



# Dealing with a Pediatric Posterior Fossa Tumor after COVID-19 Infection: Report of One Case

## *Manejo de um tumor da fossa posterior em paciente pediátrica após infecção por COVID-19: Relato de um caso*

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### Plain Language Summary

Having the issue of coronavirus disease 2019 (COVID-19) in mind, there is always a dilemma surrounding elective and non-urgent neurosurgical operations. The unanswered question is regarding whether there is any post-COVID-19 complications that hinder a patient from becoming a candidate for a neurosurgical operation. If that is the case, what should we do?

In the present article, we report our single-center experience with an unusual bleeding during the operation of a huge cerebellar tumor in a girl previously infected with COVID-19. In the end, we recommend our experience to our colleagues.

### Abstract

There are still some conditions that pediatric neurosurgeons may face in the context of coronavirus disease 2019 (COVID-19) which have not been fully addressed so far. Authors have postulated an ongoing inflammatory myocardial status in a significant proportion of patients who have recovered from COVID-19. We report our experience with a 10-month-old girl who had recovered from COVID-19 and had a case of fourth-ventricle mass in the midline of the posterior fossa. She was scheduled for micro-neurosurgical resection of the mass following the insertion of a ventriculoperitoneal shunt. There were no significant issues regarding the induction of anesthesia. A midline suboccipital approach was chosen, and the patient was fully prepared and draped. Suboccipital soft tissues and muscles were dissected layer by layer through the midline avascular line. A marked gush of blood off the midline was observed during the opening in Y of the dura mater. Then, we started to approach the occipital sinus. However, there was an unusual loss of ~ 200 mL of blood lost from this area. Despite the proper packed-cell transfusion, the patient developed bradycardia and a sudden rhythm of asystole. The cardiopulmonary cerebral resuscitation (CPCR) was initiated immediately. Despite

### Keywords

- ▶ COVID-19
- ▶ posterior fossa tumor
- ▶ pediatrics
- ▶ myocardial damage

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the maximal effort, the heart rate did not change and remained asystole. We recommend that pediatric neurosurgeons postpone the procedures to be performed in patients who have recovered from COVID-19 for more than one month after a thorough preoperative cardiac evaluation has been performed.

## Resumo

Ainda existem algumas condições que os neurocirurgiões pediátricos podem enfrentar no contexto da doença por coronavírus 2019 (COVID-19) que não foram totalmente abordadas até agora. Os autores postularam um estado inflamatório miocárdico contínuo em uma proporção significativa de pacientes que se recuperaram da COVID-19. Relatamos nossa experiência com uma menina de 10 meses que se recuperou da COVID-19 e teve um caso de massa no quarto ventrículo na linha média da fossa posterior. Ela foi programada para ressecção microneurocirúrgica da massa após a inserção de uma derivação ventrículo-peritoneal. Não houve problemas significativos em relação à indução da anestesia. Uma abordagem suboccipital na linha média foi escolhida e a paciente foi totalmente preparada e coberta. Tecidos moles e músculos suboccipitais foram dissecados camada por camada através da linha avascular da linha média. Durante a abertura em Y da dura-máter observou-se um jorro marcado de sangue na linha média. Em seguida, iniciamos a abordagem do seio occipital. No entanto, houve uma perda incomum de 200 ml de sangue perdido nesta área. Apesar da transfusão de hemácias adequada, a paciente evoluiu com bradicardia e ritmo súbito de assistolia. A ressuscitação cerebral cardiopulmonar (RCCP) foi iniciada.

## Palavras-chave

- ▶ COVID-19
- ▶ tumor da fossa posterior
- ▶ pediatria
- ▶ dano miocárdico

## Background and Importance

The relatively small number of pediatric neurosurgical subjects that coped a COVID-19 course of disease makes it a matter of debate to deal with these patients in their neurosurgical procedures.<sup>1</sup> Guidelines suggest the postponement of non-urgent procedures until the period of crisis is over.<sup>2</sup> The present article points out that patients who have recovered from COVID-19 would require of thorough work-ups that could be lifesaving prior to specific procedures. There are still some conditions that pediatric neurosurgeons may face in the context of COVID-19 which have not been fully addressed so far.<sup>3</sup> The presence of acute ischemic events and fat embolism are common in children with hemoglobinopathies and COVID-19. Shchedrygina et al.<sup>4</sup> have postulated an ongoing inflammatory myocardial status in a significant proportion of patients who have recovered from COVID-19. They have concluded that the initiation and propagation of the inflammatory cascade following viral invasion takes place irrespective of the severity of COVID-19. This process would involve patients in all age groups, including pediatric patients. Hence, COVID-19 could lead to a significant chance of progressive heart failure. We herein report our experience with a 10-month-old girl who had recovered from COVID-19 and had a case of fourth-ventricle mass in the midline of the posterior fossa. She was scheduled for micro-neurosurgical resection of the mass.

## Case Presentation

The patient was had been born through normal vaginal delivery without any known peripartum complications, and was brought to the Shiraz pediatric neurosurgery ward, a referral

center in the south of Iran, with a chief complaint of repeated episodes of nausea and vomiting despite thorough gastrointestinal investigations. A non-contrast brain computed tomography (CT) scan revealed a fourth-ventricle mass in the midline with severe obstructive hydrocephalus and a globular third ventricle. Insertion of a ventriculoperitoneal shunt (VPS) was scheduled, as our policy is to proceed with the VPS, but we chose to give the patient at least one week to try to cool the brain edema via cerebrospinal fluid diversion along with dexamethasone in an outpatient setting.

During this period, she developed a COVID-19 infection that was confirmed. So, we delayed the next operative stage for three weeks until she tested negative for severe acute respiratory syndrome coronavirus 2 (SARS-COV-2).

The patient was admitted about a month later in a stable condition. She was brought to the operating theater in an elective setting for microneurosurgical resection of the posterior-fossa lesion. It is worth noting that a thorough preoperative evaluation was performed by the pediatric anesthesiology team.

There were no significant issues regarding the induction of anesthesia. A central access line was drawn, and we changed her to a prone position. A midline suboccipital approach was chosen, and the patient was fully prepared and draped. Suboccipital soft tissues and muscles were dissected layer by layer through the midline avascular line, from the inion to the level of the C2 vertebrae. No significant bleeding occurred during this stage of dissection. A total of two burr holes were made using the Medtronic (Dublin, Ireland) Midas Rex Legend AD03 Perforator Driver, and craniectomy was carried out exposing the posterior fossa from the confluent sinus to the rim of the magnum. A marked

gush of blood off the midline was observed during the opening in Y of the dura mater. Hemostasis was achieved using surgical and two cotton balls. We proceeded with the opening of the midline portion of the dura mater, but, suddenly, ~ 100 mL of blood was lost despite the millimeter-by-millimeter advancement of the dural opening. We packed the field and filled it with copious amount of normal saline. The vital signs were still stable except for relative tachycardia (180 beats per minute). The anesthesiologist replaced the amount of blood lost drop by drop throughout the operation. We started to approach the occipital sinus. However, there was an unusual loss of ~ 200 mL of blood from this area. Despite the proper packed-cell transfusion, the patient developed bradycardia and a sudden rhythm of asystole. The cardiopulmonary cerebral resuscitation (CPCR) was initiated immediately, and the position of the patient was changed to supine while the surgical field remained wide open and just packed with enough gauze. The CPCR continued for ~ 90 minutes. Despite the maximal effort, the heart rate did not even change to one beat per minute. In the meantime, chest tubes were inserted bilaterally, but no pneumothorax was found. The electromechanical dissociation rhythm did not change. The patient passed away regardless of the attempts to reverse the rhythm.

## Discussion

Valverde et al.,<sup>1</sup> in a thorough investigation on cardiovascular involvement in pediatric COVID-19 patients, stated that the SARS-COV-2 infection resulted in direct myocardial damage, a vicious inflammatory cascade which could lead to myocardial dysfunction and ventricular arrhythmia. Furthermore, COVID-19 would exhibit a kindling phenomenon, known in cases of temporal-lobe epilepsy, which would result in myocardial dysfunction and arrhythmia. This kindling phenomenon induces fever, increased oxygen consumption, ion alterations, and, finally, a metabolic crisis.<sup>1</sup> Ludvigsson et al.<sup>5</sup> reported their experience with five children in who had recovered from COVID-19, and reviewed the literature for the long-term effects of the disease on the heart, such as perimyocarditis. The authors<sup>5</sup> claimed that these symptoms follow a similar trend in children and adults. Ley-Vega<sup>6</sup> pointed out the potential cardiac problems in a population of Cuban children previously diagnosed with convulsion. The author<sup>6</sup> found myocarditis, pericarditis, and arrhythmias in 18% of the sample (20 patients out of 110 cases), and an interesting finding was that the patients evolved satisfactorily following several weeks of monitoring and treatment. Ley-Vega<sup>6</sup> stated that these abnormalities may be reversible, but potentially time-consuming for proper recovery.

The retrospective analysis of the preoperative brain magnetic resonance imaging scan of our patient revealed nothing unusual regarding the occipital sinus. There are two plausi-

ble scenarios for our case: a post-COVID-19 subclinical myocardial damage that made this patient decompensated following a blood loss; the second scenario is based on air embolism. However, the latter is less likely because the embolus would theoretically pass through the right ventricle following our vigorous CPR.

## Conclusion

We recommend that pediatric neurosurgeons postpone the procedures to be performed in patients who have recovered from COVID-19 for more than one month after a thorough preoperative cardiac evaluation has been performed, even if there is no frank clinical disorder to estimate the cardiac reserve of a given patient.

## Highlights

- A review of specific considerations on COVID-19 in pediatric neurosurgery patients.
- A correlation between myocardial injury after COVID-19 infection and perioperative neurosurgical complications.
- A possible salvation from the perioperative neurosurgical complications related to COVID-19.

### Ethical Considerations

Approval from the institutional review board was obtained following the initial drafting of the present article.

### Conflict of Interests

The authors have no conflict of interests to declare.

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