

CASE REPORT

Cardiac arrest as an unusual complication in transforaminal full-endoscopic spine surgery under local anesthesia : a case report

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Abstract : Background : Transforaminal full-endoscopic surgery can be performed under local anesthesia, which is safer than general anesthesia, especially in the elderly. However, emergencies can still occur under local anesthesia. We describe a case of cardiac arrest at the start of full-endoscopic spine surgery under local anesthesia. Case presentation : The patient was an 80-year-old woman with right lower leg pain caused by two-level lumbar spinal canal stenosis. Two-stage full-endoscopic spine surgery under local anesthesia was planned. The first surgery was completed uneventfully. However, during the second surgery, cardiac arrest occurred because of Mobitz type II atrioventricular block. Percutaneous pacing was started immediately, followed by insertion of a temporary pacemaker via the femoral artery as a life-saving measure. Four days later, a permanent pacemaker was implanted. One month later, the second-stage decompression was completed without complications. Conclusion : Elderly patients require careful intraoperative monitoring for emergencies during surgery under local anesthesia as under general anesthesia. *J. Med. Invest.* 71 : 314-319, August, 2024

Keywords : Cardiac arrest, lumbar spine, full-endoscopic spine surgery (FESS)

INTRODUCTION

With ongoing technological advances, the indications for full-endoscopic spine surgery (FESS) are expanding rapidly. FESS can now be used to treat not only lumbar disc herniation but also a variety of other conditions, including lumbar spinal canal stenosis (1-3). Moreover, FESS can be performed using a transforaminal approach (TF) under general anesthesia or local anesthesia (4, 5). TF-FESS under general anesthesia carries a risk of intraoperative exiting nerve root injury, and Talgat *et al.* have reported that this risk is reduced when the procedure is performed under local anesthesia (6). Furthermore, local anesthesia is safer than general anesthesia for spine surgery in patients with poor general condition and in the elderly. However, surgery under local anesthesia is not always safe, and there has been a report of cardiac arrest following dexmedetomidine infusion in a patient undergoing cataract surgery under local anesthesia (7).

There have been many reports of perioperative and intraoperative cardiac arrest during spinal surgery under general anesthesia (8-10) but none during FESS under local anesthesia in patients with no preoperative evidence of atrioventricular (AV) block. This report presents as a cautionary tale a case of cardiac arrest at the start of full-endoscopic spine surgery under local anesthesia after the appearance of complete AV block.

REPORT OF THE CASE

The patient was an 80-year-old woman who had experienced pain in the anterior area of the right thigh and lateral area of the lower right leg for several years. Her weight was 48.3 kg and her height 157 cm, BMI 19.6. The pain worsened with standing, walking, and sitting. Physical examination revealed hypoesthesia of the right lateral lower leg but no muscle weakness in either lower limb. A femoral nerve stretch test was negative on both sides. A straight leg raise test was positive on the right at 70 degrees and negative at 90 degrees on the left.

X-ray examination (Figure 1) showed degenerative scoliosis with L3 as the apical vertebra. T2-weighted magnetic resonance images revealed bilateral lateral recess stenosis at L3/4 and L4/5 which was associated with scoliosis (Figure 2). A selective nerve block at L4 and L5 confirmed a diagnosis of right-sided radicular pain caused by lateral recess stenosis at L3/4 and L4/5. The surgical treatment options were posterior decompression under general anesthesia or TF-FESS under local anesthesia. Considering that the patient had only radicular pain, we decided that TF-FESS would be sufficient to improve her symptoms. Furthermore, given that the patient was elderly and wanted a minimally invasive procedure, we elected to perform TF-FESS.

When performing TF-FESS at one level in elderly women, we usually use about 20 mL of 1% lidocaine without adrenaline at a time to avoid local anesthetic overdose. Thus, we planned two-stage surgery in which the L4/5 level would be treated first and the L3/4 level 1 month later. The patient's pre-existing medical conditions included hypertension and hyperlipidemia but there was no history of cardiac problems or syncope. A preoperative electrocardiogram (ECG) showed sinus rhythm and complete right bundle branch block. There were no abnormalities on the ECG or intraoperative complications when we treated the L4/5 level under local anesthesia. Her right lateral leg pain disappeared immediately after the operation. However, because she

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Figure 1. Preoperative X-ray images obtained for an 80-year-old woman with right leg pain. The whole spine view shows scoliosis in the front (A) and lateral (B) views.



Figure 2. Preoperative T2-weighted magnetic resonance images showing (A) lumbar canal stenosis at L3/4 (B) and L4/5 (C) in midsagittal and axial views.

continued to have pain in the medial aspect of the right lower leg, FESS at L3/4 was scheduled for one month later as planned. There were no unusual events during the interval between discharge after the first surgery and the second admission. The patient's ECG at the time of readmission is shown in Figure 3A. In the ECG, there were suspicious findings of 2 : 1 Mobitz type II AV block in the V3 induction in beats 3rd and 4th, but no findings in the other inductions due to small P waves and no episodes of syncope, making accurate discrimination at this point difficult. When we later checked the ECG on arrival in the operating room, we found a 2 : 1 Mobitz type II AV block in part (Figure 3B). Her other vital signs were normal, non-invasive blood pressure was 145/82 mm/Hg, saturation of percutaneous oxygen was 98% in room air. Pentazocine and hydroxyzine hydrochloride in 0.5 A were injected preoperatively. After position change from spine to prone, non-invasive blood pressure was 139/79 mm/Hg, heart rate was 55 beats per minutes, saturation of percutaneous oxygen was 98% in room air, she had no symptoms. Even at this point, a later check of the ECG waveform record showed a 2 : 1 Mobitz type II AV block in part (Figure 3C).

Atropine was then administered. After a short period of observation, the patient's HR decreased to about 40, and Mobitz type II AV block was clearly observed with a 1 : 2 pattern (Figure 3D). At this point, we consulted an anesthesiologist. A short time later, the patient developed complete AV block (Figure 3E) and cardiac arrest, so the surgery was immediately aborted, chest compressions were started immediately (Figure 3F). The patient was returned to the supine position, and percutaneous pacing was started within 2 minutes after cardiac arrest. The cardiologist arrived and inserted a temporary pacing wire via the right femoral artery, after which the HR stabilized. This temporary pacing was performed about 15 minutes after percutaneous pacing was started. Coronary angiography performed 2 days later did not show any significant stenosis in the coronary arteries. Five days after the cardiac arrest, the cardiologist implanted a permanent pacemaker. The ECG recorded after implantation of the pacemaker is shown in Figure 3G. Two months later, when the patient's condition had stabilized, FESS was performed under local anesthesia to treat the L3/4 level (Figure 4). No problems were noted intraoperatively, and the patient's pain in the right anterior thigh area and medial aspect of right lower leg was improved.

DISCUSSION

Spine surgery in the prone position is associated with several types of risk. Reports on the frequency of cardiac events in spine surgery range from 0.67% in the paper by Fineberg *et al.* (11) to 0.34% in a report by Bovonratwet *et al.* (12). However, cardiac arrest during spine surgery is rare; Quinn *et al.* reported a rate of 0.213% and that 25% of cases occurred intraoperatively or on the day of surgery (13). However, most of these reports concern complications that have occurred when surgery is performed under general anesthesia, with few on systemic complications during lumbar spine surgery under local anesthesia. The main concerns about surgery under local anesthesia are whether analgesia is adequate and xylocaine toxicity. Zhu *et al.* reported that local anesthesia is less effective than epidural anesthesia in terms of providing analgesia (14, 15). Furthermore, although there are no reports of lidocaine toxicity during spinal surgery, Barrington *et al.* reported that lidocaine toxicity occurred in 0.098% of patients undergoing peripheral nerve block (16). Although such complications are possible, the risk of sudden clinical deterioration during surgery under local anesthesia is considered to be less than that during surgery under general anesthesia. Sairyo *et*

al. have performed FESS under local anesthesia in very elderly patients and those in whom general anesthesia is not possible and reported symptomatic improvement (17). However, we have encountered a case of cardiac arrest as a result of AV block during FESS.

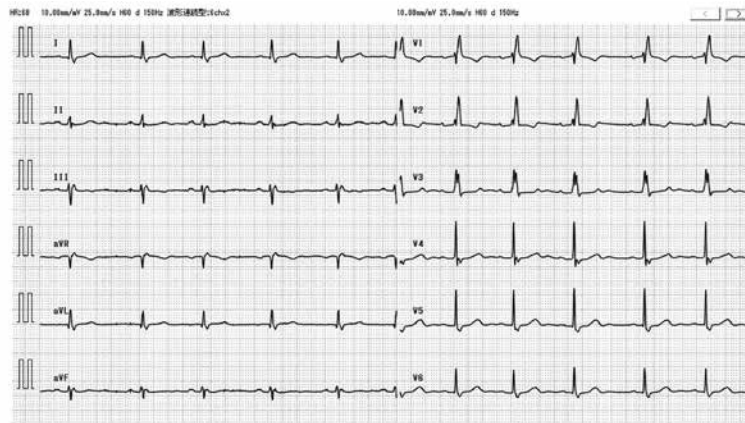
AV block occurs when normal impulse conduction through the heart is interrupted. Normal electrical conduction begins at the sinoatrial node, spreads throughout the atria, then collects at the AV node, travels to the bundle of His and the bundle branches, and propagates along the Purkinje fibers of the ventricles. Conduction disturbances can occur at both the AV node and the lower branches; most Mobitz type II blocks originate in the AV node downstream of the AV node (18). AV block can be caused by ischemia, drug toxicity, hyperkalemia, overstimulation of the vagal nerve, valvular heart disease, and myocarditis.

Our patient had a pre-existing abnormal conduction pathway, which was aggravated by overstimulation of the vagal nerve in response to strong anxiety and tension during preparation for surgery, resulting in type II AV block followed by cardiac arrest as a result of complete AV block (19, 20). Our patient had symptomatic Mobitz type II block, which is an indication for a permanent pacemaker under the ACC/AHA/NASPE guidelines (21). Therefore, a pacemaker was implanted in this case.

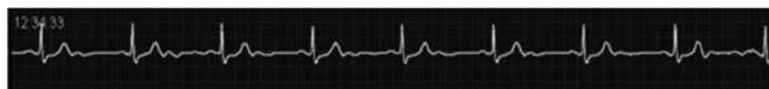
In our patient, given that the surgery was performed under local anesthesia, only an orthopedic surgeon was present during the procedure. However, an anesthesiologist arrived within 1 min of the cardiac arrest and a cardiologist arrived 7 min later. We believe that it is very important to establish a system for responding to sudden clinical deterioration during surgery. As reported by Pinheiro *et al.*, strict anesthesia management by an anesthesiologist may be necessary even in surgery under regional anesthesia (22). During a local anesthesia procedure, the primary surgeon or an assistant is basically the only person in the operating room. Because the primary surgeon is focused on preparing for and performing the surgery, the surgeon is unable to check the monitor and tends to be delayed in responding to minute changes in electrocardiograms and vital signs. We hope a system that anesthesiologists can manage the patient's general condition even in low-risk surgeries under local anesthesia should be established.

Furthermore, a decision must be made to immediately stop the surgery and change the patient's position from prone to spine. Vascular occlusion and decreased venous return occur in the prone position, which can result in an escalating reduction in cardiac output with unexpected intraoperative bleeding and a decreased circulating blood volume (23). Ko HC *et al.* experienced numerous hemodynamic changes after a change to the prone position during spinal surgery. They reported that peripheral blood retention decreased venous return, increased intrathoracic pressure and decreased left ventricular compliance increased afterload, resulting in left leg block (24). Kim KO *et al.* reported a case of atrioventricular block with ventricular asystole during supine position for hemorrhoidectomy under spinal anesthesia (25). Thus, during positional changes in surgery and spinal anesthesia, changes in circulatory dynamics can occur and induce arrhythmia. In a conscious surgery such as this one, the vagal reflex can occur. Vagally mediated atrioventricular block can be found in any situation in which a rapid parasympathetic outflow to the heart occurs, including carotid sinus massage, tilt-induced syncope, vasovagal syncope, and emotional distress. In this case, it is thought that the block was exacerbated by changes in hemodynamics, decreased venous return due to compression of the thorax in the prone position, and vagally mediated exacerbation of atrioventricular block, leading to cardiac arrest. Kwee *et al.* recommend that the patient be placed immediately in a supine position if cardiac arrest occurs because of the poor resuscitation

(A) Electrocardiogram recorded before the second surgery



(B) ECG recorded on arrival in the operating room



(C) ECG recorded 5 min after arrival in the operating room



(D) ECG recorded immediately before starting the operation



(E) Mobitz type II block changed to complete AV block



(F) Cardiac arrest occurred



(G) Electrocardiogram after pacemaker implantation

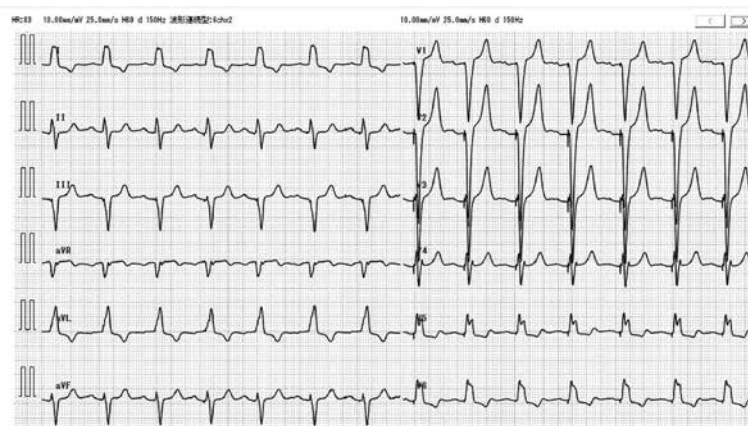


Figure 3. Electrocardiograms (ECG) recorded before the second surgery (A), on arrival in the operating room (B), 5 min later (C), and immediately before starting surgery (D), when the cardiac arrest occurred (E, F), and after pacemaker implantation (G).

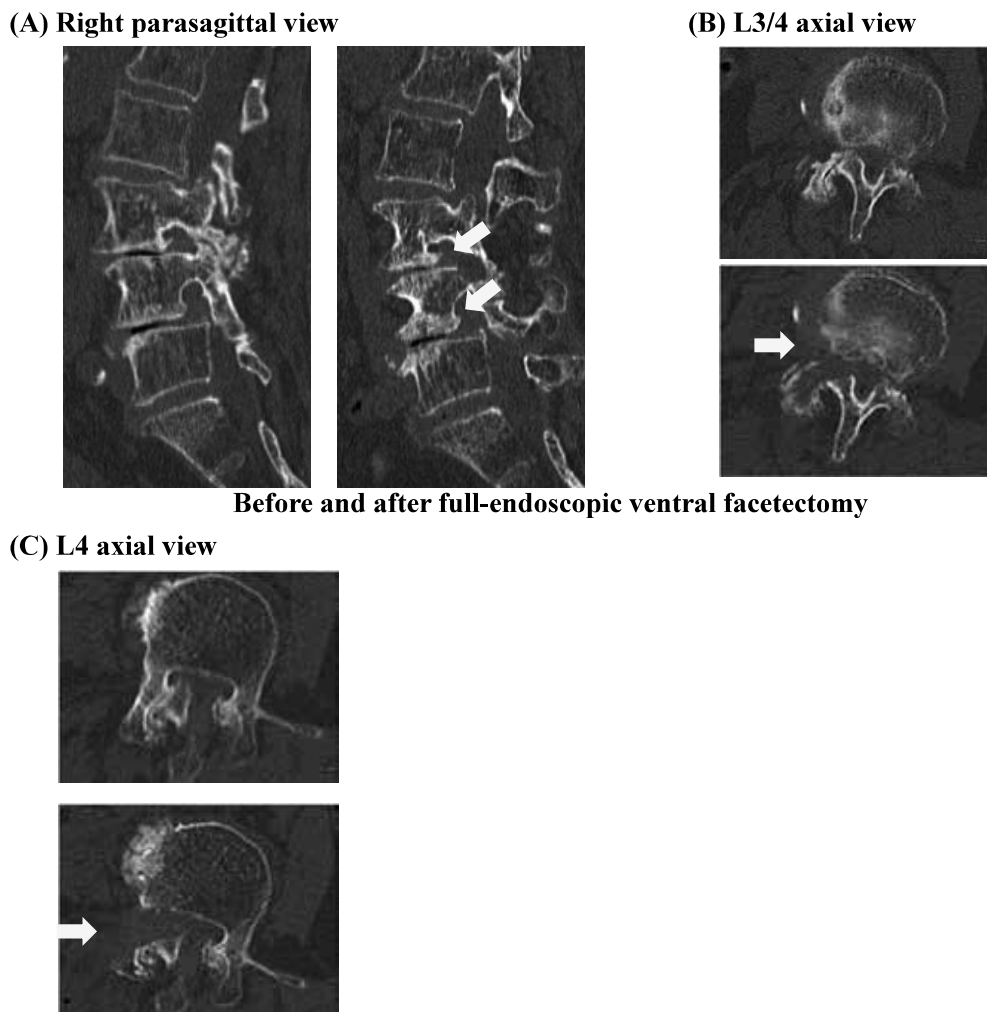


Figure 4. Computed tomography scans before and after the second surgery (A) at L3/4 (B), L4 pedicle (C). Arrows indicate the foraminoplasty area. The right foramen and lateral recess at L3/4 were adequately decompressed.

rate in the prone position (26). In the present case, the patient was promptly repositioned to the supine position after the onset of complete AV block.

This report described our experience of a case of cardiac arrest as a result of AV block during FESS. Even if the same local anesthesia procedure has been performed previously without problems, the possibility of sudden clinical deterioration during spine surgery should be kept in mind.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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ETHICAL STATEMENT

The need for ethical approval was waived because these are not required by our institution for case reports. Informed consent was obtained from the patients and/or their family.

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