Case Report

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Anaesthetic Management of Laparoscopic Incisional Hernia Repair in a Patient with Myasthenia Gravis: Case Report

Anaesthesia Section

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ABSTRACT

Myasthenia Gravis (MG) is an autoimmune disorder of the neuromuscular junction, often complicated by perioperative respiratory and neuromuscular challenges. Patients with MG undergoing laparoscopic incisional hernia repair pose unique peri-operative anaesthetic challenges due to muscle relaxants even in the periods of complete remission due to altered neuromuscular transmission, risk of respiratory compromise, and the physiological changes associated with pneumoperitoneum. A 66-year-old female patient with well-controlled MG on medications, who developed an incisional hernia following an open cholecystectomy performed five years prior, presented for laparoscopic surgical repair. Over the last three years, the hernia progressively enlarged, prompting surgical intervention. Preoperative optimisation included stable MG control with pyridostigmine. Intraoperative management featured careful titration of neuromuscular blockade, the use of remifentanil infusion for stable haemodynamics and precise analgesia control, selective opioid choice, and vigilant neuromuscular and respiratory monitoring. Ultrasound guided fascial plane block for intraoperative and postoperative analgesia to minimise systemic opioid requirements. The patient remained haemodynamically stable throughout the procedure, with adequate surgical conditions using low-dose non-depolarising muscle relaxants guided by train-of-four monitoring. The fascial plane block provided effective pain control, reducing the need for high-dose systemic opioids. The patient achieved early mobilisation and was discharged on postoperative day three without complications. This case illustrates that meticulous clinical assessment and planning, including an appropriate analgesic regimen with a fascial plane block, judicious use of short-acting opioids (remifentanil) intraoperatively, careful neuromuscular monitoring, and stable MG disease management, can lead to a successful laparoscopic incisional hernia repair with minimal complications in a patient with MG.

Keywords: Neuromuscular blockade, Remifentanil, Respiratory

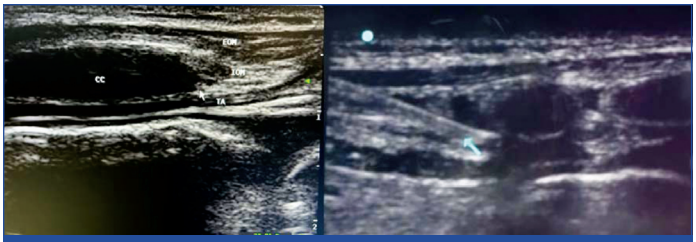
CASE REPORT

A 66-year-old female with a Body Mass Index (BMI) of 37.3 kg/m^2, American Society of Anaesthesiologists (ASA) grading III presented in department of anaesthesia due to a progressively enlarging incisional hernia at an old surgical scar from an open cholecystectomy which was performed under general anaesthesia and was uneventful approximately five years ago. Over the last three years, the hernia had gradually increased in size, causing discomfort and cosmetic concerns. She also had a 20-year history of well-controlled MG, managed on pyridostigmine 60 mg three times daily. Her MG symptoms were classified as mild, involving ocular and generalised weakness (Myasthenia Gravis Foundation of America Class IIa), with stable respiratory function tests indicating a Forced Vital Capacity (FVC) of 2.6 L and a Negative Inspiratory Force (NIF) of -32 cm H_2O [1]. Her additional medications included combination of cilnidipine 10 mg+ olmesartan medoxomil 40 mg + chlorthalidone 12.5 mg for hypertension, with unremarkable preoperative labs and imaging including a normal chest radiograph [Table/Fig-1].

[Table/Fig-1]: Preoperative chest radiograph showing clear lung fields and no acute pulmonary abnormalities.

No preoperative immunomodulating therapy was deemed necessary due to her stable MG condition. Anaesthetic considerations focused on minimising perioperative respiratory compromise and managing neuromuscular blockade, given her sensitivity to non-depolarising neuromuscular blockers. With the use of ultrasound coming in bigger way for pain management, we planned fasciae plane block with Ultrasonography (USG) guidance for intraoperative and postoperative pain management. Thoracoabdominal nerve through Perichondrial Approach (TAPA) is a novel block affecting both anterior and lateral branches of thoracoabdominal nerves. In this modified technique (M-TAPA) local anaesthesia given to the lower surface of chondrium provided a wide blockade area that includes T5 and T11-12 dermatomal level because the applied LA also passes the linea semilunaris. M-TAPA block was administered bilaterally after the induction of general anaesthesia to provide intraoperative and postoperative analgesia to reduce systemic opioid needs, which is crucial in patients with compromised neuromuscular transmission [Table/Fig-2] [2].

Remifentanil was chosen for its ultra-short-acting properties, providing precise control with minimal residual effects, which is vital in MG patients [3]. The intraoperative plan included using a low-dose rocuronium, although total i.v. anaesthesia with



[Table/Fig-2]: USG scan at the level of 9th rib with high frequency linear probe placed in transverse plane (Arrow shows entry of needle).
Abbreviations: Costal Cartilage (CC), External Oblique Muscle (EOM), Internal Oblique Muscle (IOM), Transversus Abdominis (TA)

propofol provides sedation and hypnosis, it does not relax the muscles by itself. For laparoscopic surgery, we need good muscle relaxation to improve surgical conditions, especially when creating pneumoperitoneum. Therefore, a low-dose non-depolarising muscle relaxant (rocuronium) was necessary. Additionally, we used a remifentanil infusion as remifentanil ultra-short half-life allowed us to tailor analgesia minute by minute without risking prolonged respiratory depression, which is critical in patients with MG. Train-Of-Four (TOF) monitoring to prevent excessive neuromuscular blockade. Sugammadex was prepared for rapid reversal at surgery's end to ensure a quick return to baseline neuromuscular function [4]. The surgery proceeded with the patient under general anaesthesia induced with i.v. propofol and a bolus of remifentanil 2 μg/kg, followed by the titrated dose of rocuronium. Anaesthesia was maintained with a titrated infusion of remifentanil 0.05-2 μg/kg/min, carefully balancing the need for stable haemodynamics and adequate analgesia. TOF monitoring guided the minimal rocuronium supplementation needed.

Upon completion of the 90-minute procedure, with visible twitches on TOF, sugammadex 2 mg/kg bolus was administered to reverse the neuromuscular block and promptly restoring neuromuscular function [5]. Sugammadex availability offers the potential to significantly reduce the incidence of Postoperative Residual Curarisation (PORC). The clinical advantages are rapid and reliable reversal of neuromuscular blockade, irrespective of block depth, a favourable safety and tolerability profile and most notably it's novel mechanism of action. The patient was then smoothly extubated, demonstrating full neurological recovery and adequate respiratory effort. Pain management involved ultrasound guided (sonosite micromax) b/lmodified thoracoabdominal nerve block through perichondrial approach with high frequency linear probe (13-6 MHz) at the level of 9-10th rib and low-concentration local anaesthetic (0.25% bupivacaine 20 mL each side), providing effective analgesia and facilitating early mobilisation without significant systemic opioid use. Her postoperative recovery was uneventful, and she was discharged on the third day post-surgery with stable MG control and no hernia-related complications.

DISCUSSION

The perioperative management of patients with MG requires a highly individualised anaesthetic approach because of the unpredictable nature of neuromuscular transmission and the increased risk of perioperative respiratory complications and myasthenic crisis [6]. In the present case, anaesthesia was successfully managed using Total Intravenous Anaesthesia (TIVA) with propofol and remifentanil, titrated administration of rocuronium with quantitative neuromuscular monitoring, reversal with sugammadex, and multimodal analgesia incorporating fascial plane blocks. This strategy was designed to minimise physiological stress, facilitate rapid recovery of neuromuscular function, and reduce the risk of postoperative respiratory compromise.

The TIVA with propofol and remifentanil has been widely recommended in patients with MG because of its minimal influence with neuromuscular transmission. Itoh H et al., reported that propofol exerted less effect on the neuromuscular junction than sevoflurane in the same patient undergoing two separate anaesthetic procedures [7]. Propofol, when combined with remifentanil, provides stable anaesthesia while avoiding the potentiation of neuromuscular blockade associated with volatile anaesthetic agents. Remifentanil is particularly advantageous because of its rapid onset, ultra-short context-sensitive half-life, and metabolism by nonspecific plasma and tissue esterases, resulting in minimal accumulation even after prolonged infusions [8]. These pharmacokinetic properties allow precise titration and rapid postoperative recovery.

Neuman A et al., advocated a neuromuscular blockade-free approach in MG patients, however, the same report also suggested that carefully titrated doses of rocuronium administered under quantitative neuromuscular monitoring can be used safely when coupled with reliable reversal agents [6]. When a neuromuscular blockade free strategy is selected, sevoflurane anaesthesia may provide adequate muscle relaxation to facilitate tracheal intubation and optimise surgical conditions. Furthermore, sevoflurane exhibits favorable pharmacokinetic characteristics, including rapid onset, prompt elimination, and a relatively low risk of tissue accumulation, making it a reasonable option in selected MG patients [9]. Nevertheless, the unpredictable response of myasthenic patients to neuromuscular blocking drugs necessitates vigilant monitoring whenever these agents are employed.

The introduction of sugammadex has significantly transformed the management of intraoperative neuromuscular blockade in patients with MG. Sugammadex, a modified γ-cyclodextrin, selectively encapsulates free rocuronium molecules in the plasma, creating a concentration gradient that promotes dissociation of rocuronium from nicotinic acetylcholine receptors at the neuromuscular junction. Unlike acetylcholinesterase inhibitors, sugammadex does not interfere with acetylcholine metabolism, neuromuscular junction physiology, or receptor function, thereby avoiding the risk of precipitating a cholinergic crisis. Carron M et al., reported the safety and efficacy of the rocuronium-sugammadex strategy in myasthenic patients undergoing both intravenous and inhalational anaesthesia [4]. Consistent with these findings, the use of rocuronium followed by sugammadex in the present case facilitated satisfactory surgical conditions while ensuring rapid and predictable recovery of neuromuscular function [10].

Effective postoperative analgesia plays a critical role in minimising physiological stress, a recognised trigger for myasthenic exacerbation and crisis. Although epidural analgesia remains one of the most effective modalities for attenuating the surgical stress response, its use may be associated with sympathetic blockade, hypotension, and potential haemodynamic instability. Therefore, fascial plane blocks were selected in our patient as a safer alternative to neuraxial techniques. These blocks provide effective, site-specific analgesia while preserving haemodynamic stability and respiratory function [6]. Furthermore, fascial plane blocks support an opioid-sparing analgesic strategy, reducing opioid-related respiratory depression and facilitating early mobilisation and recovery [11]. Their versatility also allows their use in patients with contraindications to neuraxial anaesthesia, further expanding their applicability in high-risk populations.

The combination of TIVA with propofol remifentanil, carefully titrated rocuronium reversed with sugammadex, and fascial plane block-based multimodal analgesia represents a balanced and effective anaesthetic strategy for patients with MG undergoing major surgery. This approach provides optimal surgical conditions while minimising perioperative respiratory complications, facilitating neuromuscular recovery, and supporting enhanced postoperative outcomes. By reducing reliance on systemic opioids and avoiding excessive physiological stress, this multimodal strategy may contribute to smoother extubation, lower rates of postoperative respiratory complications, and a reduced risk of myasthenic crisis [7].

CONCLUSION(S)

This case demonstrates that an integrated, patient-centered anaesthetic approach allows safe laparoscopic incisional hernia repair in an MG patient. Key strategies included patient education and informed consent, maintaining baseline stability of patient on MG treatment, employing a fascial plane block for intraoperative and postoperative analgesia, using remifentanil for precise intraoperative analgesia control, administering minimal neuromuscular blocking doses with continuous monitoring, and ensuring prompt reversal of blockade. The patient's uncomplicated course, with no immediate postoperative desaturation and minimal opioid requirements, validates the careful balance of pharmacology, monitoring, and supportive care in the perioperative management of complex neuromuscular conditions.

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