ID 759

Advanced Nanotechnology for Intracranial Pressure Monitoring: A Comprehensive Review of Carbon Nanotube Based ICP Pressure Sensors

ARA Rahman[1#] and WLPK Wijesinghe[1]

[1]Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka

[#]38-eng-0101@kdu.ac.lk

Intracranial Pressure (ICP) is a critical parameter that influences cerebral perfusion and brain oxygenation. Proper monitoring of ICP is vital, particularly for patients with traumatic brain injuries (TBI) and other neurological conditions. Traditional methods of ICP monitoring, including observational, imaging, non-invasive, and invasive techniques, present limitations such as insufficient data, inability to provide continuous monitoring, and potential complications from invasive procedures. Recent advancements in nanotechnology, particularly involving carbon nanotubes (CNTs), offer promising alternatives for ICP monitoring. CNTs exhibit exceptional mechanical and electrical properties, high-pressure sensitivity, and biocompatibility, making them suitable for developing novel pressure sensors. Fabrication of biocompatible and precise high sensitive pressure transducers with carbon nanotubes has been a field that is highly researched and encouraged. This paper explores the potential of CNT-based sensors for ICP monitoring, emphasizing their fabrication, biocompatibility, and biodegradability. Functionalized CNTs demonstrate enhanced biocompatibility and biodegradability, addressing some of the safety concerns associated with pristine CNTs. By leveraging nanotechnology, it is possible to overcome many of the limitations of current ICP monitoring methods, paving the way for more accurate, reliable, and continuous monitoring solutions. This review article explores the significant potential of CNTs in revolutionizing biomedical applications, particularly in the context of ICP monitoring and neurotrauma care.

Keywords: *carbon nanotubes, intracranial pressure, nanotechnology, piezoresistive transducers*