

CATEGORY I – CLINICAL PRESENTATIONS: NEUROLOGY

1.0 Introduction

The overlap between neurological and substance use disorders is significant.

About one in five of neurology patients have a lifetime history of a substance use disorder with 13% reporting a current episode. In addition to overdose, withdrawal, and addictive behaviour, licit and illicit drugs produce a wide range of neurologic complications, therefore detection and treatment are essential. Substance misuse use can also lead to problems with memory, attention and decision-making as well as resulting in medical emergencies, seizures, acute confusional states and cognitive deterioration.

LEARNING OUTCOMES

Medical students will gain knowledge in:

1. Describing the range of neurological symptoms associated with substance use disorders.
2. Identifying signs and symptoms of neurological disorders affected by substance use.
3. Describing an appropriate care plan.

Vignette

Lianne is 26 and started using methamphetamine eight months ago, to which she was introduced by her boyfriend. She suffered a cerebrovascular accident (CVA) and following tests and investigations, it was diagnosed that her use of methamphetamine was one of the primary causes of the high blood pressure that caused a blood vessel in her brain to rupture. She was in a critical condition, but survived, although she has been left with partial paralysis on her left side. On discharge Lianne started drinking alcohol initially socially, but over time she found that drinking helped her cope with the emotional pain. Lianne and her boyfriend receive some individual motivational counselling and she was provided with advice about the effects that substances can have on the body.

What tests and investigations would you have recommended when Lianne was first assessed?

What could be a differential diagnosis if you were not aware of the drug use?

How would you address the increasing alcohol use, what tests and investigations would you consider and what advice would you give Lianne about her drinking?

2.0 Common presentations

2.1 Distinctive/Special features

- Substance misusers may present very late so present with severe neurological deficits.
- Substance misuse is often not mentioned, but can be elicited on direct questioning which should be undertaken all cases of neurological disorders.

- Concomitant intoxication with different substances may confuse the clinical picture.

2.2 Barriers to access

- Neurological symptoms either not recognised or ignored by patient.
- Lack of skills in taking a history and ascertaining substance use.
- Patient may not disclose substance use because the relevance to the neurological problem may not be obvious.

2.3 Effects of substances on the nervous system (Intoxication and withdrawal)

Excessive or protracted substance misuse can lead to a number of problems due to neurotoxicity. Some of the social problems associated, such as violence and loss of control over the drug, may be directly related to the neurotoxic effects e.g. alcohol on prefrontal cortical function.

Focal neurological signs are not expected in alcohol intoxication, and a blood alcohol level of <200 mg/dl should not cause coma. Acute intoxication on stimulants may result in acute anxiety, panic attacks and acute psychotic state. Cocaine intoxication may intensify the euphoria experienced by the patient but can also lead to bizarre, erratic, and violent behaviour. Restlessness, irritability, anxiety, panic, paranoia, tremors, vertigo, and muscle twitches can be observed as well. Sudden death may occur. In the case of cocaine, there is an interaction with alcohol that increases the risk of sudden death.

For opiate intoxication, pupillary constriction and track marks for injecting drug use may be observed. Signs of withdrawal from opiates include yawning, sweating, running eyes and nose, and those from sedative-hypnotics and alcohol include sweating, vomiting, pallor, hand tremor, abnormal movements, involuntary abnormal movements of the eyelids, dilated pupils, and clammy skin. Similarly, recreational/over the counter drug use may be the cause of neurological symptoms. Acute intoxication with cannabis can result in cognitive impairment, confusion and delirium while regular/heavy cannabis use may lead to neuropsychological decline. Neurological presentations of novel psychoactive drugs can include

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withdrawal with delirium, convulsions and hallucinations and delusions. At higher doses, ketamine can cause dream-like states and hallucinations, whilst causing delirium and amnesia when taken at higher dosages.

It should be noted that an acute confusional state or delirium is very common in older people and has numerous causes including intoxication or withdrawal from substances.

2.4 Neurological conditions associated with substance use

Coma and stroke: Alcoholics may have cerebral atrophy predisposing them to subdural haematomas, and disordered coagulation rendering them liable to intracerebral haemorrhage. Illicit drug use can increase the risk of ischaemic and haemorrhagic strokes. Drug use may be the most common predisposing condition for stroke among patients under 35 years of age (Esse et al, 2011). The main illicit drugs associated with stroke are cocaine, amphetamines, MDMA/ecstasy, phencyclidine (PCP), and lysergic acid diethylamide (LSD).

Stroke is the most common lasting adverse neurological event associated with the use of stimulant drugs. There also can be severe medical complications associated with cocaine abuse including neurological effects, including strokes, seizures, headaches, cognitive dysfunction and coma, as well as cardiovascular effects including disturbances of heart rhythm and heart attacks. MDMA (ecstasy) may be associated with both intracranial haemorrhage, hyperthermia and cerebral infarction, but the symptoms of intoxication may include hypertension, faintness, panic attacks, loss of consciousness and seizures. Methamphetamine use, too, can increase the risk of stroke. Tobacco is also associated with stroke and heart attack due to blood clots that may form in the arteries.

Convulsions: The most common substance related cause of seizures is alcohol withdrawal, occurring in 5-15% of those with alcohol dependence. Typically they occur 6-48 hours after last alcohol use, typically being generalised tonic-clonic seizures although partial seizures can also occur. Withdrawal from benzodiazepine and GHB/GBL are also associated with seizures. Other causes of substance related seizures include intoxication with cocaine, amphetamines, and 3,4-methylenedioxymethamphetamine (MDMA).

Cognitive deterioration: Long-term alcohol use leads to cognitive deterioration ranging from mild cognitive deficits (affecting memory, attention, concentration and decision making) to alcoholic dementia and Wernicke-Korsakoff's psychosis. There is some evidence that long term THC (tetrahydrocannabinol) misuse leads to cognitive dysfunction.

Wernicke's encephalopathy (WE): It is potentially a reversible neurology condition, but if untreated it is fatal in 17% of cases, with permanent brain damage occurring in 85% of those who do not receive appropriate treatment (Crome & Bloor, 2004). It is caused by lack of thiamine (vitamin B1) due to alcohol abuse or other causes of decreased vitamin B1. The classic triad of ocular abnormalities, ataxia and confusional state are found in

16% of patients and the onset of the syndrome may be acute, gradual and evolving over several days.

Korsakoff's syndrome: Wernicke's encephalopathy can lead to Korsakoff's psychosis, which is characterised by amnesia, confabulation and irritability.

Alcoholic – related dementia (ARD): caused by long-term, excessive drinking, resulting in neurological damage and impaired mental processing. In general, dementia occurs in people older than 65, and is a common cause of mental dysfunction. Dementia begins gradually, and progresses slowly. Symptoms include impaired ability to plan, memory loss, impaired planning and apathy mimicking depression. This is caused by alcohol's toxic effect on brain cells. Alcohol is primarily responsible for at least 10% of dementia cases (Welch, 2011).

Peripheral neuropathy: Chronic alcohol use can cause toxicity and vitamin deficiency leading to peripheral neuropathy, which is manifested in pain and tingling in the limbs. Lower limbs are affected more than upper, and foot and wrist drop, and distal muscle weakness and wasting may be observed (Crome & Bloor, 2008). Nerve damage from this condition is usually permanent, and continued drinking could lead to disability, chronic pain, and damage to arms and legs. Avoiding alcohol and improving diet can minimise the effects of the neuropathy.

Autonomic neuropathy involves damage to the nerves that are responsible for control of blood pressure, heart rate, sweating, bowel and bladder emptying, and digestion. It may be seen in chronic alcohol use, HIV/AIDS and liver disease.

Progressive cerebellar deterioration: Alcohol misuse is the most common cause of progressive cerebellar deterioration and most likely due to thiamine deficiency. Clinically, presentation may include an ataxic gait and truncal ataxia, often worse during periods of abstinence. Individuals with this syndrome are usually malnourished.

Pellagra is caused by a chronic lack of niacin (vitamin B3) in the diet. Chronic alcohol use can also cause poor absorption which combines with a diet already low in niacin and tryptophan to produce pellagra. Niacin (vitamin B3, nicotinic acid) and/or tryptophan deficiency results in skin, gastrointestinal and mental abnormalities which can progress to memory impairment, delusions, hallucinations, dementia or delirium.

Marchiafava-Bignami Disease is a rare progressive neurological disease seen mostly in those with chronic alcohol problems. It is characterized by corpus callosum demyelination, necrosis and subsequent atrophy. It generally occurs in chronic alcoholism with poor nutrition. It may present acutely with stupor, coma or seizures, or chronically with dementia, gait problems, apraxia and ataxia. It is reliably diagnosed with MRI.

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Neurological deficits can be as a result of direct or indirect use of substances

Direct effect	Indirect effect
<ul style="list-style-type: none"> Higher dose than usual (sometimes due to an unusual source, or different strength) Speed of entry of drug (especially intravenous or when smoked) Particular sensitivity to the drug Chronic/repeated use Interaction with other components of the drug or with adulterants that have been mixed with the drug (e.g. talcum powder, starch, sugar) Interaction with other drugs Interaction with pre-existing pathologies (hypertension, arteriovenous malformation (AVM), aneurysm, right to left cardiac shunt) Alcoholic cerebellar degeneration Toxic delirium with amnesia (amphetamines) 	<ul style="list-style-type: none"> Secondary effects of a coma or seizure (especially if aspiration occurs) Infection risks (easy access for pathogens, impairment of immune system, exposures to pathogens such as HIV) Head trauma (accident, assault) Accompanying lifestyle changes (alcoholism, homelessness, prostitution)

(Source: Enevoldson, 2004)

Common neurological conditions associated with substance use

	STIMULANTS	OPIATES/OPPIOIDS	ALCOHOL	SEDATIVE HYPNOTICS	CANNABIS
Headache	✓	✓	✓		✓
Stroke	✓		✓		
Seizures	✓		✓		
Coma	✓	✓	✓	✓	
Transient neurological deficits	✓				
Memory impairment	✓		✓	✓	✓
Impaired concentration	✓	✓	✓		
Wernicke-Korsakoff disease			✓		
Alcoholic cerebellar degeneration			✓		
Alcoholic myopathy			✓		
Pain		✓			
Head trauma			✓		

3.0 Assessment

Undertake a comprehensive substance misuse assessment of the patient if possible. The full physical examination should be done in order to determine to what extent the patient is intoxicated or in withdrawal, or both, for different substances. Patients may have used or be dependent on more than one substance and the interactions may produce the resulting clinical picture.

A range of investigations may have to be undertaken in order to determine the nature of the presenting problems.

4.0 Treatment

Neurological disorder may need to be treated in the first instance. However, whilst investigations and treatment are ongoing, the patient may require stabilisation on the substance of dependence or detoxification from the drug of dependence in order that a full assessment of the disorder can be diagnosed and treated.

Medical emergencies can result from withdrawal and intoxication from substances and need a rapid response. These include:

Delirium tremens

This is associated with high mortality. The mainstay of treatment is benzodiazepines. The aetiology is complex but improvement will often occur with abstinence.

Seizures

Brain imaging should normally be performed in those with their first alcohol related seizure, and when there are focal signs or other reasons for concern.

Wernicke's encephalopathy

If there is any risk of Wernicke's encephalopathy, consequences of not administering parenteral thiamine is catastrophic and outweighs the risks associated with its use (Welch, 2011). Day et al (2013) have done a systematic review of the use of Thiamine for Wernicke's encephalopathy.

Alcohol-related dementia

If the symptoms of alcohol dementia are identified early enough, the effects may be reversed. The person must stop drinking and start on a healthy diet, replacing the lost vitamins. Patients with severe substance dependence are best managed with advice and support from substance misuse teams. Patients with harmful use of drugs and/ or alcohol or those drinking at higher risk may respond to brief advice and referred on for specialist treatment and psychosocial intervention.

Effective treatments are available and brief interventions and support to change substance using behaviour through motivational enhancement therapy can have a significant impact on subsequent substance use.

5.0 Referral/networks/services

Where a substance misuse issue is identified, it is recommended that contact is made with local services to discuss an appropriate management plan for the patient presenting to services with a neurological problem which may be directly or indirectly as a result of substance use.

6.0 References and useful resources

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