



Case report

Anesthetic considerations for laparoscopy for rectal cancer in patient with amyotrophic lateral sclerosis: A case report

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ARTICLE INFO

Keywords:

Rectal neoplasms

Laparoscopy

Amyotrophic lateral sclerosis

ABSTRACT

Amyotrophic lateral sclerosis, which is also known as motor neuron disease, is a chronic neurodegenerative disease characterized by progressive muscular weakness, respiratory muscle disability, and eventual death. Previous epidemiologic studies have shown no association between cancer and amyotrophic lateral sclerosis. Colorectal cancer arising in patients with amyotrophic lateral sclerosis has rarely been reported. Here, we report a case involving rectal cancer arising in a patient with amyotrophic lateral sclerosis who subsequently underwent curative laparoscopic surgery and adjuvant chemotherapy. Amyotrophic lateral sclerosis causes the deterioration of respiratory function by compromising expiratory and inspiratory muscles; accordingly, patients with amyotrophic lateral sclerosis are at high anesthetic risk, especially with respect to general anesthesia. Careful airway management is essential, and intraoperative neuromuscular monitoring is important. A depolarizing muscle relaxant such as succinylcholine should not be used because of the potential risk of developing hyperkalemia or rhabdomyolysis. Thus, a nondepolarizing muscle relaxant (rocuronium) was used at a low dose in this case. In addition, fentanyl for postoperative patient-controlled analgesia should be used cautiously because fentanyl can cause respiratory muscle rigidity, which may reduce postoperative respiratory function in patients with amyotrophic lateral sclerosis.

Brief report

Amyotrophic lateral sclerosis (ALS), which is also known as motor neuron disease, is a chronic neurodegenerative disease characterized by progressive muscular weakness, respiratory muscle disability, and eventual death. In the United States, the incidence of ALS is 1–3 per 100,000 in the general population [1], and colorectal cancer is the third most commonly diagnosed type of cancer [2]. Previous epidemiologic studies have shown no association between cancer and ALS [3]. The average survival time of ALS patients after symptom onset is approximately 3–5 years. Colorectal cancer arising in patients with ALS has rarely been reported. A 60-year-old man with stage IV rectal cancer who developed ALS after palliative surgery has been described [4]. In addition, given the potential risk of general anesthesia [5], curative laparoscopy for rectal cancer arising in an ALS patient has not previously been reported in an English-language publication [4]. Here, we report a case involving rectal cancer arising in an ALS patient who

subsequently underwent curative laparoscopic surgery and adjuvant chemotherapy.

A 56-year-old woman was referred to the colorectal cancer clinic due to a rectal mass. The patient had complained of intermittent abdominal pain and hematochezia for one month. Acquisition of the patient's history revealed that she had been diagnosed with ALS two years previously and had been treated with the glutamate antagonist Riluzole (Rilutek®, 50 mg twice daily, Sanofi-Aventis Korea, Inc.). The patient's Amyotrophic Lateral Sclerosis Functional Rating Scale score, which measures physical performance during activities of daily living, was 14 [6]. The patient had motor weaknesses in the upper and lower extremities and dysarthria. Electromyography showed ongoing denervation and chronic evidence of reinnervation throughout the entirety of the cervical, thoracic and lumbar segments, a finding consistent with ALS. On physical examination, the patient's blood pressure was 105/70 mmHg, her pulse rate was 73 beats per minute, her body temperature was 36.6 °C, and her respiratory rate was 20 breaths per minute. A

Peer review under responsibility of Egyptian Society of Anesthesiologists.

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Received 6 August 2018; Received in revised form 9 September 2018; Accepted 21 September 2018

Available online 25 September 2018

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percutaneous endoscopic gastrostomy tube was observed in the upper abdomen. Laboratory investigations revealed that the patient's hemoglobin level was 12.9 g/dL, her white blood cell count was 8720 cells/mm³ (68.2% neutrophils), and her carcinoembryonic antigen level was less than 2 mg/mL. Other laboratory results were within normal ranges. Colonoscopy with biopsy confirmed an ulcerofungating rectal adenocarcinoma approximately 5 cm from the anal verge. Midazolam (3 mg) and pethidine hydrochloride (50 mg) were administered intravenously for sedation for 17 min during colonoscopic examination and biopsy. An abdominal computed tomography scan and pelvic magnetic resonance imaging showed a rectal cancer abutting the posterior wall of the uterus and multiple metastatic lymphadenopathies in the colonic mesentery and mesorectum. The patient refused preoperative chemoradiation therapy and underwent laparoscopic low anterior resection with diverting loop ileostomy and total abdominal hysterectomy with bilateral salpingo-oophorectomy. The anesthetic and operative times were 420 and 365 min, respectively. Before endotracheal intubation, 80 mg propofol (1.5 mg/kg) and 10 mg rocuronium were administered, and an additional 10 mg rocuronium was given 5 min later. Surgery was started at 55 min after starting anesthesia. A total of 20 mg of rocuronium was used for muscle relaxation during surgery (5 mg at 200 min, 10 mg at 250 min, and 5 mg at 355 min after anesthesia). Anesthesia was maintained with 1–1.5 vol% sevoflurane in 50% oxygen with continuous infusion of 0.1–0.5 mcg/kg/min remifentanyl. Glycopyrrolate (0.2 mg) and pyridostigmine bromide (10 mg) were used to reverse the effects of the muscle relaxant. Postoperative patient-controlled analgesia was given as follows. The initial dose of fentanyl was 75 mcg, the infusion rate was 0.02 mcg/kg/min, the top-up dose was 15 mcg, the lucid interval was 15 min, and the total duration of infusion was 48 h. Pathologic results showed pT3N0M0 cancer (lymph nodes: 0/20), and the distal and circumferential margins were 2 cm and 2 mm, respectively. The patient recovered uneventfully and received six cycles of adjuvant chemotherapy (5-fluorouracil with leucovorin). After completing chemotherapy, the patient refused ileostomy reversal. To date, at four years and six months after surgery, the patient has not exhibited recurrence.

ALS causes the deterioration of respiratory function by compromising expiratory and inspiratory muscles; accordingly, ALS patients are at high anesthetic risk, especially with respect to general anesthesia. Careful airway management is essential, and intraoperative neuromuscular monitoring is important. A depolarizing muscle relaxant such as succinylcholine should not be used because of the potential risk of developing hyperkalemia or rhabdomyolysis [5]. Thus, a non-depolarizing muscle relaxant (rocuronium) was used at a low dose in this case. The typical dose of rocuronium is 1.0 mg/kg; however, in this

patient, who weighed 60 kg, 10 mg of rocuronium was administered for anesthetic induction, and an additional 5 mg was administered two times for anesthetic continuation. In addition, fentanyl for postoperative patient-controlled analgesia should be used cautiously because fentanyl can cause respiratory muscle rigidity, which may reduce postoperative respiratory function in patients with ALS. Riluzole was given on postoperative days as well as on the day of surgery. During adjuvant chemotherapy, Riluzole was continued, and there were no serious Riluzole-related adverse reactions. The mechanism of action of Riluzole is not fully elucidated in ALS; however, modulation of glutamate neurotransmission and inhibition of neuronal voltage-gated sodium channels are believed to be neuroprotective by preventing an abnormal increase in the number of astrocytes [7]. We encountered a case involving rectal cancer arising in an ALS patient who subsequently underwent curative laparoscopic surgery and adjuvant chemotherapy. Careful anesthetic, intraoperative, and postoperative management is needed to achieve a favorable outcome in such cases.

Competing interests

The authors have no competing interests to declare.

References

- [1] Freedman DM, Wu J, Daugherty SE, Kuncel RW, Enewold LR, Pfeiffer RM. The risk of amyotrophic lateral sclerosis after cancer in U.S. elderly adults: a population-based prospective study. *Int J Cancer* 2014;135:1745–50. <https://doi.org/10.1002/ijc.28795>.
- [2] Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *Int J Cancer* 2015;136:E359–86. <https://doi.org/10.1002/ijc.29210>.
- [3] Tabares-Seisdedos R, Rubenstein JL. Inverse cancer comorbidity: a serendipitous opportunity to gain insight into CNS disorders. *Nat Rev Neurosci* 2013;14:293–304. https://doi.org/http://www.nature.com/nrn/journal/v14/n4/supinfo/nrn3464_S1.html.
- [4] Sato Y, Takayama T, Nikaido T, Wada Y, Sagawa T, Abe S, et al. Report of an autopsy case of colon cancer with amyotrophic lateral sclerosis. *Nihon Shokakibyō Gakkai Zasshi* 2007;104:1365–70.
- [5] Onders RP, Carlin AM, Elmo M, Sivashankaran S, Katirji B, Schilz R. Amyotrophic lateral sclerosis: the Midwestern surgical experience with the diaphragm pacing stimulation system shows that general anesthesia can be safely performed. *Am J Surg* 2009;197:386–90. <https://doi.org/10.1016/j.amjsurg.2008.11.008>.
- [6] Cedarbaum JM, Stambler N, Malta E, Fuller C, Hilt D, Thurmond B, et al. The ALSFRS-R: a revised ALS functional rating scale that incorporates assessments of respiratory function. BDNF ALS Study Group (Phase III). *J Neurol Sci* 1999;169:13–21.
- [7] Carbone M, Duty S, Rattray M. Riluzole neuroprotection in a Parkinson's disease model involves suppression of reactive astrocytosis but not GLT-1 regulation. *BMC Neurosci* 2012;13:38. <https://doi.org/10.1186/1471-2202-13-38>.