

Incidência de Depressão Respiratória no Pós-Operatório em Pacientes Submetidos à Analgesia Venosa ou Peridural com Opioides *

The Incidence of Postoperative Respiratory Depression in Patients Undergoing Intravenous or Epidural Analgesia with Opioids

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RESUMO

Duarte LTD, Fernandes MCBC, Costa VV, Saraiva RA - Incidência de Depressão Respiratória no Pós-Operatório em Pacientes Submetidos à Analgesia Venosa ou Peridural com Opioides.

JUSTIFICATIVA E OBJETIVOS: A analgesia controlada pelo paciente (PCA), por via venosa ou peridural, é técnica segura e eficaz no tratamento da dor pós-operatória. Todavia, o uso de opioides não é isento de risco, e a depressão respiratória é a complicação mais temida. Os objetivos deste estudo foram descrever a incidência de depressão respiratória associada à analgesia pós-operatória com opioides administrados por via peridural ou venosa e as características dos pacientes que apresentaram a complicação.

MÉTODO: Estudo de incidência, retrospectivo, em pacientes operados no Hospital SARAH Brasília entre dezembro de 1999 e dezembro de 2007 e tratados com PCA com opioides por via venosa ou peridural. Foram definidos como casos de depressão respiratória: frequência respiratória ≤ 8 irpm, necessidade do uso de naloxona ou saturação periférica de oxigênio abaixo de 90%.

RESULTADOS: Foram avaliados 2790 pacientes, dos quais 635 pacientes receberam PCA venosa e 2155, analgesia peridural. Ocorreram sete casos de depressão respiratória pós-operatória (incidência de 0,25%). Destes, seis pacientes foram tratados com PCA venosa com morfina, enquanto o último recebeu analgesia peridural com fentanil. A média de idade foi de $30,5 \pm 24,7$ anos; o tempo médio entre o término da anestesia até a ocorrência da depressão respiratória foi de $18,1 \pm 26,3$ horas. A ocorrência de depressão respiratória foi significativamente mais frequente na PCA venosa com morfina ($p = 0,001$) e idade menor que 16 anos ($p < 0,05$).

CONCLUSÕES: A incidência de depressão respiratória encontrada foi semelhante à descrita na literatura, sendo mais frequente em crianças e adolescentes, e com PCA venosa.

Unitermos: ANALGESIA: peridural, pós-operatória controlada pelo paciente; ANALGÉSICOS, Opioides; COMPLICAÇÕES: insuficiência respiratória

SUMMARY

Duarte LTD, Fernandes MCBC, Costa VV, Saraiva RA – The Incidence of Postoperative Respiratory Depression in Patients Undergoing Intravenous or Epidural Analgesia with Opioids.

BACKGROUND AND OBJECTIVES: Intravenous or epidural patient-controlled analgesia (PCA) is a safe and effective technique in the treatment of postoperative pain. However, the use of opioids is not devoid of risks, and respiratory depression represents the most feared complication. The objective of the present study was to describe the incidence of respiratory depression associated with postoperative analgesia with the intravenous or epidural administration of opioids and the characteristics of the patients who developed this complication.

METHODS: This is a retrospective, incidence study in patients who underwent surgeries at the Hospital SARAH Brasília from December 1999 to December 2007 and treated with intravenous or epidural PCA with opioids. Respiratory depression was defined as: respiratory rate ≤ 8 bpm, need to use naloxone, or peripheral oxygen saturation below 90%.

RESULTS: Two thousand seven hundred and ninety patients were evaluated; 635 of those patients received intravenous PCA and 2155 epidural analgesia. Seven patients developed postoperative respiratory depression (0.25%). Six of those patients were treated with intravenous PCA with morphine, while the last one received epidural analgesia with fentanyl. Patients had a mean age of 30.5 ± 24.7 years; the mean time between the end of anesthesia and the development of respiratory depression was 18.1 ± 26.3 hours. The incidence of respiratory depression was significantly higher in PCA with intravenous morphine ($p = 0.001$) and age below 16 years ($p < 0.05$).

CONCLUSIONS: The incidence of respiratory depression was similar to that described in the literature; it is more frequent in children and adolescents, and with intravenous PCA.

Keywords: ANALGESIA: epidural, postoperative patient-controlled; ANALGESICS, Opioids; COMPLICATIONS: respiratory failure

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INTRODUCTION

Intravenous or epidural patient-controlled analgesia (PCA) has been used since the decade of 1970, and it is considered a safe and effective technique in the treatment of moderate to severe pain ¹. However, adverse events such as nausea, vomiting, pruritus, urinary retention, sedation, and respiratory depression can develop secondary to the use of opioids ^{11,2}.

Some authors have suggested that the low incidence of respiratory depression and hypotension can be an indicator of the safety of the anesthetic technique². Respiratory depression is the adverse effect most feared by anesthesiologists during analgesia with opioids. In the literature, the incidence of respiratory depression in adults associated with the use of opioids varies considerably, mainly due to the different definitions adopted by the authors²⁻⁴. Usually, studies define respiratory depression by the presence of a respiratory frequency lower than 8 to 10 bpm or a reduction in peripheral oxygen saturation (SpO₂) determined by the pulse oximeter³⁻⁵.

In the Brazilian literature, studies on the incidence of respiratory depression associated with the use of postoperative opioids both in epidural analgesia and in intravenous PCA are rare. This knowledge is fundamental to improve the quality of postoperative analgesia.

The primary objective of this study was to report the incidence of respiratory depression associated with the treatment of postoperative pain with opioids, in epidural analgesia and intravenous PCA. The secondary objective of this study was to describe the characteristics of the technique and the population of patients who developed this complication.

METHODS

After evaluation and approval by the Ethics on Research Committee of Rede SARA de Hospitais de Reabilitação, the present study was conducted by collecting data generated by the Quality Control Program of the Acute Pain Service of the Hospital Sarah de Brasília, which is based on the daily postoperative care of patients treated with spinal analgesia or intravenous PCA.

Information on all patients followed by the Acute Pain Service was inserted in a data bank. Afterwards, patients treated with epidural analgesia (continuous epidural infusion or epidural PCA) or intravenous PCA (continuous intravenous infusion or intravenous PCA) with opioids, from December 1999 to December 2007, were included in the present study. All cases of respiratory depression, which was defined as a respiratory rate lower or equal to 8 bpm, SpO₂ below 90% and/or the need of reversal with naloxone, were recorded. The incidence of respiratory depression was calculated and compared among the groups of patients treated with epidural analgesia or intravenous PCA.

The technique of postoperative analgesia was indicated in the pre-anesthetic evaluation and corroborated by the anesthesiologist responsible for the post-anesthetic recovery room, who scheduled and instituted the analgesia. During the observation period in the postoperative ward, vital signs (blood pressure, heart rate, and respiratory rate) and the level of consciousness according to the modified Ramsay scale⁶ were monitored. All patients were monitored with pulse oximeter. Patients who remained drowsy (scores of 5 or 6 in the modified Ramsay scale) in the immediate postoperative

period or those who underwent large size surgeries were observed in the Intensive Care Unit.

Anthropometric data: age, physical status; aesthetic technique used during the surgery, analgesic technique, analgesia parameters (demand dose, blockade interval, rate of infusion, and total dose administered), concentration of the local anesthetic (when applicable) and opioid used, pain scores at rest and with mobilization (twice a day), duration of analgesia, adverse effects and complications, and patient satisfaction with the analgesic technique were also recorded. Observation and monitoring were maintained throughout the administration of analgesia.

Descriptive analysis and Fisher's Exact test were used to analyze the data. When relevant, data are presented as mean ± standard deviation (SD). A p < 0.05 was considered significant.

RESULTS

Two thousand seven hundred and ninety patients were included in the study; 635 of those patients underwent intravenous analgesia and 2,155 underwent epidural analgesia. Table I shows the characteristics of the patients included in the study. Table II presents patient distribution according to the postoperative analgesia technique. According the criteria used, only seven cases (0.25% or 2.5 cases in 1,000) of postoperative respiratory depression were observed (Table II). The rate of complication according to the analgesia technique used was 0.05% with epidural analgesia, and 0.94% with intravenous PCA. The rate of respiratory depression was significantly higher in patients treated with intravenous PCA (85.7%; p = 0.001). Among patients treated with intravenous

Table I – Anthropometric Characteristics According to the Route of Opioid Administration

| | Opioid | |
|-----------------|-------------|-------------|
| | Intravenous | Epidural |
| Age (years) * | 33.5 ± 19.3 | 37.2 ± 21.2 |
| Weight (kg) * | 61 ± 18.9 | 62.2 ± 18.7 |
| Gender | | |
| Male | 323 | 1146 |
| Female | 312 | 1009 |
| Physical status | | |
| ASA I | 136 | 652 |
| ASA II | 437 | 1349 |
| ASA III | 61 | 149 |
| ASA IV | 1 | 5 |
| Total (%) | 635 (22.8) | 2155 (77.2) |

*Results expressed as Mean ± SD

Table II – Patient Distribution According to the Postoperative Analgesia Technique

| Analgesia | Respiratory Depression n (%) | | |
|----------------------|------------------------------|---------------------|-------------------|
| | Yes | No | Total |
| Epidural | | | |
| Continuous infusion | 1 (14.3) | 1322 (47.5) | 1323 (47.4) |
| Bolus only | 0 | 3 (0.1) | 3 (0.1) |
| Infusion + bolus | 0 | 829 (29.8) | 829 (29.8) |
| Intravenous # | | | |
| Continuous infusion | 2 (28.6) | 3 (0.1) | 5 (0.2) |
| Bolus only | 3 (42.9) | 624 (22.4) | 627 (22.5) |
| Infusion + bolus | 1 (14.3) | 2 (0.1) | 3 (0.1) |
| Total | 7 (0.5) | 2783 (99.75) | 2790 (100) |

Results expressed in number of patients (n) and percentages (%)

#A significant association between intravenous analgesia and respiratory depression was observed ($p = 0.001$)

Table III – Patients with Respiratory Depression

| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 |
|----------------------|------------------|------------------|----------------------|--------------------|------------------|----------------------|----------------------------|
| Gender | F | M | F | F | F | F | F |
| Age(years) | 15 | 44 | 11 | 13 | 58 | 7 | 66 |
| Weight (kg) | 30.8 | 59.3 | 26 | 61 | 77.8 | 11.7 | 34 |
| Anesthesia | Balanced general | Balanced general | General + epidural | General + epidural | Balanced general | Balanced general | General + epidural |
| Analgesia | Intravenous PCA | Intravenous PCA | Intravenous infusion | Epidural infusion | Intravenous PCA | Intravenous infusion | Intravenous PCA + Infusion |
| Opioid | Morphine | Morphine | Morphine | Fentanyl | Morphine | Morphine | Morphine |
| Total dose | 3.5 mg | 27 mg | 2 mg | 0.1 mg | 45 mg | 8.4 mg | 11 mg |
| Time (hs)* | 3 | 4 | 4 | 1 | 9 | 72 | 34 |
| Pain Scores (M/R) cm | 0/0 | 0/5 | 0/0 | 0/0 | 0/2 | 0/0 | 0/10 |
| RR (bpm) | 8 | 8 | 8 | 7 | 4 | 8 | 8 |
| SpO ₂ (%) | 96 | 78 | 96 | 92 | 68 | 98 | 95 |

*Time from analgesia until the development of respiratory depression

PCA – patient-controlled analgesia; M – movement; R – rest; RR – respiratory rate; SpO₂ – peripheral oxygen saturation

PCA who developed respiratory depression (6 patients), 3 patients received patient-controlled boluses of the opioid (morphine), 2 received continuous intravenous infusion of morphine, and one patient received boluses and continuous infusion of opioid (Table II).

Although males were predominant in the study population (52.7%), among the 7 patients who developed respiratory depression, 6 (85.7%) were females. However, a significant statistical difference between the genders was not observed. Patients who developed respiratory depression had a mean age of 30.5 ± 24.7 years, with a minimum of 7.3 years and maximal of 66.2 years. Respiratory depression was more

frequent in patients younger than 16 years (57.1%; $p < 0.05$). Six patients were classified as ASA II, and the other patient was classified as ASA III. Three patients underwent thoracic surgeries, two orthopedic surgeries, one urologic surgery, and one neurological surgery.

Table III correlates the doses of opioids used, time until the development of complications, and pain scores at rest and with mobilization along with the respiratory rate and peripheral oxygen saturation in each case of respiratory depression. The total dose of opioids administered until the development of respiratory depression varied considerably among the patients. In the only patient who received conti-

Table IV – Parameters of Postoperative Analgesia in Patients with Respiratory Depression

| | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 |
|--------------|-----------------|-----------------|------------------------|----------------------|-----------------|------------------------|----------------------------|
| Age(years) | 15 | 44 | 11 | 13 | 58 | 7 | 66 |
| Weight (kg) | 30.8 | 59.3 | 26 | 61 | 77.8 | 11.7 | 34 |
| Analgesia | Intravenous PCA | Intravenous PCA | Intravenous infusion | Epidural infusion | Intravenous PCA | Intravenous infusion | Intravenous PCA + Infusion |
| Opioid | Morphine | Morphine | Morphine | Fentanyl | Morphine | Morphine | Morphine |
| Initial dose | 2 mg | - | 2 mg | 6 mL | - | 0.18 mg | 2 mg |
| Infusion | - | - | 0.5 mg.h ⁻¹ | 2 mL.h ⁻¹ | - | 0.1 mg.h ⁻¹ | 1 mg.h ⁻¹ |
| Bolus dose | 0.5 mg | 1 mg | - | - | 3 mg | - | 1 mg |
| Interval | 5 min | 10 min | - | - | 15 min | - | 10 min |

PCA – patient-controlled analgesia

nuous epidural infusion and developed this complication, 0.1 mg (or 0.002 mg.kg⁻¹) of fentanyl was administered. In patients treated with bolus intravenous PCA, the total dose of morphine until the development of respiratory depression varied from 2 mg to 45 mg. In the patient who received bolus intravenous PCA associated with continuous infusion, 11 mg (or 0.2 mg.kg⁻¹) of morphine were administered. The patient treated with continuous infusion of morphine received a total dose of 8.4 mg (or 0.72 mg.kg⁻¹). The mean interval from the beginning of analgesia until the development of respiratory depression was 18.1 ± 26.3 hours (minimum of 1 hour and maximum of 72 hours).

Regarding the anesthetic technique during the surgery, 5 patients received general balanced anesthesia and 2 received combined anesthesia (general + epidural anesthesia). In the patients who received epidural anesthesia, 0.5% bupivacaine with vasoconstrictor without the association of an opioid was used.

Table IV shows the parameters used for analgesia of each patient who developed respiratory depression. Among those patients, two also developed pruritus and one developed urinary retention. Despite the complications, all patients were satisfied with the analgesic technique.

DISCUSSION

None of the opioids currently available is completely safe. On the other hand, the literature has extensive evidence that patients receiving opioids to control postoperative pain can be safely cared for in surgical wards as long as trained personnel and well defined directions are available. The importance of an acute pain service for more effective and safer handling of opioids in order to prevent complications in this environment should not be underestimated⁷. The structure of postoperative care should allow the identification of risk factors and the continuous follow up and monitoring of patients, modifying and individualizing doses and infusions to optimize analgesia and reduce the incidence of adverse effects and complications.

Since it is a rare complication, most clinical assays with random patient distribution do not have enough power to determine the influence of the technique of postoperative analgesia on the development of respiratory depression. Besides, due to the different definitions of respiratory depression adopted by the authors, the incidence described in the literature varies considerably⁸. In general, it is a consequence of an opioid overdose or interaction with other drugs administered to the patient⁹. Very aggressive pain management can lead to sedation and fatal respiratory depression¹⁰. The administration of repeated, relatively elevated, doses of opioids in short time intervals increases the severity of the situation. Therefore, slow and gradual titration of the dose of opioids is the best way of reducing the risk of an overdose¹¹.

Patient-controlled analgesia (PCA) has been widely used in the treatment of postoperative pain with few side effects and a high degree of patient satisfaction^{5,12,13}. While opioids are the drugs of choice for severe postoperative pain, the technique of patient-controlled analgesia represents the golden standard of the intravenous administration of opioids for this end¹. Morphine is the preferred opioid for PCA¹⁴. After titration and beginning of analgesia, due to its fast onset of action, small intravenous boluses allow the individual titration of the dose necessary for adequate pain control^{11,15}. Therefore, large elevations in the plasma concentration of opioids is prevented and, consequently, the incidence of adverse events and complications. The blocking interval programmed in PCA is important to prevent overdoses¹⁴. Very short blocking intervals or boluses of high doses can lead to treatment failure due to the development of intolerable side effects. The most common problems during PCA include nausea, vomiting, constipation, pruritus, somnolence, and respiratory depression^{12,14}. Among the complications, respiratory depression is the most feared.

Respiratory depression can be defined according to the development of sedation¹⁶; respiratory rate, depth, and rhythm¹⁷; and oxygen saturation¹⁸. However, a single parameter spe-

cific enough to indicate the development of this complication does not exist. The respiratory rate by itself can be a limited indicator of respiratory depression, since it does not consider hypoventilation during superficial breathing or ineffective ventilation during excessive sedation¹⁷. Besides, an exact correlation between depression and pulse oximetry does not exist¹⁸. Measurement of the transcutaneous pressure of CO₂ (P_{ET}-CO₂) was more sensitive than pulse oximetry and respiratory rate on the identification of opioid-induced respiratory depression in patients receiving oxygen supplementation during epidural analgesia or intravenous PCA with morphine¹⁹.

Besides, it is possible that the frequency with which ventilation is monitored interferes in the reported incidence of respiratory depression. Continuous oximetry and capnography in patients treated with intravenous PCA with morphine has shown a higher incidence of decreased arterial saturation and bradypnea than those reported with regular, intermittent, monitoring²⁰.

The incidence of respiratory depression reported in the literature varies from zero to 5.2% when opioids are used for analgesia. However, the incidence is more commonly about 0.25%^{3,4,14,19,20}. This frequency is very similar to the general incidence of respiratory depression seen in the present study (2.5 cases in 1,000).

The risk factors for respiratory depression in patients treated with intravenous PCA commonly described in the literature include age above 70 years; use of basal continuous infusion; presence of renal, hepatic, pulmonary, or cardiac dysfunction; history of sleep apnea; concomitant use of central nervous system depressants; obesity; thoracic or upper abdomen surgery; and boluses greater than 1 mg^{14,21,22}. Other risk factors include hypovolemia, lack of comprehension on how the PCA works, and use of the analgesia device by a third party (family members, for example). In the present study, it was not possible to identify specific risk factors. The cases of respiratory depression were rare and occurred after different anesthetic techniques and surgical interventions.

In this series, the complication occurred more commonly in patients younger than 16 years. Most of those patients were treated with intravenous PCA. On the other hand, the literature describes that elderly patients treated with parenteral opioids have a higher incidence of postoperative apnea and periodic respiration while asleep. This effect reflects a higher initial plasma concentration of the opioid and not a higher sensitivity of the respiratory center. Commonly, the consumption of opioids is lower in elderly than in younger patients when intravenous PCA is used¹². However, they report comparable pain relief with a lower incidence of adverse effects and greater satisfaction²³. The results of the present study, i.e., younger patients showing a higher incidence of respiratory depression could be explained by an overdose due to the inadequate use of the PCA equipment. But in fact those patients used low doses of the opioid (Table III).

Opioid-induced respiratory depression after intravenous or epidural administration can occur at any time during the postoperative period⁴. In fact, in the present study, although the mean interval for the development of respiratory depression was of 18 hours, this interval varied anywhere from 1 hour to 72 hours. The doses of opioids administered also varied considerably in patients who developed respiratory depression, which demonstrates the individuality of this problem. Taylor et al.²² reported that the incidence of respiratory depression is higher in the first 24 hours of the postoperative period. For this reason, many authors recommend that patient observation and monitoring of the level of sedation and respiratory frequency should be done more frequently in the first 24 hours²². Pulse oximetry should also be used when basal continuous opioid infusion is associated with intravenous PCA⁹. One might have to be more vigilant at night. Nocturnal hypoxemia in patients with intravenous PCA, whose severity can be decreased by the administration of supplementary oxygen, has been described²⁴.

In epidural analgesia, respiratory depression secondary to the use of opioids can be classified didactically as early and late. Early depression occurs more commonly with lipophilic opioids (fentanyl, sufentanil, and diamorphine) up to two hours after administration and it is secondary to the systemic absorption and supraspinal effect of opioids^{25,26}. The availability of more liposoluble opioids to reach the cerebrospinal fluid (CSF) and the spinal cord is reduced²⁷. Therefore, the analgesic action is segmentary and of shorter duration. The concentration of lipophilic opioids in the CSF decreases rapidly, they show limited rostral dispersion, and they are associated with a lower risk of respiratory depression²⁷. The risk of respiratory depression increases with the epidural administration of hydrophilic opioids, such as morphine. Those drugs are absorbed more slowly from the CSF and, for this reason, have greater rostral dispersion and can accumulate²⁷. They are commonly associated with the late type of respiratory depression that can manifest up to 24 hours after the administration of the drug, but typically occurs after 6 to 12 hours²⁷.

The incidence of respiratory depression differs considerably among the different analgesia techniques with opioids. In the present study, patient-controlled intravenous analgesia was associated with a significantly greater rate of respiratory depression. It was not possible to identify, in our study population, whether the use of continuous opioid infusion is an additional risk factor for this complication. Since this is a rare occurrence, it is possible that the size of the study population was not enough to rule out this hypothesis. However, other authors defined the use of continuous opioid infusion as a risk factor for respiratory depression^{9,28}. The safety of intravenous PCA is based on a negative feedback in which the patient becomes too sedated to activate the demand button before the development of clinically relevant respiratory depression. On the other hand, the addition of basal infusion to intravenous PCA can increase the incidence of respiratory

depression since it interrupts the safety mechanism of this technique because it maintains the administration of the opioid despite the progression to respiratory depression⁹. Only one patient treated with epidural analgesia developed respiratory depression. In this case, fentanyl was the opioid administered. The epidural administration of opioids is associated with numerous and occasionally severe adverse events^{25,29-31}. However, respiratory depression induced by the epidural administration of opioids is a rare complication^{25,32}. Indeed, studies have suggested that its incidence is lower than with the intermittent systemic administration of opioids²⁵. This is an effective analgesia technique^{25,29} that can be safely used in postoperative wards^{32,33}. In continuous epidural infusions, lipophilic opioids such as fentanyl and sufentanil are the drugs of choice due to their fast onset of action and short duration facilitating dose titration. Centralizing the epidural catheter in the dermatomes of the surgical wound is fundamental to guarantee not only the quality of analgesia, but also the administration of smaller doses of local anesthetics and opioids and consequently reducing the incidence of adverse events³⁴.

Regardless of the route of administration of opioids, respiratory depression does not develop suddenly. It is always associated with other signs of depression of the central nervous system, such as sedation¹⁶. Analgesia precedes sedation, which precedes respiratory depression. Tsui et al.³⁵ reported that 95% of patients with respiratory depression also had somnolence. Deep sedation is considered a clinical sign of impending respiratory depression. Therefore, regular monitoring of the level of consciousness during the analgesia period is necessary for the early detection of respiratory depression²⁵. The majority of patients who presented arterial desaturation maintained respiratory frequency equal or greater than 10 bpm. Parker et al.³⁶ observed that 16.1% of patients showed excessive sedation, while only 5.2% showed oxygen saturation below 85%. Finally, Wheatley et al.³⁷ demonstrated that the respiratory rate was lower than 10 bpm in only 2.0% of patients who were sedated. In large size surgeries, epidural analgesia was associated with lower levels of sedation while intramuscular administration of opioids and intravenous PCA were more commonly associated with sedation³⁸.

Intravenous PCA and epidural analgesia are effective in the control of postoperative pain. The incidence of respiratory depression is very low and easily reversible when proper monitoring and individualized care are instituted. The risk-benefit ratio is widely favorable to the use of those analgesia techniques in the postoperative period.

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RESUMEN:

Duarte LTD, Fernandes MCBC, Costa VV, Saraiva RA - Incidencia de Depresión Respiratoria en el Postoperatorio en Pacientes Sometidos a la Analgesia Venosa o Epidural con Opioides.

JUSTIFICATIVA Y OBJETIVOS: *La analgesia controlada por el paciente (PCA), por vía venosa o epidural, es una técnica segura y eficaz en el tratamiento del dolor postoperatorio. Sin embargo, el uso de opioides no está exento de riesgos y la depresión respiratoria es la complicación más temida. Los objetivos de este estudio fueron describir la incidencia de depresión respiratoria asociada a la analgesia postoperatoria con opioides administrados por vía epidural o venosa, y las características de los pacientes que presentaron la complicación.*

MÉTODO: *Estudio de incidencia retrospectiva en pacientes operados en el Hospital SARAH Brasilia entre diciembre de 1999 y diciembre de 2007 y tratados con PCA con opioides por vía venosa o epidural. Se definieron como casos de depresión respiratoria, frecuencia respiratoria d'' 8 irpm, necesidad del uso de naloxona, o saturación periférica de oxígeno por debajo de un 90%.*

RESULTADOS: *Fueron evaluados 2790 pacientes, de los cuales 635 pacientes recibieron PCA venosa y 2155, analgesia epidural. Se dieron siete casos de depresión respiratoria postoperatoria (incidencia de 0,25%). De ellos, seis pacientes fueron tratados con PCA venosa con morfina, mientras que el último recibió analgesia epidural con fentaniil. El promedio de edad fue de $30,5 \pm 24,7$ años; el tiempo medio entre el término de la anestesia hasta el apareamiento de la depresión respiratoria fue de $18,1 \pm 26,3$ horas. El apareamiento de depresión respiratoria fue significativamente más frecuente en la PCA venosa con morfina ($p = 0,001$) y en una edad menor que 16 años ($p < 0,05$).*

CONCLUSIONES: *La incidencia de depresión respiratoria encontrada fue similar a la descrita en la literatura, siendo más frecuente en niños y adolescentes con PCA venosa.*