Robotic-Assisted Thyroidectomy: A New Experience in Anaesthesia

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Abstract

This is our first experience in providing general anaesthesia for robotic-assisted thyroidectomy (RAT). It is rather a new experience for our anaesthetic team and few issues should be addressed. The conduct of RAT must be fully understood and familiarized as it may present with few challenges for the anaesthesiologists. The key point of success during this learning curve period is the importance of teamwork between the anaesthesiologists and the operating surgeons. The specific anaesthetic challenges include limited access to the patient post-docking of the robot, the need of extra precautions of the anaesthetic circuit and IV line connections, a vigilant anaesthesiologists and options for postoperative pain relief.

Keywords: General anaesthesia, postoperative pain, remifentanil, robotics, thyroidectomy

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Introduction

Advanced surgical skills and techniques by using robotic device and technology have become more popular which by default will also lead to a new horizon for the anaesthesiologists. Robotic-assisted thyroidectomy is associated with less significant postoperative neck discomfort, less swallowing disturbance and provides a good cosmetic result (1). Effective continuous communication is deemed paramount between surgeons and anaesthesiologists as both are still at a learning curve. Utilizing the Da VinciTM surgical robot has become a new technique for the surgeons to excise the diseased thyroid gland. Ensuring and maintaining safety to the patients are important due to the presence of bulky equipment accommodating the operation theatre (1,2). Postoperative pain management also needs a special attention and consideration in this type of surgery.

This is our first four cases of bilateral axillo-breast approach RAT done at Universiti Teknologi MARA Medical Centre (UiTMMC), Sungai Buloh Campus. The patients’ age was ranging between 50 to 60-years old and all of them were in the physical status classification of ASA II. Preoperative investigations were unremarkable and indirect laryngoscope done by the otorhinolaryngology team revealed normal vocal cord mobility. A written and informed consent for anaesthesia was taken from each patient after explaining the anaesthetic techniques and their perioperative implications.

Case Report

Anaesthesia and Intraoperative Management

In the operating theatre (OT), standard monitoring devices were applied to the patients which are comprised of the non-invasive blood pressure monitoring, pulse oximetry, electrocardiogram and end tidal carbon dioxide (ETCO2) monitoring. Baseline vital signs were recorded using standard UiTM anaesthesia form. After preoxygenation with 100%
secured. All patients were given local anaesthesia of intravenous line tubing with extension were used and bandaged to reduce the risk of hypothermia. Long sandbag underneath the shoulder. All limbs were at the sides. The patient's head was extended with a trocar site by the surgeon prior to its insertion.

The patient’s vocal cords to facilitate EMG monitoring of the RLN when connected to a multichannel EMG monitoring device. If monitoring correctly, the EMG monitor should show a consistent sound signal and an action potential tracing (3).

Anaesthesiologists, anaesthesia workstation, ventilator machine, IV drip sets and syringe pump were positioned at the left upper end of the patient after few attempts of positioning. This final position was chosen to allow the surgeon’s assistants to mobilize easily during the procedure. In our case, the Da Vinci TM was located at the head end of the patient. However, positions of the equipment and anaesthesiologists may differ depending on the surgical approach used by different surgeons where they were displaced away to the foot end (1) (Fig. 1).

In the anticipation of a long surgery, hypothermia can occur and caution should be taken. A warming mattress was placed under the patient and all limbs were bandaged. Warmed fluids were used and infused via fluid warmers. However, forced-air warming device was not used in these patients as it might disrupt the surgeon’s field due to the bulky hose.
Hypothermia can occur due to prolonged operative time and should be treated aggressively using fluid warmers, warming blankets and mattresses (2). Temperature probe should be inserted not only to monitor hypothermia but also to ensure no over warming of the patient during the surgery.

Once everything is secured and docking of the Da Vinci TM has been finalized, direct access to the patient will be limited. The robot is rigidly fixed to its trocar insertion sites and chest or encroaching over the patients head, chest and abdomen. This invasion of the anaesthetic workplace leads to limited access to the patient’s airway, monitoring devices and intravenous lines (2). After the robot has been positioned and engaged, the anaesthetists will have a very limited access to the patient. Thus, any lines, monitors and patient protective devices must be placed beforehand and should be secured properly to ensure no kinking or displacement (4) (Fig. 2).

For the 2nd, 3rd and 4th case lesser time is needed for the preparation and positioning of the equipment and patients. This is mainly because the anaesthesiologist and other OT healthcare personnel have already become familiarized with the workflow based on the experience of inducing the 1st case.

In this type of procedure, patients were placed supine with the neck extended. Hence, there is minimal haemodynamic or respiratory compromise encountered. Unlike the extreme reverse trendelenburg position used in robotic assisted prostatectomy, it will lead to an increase in intracranial pressure, pulmonary capillary wedge pressure, central venous pressure, decreased in lungs functional residual capacity, pulmonary compliance and oxygen saturation (2).

Figure 1: Preparation and location of the anaesthetic workstation

Figure 2: Difficult direct access to the patient once docking done and surgery started. Main surgeon operating using the Da VinciTM surgical robot sitting away from surgical field

Through the bilateral axillo-breast approach, carbon dioxide was insufflated to the upper chest with a pressure of < 8mmHg. This might induce subcutaneous emphysema impaired the patient’s ventilation and required higher ventilating pressure. Inspiratory pressure (IP) was set at <20cm H20 with tidal volume of 6-8ml/kg. There were no significant problems associated with it. Ventilatory parameters were adjusted to aim normocarbia with end-tidal CO2 of 35-40 mmHg. Carbon dioxide insufflation also can be associated with an increased probability of pneumomediastinum and air embolism (2).

Pain management

As the surgery of RAT was bilateral axillo-breast approached, it’s involves 4 skin incisions for trocar insertion size of 1-2 cm each but tunneling of the port under the skin length about 15cm each which can cause more pain. Plus insuflation of the carbon dioxide under the skin may contribute to the pain.

So our first case was given morphine and parecoxib (COX-2 inhibitor) plus PCA morphine postoperative while other two cases received remifentanil with morphine and parecoxib at the end of surgery. All of them had satisfactory pain control post operatively.

Reports showed multiple methods were used for postoperative pain management in robotic assisted thyroidectomy. Boccara et al. reported 20 cases of thyroid and parathyroid surgery utilizing robotic assistance in which IV acetaminophen 1.0g and ketoprofen 100mg was given 60 mins prior to skin closure. During emergence and after endotracheal extubation, IV morphine is titrated according to VAS <4. PCA morphine was given postoperatively (5).
Multimodal approach of pain management has been introduced including perioperative medications. A perioperative administration of pregabalin (150mg twice per day) is effective in reducing early postoperative pain (6). Different mode of administration of analgesia includes local anaesthetic spray.

A prospective randomized controlled trial by Ryu et al. showed reduced postoperative pain and PCA consumption without adverse events using levobupivacaine spray on the operative field at the end of robotic thyroidectomy (7). Bilateral superficial cervical plexus block had also shown to be an effective method to reduce acute pain after robotic-assisted surgery (8).

Conclusion

This is our first experience in providing general anaesthesia for RAT and it was successful. The key point of success during this learning curve period is the importance of teamwork between the anaesthesiologist in-charge and the operating surgeons. The specific challenge of giving anaesthesia with limited access to the patient is the need of extra precaution in making sure all connections intact and a vigilant anaesthesiologist. There are various methods of post operative pain relief used in robotic thyroidectomy and in our cases the methods we used worked well.

References