

# Is the industry heading towards undue sophistication?

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## ABSTRACT

**Introduction:** Patients with cerebral palsy present for a wide variety of surgeries, ranging from general surgical conditions to particular interventions. Understanding the etiology, clinical manifestations and therapy of Cerebral Palsy (CP) will improve perioperative care for these patients.

**Case report:** A 24 year female with spastic cerebral palsy was posted for excisional arthroplasty of left hip for recurrent left sided hip dislocation. The patient experienced multiple episodes of sinus bradycardia shortly after induction. The patient's jaw was completely relaxed without the use of any muscle relaxants. At first, adequate tidal volume was being delivered to the patient by the modern anaesthesia machine but on positioning the patient lateral, significant amount of audible leak was present. On switching to manual ventilation, adequate tidal volume was being delivered to the patient.

**Discussion:** The poor nutritional status or a lifelong non-ambulatory status compounded by lack of muscle and fat deposits in the body may be the

reason behind the episodes of bradycardia and complete relaxation of the jaw without the use of muscle relaxants. Though adequate tidal volume was being delivered at the beginning of the induction, on lateral position remarkable amount of leak was present. The modern sophisticated anaesthetic work stations with the ascending bellow technology are programmed to detect even minimal amount of leak which can hinder the delivery of adequate tidal volume to the patient in certain instances. This may be the reason why the patient was getting ventilated manually on the piston type of ventilator technology overriding the in built automation of the machine.

**Conclusion:** The wide range of clinical picture varying considerably can result in an unpredictable response of patients with CP to anaesthesia making induction and maintenance of anaesthesia and haemodynamic stability quite challenging to an anaesthetist. Furthermore, modern technology might not necessarily work well in every situation. One must be always willing and ready to revert back to old school depending on the situation.

**Key Words:** Cerebral palsy; Anaesthesia; Arthroplasty; Bradycardia; Tracheostomized

## INTRODUCTION

Cerebral Palsy (CP) refers to a heterogeneous group of non-progressive, but often changing, motor impairment syndromes involving permanent motor dysfunction that affects the muscle tone, posture and/or movement secondary to lesions or anomalies of the brain arising in the early stages of its development [1]. The degree and type of disability in this condition depend on the extent and site of the cerebral pathology. Patients with CP present for a wide variety of surgeries, ranging from general surgical conditions to particular interventions [2]. Anaesthetic management of patients with CP requires consideration of both the psychological as well as medical aspects of their condition which might be quite challenging. Perioperative challenges include: seizure control, optimization of respiratory function, gastro-oesophageal reflux and management of pain, muscle spasm, nausea/vomiting and caregivers' close engagement in successful communication [3]. Patients with CP will receive better perioperative care if the etiology, clinical symptoms and management of the condition are well understood [4].

## CASE PRESENTATION

A 24 year tracheostomized female with spastic cerebral palsy associated with seizure disorder, was posted for excisional arthroplasty of left hip for recurrent left sided hip dislocation. Her most recent generalized tonic-clonic seizure occurred four years ago, at which point she spent twenty-eight days on a ventilator in a critical care unit. She had been tracheostomized since then. On pre-anaesthetic checkup, all the routine blood investigations were within normal limit. Echocardiography disclosed normal findings. On examination, contracture had developed over time at elbows, wrists, hips, knees and ankles. The patient appeared to be malnourished with cognitive impairment and was bed ridden [5].

On the day of surgery, the patient was shifted to the operation theatre with a 22 gauge intravenous cannula on right forearm. The patient was pre-oxygenated through the tracheostomy tube. Intravenous induction was done with low dose propofol (60 mg) and fentanyl (50 mcg). The patient experienced multiple episodes of sinus bradycardia shortly after induction and her heart rate dropped to 36 beats per minute. Injection atropine 0.6 mg IV was given stat. Single dose of atropine brought the heart rate back to normal limits. The patient's jaw was completely relaxed without the use of any muscle relaxants. At first, adequate tidal volume was being delivered to the patient by the modern anaesthesia machine but on positioning the patient lateral, significant amount of audible leak was present. Adequate tidal volume could still not be generated even after attempting to ventilate the patient by hand. After that, we moved from the ascending bellow kind of anesthetic workstation to the piston type, which is a more traditional design. Significant amount of leak was still present. We then switched to manual ventilation following which adequate tidal volume was being delivered to the patient. There were no episodes of desaturation during this event [6].

The patient was manually ventilated on the piston type of anaesthesia machine without giving any muscle relaxant throughout the procedure. The requirement of propofol was minimal and was repeated only once (30 mg) during the entire course of the surgery. At the end of the surgery, the patient was haemodynamically stable and shifted out after she started taking adequate and regular respiratory efforts and following commands.

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**Figure 1)** Tracheostomized (uncuffed tracheostomy tube) patient with cerebral palsy in lateral position

### DISCUSSION

Cerebral palsy is the result of an injury to the developing brain during the antenatal, perinatal or postnatal period. Although the exact etiology is unknown, perinatal asphyxia leading to hypoxic brain injury is thought to be the cause of cerebral palsy in this patient. The drug response may vary from the normal response in the patients with cerebral palsy. The exact reason for sinus bradycardia following induction is unclear but can be attributed to the poor nutritional status or a lifelong non-ambulatory status. This is often compounded by lack of muscle and fat deposits in the body. The jaw was fully lax immediately after the induction with a minimal dose of propofol without even giving a muscle relaxant. Patients of CP are often found to be resistant to non-depolarizing muscle relaxants primarily due to up regulation of the AchR's. Anaesthetic agents lead to a greater hypnotic state in these patients as compared with otherwise normal individuals. In clinical practice, narcotics appear to have greater potency in patients with CP [7].

Though adequate tidal volume was being delivered at the beginning of the induction, on lateral position remarkable amount of leak was present. The apparent reason might be the un-cuffed tracheostomy tube that got displaced on changing the position. This could have been avoided if we

would have changed the TT to cuffed type the day before the surgery. These patients may be severely affected by drooling and surplus secretions because of the decreased ability to swallow the secretions leading to the blockage of TT which might have further contributed to the problem. The modern sophisticated anaesthetic work stations with the ascending bellows technology are programmed to detect even minimal amount of leak which can hinder the delivery of adequate tidal volume to the patient in certain instances. This may be the reason why the patient was getting ventilated manually on the piston type of ventilator technology overriding the in-built automation of the machine [8].

### CONCLUSION

Though knowing the pathology associated with different types of CP and their related clinical conditions can enable the anaesthetist to anticipate the likely problems which might impinge on anaesthesia and the peri-operative period, the wide range of clinical picture varying considerably can result in an unpredictable response of patients with CP to anaesthesia making induction and maintenance of anaesthesia and haemodynamic stability quite challenging to an anaesthetist. Furthermore, modern technology might not necessarily work well in every situation. One must be always willing and ready to revert back to old school depending on the situation.

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