

Cardiac Arrest Monitored by Near-infrared Spectroscopy During a Correction of Congenital Diaphragmatic Hernia

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BACKGROUND

Congenital diaphragmatic hernia (CDH) and esophageal atresia with tracheoesophageal fistula (EA/TEF) are challenging conditions for anesthetic management.

Brain Near-infrared Spectroscopy (NIRS) may be a valuable monitoring on these patients.

CASE REPORT

A 6-day-old female, 2,230 Kg, ASA 4, with coexisting CDH and EA/TEF was admitted from the NICU to the OR for CDH repair. The patient was in fair general condition on physical examination, with jaundice grade 4/4, well-perfused, intubated (3,0 uncuffed ETT) on standard mechanical ventilation, sedated with fentanyl and dexmedetomidine.

Pre- and post-ductal oxygen saturation was 90% and 94%, respectively. Chest/abdomen X-ray showed herniation of the stomach into the left hemithorax. Transthoracic echocardiogram showed an ejection fraction of 72%, CIA, PCA, and pulmonary hypertension (PASP = 50 mmHg). On admission she was on milrinone and noradrenaline infusions. The patient was further monitored with ECG, end-tidal CO₂, noninvasive blood pressure, processed EEG, near-infrared spectroscopy (NIRS) (Figure 1), rectal temperature, and a Foley catheter.

Case Report (continuing): Anesthesia maintenance was done with sevoflurane, fentanyl, and dexmedetomidine, titrated accordingly with EEG. Suddenly after initiation of laparotomy, probably due to positive ventilation into the fistula (Figure 2), it was noted a massive gastric distension and worsening of mechanical ventilation.



Figure 1. NIRS and EEG in place.

At the end of the procedure, after surgeons removed the ligation, we immediately noted another significant drop in the cerebral oximetry. The patient evolved into a new cardiac arrest for 5 minutes that only resolved with a new ligation. The patient was sent to the NICU intubated and sedated and with vasoactive drugs titrated. The ligation of the cardia was left in place for a further second approach for correcting the EA/TEF after stabilization.

A quicky drop on the cerebral oximetry was observed (Figure 3), followed by cardiac arrest. She was resuscitated for 6 minutes.

After ROSC, ligation of the gastric cardia was necessary to enable positive ventilation and correction of CDH.

DISCUSSION

The positive pressure of conventional mechanical ventilation might have been enough to pass air towards the fistula into the stomach.

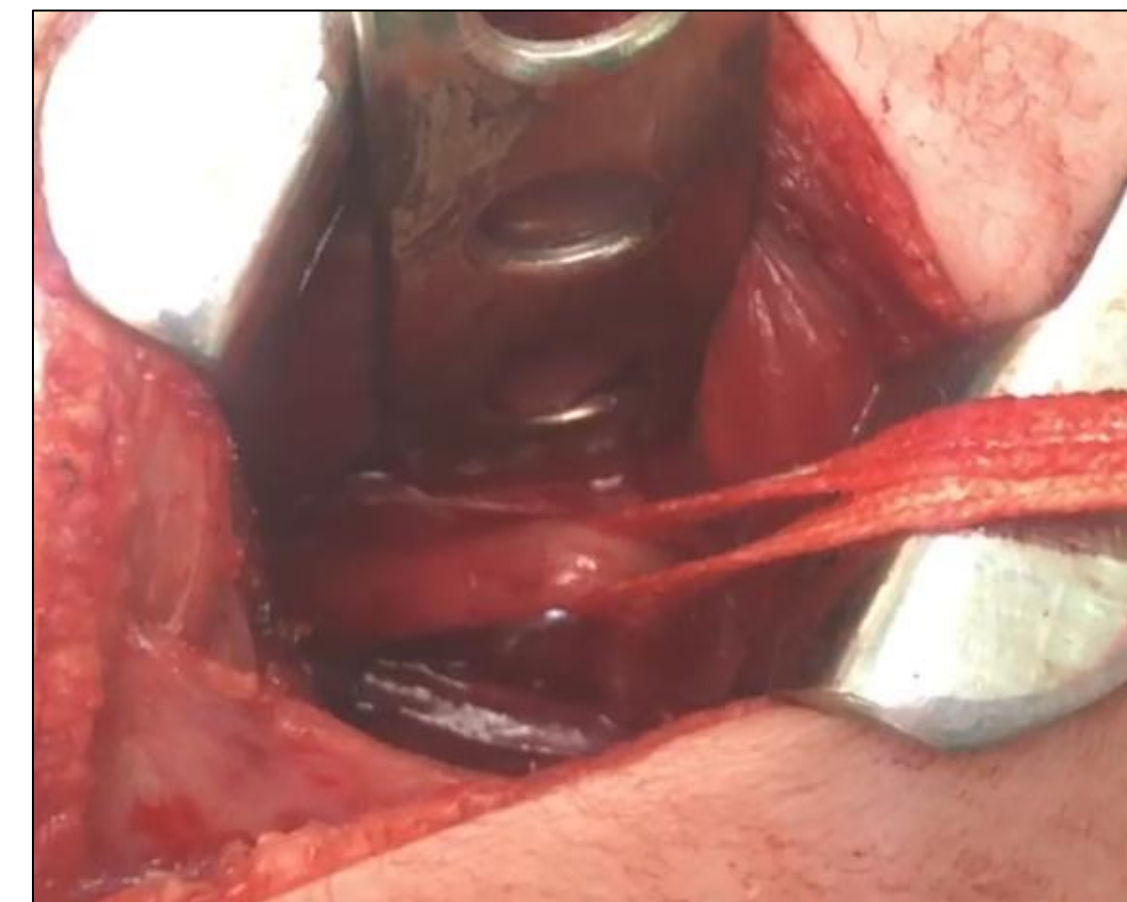


Figure 2. Tracheoesophageal fistula.

It raised the abdominal pressure worsening hemodynamic and ventilation. These in combination might have been the cause of cardiac arrest in both situations. NIRS was a little bit ahead than other monitors indicating an imminent cardiac arrest, but it was not interpreted on time. The rapid ligation made by surgery was fundamental to restore circulation. The rapid identification of pitfalls by surgeons and anesthesia providers made possible ROSC. We documented two episodes of severe drop in cerebral oxygenation before cardiac arrest.

LEARNING POINTS

- NIRS is a valuable intraoperative resource for monitoring high-risk pediatric patients;
- Identification of intraoperative cardiac arrest might be a new indication of NIRS;
- Cardia ligation may be lifesaving on CDH + EA/TEF patients on cardiac arrest.

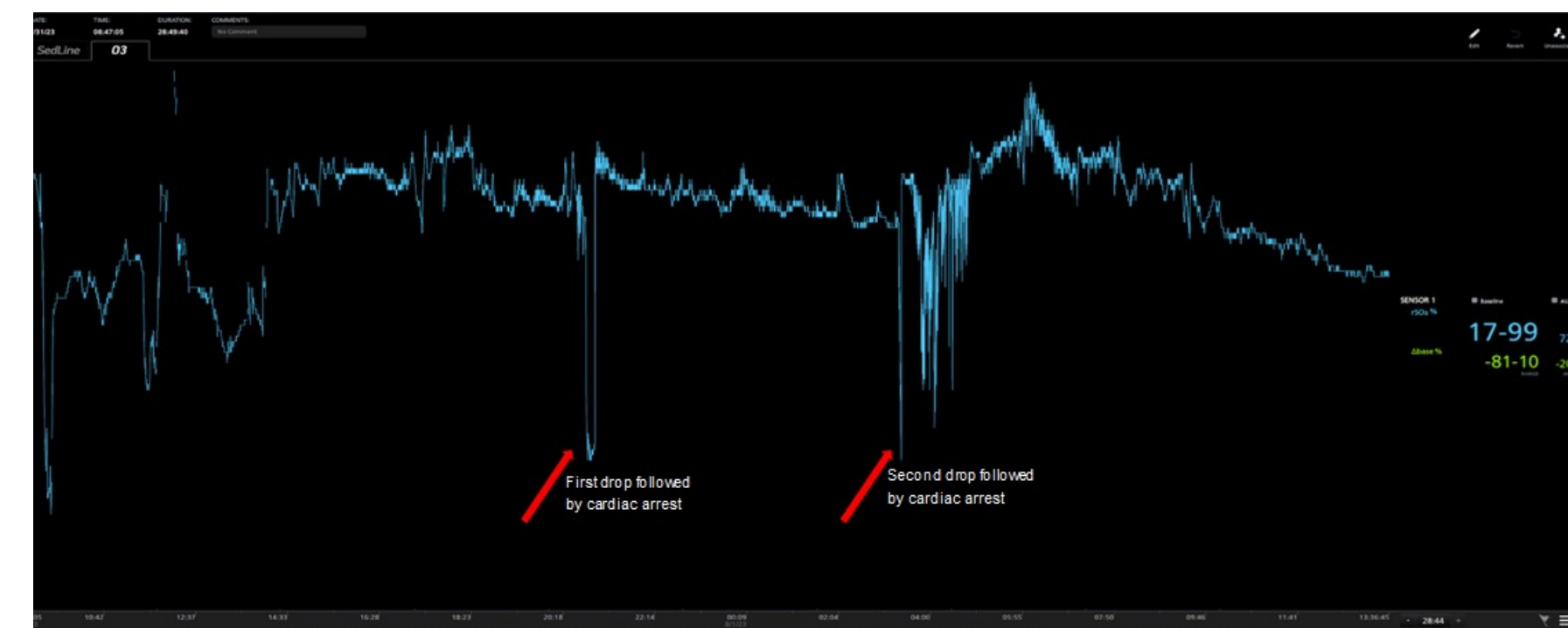


Figure 3. Cerebral oximetry during CDH repair showing quicky drops (red arrows) corresponding to 2 cardiac arrests followed by ROSC.