A Novel Teaching-learning Method of Nerve Injury Using Banana and Toothpick: A Low Fidelity Static Model Approach

Nalini, Y.C.[1], Gowda, A.[2], Nayak, V.K.R.[3]

Introduction

The National Medical Commission has amended the medicine curriculum in India, put forth "Competency-based undergraduate medical education curriculum-CBME" from the academic year 2019–20, and specified the competencies, which an undergraduate student must acquire during his academic tenure (Medical Council of India, 2020). In the Indian scenario nerve injuries, are very common. One of the core competencies in the Physiology undergraduate curriculum states the causes and grading of nerve injury. Nerve injuries are taught in a didactic lecture**.** A student needs to understand the changes that can happen to a peripheral nerve on transection. The expression of peripheral nerve injury in patients can range from mild discomfort to long-term impairment. According to Sunderland's classification (based on the presence of demyelination, damage of axons and connective tissue) nerve injury comprises of first degree (Neuropraxia-mild form), second degree (Axonotmesis), third degree (Nerve fibre interruption), fourth degree (Neurotmesis) and fifth degree (Complete Transection). Understanding the basic principles of nerve injury would aid to form a strong clinical foundation that remains a challenge for medical student and teacher.

[1]Department of Physiology, MGMCRI, SBV, Pondicherry, India

[2]Associate Professor, Department of Transfusion Medicine, JIPMER, Pondicherry, India

[3]Department of Physiology, Sree Gokulam Medical College and Research Foundation, India

Corresponding author: Dr. Vineetha K Ramdas
Email: drvinu1986@gmail.com

DOI: https://doi.org/10.4038/seajme.v16i2.394

Students need to understand degenerative and regenerative changes in the nerve for better patient management (Menorca *et al*., 2013). The simulation-centered learning is considered a proven methodology for grooming medical competencies globally (Williams *et al*., 2016). There are limited studies with respect to the use of simulation in teaching physiology using low-fidelity models. In this study, we briefly describe an easy, low-cost experiment, low-fidelity static model that makes the learning of nerve injury concepts clearer with visualization and enhances concept understanding. As one of the tools to promote interactive learning, this demonstration was done to first-year medical students during a didactic lecture on the topic of nerve injury in the nerve-muscle physiology module. The objective of this study was to prepare a low-fidelity static model to explain the physiological changes during nerve injury to 1st-year MBBS undergraduate students.

Methodology

To construct the nerve injury model, the essential resources required are a banana with pin tops to simulate myelinated nerve fiber and toothpicks to simulate axonal sprouts. The demonstration was a part of the didactic lecture. The time duration was 10-15 minutes. The purpose of this study was to explore the utility of this nerve injury model with respect to enhanced understanding of the subject content in 1st year MBBS students. This demonstration aids in understanding the specific learning goals of degenerative and regenerative changes following a nerve injury. The authors tried to demonstrate various

degrees of injuries based on Sunderland's classification. The first degree of injury denotes neuropraxia which manifests with the absence of Wallerian degeneration and intact axons. The second-degree injury denotes axonotmesis manifests as intact endoneurium and Schwann cells but a severed axon.

The fourth-degree injury shows degenerative and regenerative changes. Sunderland's fifth-degree injury denotes neurotmesis which manifests as complete transection of the trunk along with scar formation (Hasirici *et al*., 2014). Because of the COVID-19 pandemic, this model was displayed and described in an online platform. Student's responses were collected via Google forms.

Response from Students

Out of 240 students, 125 chose to respond, and among them, 111 felt that this demonstration aided them to better understand the topic. Strengths identified were multiple modalities of stimulation, like visual and kinesthetic, can be bought out during a lecture along with readily available resources in combination with minimal technology. Limitations of the study include that student's performance of retaining the knowledge has not been assessed. The authors would like to mention that low fidelity simulation centred methods are inexpensive and can be conducted with easily available resources. They can also be proved to enhance student engagement and concept understanding. The authors hope that this model will be well received by educators and medical students in the future.

Compliance with ethical standards

Funding: This study is a self – funded project.

Conflict of interest: The authors declare no conflict of interest.

Informed consent: The volunteering students gave informed consent for participating in the study.

The study was approved by the Institutional Ethics Committee.

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