Robotic Laparoscopic Gastric Binding In Eight Years Old Child Using Da Vinci's Apparatus: Anesthesiologist Point of View

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Citation

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Abstract

In the past six years, virtually all gastrointestinal operations have been accomplished using tele-robotic techniques. The purpose of this case study is to describe our initial experience with telerobotic gastrointestinal operations. Robotic system provides surgeons performing endoscopic laparoscopic surgery with wide motion that can not be done by surgeon hands. We report a case of gastric adjustable banding in eight year child suffering from morbid obesity in order to give an insight on the anesthetic difficulties and extent of surgery performed by da Vinci Apparatus. In this case the robot was set up in 60 minutes. The surgery took 180 minutes. The anesthesia duration was 240 minutes. The patient recovered in 10 minutes. Per-operative hemo-dynamic observations were kept within normal ranges. Intraperitoneal CO2 insufflation pressure was 15 mmHg. The patient tolerated the procedure well.

The anesthetic technique took care of adapting to prolonged surgical time watching for the manipulation guarding against the technical difficulties with robot-assisted surgery. Robotic surgery in children using the Da Vinci system seems to be possible. The machine needs high costs and prolonged system setup which consider disadvantages.

INTRODUCTION

In the past six years, virtually all gastrointestinal operations have been accomplished using tele-robotic techniques. Robotic surgery lunched minimally invasive surgery into precision surgery [1]. Surgeon's hand movements at the console are smoothly transmitted to the robot instruments [2].

Since the introduction of robotic surgery in our hospital 2003-2004, it became part of daily activity of operating room. It has been applied in thoracic, cardiac urology general surgery [3,4,5,6,7,8,9,10,11] and recently in pediatric surgery. Robotics use the principle of minimally invasive operations that otherwise would require extensive incisions and long recovery times when done by standard open-methods. It offers the potential for minimal scarring, dramatically reduced recovery times, less suppression of the body's immune system, reduced transfusion requirement and reduction in stress response compared to open procedures [6].

The Da Vinci Surgical System (Intuitive Surgical, Inc. of Sunnyvale, CA) [1], consists of two primary components, the surgeon's viewing and control console and the surgical arms that are used to perform the surgery. These pencil-sized instruments, equipped with tiny, computer-enhanced mechanical wrists, are designed to duplicate and enhance the dexterity of the surgeon's forearm and wrist at the operative site through entry ports less than one-half inch in diameter (Figure 1 a, b and c). To the best of our knowledge this is the first report on anesthetic considerations of robot-assisted Gastric banding in a child from Saudi Arabia.

Figure 1

Figure 1: a. apparatus setup draped above the patient

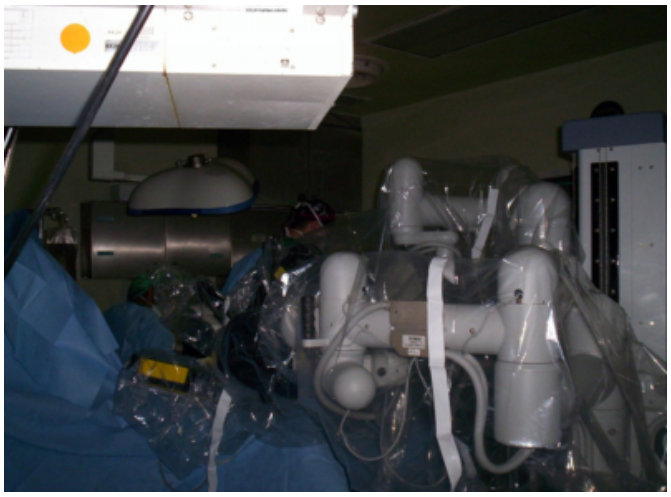


Figure 2

Figure 1b: The anesthesiology end.

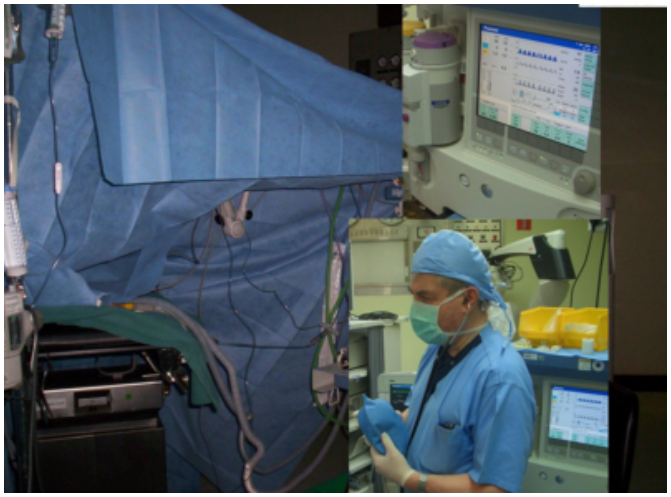
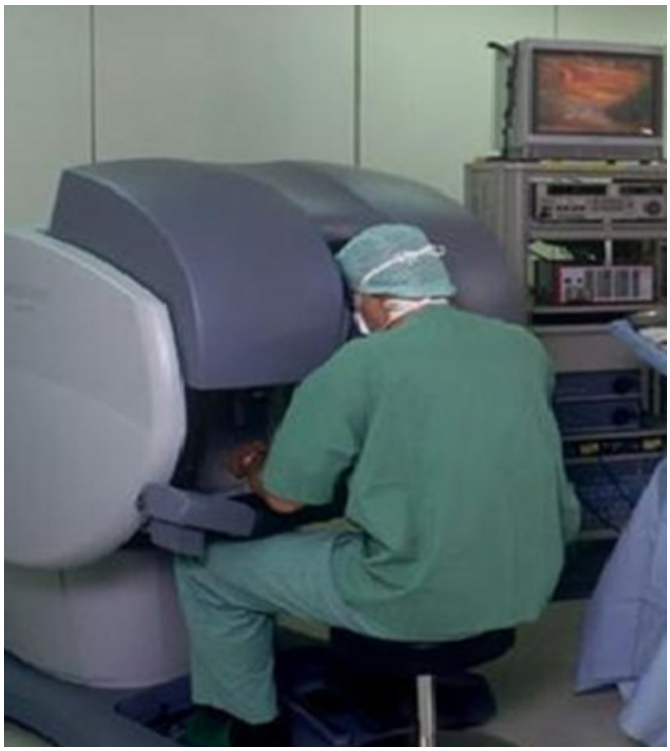


Figure 3

Figure 1c: surgeon console



CASE REPORT

An eight years and three months old Saudi boy, who was referred from other Center in Northern City in Kingdom of Saudi Arabia, has the following problems:

1. Occipital encephalocele which was excised after birth.
2. Ventriculomegaly for which a VP shunt was done after birth.
3. Central hypothyroidism
4. Morbid obesity

He was born at 35 weeks of gestation to a diabetic hypertensive mother. A cystic mass was notice at the base of the occipit for which he went through a neurosurgical investigation and diagnosed of occipital meningomyelocele and ventriculomegaly. The mass was excised and a Ventro-Pere VP shunt was placed to relieve the Cerbro-Spinal Fluid (CSF) obstruction. He went through endocrine investigation which revealed normal growth hormone and cortisol values, but hia total thyroxine was on the low side (between 6-7mcg.dl) and his TSH was around 5-8 u/l. He has normal TBG 21mg/l (normal level is between 12-25). His free

thyroxine was around 0.8 mcg/dl and his TSH was in the range of 4-5 on repeat. For this reason he was started on a low dose Thyroxine and was followed up in the clinics. He continued to have normal cortisol and normal growth velocity.

On follow up it was noted that his weight was increasing rapidly. He stopped follow-up visit after the age of 5 years and when he reappeared last time on July 2005 at the age of 8 and half years, his weight was 91 kg and height was 123.8 cm. His height was following the 25 th percentile and parallel to his curve but his weight is really increasing and he has been inactive.

He complains of pain in his legs during walking and his father sought medical advice in neighboring state clinics recently looking for solution to his obesity but he was told that there was no underlying organic etiology to be treated. He had CT scan of his head in Kuwait which was reported normal. All other endocrine workup, according to the father was normal. He is still on Thyroxine 75 mcg/day and his levels were checked recently and his free thyroxine is 0.98ng/dl and TSH 2.58. He has normal electrolytes, his hemoglobin A1C was 6.5% and his fasting blood sugar was 103mg/dl. His cholesterol was 137. LDL 79 and triglyceride 49 mg/dl.

It was made clear to the Father that his son has morbid obesity. Probably central in origin and He was referred him to Orthopedics to assess his bow legs and for Pediatric Surgery to see if he can have any surgical intervention for his morbid obesity. He was also referred to Neurosurgery to review his VP shunt because the last ime it was reviewed was in 1997.

There was no medical therapy to offer for his obesity except to try reducing his intake and let him try to be more active, which is very difficult at his stage. He was considered to be a good candidate for surgical intervention.

Figure 4

Table 1: Pre-operative assessment

Age	8 years, 3 month old
Sex	Male
Height	123.8 cm
Weight	91 kg
BMI	59

PREVIOUS OPERATIONS

- Excision of occipital encephalocele after birth.
- Placement of a VP shunt to relive CSF obstruction.

Both done under general anesthesia with no complications were documented.

RELEVANT MEDICAL ILLNESSES

- Central hypothyroidism since birth on thyroxine 75 mcg OD.
- Morbid obesity
- Bronchial asthma 4 years back on sulbitamol nebulizer PRN, last attack was 1 month ago.
- History of productive cough of yellowish sputum for last 2 days, not on any medications.

VITAL SIGNS

-Pulse:110 beat/min.

-BP:135/75 mm Hg

-Temperature: 37.7 °C

-Respiratory rate: 19 breath/min.

ON EXAMINATION

The patient appeared conscious, alert, oriented to time, person and place. He looked obese, not in pain, not in distress, not cyanosed or jaundiced and lying comfortably on the bed. Teeth are normal and fixed

Airway assessment: Mallampatti score was (IV), short neck and small mouth.

Cardiovascular System. : normal S1+S2+0, no murmur.

Respiratory system: wheezes bilaterally and basal lung crepitations, mainly on the base of the left lung.

INVESTIGATIONS

WBC: 15.8 with lymphocyte predominance.

Hb: 10.7 g/l

Electrolytes: within normal limits

Coagulation studies: within normal limits.

No pre-operative medications were given.

ANAESTHESIA

Started at 14:00 :

Monitoring on:

Initial SpO2 = 98%

ETCO2 = 48

Core temperature = 37.5

Anaethesia was induces by inhalation of: sevoflurane and oxygen at first.

Then intravenous cannula 20 gauge inserted at the dorsum of left hand and lactated Ringer'solution infusion and 1 g cefazoline started

Fentanyl 150 mcg was given initially followed by 10 mg cisatracurium then propofol 100 mg, then he was intubated using endotracheal tube size 6.5 fixed at 20 cm

The anesthesia was maintained using: oxygen, air sevoflurane 2.5 % and intermittent doses of fentanyl and cisatracurium.

1 hour and 15 minutes after initiation of anesthesia, the patient notices to have progressive increase in the blood pressure so he was shifted to and maintained on isoflurane till the end of the operation.

SURGERY

While the patient was under steady general anaesthesia, and in supine position, the abdomen was prepared and scraped.

Above umbilicus incision made after Veress needle at peribond CO2 inflation of 15 mm Hg pressure.

Robotic draped arm was connected to the inserted camera and placed trochar.

FINDING

Normal organ
No bleeding

PROCEDURE

The right chest identified and dissected. Retroesophageal band was placed in position. Calibration tube was inserted by the anesthesiologist (BioEntrics calibration tube-Inamed coroporation Santa Barbara CA USA). Suture done by vicryl 4-0 suture material, wound was closed. Then skin closed with vicryl 4-0 suture material. Surgery ended at 18.00

IMMEDIATE POST OPERATIVE CARE

Patient was subjected to routine post operative care, given oxygen via face mask and lactated Ringer'solution continued at a rate of 130 ml/h. and Pethidine of 90 mg was given intramuscularly once.

The patient was observed in SICU overnight and discharged after 24 h to the floor

He stayed another day in the hospital and discharged home with follow up visit appointment.

DISCUSSION

Robotic surgery lunched minimally invasive surgery into precision surgery. Surgeon hand movements at the console are smoothly transmitted to the robot instruments. In theory and practice a very delicate surgery can be perfectly performed due to the following factors:

1. Seven degrees of freedom of instruments are allowed using the robotic arm which is give wider movement range than the surgeon hands in conventional surgery [3].

2. The learning curve is short and can be easily acquired allowing accuracy in using the robot.

3. 3D high quality virtual operating field and stable camera platform allow gentle and precise dissection and suturing.

The system was successfully used for partial posterior fundoplication surgery [4]. However, robotic surgery presents many challenges to the anesthesiologists.

Anesthesiologists need new methods of patient care as well as proper screening of patients preoperatively. A number of technical issues have been faced. For example: during

surgery with the use of the large robot system hinders access to the patient. This will impose extra care in securing:

1. Intravenous access prior to surgery.
2. Endotracheal tubes.
3. All monitoring and contact electrodes.
4. Keeping anesthesia tube and circuit away from pressure exerted by the robotic arm

Similarly, in robot-assisted laparoscopic surgery (besides the known physiological effects of CO2 pneumopertoneum) [13] patient positioning will have to be very carefully done to avoid injury to pressure points [5] In a recent report, intraoperative BIS monitoring was recommended to prevent awareness during anesthesia [6] In pediatrics, the Da Vinci is not adopted largely because the robot is very large and the instruments are 5mm of size [11]. New devices are needed in the future. The cost of the system and instruments is another limiting factor for the development of this technology which cannot be actually developed for economical reasons in children [11].

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