Thoracic combined spinal-epidural anesthesia for laparoscopic cholecystectomy in an obese patient with asthma and multiple drug allergies: a case report

DOI 10.1515/iss-2016-0024
Received September 28, 2016; accepted November 6, 2016; previously published online December 3, 2016

Abstract: Drug allergies, asthma, and obesity are more common in modern societies, and patients with these problems are often a challenge for anesthetists. Different techniques of regional anesthesia can be beneficial particularly for this group of patients. We present a patient who suffered from all of the above-mentioned conditions and successfully underwent laparoscopic cholecystectomy under thoracic combined spinal-epidural anesthesia. It is still not a popular practice, and we would like to show another indication for using it.

Keywords: anesthesia in obese patients; anesthesia in patients with asthma; laparoscopic cholecystectomy; thoracic combined spinal-epidural anesthesia.

Case report

Our patient, a 34-year-old female ASA III, was scheduled for elective laparoscopic cholecystectomy because of repetitive biliary colic episodes present for past 2 months. She was referred to our department after she was disqualified from general anesthesia in two other hospitals. The patient was obese, her body mass index (BMI) was 47 (127.5 kg, 168 cm), and she suffered from many comorbidities. She had arterial hypertension treated with telmisartan, furosemide, clonidine, bronchial asthma controlled with salmeterol and fluticasone, and stage 3 chronic kidney disease (cyclosporine-induced nephropathy). She also suffered from atopic dermatitis (treated with cetirizine, steroids, and cyclosporine, which resulted in nephropathy) and multiple drug allergies. She also experienced anaphylactic shock (presumably induced by drugs) in her history. Drug allergies were diagnosed and confirmed by an appropriate allergological assessment. The patient was allergic to atropine, midazolam, ethomidate, fentanyl, tramadol, suxamethonium, vecuronium, cisatracurium, and metamizole. Allergy to lidocaine and bupivacaine was ruled out.

We decided that standard general anesthesia was not a safe choice in this particular case, especially due to the limited drug choice and the history of anaphylactic shock. Therefore, after discussing possible options with both the patient and the surgeons, we decided to perform thoracic combined needle through needle spinal-epidural (CSE) anesthesia according to the experience of van Zundert’s group [1, 2]. After the decision, the patient was prepared for the surgery by the bariatric team in cooperation with nephrologists. We wanted to keep the insufflation pressure during laparoscopy as low as possible, without worsening surgical conditions, so during 1 week of preoperative management a preoperative energy restrictive diet was introduced to reduce the liver and intraabdominal adipose tissue volume, to reduce intraabdominal pressure, and to facilitate laparoscopic surgery with pneumoperitoneum with lower inflation pressure. Our aim was not to exceed 12 mmHg. The management was successful and the patient lost 7 kg before the surgery.

Because of the morbid obesity of the patient, there was a high risk of laparoscopy failure and a need to converse to classic laparotomy. We anticipated this risk so we planned an anesthetic rescue strategy if this situation would occur. We planned combining thoracic epidural anesthesia with volatile induction of light general anesthesia with sevoflurane combined with low doses...
Surgical muscle relaxation was achieved by spinal anesthetic anesthesia combined with intravenous ketamine. Oxygen (4 L min\(^{-1}\)) was given through a facemask. After could move her legs and hip flexion was also possible. There were no signs or complaints of respiratory distress. The patient was discharged home.

The blood pressure decreased from 190/150 to 120–130/80 mmHg at the beginning of the surgery and the heart rate decreased from 90 to 70 beats min\(^{-1}\) and remained stable during the surgery (Figure 1). During the operation (lasted 65 min), 1000 mL of crystalloid were given intravenously. After 35 min of surgery, the patient complained of pain in the right shoulder. She was given ketamine 15 mg intravenously twice [3], and the subphrenic instillation of bupivacaine 0.25% above the liver was performed by the surgeon. Surgical conditions were acceptable for the surgeons and comfortable for the patient. The patient was able to move herself from the operation table to her bed. Once the sensory block subsided and there were no neurological sequelae, the continuous infusion of bupivacaine 0.125% was started at 6 mL h\(^{-1}\). The postoperative period was uneventful, and 3 days later, the patient was discharged home.

Cholecystectomy is usually performed under general anesthesia, but in some cases it is impossible or too dangerous for the patient. Our report proves that there is an alternative way to achieve a sufficient and comfortable anesthesia for both the patient and the surgeons using regional techniques.

Thoracic epidural anesthesia is not considered a safe technique. The two main concerns are a greater risk of damaging the spinal cord with the needle during the dura puncture and ventilatory impairment caused by an extensive thoracic nerve block. According to van Zundert’s group [1, 2], the distance between the dura mater and the spinal cord in the middle to the lower thoracic level is greater than the size of epidural space, at the same level allowing an experienced clinicist to perform safe spinal anesthesia. The incidence of paraesthesia is lower than expected and usually a response to simply withdrawing the needle [2], but it should be always taken into consideration that there is a possibility of damaging the spinal cord [2, 4].

As for ventilatory impairment, it is true that blocking the thoracic nerves will affect the strength of abdominal wall muscles and impair cough and forceful expiration, but the main respiratory muscle, the diaphragm, stays...
unaffected, as its main innervation comes from cervical nerves. We used a small amount of plain bupivacaine 0.5% combined with clonidine (1.5 mL) to reduce the impact of the block on respiratory function, and it was sufficient enough for our patient to receive oxygen 4 L/min via facemask to maintain saturation in range of 95%–97% (Figure 2), although she suffers from asthma and is extremely obese. There is, however, a potential risk of inducing respiratory distress, especially in patients with respiratory diseases such as asthma and chronic obstructive pulmonary disease and if the patient is using active expiration to maintain proper ventilation. Therefore, potential risks and benefits should be estimated for every patient individually. Another important thing is maintaining a proper pressure of pneumoperitoneum, which can be difficult because a compromise between the comfortable operating conditions for the surgeons and a satisfactory function of diaphragm is necessary.
We decided to perform thoracic CSE anesthesia instead of other possible solutions because thoracic epidural anesthesia is routinely used in our department, so we are familiar with this technique and we also wanted to provide not only a suitable surgical anesthesia but also a comprehensive postoperative pain management for our patient.

In conclusion, thoracic CSE anesthesia could be an alternative to general anesthesia for cholecystectomy, especially in patients with contraindications – severe respiratory diseases [1] or drug allergies – but only with individual evaluation of the patient and a properly experienced clinician.

Acknowledgments: We would like to thank the patient for her permission to publish the details of her case. This study was supported only by our department financial resources.

Author Statement
Research funding: Authors state no funding involved.
Conflict of interest: Authors state no conflict of interest.
Informed consent: Informed consent has been obtained from all individuals. The research related to human use complied with all the relevant national regulations and institutional policies and was performed in accordance to the tenets of the Helsinki Declaration and has been approved by the author’s institutional review board or equivalent committee.

Author Contributions
A.D. obtained the patient’s consent for publication. A.D. and H.M. performed the thoracic CSE anesthesia. M.C. wrote the first draft of the paper.

References
[1] van Zundert AAJ, Stultiens G, Jakimowicz JJ, van den Borne BEEM, van der Ham WGJM, Wildsmith JAW. Segmental spinal anesthesia for cholecystectomy in a patient with severe lung disease. Br J Anaesth 2006;96:464–466.
[2] van Zundert AAJ, Stultiens G, Jakimowicz JJ, van den Borne BEEM, van der Ham WGJM, Wildsmith JAW. Laparoscopic cholecystectomy under segmental thoracic spinal anesthesia: a feasibility study. Br J Anaesth 2007;98:682–686.
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[4] Reynolds F. Damage to the conus medullaris following spinal anesthesia. Anaesthesia 2001;56:238–247.

Supplemental Material: The article (DOI: 10.1515/iss-2016-0024) offers reviewer assessments as supplementary material.
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DOI 10.1515/iss-2016-0024
Received September 28, 2016; accepted November 6, 2016

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Reviewers’ Comments to Original Submission

Reviewer 1: anonymous
Oct 14, 2016

Reviewer Recommendation Term: Accept with Minor Revision
Overall Reviewer Manuscript Rating: N/A

| Custom Review Question(s)                                      | Response |
|-----------------------------------------------------------------|----------|
| Is the subject area appropriate for you?                       | 3        |
| Does the title clearly reflect the paper’s content?            | 4        |
| Does the abstract clearly reflect the paper’s content?         | 4        |
| Do the keywords clearly reflect the paper’s content?           | 3        |
| Does the introduction present the problem clearly?             |          |
| Are the results/conclusions justified?                         | 3        |
| How comprehensive and up-to-date is the subject matter presented? | 2        |
| How adequate is the data presentation?                         | 3        |
| Are units and terminology used correctly?                      | 3        |
| Is the number of cases adequate?                               | N/A      |
| Are the experimental methods/clinical studies adequate?        | N/A      |
| Is the length appropriate in relation to the content?          | 4        |
| Does the reader get new insights from the article?             | 3        |
| Please rate the practical significance.                        | 2        |
| Please rate the accuracy of methods.                           | N/A      |
| Please rate the statistical evaluation and quality control.    | N/A      |
| Please rate the appropriateness of the figures and tables.     | 1 - Low/No|
| Please rate the appropriateness of the references.             | 3        |
| Please evaluate the writing style and use of language.         | 3        |
| Please judge the overall scientific quality of the manuscript. | 2        |
| Are you willing to review the revision of this manuscript?     | Yes      |
The present manuscript presents data of a case report on thoracic combined spinal-epidural anesthesia for laparoscopic cholecystectomy in an obese patient with asthma and multiple drug allergies. The authors considered general anesthesia not safe in this patient and thus, performed thoracic combined needle through needle spinal-epidural anesthesia. During the 65-minute long operation oxygen was sublemented through a face mask. Intraoperatively, the patient claimed pain in the right shoulder which was treated by ketamine i.v. and subphrenic installation of bupivacaine by the surgeon. The authors conclude that thoracic combined spinal-epidural anesthesia is an alternative to achieve sufficient and comfortable anesthesia for both surgeon and patient.

The case report is well written. Details of the anesthesiologic procedures are given and discussed in detail. However, from a surgical point of view, there are some limitations of the procedure which have not been discussed yet. What is the strategy when there are problems such as insufficient pneumoperitoneum or intraoperative complications with or without need for conversion to laparotomy?

Reviewer 2: anonymous

Oct 24, 2016

**Reviewer Recommendation Term:** Revise with Major Modifications

**Overall Reviewer Manuscript Rating:** 50

| Custom Review Question(s)                                      | Response |
|----------------------------------------------------------------|----------|
| Is the subject area appropriate for you?                       | 3        |
| Does the title clearly reflect the paper’s content?            | 4        |
| Does the abstract clearly reflect the paper’s content?         | 4        |
| Do the keywords clearly reflect the paper’s content?           | 4        |
| Does the introduction present the problem clearly?             | N/A      |
| Are the results/conclusions justified?                         | 3        |
| How comprehensive and up-to-date is the subject matter presented? | 4        |
| How adequate is the data presentation?                         | N/A      |
| Are units and terminology used correctly?                      | N/A      |
| Is the number of cases adequate?                               | N/A      |
| Are the experimental methods/clinical studies adequate?        | N/A      |
| Is the length appropriate in relation to the content?          | 4        |
| Does the reader get new insights from the article?             | 3        |
| Please rate the practical significance.                        | 3        |
| Please rate the accuracy of methods.                           | 3        |
| Please rate the statistical evaluation and quality control.    | N/A      |
| Please rate the appropriateness of the figures and tables.     | 2        |
| Please rate the appropriateness of the references.             | 3        |
| Please evaluate the writing style and use of language.         | 4        |
| Please judge the overall scientific quality of the manuscript. | 3        |
| Are you willing to review the revision of this manuscript?     | Yes      |

**Comments to Author:**

The case is interesting but there are some issues which should be addresses:

- Figure 1 includes names, which should not be included in a manuscript. Please anonymise the figure.

- What means „CSF“ and „CSE“?

- What would have been the „rescue strategy“ in case of failure of the selected anesthesia form with special regard to the allergies of the patient?
Dear Editor,

I did my best trying to answer reviewer comments and to change my paper accordingly. I would like to thank You and the reviewers for Your time and effort with reading and reviewing our work.

Best regards

Reviewer #1: The present manuscript presents data of a case report on thoracic combined spinal-epidural anesthesia for laparoscopic cholecystectomy in an obese patient with asthma and multiple drug allergies. The case report is well written. Details of the anesthesiologic procedures are given and discussed in detail. However, from a surgical point of view, there are some limitations of the procedure which have not been discussed yet.

What is the strategy when there are problems such as insufficient pneumoperitoneum or intraoperative complications with or without need for conversion to laparotomy?

Answering to this comment I have included a more detailed description of the surgery and our plan in case of complications. After the decision that the surgery is going to be performed, the patient was prepared for the surgery by the bariatric team in cooperation with nephrologists. We wanted to keep the insufflation pressure during laparoscopy as low as possible, without worsening surgical conditions, so during one week of preoperative management a pre-operative energy restrictive diet was introduced to reduce the liver and intraabdominal adipose tissue volume, to reduce intraabdominal pressure and to facilitate laparoscopic surgery with pneumoperitoneum with lower inflation pressure. Our aim was not to exceed 12 mmHg. The management was successful and patient lost 7 kg before the surgery.

Because of morbid obesity of the patient, there was a high risk of laparoscopy failure and need to converse to classic laparotomy. We anticipated this risk so we planned an anesthetic rescue strategy if this situation would occur. We planned combining thoracic epidural anaesthesia with volatile induction of light general anaesthesia with sevoflurane combined with low doses of ketamine intravenously. Airway would be secured with laryngeal mask airway (the LMA ProSeal). The LMA ProSeal is equipped with an additional channel that allows suctioning of gastric contents. It is also designed to effectively protect the airway with 50% higher peak ventilatory pressures without a leak compared to standard laryngeal mask airway. We would also consider starting intravenous lidocaine infusion in case of non-adequate anaesthesia since allergy to lidocaine was excluded. If this strategy failed and airway pressure would exceed 30 mmH20, patient would be intubated in deep inhalational anaesthesia combined with intravenous ketamine. Surgical muscle relaxation was achieved by spinal anaesthesia and basic analgesia by CSE (Combined spinal-epidural anaesthesia)

Reviewer #2: The case is interesting but there are some issues which should be addresses:

- Figure 1 includes names, which should not be included in a manuscript. Please anonymise the figure.

I have anonymised the figure

- What means “CSF” and “CSE”?
CSF cerebrospinal fluid
CSE combined spinal-epidural

I have included the explanation of abbreviations in the manuscript

- What would have been the “rescue strategy” in case of failure of the selected anesthesia form with special regard to the allergies of the patient?
This comment is similar to the first one and the answer is written above. The surgery was elective and our selected anesthesia method was crucial for the whole management, so if it would fail we would try again to achieve a working, efficient CSE. If on the other hand the state of the patient would deteriorate and the procedure would become urgent, than we would perform volatile induction and maintenance of anesthesia with a high concentration of volatile anesthetic to achieve a sufficient degree of muscle relaxation without serious hypotension, combined with ketamine and lidocaine both intravenously and local for analgesia and beta-blockers for stabilizing cardiovascular response to surgical stimuli. This would only be done in an emergency situation as it is far from ideal anaesthesia but also only way without risking anaphylaxis.

**Reviewers’ Comments to Revision**

**Reviewer 1: anonymous**

Nov 04, 2016

| Reviewer Recommendation Term: | Accept |
|-------------------------------|--------|
| Overall Reviewer Manuscript Rating: | N/A |

| Custom Review Question(s) | Response |
|----------------------------|----------|
| Is the subject area appropriate for you? | 3 |
| Does the title clearly reflect the paper’s content? | 4 |
| Does the abstract clearly reflect the paper’s content? | 4 |
| Do the keywords clearly reflect the paper’s content? | 4 |
| Does the introduction present the problem clearly? | 4 |
| Are the results/conclusions justified? | 2 |
| How comprehensive and up-to-date is the subject matter presented? | 2 |
| How adequate is the data presentation? | 2 |
| Are units and terminology used correctly? | 2 |
| Is the number of cases adequate? | 5 - High/Yes |
| Are the experimental methods/clinical studies adequate? | N/A |
| Is the length appropriate in relation to the content? | 5 - High/Yes |
| Does the reader get new insights from the article? | 3 |
| Please rate the practical significance. | 2 |
| Please rate the accuracy of methods. | 2 |
| Please rate the statistical evaluation and quality control. | N/A |
| Please rate the appropriateness of the figures and tables. | 2 |
| Please rate the appropriateness of the references. | 3 |
| Please evaluate the writing style and use of language. | 2 |
| Please judge the overall scientific quality of the manuscript. | 3 |
| Are you willing to review the revision of this manuscript? | Yes |

**Comments to Author:**
The reviewers comments have been adressed well and the manuscript has benefited from the revision very much.
Reviewer 2: anonymous

Nov 03, 2016

| Custom Review Question(s)                                      | Response |
|-----------------------------------------------------------------|----------|
| Is the subject area appropriate for you?                        | 4        |
| Does the title clearly reflect the paper's content?             | 4        |
| Does the abstract clearly reflect the paper's content?          | N/A      |
| Do the keywords clearly reflect the paper's content?            | 4        |
| Does the introduction present the problem clearly?              | N/A      |
| Are the results/conclusions justified?                          | 4        |
| How comprehensive and up-to-date is the subject matter presented?| 4        |
| How adequate is the data presentation?                          | N/A      |
| Are units and terminology used correctly?                       | N/A      |
| Is the number of cases adequate?                                | N/A      |
| Are the experimental methods/clinical studies adequate?         | N/A      |
| Is the length appropriate in relation to the content?           | 4        |
| Does the reader get new insights from the article?              | 3        |
| Please rate the practical significance.                         | 3        |
| Please rate the accuracy of methods.                            | N/A      |
| Please rate the statistical evaluation and quality control.     | N/A      |
| Please rate the appropriateness of the figures and tables       | 3        |
| Please rate the appropriateness of the references               | 3        |
| Please evaluate the writing style and use of language           | 3        |
| Please judge the overall scientific quality of the manuscript.  | 3        |
| Are you willing to review the revision of this manuscript?      | Yes      |

Comments to Author:
The points I made in my recent review have been addressed sufficiently. So, the paper should be accepted for publication.