OLGU SUNUMU/CASE REPORT

Anesthetic management of a child undergoing bilateral laparoscopic adrenalectomy

Bilateral laparoskopik adrenalektomi yapılan çocukta anestezik yaklaşım

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Abstract

Pheochromocytoma is a rare catecholamine secreting neuroendocrine tumor in children. It is usually localized unilaterally in adults but often bilaterally in children. The symptoms are variable related to the level of secreted catecholamine. The most common symptoms are hypertension, tachycardia and headache. Beta blockers, alcohol consumption, injection of contrast substance and surgical procedures may lead to attacks. The most effective treatment is surgical resection. In recent years, laparoscopic surgery has been more preferred. Anesthetic management is very important in this cases. Especially, sudden hemodynamic changes may be observed during laparoscopic adrenalectomy. In our case, the control of hemodynamic changes with esmolol and norepinephrine infusion were discussed during bilaterally laparoscopic adrenalectomy in a 14-year old child with pheochromocytoma.

Key words: Pheochromocytoma, laparoscopy, child, esmolol, norepinephrine.

INTRODUCTION

Pheochromocytoma is the most common tumor of sympathetic nervous system localized either in the adrenal gland or extra-adrenal¹. In generally, it is observed in adults and localized unilaterally. However, it is rare and often bilaterally in children. It may be isolated, sporadic or associated with some inherited diseases such as multiple endocrine neoplasia type-2 (MEN 2), von Recklinghausen, Sturge Weber and von Hippel-Lindau disease.

General symptoms are hypertension, tachycardia, headache, palpitations, sweating, orthostatic hypotension related to the level of secreted catecholamine². Magnesium sulfate, sodium nitroprusside, sodium nitroglycerin, α-blockers, calcium channel blockers and β-blockers are often used to provide hemodynamic stability²⁻⁵.

The most effective treatment is surgical resection. The anesthetic management is extremely important due to hemodynamic fluctuations. Laparoscopic adrenalectomy was first reported by Ganger et al in 1992. It is a safe and effective approach for the
treatment of pheochromocytoma although technical difficulties may limit the success especially in small children. Laparoscopic adrenalectomy allows reduction of hospital costs, shorter hospital stay, decreases analgesic requirement compared with open technique. We reported our anesthetic management in 14-year-old boy during laparoscopic adrenalectomy. Our aim is to emphasize the anesthetic management of a child with pheochromocytoma.

CASE

A 14-year-old boy, weighing 42 kg, had a history of headache, nausea, vomiting, weakness, dyspnea and cold sweating. Physical examination revealed hypertension (170/100 mmHg), sinus tachycardia (92 beats min-1) and systolic murmur (1/6). The patient was on nifedipine, captopril, doxazosin 4 mg daily and carvedilol 6 mg twice a day. Preoperative medical therapy are to provide optimal control hypertension again. The mass was observed to be very near the vena cava inferior after beginning of laparoscopy. During surgery, arterial blood pressure decreased suddenly (63/49 mmHg). We stopped esmolol infusion and we observed serious bleeding in surgical field due to vascular injury. Laparoscopy was converted to open surgery via right subcostal incision. Two units of erythrocyte suspension and 500 mL-1 colloid were given to the patient and hemodynamic control was provided with the fluid resuscitation. The mass was removed totally, but the arterial blood pressure was observed to be 51/40 mmHg after removing the mass. We infused additional 250 mL-1 Ringer Lactate to increased fluid infusion rate (15 mg kg-1 h-1) and started dopamine infusion (10 μg kg-1 min-1). However fluid resuscitation and dopamine were not effective to control of hypotension. Norepinephrine infusion (1 μg kg-1 min-1) was added to dopamine infusion. Hemodynamic parameters are shown at Fig 1.

The surgery was ended at 405th minutes and 2-15 mL kg-1 h-1 Ringer Lactate, totally 3200 mL, were infused to the patient during surgery. Urine output was 800 mL, totally. Arterial blood gas analysis and blood glucose levels remained within normal limits (Table 1). We terminated vasoactive drugs by reducing until the end of the surgery. The patient was extubated after residual neuromuscular block was reversed with neostigmine (0.05 mg/kg) and atropine (0.015 mg/kg) and postoperative analgesia was provided with iv 15 mg kg-1 paracetamol. The patient was discharged from the hospital without any problems at 6 days after surgery.

DISCUSSION

Hemodynamic fluctuations are most frequently encountered problems in the patients with pheochromocytoma. The main objectives of preoperative medical therapy are to provide optimal blood pressure and heart rate. In our case, blood pressure was stabilized with nifedipine, captopril, doxazosin and carvedilol before surgery.
Laparoscopic adrenalectomy in a child

Figure 1. Peroperative changes in hemodynamic parameters.
0: before induction, 5 min: after intubation, 45 min: surgery started, 60 min: nitroglycerine infusion started, 165 min: esmolol infusion started, 240 min: dopamine infusion started, 300 min: esmolol infusion stopped, 345 min: dopamine infusion stopped, 360 min: noradrenalin infusion started, 390 min: noradrenalin stopped, 405 min: dopamine stopped, after extubation;
SAP: Systolic arterial pressure, DAP: Diastolic arterial pressure, MAP: Mean arterial pressure, HR: Heart rate.

Table 1. The patients’ arterial blood gas analysis and CVP values

<table>
<thead>
<tr>
<th></th>
<th>0th min</th>
<th>60th min</th>
<th>120th min</th>
<th>180th min</th>
<th>240th min</th>
<th>300th min</th>
<th>360th min</th>
<th>420th min</th>
</tr>
</thead>
<tbody>
<tr>
<td>PaO2 (mmHg)</td>
<td>112</td>
<td>189.6</td>
<td>262.1</td>
<td>261.3</td>
<td>259</td>
<td>243.5</td>
<td>259.1</td>
<td>268.8</td>
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<tr>
<td>PaCO2 (mmHg)</td>
<td>38.7</td>
<td>38</td>
<td>40.6</td>
<td>40.9</td>
<td>40.5</td>
<td>42.8</td>
<td>39</td>
<td>40.4</td>
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<tr>
<td>pH</td>
<td>7.39</td>
<td>7.340</td>
<td>7.38</td>
<td>7.38</td>
<td>7.38</td>
<td>7.35</td>
<td>7.34</td>
<td>7.33</td>
</tr>
<tr>
<td>BE (mmol/L)</td>
<td>-1.8</td>
<td>-1.7</td>
<td>-1.7</td>
<td>-1</td>
<td>-1.7</td>
<td>-2.3</td>
<td>-5</td>
<td>-4.5</td>
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<td>Hct (%)</td>
<td>30.5</td>
<td>30.4</td>
<td>29.4</td>
<td>29.5</td>
<td>26.6</td>
<td>26.9</td>
<td>22.7</td>
<td>25.7</td>
</tr>
<tr>
<td>Hb (g/dL)</td>
<td>8.9</td>
<td>8.9</td>
<td>8.6</td>
<td>8.6</td>
<td>8.1</td>
<td>8.1</td>
<td>7.5</td>
<td>8.7</td>
</tr>
<tr>
<td>HCO3 (mmol/L)</td>
<td>21.8</td>
<td>22.9</td>
<td>22.9</td>
<td>23.4</td>
<td>22.9</td>
<td>22.4</td>
<td>20.2</td>
<td>20.7</td>
</tr>
<tr>
<td>CVP (mmHg)</td>
<td>11</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>10</td>
<td>14</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

Tracheal intubation, surgical stimulus and manipulation may cause catecholamine release. Excessive catecholamine surges can lead to hypertensive crisis, stroke, cardiomyopathy and arrhythmia. Anxiolytic agents may be beneficial to reduce preoperative stress. We applied midazolam to our patient for premedication but we did not perform epidural catheterization because the parent refused it. Pentothal sodium can be used safely for anesthesia induction and opioids may be added. Sevoflurane is one of the most preferred inhalation agent have a good hemodynamic profile. We used pentothal sodium for anesthesia induction and we preferred morphine as opioid to provide intraoperative hemodynamic stabilization. We did not observe hypertensive response after intubation. Generally, intraoperative hypertensive episodes are treated by antihypertensive drugs and increasing the depth of anesthesia. Antihypertensive agents may be used alone or combination according to the severity of clinical situation. Sodium nitroglycerine is often used for hypertensive episodes but it may be insufficient as in our case. Esmolol has a ultra-short elimination half-life and it may be particularly advantageous due to this characteristic. In several studies, esmolol has been used successfully to control of hypertension in the patients with pheochromocytoma. In our case, we could not decrease blood pressure with sodium nitroglycerine and we provided better hemodynamic stability with esmolol.
Hypotensive attacks can occur after adrenal vein ligation due to a decrease in the catecholamine plasma concentrations. This condition was tolerated by volume administration and discontinuation of antihypertensive agents. Epinephrine, norepinephrine, phenylephrine, dopamine or vasopressin infusions are rarely required. We did not observe any hypotensive attack during the left adrenalectomy. However, in the right side, we observed sudden hypotension due to vascular injury and removal the mass. In this period, we required open surgery, termination of antihypertensive agent and volume expansion. We performed fluid and blood replacement therapy according to the patients' hemodynamic parameters (blood pressure, heart rate, central venous pressure, hemoglobin, etc.). This applications did not increase blood pressure and we started inotropic agent.

Laparoscopic surgery has a number of advantages compared with open surgery such as shorter hospital stay, faster recovery, decreased analgesic consumption. However, it leads to increased intraabdominal pressure and may cause catecholamine release by the adrenal lesion. Sudden hemodynamic change is more common than open technique and manipulation can be difficult especially in children. It may require open approach at the same time or afterwards. Our patient was scheduled for the laparoscopic excision of the masses. Left laparoscopic adrenalectomy was applied successfully, but in the right side, we observed sudden hypotension due to vascular injury and we required open surgery. Therefore we did not observe the advantages of laparoscopy completely.

Preterius et al. reported that the level of catecholamine increases at intubation and during pneumoperitoneum. We could not evaluate catecholamine levels during surgery and it was a limitation of our study but during the manuplation of the tumor severe hypertension occurred.

Laparoscopic adrenalectomy is associated with sudden hemodynamic changes. Therefore, anesthetic management is very important in this cases. Esmolol infusion was used safely to provide hemodynamic stability. Norepinephrine infusion may provide better inotropic support than dopamine in case of hypotensive episodes in children. It should be noted that laparoscopic surgery may convert to open technique due to vascular injury or difficult manipulation.

REFERENCES