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Spinal Versus General Anesthesia for Spine Surgery During the COVID-19 Pandemic: A Case Series

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Abstract

Background: Hospitals are one of the primary resources for disease transmission, so many guidelines were published, and neurosurgeons were advised to postpone elective spine surgeries during the COVID-19 pandemic.
Objectives: To avoid pulmonary complications and reduce the risk of spreading the virus and contracting the disease during the COVID-19 era, we operated a group of our patients under spinal anesthesia rather than general anesthesia.
Methods: We retrospectively analyzed all patients who underwent discectomy surgery for lumbar spinal disc herniation under SA between September 2020 and 2021.
Results: Sixty-four patients diagnosed with lumbar disc herniation underwent lumbar discectomy with SA. All patients except three were male. The mean age was 44.52 ± 7.95 years (28 to 64 years). The mean procedure time for SA was 10 minutes. The duration of the surgery was 40 to 90 minutes per each level of disc herniation. The mean blood loss was 350 cc (200 to 600 cc). The most common involved level was L4/L5 intervertebral disc (n = 40 patients; 63.5%). The mean recovery time was 20 minutes. Only three patients requested more analgesics for relief of their pain postoperatively. All patients with discectomy were discharged a day after surgery, and in the case of fusion, two days after surgery. All the patients were followed up for six months, showing no recurrence symptoms, good pain relief, satisfaction with the surgery, and no bad memory of the surgery.
Conclusions: Spinal anesthesia is a good alternative or even the main anesthesia route for patients with lumbar disc herniation. More studies are needed to elucidate the best candidate for SA in patients with lumbar pathology.

Keywords: Lumbar Disc Herniation, Diskectomy, SARS-CoV-2, General Anesthesia, Spinal Anesthesia

1. Background

As a new respiratory infection caused by SARS-CoV-2, COVID-19 started in China and rapidly spread to all countries worldwide. Following its widespread outbreak, the WHO declared a new pandemic on March 11, 2020 (1).

Hospitals are one of the primary resources for disease transmission, so many guidelines were published, and neurosurgeons were advised to postpone elective spine surgeries during the COVID-19 pandemic. Although many spine problems do not need an emergency operation, postponing surgery until an unknown time is impossible. Moreover, many spine diseases result in disabling pain and morbidity, which interfere with daily life; therefore, many spine surgeries continue to be done (1, 2).

At present, general anesthesia (GA) is the most common technique of anesthesia for spine surgery. Some studies evaluated the effectiveness of spinal anesthesia as an excellent alternative to GA for spine surgery. Spinal anesthesia (SA) has some advantages over GA: Decreased blood loss, decreased post-operative pain score, less post-operative hospitalization, less need for blood transfusion, reduction of anesthesia and operation time, reduction of post-operative hypoxic episodes, less possibility of brachial plexus injury and pressure ulcer, and less likelihood of post-operative complications (2-4).

Some studies have revealed that lower thoracic and lumbar pathologies can be operated safely under SA, and this anesthetic approach is emerging for spine surgeries (4, 5).

2. Objectives

Due to the extensive prevalence of COVID-19 in our geographic area and considering that many patients with lumbar disc herniation had refractory pain and needed surgery, we operated them on using SA instead of GA. Here,

we share our experience with SA in the COVID era for lumbar disc herniation surgery and discuss the advantages and disadvantages.

3. Methods

We retrospectively evaluated all patients who underwent discectomy surgery for lumbar spinal disc herniation (by the senior author (SA D)) between September 2020 and 2021.

3.1. Preoperative Evaluation

For all patients, conservative management failed, and they were candidates for the surgery due to refractory and disabling symptoms or neurological deficits. A lumbar spine MRI was performed to document the pathology and rule out other diagnoses. Whenever needed, EMG and NCV were performed.

For the evaluation of COVID-19, we followed the hospital protocol as follows. First, a detailed history and physical examination were obtained, and then a chest CT scan was performed to evaluate the pulmonary involvement of COVID-19. We routinely did not take laboratory tests to evaluate COVID-19 status, but a laboratory test was requested in the presence of symptoms or pulmonary signs of COVID-19. The surgery was postponed for patients with signs and symptoms of COVID-19 or positive laboratory tests except for emergency cases. All patients were admitted to the hospital the night before or on the morning of surgery.

3.2. Intraoperative Protocol

An anesthesiologist evaluated all patients in the operating room. The procedure was started with local anesthesia in the lumbar puncture site with 5 cc lidocaine 2% in the sitting position. Lumbar puncture was performed by a 24-gauge needle. For spinal anesthesia, 12.5 mg bupivacaine and 20 μg fentanyl were injected intrathecally, commonly resulting in anesthesia at the level of T8.

Although T8 was the lowest level of anesthesia we planned, extending it even to the T4 level was possible, if necessary. Fortunately, we did not need higher levels of anesthesia in our series. However, as a routine practice, we avoided that for the following reasons. First, we thought that anesthesia above the T8 level might involve the respiratory muscles and not only make the patient uncomfortable and unwell, but might even agitate the patient, interfere with the operation, and require more sedatives. Second, considering the pathology and the duration of surgery, we estimated that this level of anesthesia is appropriate and sufficient.

Moreover, it was estimated that anesthesia at the T8 level would take about 4 hours to wear off, so we planned SA only for patients with an estimated surgery duration of roughly two hours (because we anticipated that this procedure might take longer than the anesthesia time). Furthermore, despite this caution, we were prepared to convert SA to GA if necessary.

In addition, we did not observe any significant side effects or complications related to SA or the surgical approach. Fortunately, we did not have any cases of converting SA to GA intraoperatively too. It should be mentioned that from our knowledge and experience, we consider T8 dermatome to be sufficient even for upper lumbar surgery.

A Foley catheter was inserted for all patients. After 5 minutes, the patient was placed in the prone position. The patients were asked to check the position by themselves to be comfortable. The position was rechecked and revised whenever the patient was uncomfortable, and in the case of agitation after a prone position, 2 - 3 mg midazolam or sometimes 0.7 - 0.1 μg/kg dexmedetomidine was prescribed intravenously. The cardiopulmonary conditions were monitored thoroughly throughout the operation.

3.3. Post-operative Measures

After the procedure was finished, the patient was turned to a supine position and transferred to the recovery room. After two levels of reduction at the anesthesia level, the patient was transferred to the ward. Apotel was prescribed after the operation as an analgesic. After returning the sensory and motor function of the lower limb, the patients ambulated. In the case of uneventful surgery, the patients were discharged a day after surgery.

3.4. Inclusion Criteria

We included patients diagnosed with lumbar discopathy who were candidates for surgery, patients older than 18 years, those with informed consent to surgery, and those who were candidates for SA by the anesthesiologist.

3.5. Exclusion Criteria

We excluded the patients who had clinical, radiologic, or laboratory evidence of COVID-19, patients who refused SA, and those with evidence of infection at the site of needle puncture, a history of increased intracranial pressure, inability to sit for lumbar puncture, and missing the follow-up.

3.6. Ethical Considerations

The retrospective study was conducted following the Helsinki Declaration. Moreover, informed consent was obtained from all patients.

Table 1. Summarizes the Results of the Present Study.

Variables	Results
Number of patients	64
Mean age (y)	44.52 ± 7.95
Mean weight (kg)	79
Sex (patients)	
Male	61
Female	3
Mean procedure time for SA (min)	10
Mean blood loss (cc)	350
Mean recovery time (min)	20
Surgical procedure (patients)	
Diskectomy	60
Laminectomy	2
Laminectomy and diskectomy (patients)	one
Laminectomy and fusion	one
Level of disc herniation (patients)	
L4/L5	40
L5/S1	19
L3/L4	one

4. Results

Sixty-four patients diagnosed with lumbar disc herniation underwent lumbar discectomy with SA. All the patients except three were male. The mean age was 44.52 ± 7.95 years, ranging from 28 to 64 years. The mean weight was 79 kg in the range of 61 to 83.5 kg. All the patients had a positive family history of disc herniation. The mean procedure time for SA was 10 minutes. The duration of the surgery was 40 to 90 minutes per each level of disc herniation. The mean blood loss was 350 cc, ranging from 200 to 600 cc.

In 60 patients, a one-level discectomy was performed, and two patients underwent only laminectomy without discectomy (laminectomy from L2 to L5). One patient had a two-level laminectomy and one-level discectomy, and one had a laminectomy and pedicular screw fusion.

The most common involved level was L4/L5 intervertebral disc (n = 40 patients; 63.5%). The other involved levels included L5/S1 in 19 patients and L3/L4 in one patient.

The mean recovery time was 20 minutes. Only three patients had requested more analgesics for relief of their pain postoperatively.

All the patients with discectomy were discharged a day after surgery, and in the case of fusion, two days after surgery. All the patients were followed up for six months, showing no recurrence symptoms, good pain relief, satisfaction with the surgery, and no bad memory of the surgery.

5. Discussion

Unnecessary surgeries have been postponed during the COVID-19 era, primarily cosmetic surgeries. Spinal diseases that usually need surgery cannot be postponed due to neurological deficits, gait problems, or severe pain.

Despite strict preoperative COVID-19 screening, some patients may be asymptomatic or in the latent phase of the disease. These cases are at higher risk of pulmonary complications after GA or can transmit the disease to the hospital staff, especially the anesthesia team, during the intubation (6).

It is demonstrated that SA has some advantages over GA: Less post-operative nausea and vomiting, less cardiopulmonary concerns, less post-operative narcotics for pain relief, less hospitalization time and cost, reduced possibility of cardiac attacks, less venous and arterial thrombosis, fewer complications related to the prone position such as compressive sore, and less cognitive dysfunction. Moreover, during the COVID-19 pandemic, SA has more advantages, including less concern about disease transmission during intubation and extubation, decreased likelihood of ventilator and other instrument contamination, and decreased risk of COVID-19-related pulmonary complications (1, 3, 4, 7).

Deng et al. compared 619 patients undergoing spine surgery with GA and 144 with SA. In the SA group, 106 patients underwent spinal decompression, 11 underwent foraminotomy, and 27 underwent microdiscectomy. The approach for SA was a lumbar puncture in the sitting position, IV sedation with midazolam or fentanyl for the puncture, bupivacaine for intrathecal injection with a 22-, 24-, or 25-gauge needle, and IV sedation with propofol, midazolam, or fentanyl for intraoperative sedation. The mean total medicine number per patient was 10 drugs in the GA group and five in the SA group, which was significantly different. Moreover, the frequency of vasopressors usage and the number of patients who received vasopressors were significantly lower in the SA group (8).

Studies reported the baseline total post-operative complication rates of up to 10% and subsequent mortality of up to 3% in the pre-COVID-19 era. During the COVID-19 pandemic, patients who are a candidate for surgery are at higher risk of exposure to SARS-CoV-2 and subsequent respiratory complications during hospitalization and surgery. It is due to pro-inflammatory cytokines and immunosuppressive response following surgery and ventilation (1).

An international, multicenter cohort study conducted in 235 hospitals in 24 countries evaluated 1128 patients who underwent surgery and had a COVID-19 infection from seven days before to 30 days after the operation. All the patients had a 30-day follow-up. COVID-19 infection was diagnosed in 26.1% of the patients before and 71.5% after the operation. The diagnosis was made by laboratory tests, radiologic and clinical findings in 85.9%, 7.1%, and 6% of the patients, respectively. The 30-day mortality was 23.8%. Men had higher mortality than women (28.4% vs. 18.2%), and patients aged 70 or older had higher mortality than those below 70 years (33.7% vs. 13.9%). The mortality was higher in emergency operations than in elective ones (25.657% vs. 18.9%). Also, 51.2% of the patients had at least one respiratory complication; 40.4% had pneumonia, 21.3% had unexpected ventilation, and 14.4% had ARDS. The patients with respiratory complications had higher 30-day mortality (38% vs. 8.7%). Also, 81.7% of the patients who died had respiratory complications. They explained that the threshold for spine surgery in the COVID era should be higher than normal practice. Moreover, men aged 70 or older with an emergency or a major operation are especially at higher risk of mortality. In this study, mortality was mainly related to post-operative respiratory complications. They concluded that during the COVID-19 pandemic, unnecessary procedures should be postponed, and non-surgical treatment should be enhanced to avoid surgery (1).

In another study, Khattab et al. evaluated 149 patients who underwent lumbar and lower thoracic spine surgery by SA. Also, 49 patients were male, and 100 were female. The mean age was 47.5 years in the range of 22 - 85 years. The duration of surgery was 45 to 300 minutes, and the mean blood loss was 385 ± 156 cc. There were no main intraoperative or cardiopulmonary complications. All the patients were able to tolerate PO immediately after the surgery. The patients could be ambulated without helping devices 6 to 8 hours after surgery. The patients were discharged 2 or 3 days after surgery. The VAS and DOI demonstrated excellent post-operative pain relief. In addition, 124 patients were satisfied with the surgery under SA, and the remaining patients were unsatisfied with SA but were satisfied with the post-operative outcome (9).

In another study, Pierce et al. evaluated 544 patients (183 under GA and 361 under SA). They reported that operation time, total anesthesia and recovery time, time to incision, and length of stay in the Post-anesthesia Care Unit and the hospital were significantly shorter in the SA group (10).

In a review article, De Rojas et al. reviewed 11 publications after removing the unmatched studies. Seven publications reported the length of stay in PACU, two in favor of GA and one in favor of SA. Four publications did not show any difference. Six studies reported hospitalization time, of which two favored the SA. Considering pain score and narcotic prescription, seven studies demonstrated better outcomes in the SA. Moreover, in five of eight reports, the nausea was less in SA than in GA (11).

Furthermore, post-operative pain is a significant cause of patient discomfort, patient immobility, immobility-related complications, and high post-operative analgesic usage. It is explained that epidural and intrathecal anesthesia drugs can decrease the severity of post-operative pain. Therefore, patients who underwent SA had less post-operative pain (12). In support of this, Attari et al. compared patients who operated under SA and GA in a randomized clinical trial. They showed that the prescription of painkillers and using meperidine were significantly lower in the SA group, and patients who underwent SA were more satisfied than those in the GA group (4).

In our series, there were no intraoperative complications; the mean time of the anesthesia procedure was shorter than it was in GA; in the absence of IV sedation, the patient had a protective face mask throughout the operation; also, the recovery time was much shorter than it was in GA, and the risk of COVID-19 transmission was very low.

5.1. Conclusions

Spinal anesthesia is a good alternative or even the main anesthesia route for patients with lumbar disc herniation. More studies are needed to elucidate the best candidate for SA in patients with lumbar pathology. Moreover, further research should demonstrate the results of SA for spinal fusion and spinal pathologies other than disc herniation and lumbar region.

Footnotes

Authors' Contribution: Daneshi AH: Design of the study, supervision of the study, and revision of the manuscript. Nabiuni M: Design of the study, supervision of the study, and revision of the manuscript. Taheri M: Collection of data, statistical analysis, writing the article, and interpretation of results. Pour Rustaei R: Collection of data, statistical analysis, and interpretation of results.

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