</td>
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<tr>
<td>Money, Time Concept</td>
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<td>Living Skills</td>
<td>11</td>
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<td>Reading Ability</td>
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<td>Physical Maturity</td>
<td>18</td>
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<td>Expressive Language</td>
<td>20</td>
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Alcohol in pregnancy

- Harm to the baby: threshold level not known
- Recommendation to NOT DRINK AT ALL in pregnancy

- Health professionals don’t like to ask women about drinking in pregnancy
- Community backlash about not drinking in pregnancy
- Stigma and guilt on part of mother so few women access treatment
Neuroplasticity

AOD in pregnancy:

* Importance of environment

* Comparing AOD exposed vs non-exposed:
  Nurturing vs stressful (MH, poverty) environment
Improvements are occurring...

More pregnant women abstaining from alcohol

- 40% in 2007
- 53% in 2013

NDSHS_2013_AIHW
Adolescence & young adulthood is a critical period of brain development.

Brain composition (neuronal connections) changes substantially in adolescence – called “brain re-modelling”.

Re-modelling is dramatically influenced by the young person’s experiences and interactions with the outside world.
Prefrontal Cortex

Decision making
Right vs wrong
Inhibition
Working memory
Planning
Cognitive flexibility

Alcohol: adolescence & young adulthood

Intoxication

Post-intoxication (mid-week Wednesdays)

Longer term:
   Alcohol causes premature aging of the brain
   (memory, executive function)

Before: need 10 years heavy alcohol consumption before impairment

Now: age of onset and amount of alcohol are very important factors

Hermens 2013
12-17 year olds choosing NOT to drink: 64% (2010) to 71% (2013)


Nb. parents
Areas for more work

18-24 yo’s are still the group most likely to binge drink

Especially males

Levels of consumption (“binges”) are very high
eg bottle of spirits, 15-20+ standard drinks

NDSHS_2013_AIHW
Alcohol and older person

Spectrum: alcohol causes premature ageing of the brain

* Cognitive impairment (subtle memory deficits, other)
* Alcohol impact on dementia
* Acquired brain injury
Which illicit drugs are associated with brain injury?
Illicit drugs and brain injury

Cannabis

Methamphetamine ("ice")

New psychoactive agents (NPS)/NBoMES

Opioids:
- heroin
- prescription opioids

Indirect injury more common
eg sedation, apnea
New psychoactive agents (NPS)/NBoMES

Anna Wood died 20 years ago last month.

Anna Wood's drug death message falling on deaf ears, says her father Tony

Henry Kwan jumps to his death in a synthetic psychosis

Part of the crowd at Sydney's Stereosonic music festival at Olympic Park on Saturday.
Illicit drugs and brain injury

New psychoactive agents (NPS)/NBoMES
  cerebral toxicity – unconsciousness, coma

Methamphetamine (“ice”)
Prolonged stimulant use

Changes the brain in fundamental and long-lasting ways

Dopamine neurons
Methamphetamine effects on the brain - chronic

**Eroding the Mind**
Researchers have mapped brain decay caused by methamphetamine use. The damage affected memory, emotion and reward system.

**Areas of Greatest Loss**
- Emotion, Reward (Limbic system)
- Memory (Hippocampus)

Average difference in brain tissue volume of methamphetamine users, as compared with non-users.
Genetic susceptibility to nerve damage

Young methamphetamine users

* Impulse control

* Memory and executive function

* Long term users have cerebral atrophy

* Use before 21 years -> smaller brain volume
Deficits on executive tasks:

- Poor judgment
- Lack of insight
- Poor strategy formation/planning
- Impulsivity
- Reduced capacity to determine consequences of actions
Can individual recover?

- Recovery from heavy use requires prolonged abstinence
  - Nb craving

- Irreversible damage in some
Cannabis

longterm injury – attention, working memory, verbal memory
adolescent onset vs later, dose, frequency, duration
_in utero _exposure?
recovery with abstinence?

nb. Role of cannabinoids in acute brain injury??
How can we predict who will sustain substance related brain injury?
Predicting AOD related brain injury

- Family history
- Genetic
- Age of onset
- Degree of use (amount, frequency)

- Neuropsychological monitoring?
  As a proposed practice?
  Research
  Theory
Practical approaches to AOD related brain injury

* Early intervention – presently not nearly enough yet important
  * Impacts on retention in treatment
  * Impacts on treatment success

* More regular monitoring of cognitive function
  * Not currently mainstream practice, usually late eg for guardianship reasons
    * Best method?
      * Formal neuropsychological testing time consuming and costly
    * Bedside testing – MOCA, others – relatively blunt tools
    * Software?
Moving forwards

* Greater practical focus
  > will stimulate the research into knowledge gaps

* Consistent measurement
  > determine which tool, use across sector

* Regular monitoring
  > identify deteriorations earlier and intervene
  > neuroplasticity