The Clinical Reasons Why Not to Hyperventilate Traumatic Brain Injuries (and how to control it).

For many years aggressive hyperventilation of the patient suffering from Traumatic Brain Injury (TBI) has been standard practice around the world. The original concept behind the use of this technique was to reduce intracranial pressure. However, there have been no studies to show that the patient's neurological outcome is improved by this practice. A report by the American College of Neurosurgeons (based on research of all applicable literature from the last 25 years) now casts severe doubt on the routine use of this technique in patients suffering from TBI.

In their **"Guidelines for the Management of Severe Head Injury",** clear clinical evidence presented supports their call for a discontinuance of prophylactic hyperventilation as a treatment for TBI. In 40% of patients suffering from TBI, brain swelling and an increase in intra-cranial pressure occurs. High intra-cranial pressure following traumatic brain injury is one of the main causes of death in these patients, but it has however been wrongly assumed that hyperventilation is the great panacea for all neurological ills.

Intra-cranial pressure reduction is achieved through hyperventilation by constricting the vessels in the brain and reducing cerebral blood flow. Twenty years of research clearly shows that, in the first day following injury, the cerebral blood flow is already less than half the norm and that aggressive hyperventilation potentially risks causing cerebral ischaemia. It has also been found (in some patients), that **aggressive hyperventilation can actually cause an increase in intracranial pressure**.

There is irrefutable scientific evidence to show that patients with TBI have low cerebral blood flow and it is strongly suggested that in the first hours after injury the cerebral blood flow approaches levels that are consistent with causing brain ischemia. Hyperventilation will further reduce cerebral blood flow values but will not consistently cause intracranial pressure levels to fall.

It has also been shown, in a randomized clinical study, that **outcomes for TBI patients are worse if they are aggressively hyperventilated**. The recommendations of the American College of Neurosurgeons are quite clear and are backed by a significant amount of scientific evidence. **Prophylactic hyperventilation should be avoided during the first five days following severe TBI and should be especially avoided during the first 24 hours.**

"So what is the answer for those who are at the frontline in the treatment of patients with TBI"?

Limiting the use of hyperventilation following severe TBI to those patients where the deterioration in their neurological condition warrants this type of intervention, may be a safe option. Also, when deemed absolutely clinically necessary, limiting the length of time that hyperventilation is employed should be considered. However, how do we decide when to hyperventilate? Monitoring the patient's intracranial pressure and cerebral blood flow are ways of identifying the point at which cerebral ischemia may occur, but this is impossible to undertake in the field.

Regardless of the type of injury, hyperventilation is never a substitute for **controlled ventilation**. Based on this research, we all should re-evaluate our protocols and consider whether hyperventilation or good ventilation should be our main aim in traumatic brain injured patients.

Where manual resuscitators are the mainstay of patient ventilation then using a device where the flow is controlled (rather than simply attempting to limit pressure with a pressure relief valve) is the best way to reduce the negative effects hyperventilation in this patient group.

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