

An Unexpected Outcome of an Ischemic Stroke on Reward Pathways in the Human Brain

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Background

- Addiction affects millions of Americans in the United States often resulting from a complex interplay of genetic and environmental factors, and frequently linked to mental health disorders¹. Many experts agree there is no cure to addiction, but there are effective treatments available¹. Many patients continue to succumb to addiction despite treatment; therefore, more research needs to be done to develop new therapies in addiction medicine¹.
- It is well known dopamine plays a significant role in addiction pathways in the human brain; more specifically, in the meso-cortico-limbic system².
- More recent studies collected data on newly diagnosed stroke patients who were smokers and/or used other recreational drugs^{3,4}. It was observed, patients, who had the insular cortex affected by the stroke in addition to the meso-cortico-limbic system, had more diminished drug seeking behavior when compared to patients with only the meso-cortico-limbic system affected^{3,4}.

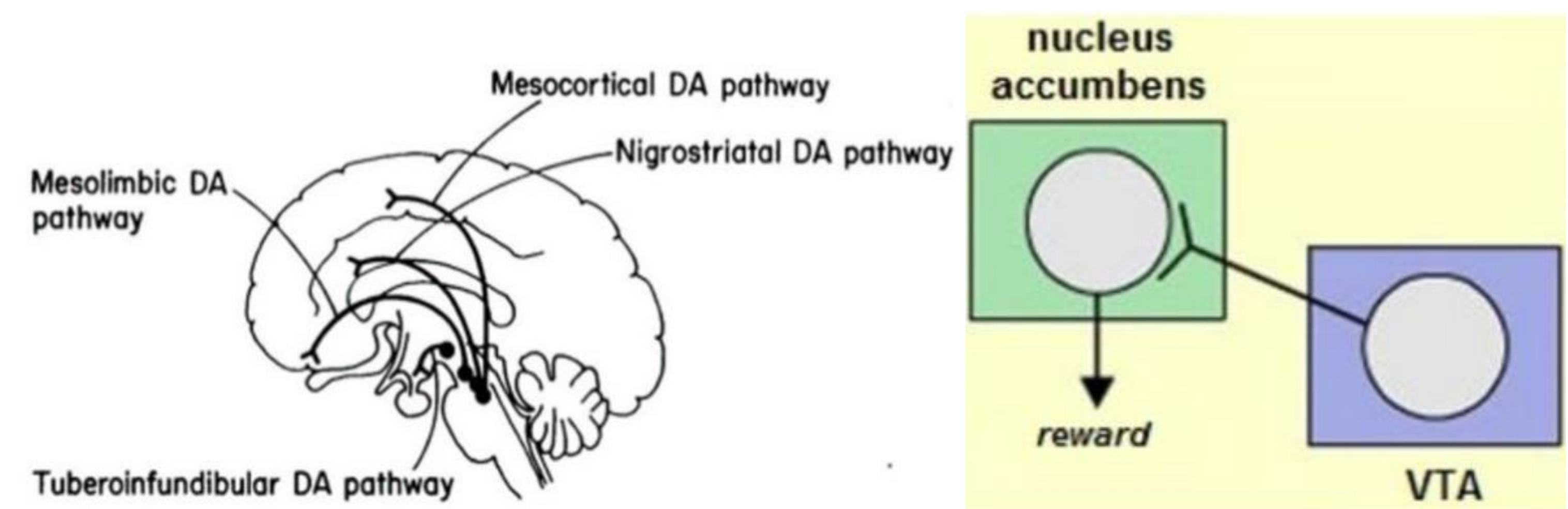


Figure 1. Dopamine Pathways in the Brain⁵

Figure 2. Ventral Tegmental Area Nucleus Accumbens Connection⁵

Objective

This case report suggests that ablation of addiction pathways may be another potential treatment option for addiction. However, more research is needed to determine the safety and efficacy of this approach

Case Presentation

- The patient was a 63-year-old female with a past medical history of hypertension, hyperlipidemia, an 80-pack year (2 PPD) smoking history, a history of multiple strokes, and a higher-than-average intake of Mountain Dew (3 20 oz bottles a day on average).
- She presented to the ED with facial droop and slurred speech. She had a one-day history of altered mental status, inappropriate speech, and trouble maintaining personal hygiene and caring for her pets.

Results

- On presentation, the initial vital signs showed oxygen saturation above 90%, blood pressure 170/87, pulse and respiratory rate were within normal limits. Upon physical examination in the emergency department, she had appropriate affect and mood, but was mildly confused, and only oriented to person. Code stroke was activated but tPA was not administered as it had been over 4.5 hours when presenting symptoms occurred.
- On initial assessment in our facility, comprehensive full body and neurological exams were unremarkable other than mild facial droop. A Montreal Cognitive Assessment raised a score of 13/30 indicating moderate cognitive impairment and CT results ruled out intracranial hemorrhage raising suspicion of ischemic stroke and warranting an MRI.

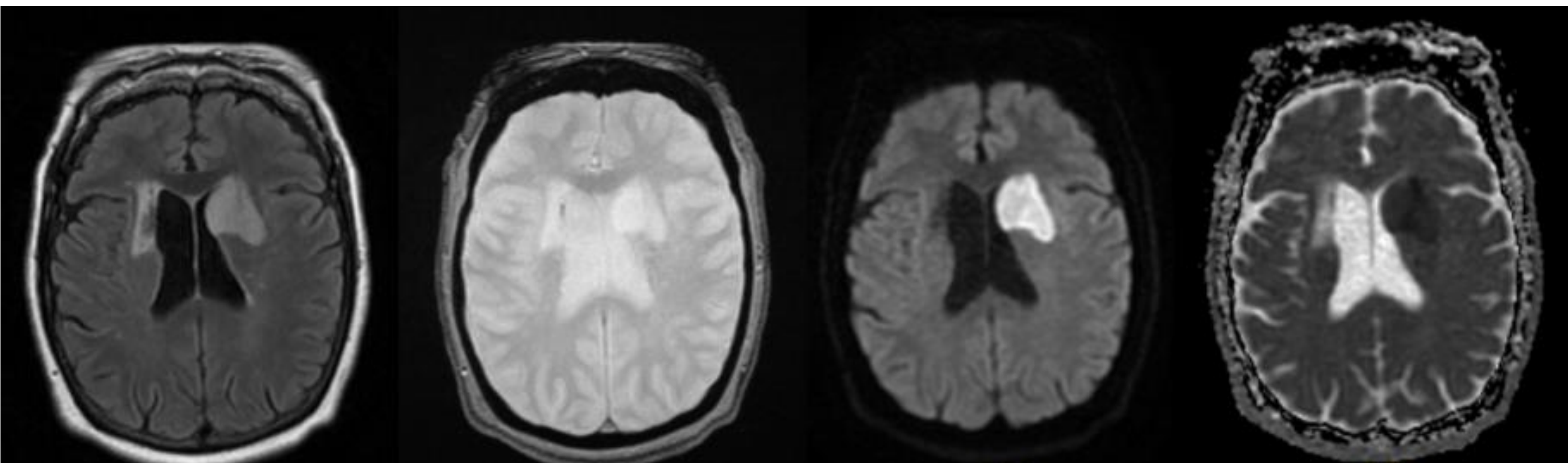


Figure 3. MRI Brain Without IV Contrast: Flair Sequence, GRE, DWI, ADC MAP (Right to Left). Acute infarct in the left caudate nucleus and basal ganglia with associated mild mass effect upon the frontal horn of the left lateral ventricle.

Discussion

- One week after her stroke, the patient had effectively quit smoking cigarettes and had lost her taste for beverages she once drank multiple times a day.
- The location of the stroke in this patient suggests damage to the caudate nucleus and nucleus accumbens, a part of the brain's addictive/reward pathway which may be responsible for her diminished addictive behaviors.

Conclusion

- This case report showcases a 63-year-old smoker who had unexpected outcome to her addiction patterns from an ischemic stroke.
- This case presents an incidental outcome that highlights what some studies have concluded in their research, that local incidental chemical ablation to the addiction pathways in the brain can result in decreased rates of addiction behaviour in human^{3,4}.
- One could argue, chemical ablation of the caudate nucleus and nucleus accumbens can be another treatment option for other diseases such as obesity and eating disorders due to the addictive nature of food.

References

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Home medications

- Metoprolol Tartrate 25 mg PO BID
- Atorvastatin 80 mg PO Daily
- Levothyroxine 75 mcg PO Daily
- Vitamin D2 1,250 units PO Q7D
- Aspirin 81 mg PO Daily

Labs and other imaging studies within normal limits

- CBC
- CMP
- Lipid panel
- Urinalysis
- Brain CT w/o Contrast
- Chest X-ray

On further physical and neurological assessment:

- AAOx1 with mild dysarthria and poor recall
- Cranial nerves, motor testing, cerebellar testing, and reflexes were intact