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Research Article

Robotics in ENT and Head and Neck Surgery: Personal Experience in Our Tertiary Care Hospital

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Abstract

Background: With clear advantages, such as higher patient comfort, safety and shorter length of stay at hospital, Robotic surgery is becoming a preferred mode of surgery. This paper describes our clinical experience of 135 cases at department of ENT and Head and Neck surgery, Indraprastha Apollo Hospitals (IAH), New Delhi, India.

Methods: From November 2016 to October 2019, we have performed 135 Robotic surgeries, with various approved indications in ENT and Head and Neck using da Vinci Si (Intuitive Surgical systems, Sunnyvale, CA, USA). We used a 30 degree angled binocular scope (12mm) with monopolar cautery in one arm and Maryland dissector (5m) in the other, with specialized retractors for gaining access.

Results: Satisfactory results were found in almost all robotic assisted surgeries. Transoral robotic surgery (TORS) were performed without mandibular cuts or external scars. Majority of surgeries were performed for sleep apnea [TORS for base of tongue reduction with (n=13) and without (n=86) epiglottoplasty] resulting in improved Apnea-Hypopnea Index (AHI) levels. We noticed significant subjective improvement with minimal complications and excellent functional outcomes. Second most frequent procedure performed was thyroidectomy (n=23) via trans-axillary approach and results were encouraging. Other surgeries performed were T1 and T2 laryngeal malignancies (n=3), parathyroid surgery (n=1), T1 and T2 stage tonsil and base of tongue cancer (n=2), haemangioma base of tongue (n=1), parapharyngeal mass (n=1), lingual thyroid (n=1), submandibular gland dissection (n=1), palatal tumor (n=1), chronic lingual tonsillitis (n=1) and Eagle's syndrome (n=1). The overall results were satisfactory and only one patient required ICU stay to monitor perioperative high BP.

Conclusion: In our experience results of robotic surgeries are very satisfactory for both patients and surgeon. Robotic surgery has definite benefits over endoscopic and open approaches with multiple advantages and few drawbacks commonest being high consumer cost, which is a significant amount in a developing country like India.

Keywords: Experience, Robotic Surgery, da Vinci Si, ENT and Head and Neck Surgery; TORS (Transoral Robotic Surgery)

Abbreviations

TORS: Transoral Robotic Surgery; AHI: Apnea-Hypopnea Index; OSAHS: Obstructive Sleep Apnea-Hypopnea Syndrome; FK-WO: Feyh-Kastenbauer Weinstein- O'Malley; IAH: Indraprastha Apollo Hospitals

Introduction

Throughout the world robotic surgery is fast gaining ground as a preferred mode of surgery and has been gradually increasing in India. Da Vinci system was introduced in India in 2006 and since then 72 da Vinci system have been installed in India [1]. In our in-

stitute the robotic system is in action since June 2012. Apart from clear advantages such as higher patient comfort, minimal bleeding and safety, it also helps to significantly cut down the length of stay at hospital. Robotic surgery has a limited history and is a new concept in ENT and head and neck surgery. It is now being used successfully for many surgical indications [2-6].

This article describes our clinical experience at department of ENT and head and neck surgery, Indraprastha Apollo Hospitals (IAH), New Delhi, India. Ever since the robotic ENT surgeries program was started in our institution in November 2016, we have performed 135 cases of robotic surgeries using the da Vinci surgical system till October 2019. The first Robotic surgery in our department performed was Transoral robotic surgery (TORS) for Obstructive Sleep Apnea-Hypopnea Syndrome (OSAHS) and executed successfully. In our hospital General and Urological robotic surgeries has a higher proportion of all robotic procedures. Since the da Vinci system installed in India, the large volume of data has been published by the entire world in the field of Urology, General Surgery and Gynaecology, whereas in ENT and Head and Neck, it was in infancy. Our main objective is to report preliminary experience with robotics in ENT and Head and Neck surgery. In near future our centre will be comparable to other robotic institutes around the world.

Methods

The surgical robot used in our department of ENT is the da Vinci Si (Intuitive surgical systems, Sunnyvale, CA, USA). It is a telesurgery system consisting a robotic cart with 3 arms and a surgeon console, kept in the same operation theatre. Our robotic surgery operating room is designed in separate block secluded from the main operating area. In most of the cases we used a 30 degree angled 3 – dimensional scope (12mm) with a monopolar cautery in one arm and a Maryland dissector (5mm) in the other.

In nearly 3 years of our experience with robotic surgery, we have successfully performed 135 cases with various indications in the field of ENT and head and neck. The patients were selected according to the US FDA (Food and Drug Administration) approved indications for robotic surgery in ENT and head and neck surgery and all the contraindications were carefully considered [7]. Majority of our patients (n= 85, 62.9%) were international, from varied regions like Russia, Africa, Middle East etc. and others were Indians. We performed robotic assisted surgeries for sleep apnea (Transoral robotic surgery, TORS for base of tongue reduction with or without epiglotoplasty), thyroid surgeries (hemithyroidectomy) via transaxillary approach [8-11], parathyroid surgeries, T1 and T2 stage tonsil and base of tongue cancers, hemangioma base of tongue, parapharyngeal mass, lingual thyroid, submandibular gland dissection, palatal tumor, chronic tonsillitis, eagle syndrome and T1 and T2 stage laryngeal malignancies (confirmed after staging endoscopy and radiologically).

Oropharyngeal and laryngeal TORS

For TORS we gained access using Crockard retractor for base of tongue resection for OSAHS (Obstructive Sleep Apnea-Hypopnea Syndrome) surgeries, for tonsil and base of tongue cancer, hemangioma base of tongue, parapharyngeal mass, lingual thyroid, palatal tumor and for Eagle's syndrome. For laryngeal cases, we appropriately selected patients from both a tumor and anatomic perspective. Our all patients were node negative clinically and radiographically (Positron emission tomography in combination with computed tomography) and none had anatomical contraindication to TORS. FK-WO (Feyh-Kastenbauer Weinstein-O'Malley) retractor with appropriate tongue blade was used to gain access to the laryngopharynx giving wide angled panoramic vision. These retractors allowed us easy resection and adequate mobility of the robotic arms maximizing the exposure [6,12].

Robotic thyroidectomy

Transaxillary approach was used in all 23 cases of robotic thyroidectomy without carbon dioxide (CO_2) insufflation. We were successful in creating a working space and exposing thyroid nodule/mass using Chung retractor. For initial few cases creating an appropriate exposure was challenging for us, but after operating adequate cases we attained the proficiency.

Results

Between November 2016 and October 2019, 135 patients underwent robotic assisted surgeries for various indications (94 men and 41 women, mean age 44.3 years and range 23 to 79 years). In our experience results of robotic surgeries are very satisfactory for both patient and surgeon. Tumors both benign and malignant (T1, T2 lesions) were accessed transorally without mandibular cuts or external scars. In none of the patient we required blood transfusion and our all patients were discharged in good condition. We have been maintaining a feedback of the patients in their own handwriting and it has been very encouraging. It reiterates clear benefits of robotic surgeries.

TORS for obstructive sleep apnea

The first and most frequently procedure we performed was TORS for sleep apnea (63.7%, n=86). We offered TORS to patients (moderate to severe OSAHS) who had either refused positive airway pressure treatment or the treatment had failed. Patient response in terms of relief, especially in sleep surgeries is overwhelming because of significant improvements in AHI levels and quality of life of patients as seen in repeat sleep studies conducted 4-6 months post-surgery. None of our patients needed postoperative tracheostomy and feeding tube insertion. Recorded complications were temporary dysphagia, numbness and swelling of tongue. No serious complications like lingual artery injury or hypoglossal nerve injury occurred. Oral feeding was started after keeping the patients nil per oral for 6 hours post operatively, beginning with liquids and soft diet and discharged on second post-operative day.

Thyroidectomy

The next most frequent procedure we performed was thyroidectomy via transaxillary approach (n=23, 17.03%). The results of Robotic thyroidectomy in our setup was encouraging and none of our patients suffered recurrent laryngeal nerve (RLN) palsies. All thyroid patients in our series were happy because of hidden scar and no musculoskeletal pain in the neck after surgery. We put 12/14 FG drain at axillary site which was removed in almost every case within 4th postoperative day.

TORS with epiglottoplasty

N=13, 9.62% patients underwent TORS with epiglottoplasty for sleep apnea. This group of OSAHS patients had retroflexed, edematous or floppy epiglottis. All of them had excellent post-operative result in respect to AHI and functional outcomes (swallowing and speech function).

TORS for laryngeal cancer

3 cases of laryngeal cancer (one glottic, T1 stage and two supraglottic, each T1 andT2) underwent TORS. For glottic cancer, patient was tracheostomized under local anesthesia and cordectomy was done. For supraglottic cancer, one patient (T1 stage) underwent wide excision of epiglottis and other one (T2) underwent tracheostomy followed by excision of tumor. Both patients were decannulated between 4 to 6 weeks. Functional outcomes were excellent during follow up of all 3 patients and all got free negative margins on histopathology.

Other procedures

All the remaining mentioned cases were performed with assistance of robot once only. All were successfully executed without any complication, providing subjective satisfaction.

- **Conversion rate:** Robotic surgeries in our department achieved 100% success in terms of not being converted to open surgery for any indication. We were successful in achieving adequate surgical exposure in all cases.
- **Morbidity:** Only one patient out of 135 cases required overnight ICU stay to monitor perioperative very high BP.

Discussion

Our experience at IAH represents to our knowledge, one of the largest single institutional report of clinical experience in robotic surgeries in ENT and head and neck using the da Vinci system in India. One of the main targets of robotic technology is to provide safe and precise surgeries in ENT and head and neck, also providing minimal morbidity to our patients with excellent results. As we are recruiting more and more patients for Robotic surgeries, our set up time (docking of robot) and robotic console time is decreasing with experience along with improved results.

Robotic surgery in ENT and Head and Neck is a safe and acceptable option and offers definite benefits over conventional open and endoscopic approaches [13]. It provide multiple benefits like magnified 3-D high definition vision, improve dexterity with 7 degrees of freedom, excellent precision, tremor filtration, motion scaling and the last but not the least surgeon ergonomics [13,14]. These properties enables the da Vinci robot to perform within a confined spaces in ENT and Head and Neck surgeries. For oropharyngeal and supraglottic pathologies, TORS approach is undeniably appropriate.

The main drawback of the robotic system in developing countries like India revolve around economical costs of the robotic surgery and lack of financial coverage by insurance companies. In our setup, unlike other countries we are not using luxuries like robotic staplers, lasers and robotic arms for suturing which we cannot afford and again adding to the consumer cost. Next common limitation of present time robotic surgery is the absence of haptic feedback, and its need become essential while resecting a tumor to determine the margin of the tumor [7]. Another strange limitation we are facing specifically in our country is lack of awareness regarding robotic procedure in ENT among general public and even among many medical practitioners.

Overall, robotic surgery in ENT and head and neck surgery represent novel minimally invasive approach in the treatment of multiple diseases. But the ultimate goal of this article is to summarize fruitful experience of robotic surgeries in ENT in both surgeon and

patient aspects. We are working on expanding our horizon in robotics in ENT and head and neck surgery encompassing all indications in our field.

Conclusion

Robotic surgery has definite benefits over endoscopic and open approaches. Our experience on Robotic ENT and Head and Neck surgeries clearly indicates feasibility, safety and excellent outcomes. There are some robotic, financial and awareness associated drawbacks, but we hope they will overcome in near future. The multi-departmental use of a single robot can solve the problem of high treatment costs of robotic surgeries in countries like India where bulk of patients cannot afford this costlier better alternative. Even though, crossing many hurdles our experience with Robotic surgery has been encouraging.

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Conflicts of Interest

None.

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