Continuous Spinal Anaesthesia for Endovascular Repair of Abdominal Aortic Aneurysm in High-Risk Patient

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Endovascular aneurysm repair (EVAR) is increasingly being used in abdominal aortic aneurysm (AAA) treatment, as it is less invasive than open surgery. A wide range of anaesthetic types, such as general anaesthesia, neuroaxial blocks and local anaesthesia, have been shown to be appropriate for the EVAR procedure. In the continuous spinal anaesthesia (CSA) method, the local anaesthetic may be titrated through a catheter placed in the subarachnoid space, allowing better control of the anaesthetic level and a reduction in potential haemodynamic side effects. Our aim is to present CSA as a successful anaesthetic technique for EVAR in an AAA patient with severe co-existing diseases.

Keywords: Abdominal aortic aneurysm, endovascular repair, continuous spinal anaesthesia, high-risk patient

Introduction

Endovascular aneurysm repair (EVAR) has become a first-line treatment option for patients with abdominal aortic aneurysm (AAA) (1). In addition to being less invasive than open surgery, it has been determined to provide an opportunity to reduce perioperative mortality and morbidity due to the use of local or regional anaesthesia, especially in high-risk patients (2, 3).

Various anaesthetic methods for EVAR have been determined in the literature. However, there are insufficient data on continuous spinal anaesthesia (CSA) use for EVAR. Our aim is to present CSA as a successful anaesthetic technique for EVAR in an AAA patient with severe co-morbid diseases.

Case Presentation

A 70-year-old male patient (weight: 68 kg, BMI: 22 kg m⁻²), who was hospitalised in the pulmonary diseases service due to shortness of breath and air hunger, was diagnosed with abdominal aortic aneurysm after thoraco-abdominal CT imaging, and EVAR was planned. With a history of hypertension, congestive heart failure and chronic obstructive pulmonary disease (COPD, sufferer from 25 years), the patient had a smoking habit of one pack day⁻¹ for 50 years. The physical examination showed rough respiratory sounds bilaterally and prolonged expiration. Pulmonary function test revealed forced expiratory volume in 1 second (FEV₁): 0.69 L (25% of the predicted value), force vital capacity (FVC): 1.41 L (48% of the predicted value) and FEV₁/FVC: 49%. ECG showed atrial fibrillation, echocardiography showed that left ventricle segmental wall motion was abnormal, ejection fraction was 25%-30%, tricuspid insufficiency was 3⁰ and pulmonary artery pressure was 45 mm Hg. Urea and creatine levels were slightly higher than normal (65 mg dL⁻¹ and 0.9 mg dL⁻¹, respectively), haematocrit level was 46.7% and white cell count was 11,800 mm⁻³. Arterial blood gas analysis gave the following results: pH: 7.41, SO₂: 89%, PCO₂: 48 mmHg and PO₂: 52.3 mmHg. The patient was accepted to be in the American Society of Anesthesiologists (ASA) IV physical risk group.

Continuous spinal anaesthesia was planned because of the patient’s advanced respiratory and cardiac problems. No premedication was administered, other than the anti-hypertensive and bronchodilator medications. In the angiography

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Received: 01.02.2014
Accepted: 03.07.2014
Available Online Date: 05.02.2015
room, after initial controls of the patient with ECG, peripheral oxygen saturation (SpO₂) and non-invasive blood pressure monitoring (NIBP), lactated Ringer’s solution infusion was begun. In the sitting position, with respect to local steri-
sation, at the L3-4 intervertebral interval, 2 mL 2% lidocaine
was administered for local anaesthesia. With a continuous
spinal set (Spinocath, B. Braun, Melsungen, Germany), an
epidural needle was inserted with a median approach, and it
was placed 7 cm into the epidural space using the loss of
tension to air method. Within the epidural needle, a 27 G
spinal needle was used to pass through the dura, and after
free flow of cerebro-spinal fluid was observed, a 24 G catheter
was placed 1.5-2 cm into the cephalic side of the subarachnoid
space. After a filter was connected and the catheter was
fixed to the skin, the patient was moved to a supine posi-
tion. About 1 hour later, 1 mL (5 mg) 0.5% levobupivacaine
(Chirocaine 0.5%, 10 mL vial Abbott, Norway), diluted with
1 mL saline (2 mL 0.25% levobupivacaine), was adminis-
tered through the spinal catheter. Sensory block was assessed
as complete loss of pinprick sensation (22-gauge hypodermic
needle). The patient was evaluated about 10 minutes after
the administration was established, and if it was not at the
T10 level, an additional dose of 0.5 mL 0.5% levobupiva-
caine, diluted with 0.5 mL saline, was administered. After
a total of 7.5 mg levobupivacaine provided sensorial nerve
block at the T10 level, the patient was taken to the angio-
graphy room, and 0.05 mg kg⁻¹ midazolam was given. After
5-lead ECG, SpO₂ and end-tidal CO₂ measurement, in ad-
tion to blood pressure monitoring, using a 20 G catheter
for intra-arterial cannulation, central vein catheterisation and
urinary catheterisation, the operation began. The procedure
was completed in an interventional angiography room using
a C-arm angiography device (INFX-8000C Toshiba Medi-
cal Systems, Tokyo, Japan). The left femoral artery and the
right femoral artery were prepared by opening with a vertical
incision. After heparinisation and placement of appropriate
catheters from the left within the 18 F sheath, the main-body
stent-graft (W.L. Gore&Associates, Inc. Flagstaff, Arizona,
USA) was opened beneath the renal arteries. Leg grafts and
necessary extensions were placed. Placement of the graft was
confirmed and contrast material leakage from the aneurysm
sac was checked (endoleak) with control angiography, the
sheaths were removed, and the procedure was ended.

The procedure lasted 100 minutes, and no additional anaes-
thesia was required. Then, 10,000 IU of heparin was neutral-
ised with 10,000 IU protamine HCl intraoperatively. A total
of 1500 mL crystalloid was given, and there was about 300
mL of blood loss during procedure. After the procedure was
ended, the patient was transferred to the ICU. For postopera-
tive analgesia, 1 mg kg⁻¹ iv tramadol was used. After a normal
bleeding-clotting profile (ACT, INR and aPTT) values was
observed, about 5 hours after heparin administration, the spi-
nal catheter was removed. No complications developed dur-
ing follow-up, and he was transferred from the ICU to the
ordinary ward on the first day of the procedure.

Discussion

In this case report, we present the use of CSA as an appropri-
ate anaesthetic method for EVAR repair of AAA in a patient
with serious respiratory and cardiac risks.

The studies about the effects of anaesthetic type on EVAR
results are limited. A multi-centre study (EUROSTAR) of
5557 patients evaluated the effects of regional and general
anaesthetics in EVAR patients. While the regional anaesthesia
group included high-risk patients, this group had fewer com-
plications than the general anaesthesia group and had shorter
intensive care and hospital stays. They determined that local
anaesthesia could be used for selecting candidates and less
complex procedures (4).

Previous studies suggest that priority should be given to tech-
niques with the possibility of dose titration, such as CSA,
rather than single-dose spinal anaesthesia, which can result in
a high anaesthetic level, even with a low dose, especially for
patients who are elderly or have cardiovascular and respira-
tory system problems (5, 6).

Similarly, there are some studies suggesting that CSA is su-
perior to combined spinal-epidural anaesthesia (CSE) and
continuous epidural anaesthesia (CEA) in terms of haemo-
dynamic stability (7-9). Imbelloni et al. (10) suggested that
both CSA and CSE provided good surgical conditions, and
sensory blockade level and incidence of haemodynamic
changes were lower with CSA in major orthopaedic surgery.
Reisli et al. (11) reported that CSA had a more rapid onset of
action, produced more effective sensory and motor blockade
and a shorter recovery period and had fewer haemodynamic
effects than CEA.

The studies evaluating levobupivacaine for CSA are limited
in the present literature. In a recent study of Sell et al. (12),
the minimum effective local anaesthetic dose was 11.7 mg
for levobupivacaine using the CSA technique for hip replace-
mant surgery. Baydilek et al. (13) reported that in patients
undergoing TUR surgery with CSA, an average of 8.7 mg
levobupivacaine provided sufficient anaesthesia. We obtained
a sufficient anaesthetic level with 7.5 mg levobupivacaine in
this case.

Mathes et al. (14) reported the use of CSA for the EVAR pro-
cedure in a patient with advanced respiratory problems. Fol-
lowing a starting CSA dose of 5 mg 0.5% isobaric bupivacaine,
within the first 20 minutes, they administered 2 extra 2.5 mg
doses and obtained T10-level anaesthesia. During the opera-
tion, which lasted for 6 hours, they administered 2.5 mg in
extra doses through the catheter twice. With minimal heart
rate and blood pressure changes and without experiencing
any respiratory problems, the procedure was completed. They
reported that in patients with serious accompanying medical
diseases, especially severe pulmonary problems, the CSA tech-
nique might be appropriate for the EVAR procedure.
The CSA method, which administers local anaesthetic media through a catheter located in the subarachnoid space, periodically and in lower doses, allows better control of the anaesthetic level and thus a reduction in the expected haemodynamic side effects. For this reason, it is suggested that the CSA method for patients with serious accompanying problems may be a better choice for establishing anaesthesia (15).

**Conclusion**

We believe the CSA technique may be safely used for the EVAR procedure in high-risk patients.

**Informed Consent:** Written informed consent was obtained from patient who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - K.Ö., Ö.Y.; Design - Ö.Y., N.T.; Supervision - Ö.Y., K.Ö.; Funding - Ö.Y., K.Ö.; Data Collection and/or Processing - Ö.Y., K.Ö.; Analysis and/or Interpretation - Ö.Y., V.H.; Literature Review - Ö.Y., N.T., V.H.; Writer - Ö.Y., N.T.; Critical Review - V.H.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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