Usefulness of Licox Monitor in Moyamoya Disease: A Case Report

Poster #1325
Theresa Gammel (M.D. Anticipated 2022)
Elizabeth Wirkowski, M.D.
Charles B. Mikell, M.D.
Susan Fiore, M.S.
Disclosures

I DO NOT have any financial or organizational relationships with commercial interests or other entities. I hereby certify that to the best of my knowledge, no aspect of my current personal or professional circumstances places me in the position of having a conflict of interest with my duties, responsibilities and exercise of independent judgment as an Officer, Member of the Board of Directors, Nominee for Office, Educational Presenter and/or a representative of AANS/NREF/NPA.
Introduction

- Integra® Licox® monitor is typically used as an adjunct to other brain monitoring devices in the Neuro Critical Care unit (NCCU)
  - It measures brain tissue oxygenation (PbtO\textsubscript{2}) and is used in conjunction with intracranial pressure (ICP) monitors in cases of severe traumatic brain injury (TBI)

- ICP and PbtO\textsubscript{2} monitoring are standardly utilized for patients at risk of secondary brain insult and ischemia

- Usually, when ICP increases, PbtO\textsubscript{2} decreases, indicating high risk for brain ischemia

- In the following case report, the Licox monitor altered the course of a patient’s diagnostic history as the first tool to discover an unexpected trend between ICP and PbtO\textsubscript{2}, ultimately leading to the diagnosis of Moyamoya Disease
Case Description

- 49 year old Caucasian male with a PMHx of uncontrolled hypertension

- Complaints of headache and neck pain with left arm weakness

- Presented to a local community hospital after a syncopal episode and initial GCS of 3

- CTH revealed a large right basal ganglia intracranial hemorrhage with interventricular extension

Figure 1. Initial CT head. Large right basal ganglia intracranial hemorrhage with interventricular extension and mass effect noted.
Patient transferred to Stony Brook University Hospital
  - Bilateral extraventricular drains (EVDs) initially placed
  - Right frontal Licox monitor implanted after right EVD was replaced later in the day

During the night, it was noted that the patient’s PbtO$_2$ was fluctuating, *despite no changes in ICP*

Manipulation of the patient’s body position from supine to upright confirmed that PbtO$_2$ was fluctuating with respect to body position; ICPs continued to remain stable and less than 20mmHg

This was the *first time* in the course of patient’s history that an underlying irregularity of cerebral blood flow (CBF) was suspected
Figure 2. Fluctuating PbtO$_2$ levels as measured by the Licox monitor. Fluctuations are with respect to changes in body position, measured over three days. Increasing PbtO$_2$ correlates to supine body position, while lower PbtO$_2$ levels correlate with upright position. ICP remained relatively stable and under 20 mmHg.
Results

- Suspicion of Moyamoya Disease was heightened by the paradoxical fluctuations of PbtO$_2$ with respect to stable ICP relative to body position.

- This disease was high on the differential *only after* the Licox monitor increased suspicion of irregular CBF.

- A cerebral angiogram was performed, which ultimately confirmed the diagnosis of Moyamoya Disease (MMD).

Figure 3. Cerebral angiogram showing right MCA occlusion and development of surrounding collateral vessels, confirming diagnosis of MMD. Licox placement is shown in the upper right corner near the collateral vasculature.
This patient’s diagnosis of MMD was unique because the Licox monitor was the first diagnostic tool that suggested an underlying cause of irregular CBF.

MMD has the highest incidence in the Eastern Asian population, because of the autosomal dominant inheritance pattern of the susceptibility gene RNF213 (Hishikawa et al., 2016).

The patient described here was neither of Asian descent, nor had a family history of MMD, making the discovery of MMD as the underlying diagnosis even more surprising.

This highlights how truly essential the Licox monitor was in the course of this patient’s clinical diagnosis.

If the ICP monitor had been the only diagnostic tool utilized in this patient’s care, it would have been insufficient in uncovering an irregularity of CBF as the true underlying diagnosis.

Summary Points

- This case report demonstrates that the Licox monitor was critical in leading to the underlying diagnosis of Moyamoya Disease.

- The stable ICP values alone would not have led to the timely diagnosis of MMD, if it had not been for the fluctuating PbtO2 levels detected by the Licox monitor.

- We argue that this case report supports the expanded use of the Licox monitor in the NCCU setting, particularly when abnormal cerebral blood flow is suspected.