Case Report

Robotic-Assisted Thyroidectomy: A New Experience in Anaesthesia

Mardhiah Sarah HM, Adlin Dasima AK, Nadia Hanom I, Siti Aznida AK, Rusnaini MK, Mohd Fahmi Z, Mohd Nazir MS, Izwah Azyyati A, Mohd Firdaus S, Karis M

Discipline of Anesthesiology & Critical Care, UiTM Medical Centre, Sungai Buloh Campus, Jalan Hospital, 47000 Selangor, Malaysia.

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

Correspondence:

Mardhiah Sarah Harnani binti Mansor. Discipline of Anesthesiology & Critical Care, UiTM Medical Centre, Sungai Buloh Campus, Jalan Hospital, 47000 Selangor, Malaysia. Tel:+603-61265000 Fax:+603-61265224 E-mail: deebaalmansor_81@yahoo.com

Date of submission: 20 Dec, 2016 Date of acceptance: 6 Mar, 2017

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%

oxygen for 5 mins, anaesthesia was induced with intravenous fentanyl 2.0 µg/kg, propofol 2.0 mg/kg and atracurium 0.5mg/kg. Patients were intubated (TOFTM count 4) with endotracheal tube NIM Flex TM EMGTM (Medtronic Xomed. Inc Jacksonville USA) size 7.0mm using C – MacTM video laryngoscope with blade sized 3.

The NIM Flex tube was used to be able to do intraoperative nerve monitoring (IONM) of both vocal cords. The Medtronic NIM electromyographic (EMG) Endotracheal tube (Medtronic Xomed) is constructed of a flexible silicone elastomer and has a distal inflatable cuff. The tube is fitted with 4 stainless steel wire electrodes (2 pairs) that are embedded in the silicone of the main shaft of the endotracheal tube and exposed only for a short distance, slightly superior to the cuff. The electrodes are designed to make contact with 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).

The tube placement was confirmed by auscultation and capnography and secured well using tape and tegaderm®. After positioning, the extra-long ventilator circle circuit and extended intravenous lines were secured properly. Monitoring probes applied were taped and secured prior to docking of the robot. Both eyes were protected using eye ointment then taped and padded.

For the 1st case, anaesthesia was maintained with fresh gas flow of 1L/min (50% oxygen-air), sevoflurane (by achieving MAC between 1.0-1.2) and morphine 6mg for analgesia. Ventilatory parameters were adjusted to maintain an end-tidal CO2 between 35-40mmHg. Patients were placed in supine position with both arms at thesides. The patient's head was extended with a sandbag underneath the shoulder. All limbs were bandaged to reduce the risk of hypothermia. Long intravenous line tubing with extension were used and secured. All patients were given local anaesthesia of bupivacaine 0.5% with adrenaline 1:100,000 at the trocar site by the surgeon prior to its insertion.'

This patient was planned for patient-controlled analgesia (PCA) postoperatively, hence IV morphine 0.1mg/kg was given intraoperatively and IV parecoxib 40mg given at the end of surgery. Once patient was fully conscious, PCA device (protocol of 1.0mg morphine per bolus, lock-out time of 5 mins) was connected to the patient postoperatively at the recovery bay. Pain score using Visual Analogue Scale (VAS) was assessed and documented. Patient was reviewed in the ward, with satisfactory pain score <5, then PCA was off and patient was started on oral paracetamol and arcoxia®.

For the 2nd, 3rd and 4th case, anaesthesia was maintained with fresh gas flow of 1 L/min 50% oxygen-air, sevoflurane (MAC between 0.6-0.8) and IV remifentanil infusion targeting Ce 2-4ng/ml using target control infusion (TCI) machine (Minto model). At the end of surgery, IV morphine0.05mg/kg and IV parecoxib40mg were given. These three cases were not given PCA as they clearly achieved a low VAS < 5. They were comfortable throughout the recovery process. Postoperatively, patients were observed in recovery bay for hemodynamic and pain score monitoring prior to discharge to the ward. All patients were started on oral analgesia which was paracetamol and arcoxia® in the ward by the surgeon. When assessed in the ward, all patients had VAS<5.

Discussion

The 1st case took more time in preparation for surgery after induction of anaesthesia especially in positioning and docking of the robotic device to the patient. For the first case, positioning, port placement & tunneling and docking time took almost 2 hours compared to the second and third case took 70 mins and forth case took 52 mins for the process.

As for surgery time, first two cases took 2-3 hours with the assistant of the expert robotic surgeon but took 4-5 hours when done by our surgeon. This process was expected to be lengthy as it was part of the learning curve on both anaesthetic and surgical teams.

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.

https://doi.org/10.17576/JSA.2017.0701.10

Figure 1: Preparation and location of the anaesthetic workstation

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 over the patient's abdomen 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 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).

https://doi.org/10.17576/JSA.2017.0701.10

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

1. Paranjape, S., Chhabra, A. Anaesthesia for robotic surgery. Trends in Anaesthesia and Critical Care. 2014; 4(1): 25-31.

2. Lee JR. Anesthetic considerations for robotic surgery. Korean J Anesthesiol 2014; 66(1): 3-11.

3. Elisha S, Boytim M, Bordi S, Heiner J, Nagelhout J, Waters E. Anesthesia case management for thyroidectomy. AANA J 2010; 78(2): 151-60.

4. Shah SB, Hariharan U, Kulkarni A, Dabas NC. Anaesthesia for robotic thyroidectomy for thyroid cancer and review of literature. Indian J Anaesth 2016; 60(1): 55-7.

5. Boccara G, Guenoun T, Aidan P. Anesthetic implications for robot-assisted transaxillary thyroid and parathyroid surgery: a report of twenty cases. J Clin Anesth 2013; 25(6): 508-12.

6. Kim SY, Jeong JJ, Chung WY, Kim HJ, Nam KH, Shim YH. Perioperative administration of pregabalin for pain after robot assisted endoscopic thyroidectomy: a randomized clinical trial. Surg Endosc 2010; 24(11): 2776-81.

7. Ryu JH, Yom CK, Kwon H, et al. A Prospective randomized controlled trial of the postoperative analgesia effects of spraying 0.25% levobupivacaineafter bilateral axillo–breast approach robotic thyroidectomy. Surg Endosc 2015; 29(1): 163-9.

8. Shin S, Chung WY, Jeong JJ, Kang SW, Oh YJ. Analgesic efficacy of bilateral superficial cervical plexus block in robot-assisted endoscopic thyroidectomy using a transaxillary approach. World J Surg 2012; 36(12): 2831-7.