

## Using Robotics for Advanced Surgical Planning and Paediatric Otolaryngology-Head and Neck Surgery

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### Abstract

In the last two decades, there have been several changes in the field of head and neck surgery. Reconstructions using microvascular free flaps completely replaced earlier methods. More significantly, there has been a paradigm change toward attempting to re-establish normal function and appearance in addition to reliable wound closure to safeguard key structures. Using an evidence-based strategy whenever possible, the current research will propose an algorithmic approach to head and neck reconstruction of diverse subsites.

Otolaryngology and head and neck surgery are two rapidly developing medical specialties. For a thorough understanding of diseases and useful clinical applications, a lot of new knowledge and techniques have been incorporated into the fundamental studies and clinical practises of otolaryngology and head and neck for the past few years. Just think about how many medical gadgets have recently been invented for facilitating procedures and surgery, such as newly created hearing aids and coagulative surgical instruments; the trend of newly generated technology is likely to be a continuing flow. In addition, a wide variety of diagnostic techniques and research methodologies have been developed to study the underlying causes and mechanisms of diseases. The abundance of cutting-edge technologies and methods in the disciplines of otolaryngology and head and neck surgery is a major blessing for both medical professionals and patients. The goal of this special issue is to highlight the variety and current advancements that support the various subspecialties of otolaryngology and head and neck surgery.

**Keywords:** Robotics; Pediatric otolaryngology; surgical planning; Image navigation; Head and neck cancer

### Introduction

Since 2007, robotic surgery has been investigated in paediatric otolaryngology. Although its uses have been proven in numerous paediatric head and neck surgery subspecialties, its adoption has been restricted to larger facilities, and its papers have only ever included feasibility studies. With more sophisticated preoperative surgical planning and newer, smaller robotic instrumentation, robotic surgery integration may improve. Recent developments in robotic surgery and computer-aided surgical planning enable comparison and implementation of various surgical methods. Visualization, instrumentation, patient-specific anatomy, and the level of morbidity involved in establishing access all play a role in the surgical ability to reach a given target [1].

Because it improves visibility, precision, and articulation, robotic surgery is being employed more frequently. It has been demonstrated to lessen blood loss and complications and eliminates many of the issues with traditional minimally invasive procedures. Robotic surgery may have a role to play given the increase in endoscopic procedures in otolaryngology-head and neck surgery and the complications that go along with it. The current endoscopic procedures used in ENT-Head & Neck surgery have a number of drawbacks. This can include a constrained operational field, a constrained range of instrument movements, problems with line of sight, and impaired depth perception in transoral surgery [2].

Limitations in endoscopic thyroid and parathyroid surgery include unstable video camera platforms, limited motion of straight endoscopic instruments, 2-dimensional imaging, and inadequate operator ergonomics. Similar to other disciplines, robotic surgery has the potential to enhance patient care in ENT. The intrinsic anatomical restrictions, which do not exist in open chambers like the abdomen, pelvis, or thorax, however, provide special technical difficulties.

Head and neck reconstruction surgery is a rapidly evolving area. The expanding usage of microvascular free flaps is largely responsible for the advancements made in the last ten years. The anterolateral thigh, fibula osteocutaneous, and suprafascial radial forearm fasciocutaneous free flaps have all become popular flaps for repairing a variety of abnormalities [3].

The reliability and adaptability of these flaps have grown as the anatomy of these flaps has become more familiar. The sole priority is no longer reliable wound closure without exposing essential structures. Every reconstruction aims to preserve function, including speaking and swallowing, and to restore attractiveness. At the majority of centres, free flap success rates now consistently surpass 95% or greater. Additionally, reducing flap donor site morbidity is a crucial factor. The preservation of recipient vessel alternatives and flap donor sites should also be taken into account because to the high rate of recurrence as well as long-term problems following large head and neck resections and reconstructions. The next paper will evaluate and explain projected results of an algorithmic approach to mid-facial, mandibular, oral cavity, and pharyngoesophageal reconstruction [4].

In otolaryngology and head and neck surgery, recent developments in basic and clinical research have introduced new concepts and

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technology. This special issue will cover a number of unique issues, including the use of hearing aids and vestibular evoked myogenic potential, surgical instruments for enhancing thyroidectomy, identification of novel therapeutic drugs, and the underlying mechanisms of head and neck cancer. One article from each field will be chosen as the best illustration of the advancement. These articles will illustrate the state-of-the-art in otolaryngology and head and neck surgery medical advancement [5].

An essay will go over the need of testing elderly persons' cognitive abilities due to the effectiveness of utilising hearing aids. According to earlier research, hearing loss is linked to lower cognitive performance. This study looked at the cognitive abilities of senior hearing aid users. The study looked into whether or not hearing-impaired people should be given special consideration when examining cognitive performance. On the other hand, numerous implantable hearing amplification devices have been developed for the rehabilitation of hearing ability in adult patients with unilateral microtia and atresia [6].

The invention, advancement, and technological benefits of the various types of implantable hearing implants will all be covered in detail in an essay for this programme. It is simple to recommend a device to patients once you are aware of the advantages and disadvantages of each particular type of device [7].

## Materials and Methods

To learn more about the demographics, education, behaviours, and opinions related to tobacco use among paediatric otolaryngologists, a confidential online survey was created. To identify predictors of adherence to the fundamental principles of the general Pediatrics second-hand smoke exposure-prevention guidelines, responses were analysed descriptively and put into logistic regression models. We used the PubMed search engine and the authors' own knowledge for this review [8]. The search covered recent papers and old publications on various glottic stenosis topics, including basic science, aetiology, anaesthesia, and surgical methods. The following search terms were used: larynx, glottis, airway, and stenosis. Congenital and paediatric stenosis and stenosis that extended past the glottis were not covered in the articles [9].

We evaluated the research eligibility of all patients at our facility who had received radiation therapy for squamous cell carcinoma neck illness between January 2002 and December 2005, inclusive. The study comprised the individuals from this demographic who had undergone a scheduled neck dissection after finishing neck radiation therapy for squamous cell carcinoma. The main tumour site, TNM stage, and kind of neck dissection were among the demographic data gathered. These patients were monitored for absolute survival, localised disease control, and neck disease. The AJCC 2010 TNM staging criteria were used to stage the patients, and Kaplan-Meier statistical analysis was used to calculate survival curves. Five-year survival rates were used to summarise the results [10].

## Discussion

The most crucial component of successful surgery is the avoidance of complications, which is in addition to achieving the anticipated operational result. One of the most serious consequences during postoperative treatment is SSI, according to experts. Our goal has been to uncover the strongest arguments in favour of or against using prophylactic antibiotics during routine head, neck, and maxillofacial surgery operations. In our systematic study, only a small number of reviews or meta-analyses with a high level of evidence on the

aforementioned issues were found [11].

Since the use of antibiotic prophylaxis during endoscopic sinus surgery has not been shown to statistically significantly reduce infection, the authors believe that the limited patient and study populations are the primary restriction based on research with a high degree of evidence. Amoxicillin/clavulanate and cefuroxime were the antibiotics employed. In one trial, the preoperative single dose of the antibiotic was given to the comparison group. However, this meta-analysis is vehemently opposed to prophylactic antibiotic use during endoscopic sinus surgery [12]. Additionally, there hasn't been a convincing argument made against the preventive antibiotic regime in benign and malignant tumour surgery in this area of specialisation. Additionally, the great number of routine cases has not been the subject of much research supported by solid data, the aforementioned areas of expertise in recent years, although issues relating to the care of patients at high risk or with particular illnesses are only discussed broadly [13].

In the therapeutic planning for head and neck cancer, radiation is now a key modality due to improvements in technique and side-effect management. It has been demonstrated that radiotherapy considerably lowers the yield of total nodal yields during neck dissection as well as the quantity of positive nodal illness discovered. This benefit has also been seen for combination chemo-radiotherapy. Despite these precautions, a sizable number of neck dissections still show positive nodal illness [14]. No association was established between patient age, presenting T-stage, pre-treatment nodal size, radiation dose, or type of neck dissection with the occurrence of cancer in dissection specimens by Boyd et al. (1998) and Sewall et al. (2007). Another series, in fact, discovered that patients who underwent cisplatin-based chemo radiotherapy had neck metastases in one-fourth of their dissections. The authors came to the conclusion that neck dissection in this group is strongly recommended [15].

## Conclusions

The available evidence implies that robotic surgery in OHNS has advantages, notably in terms of accessibility, accuracy, and operating time, although controlled, prospective research with measurable outcomes are lacking. Before a robotic OHNS service is formed, economic feasibility studies must be completed.

It is necessary to assess the ENT applications' cost effectiveness. It is also essential to have a strong framework for instruction, evaluation, and safe application. Further tool and endoscope miniaturisation will determine whether minimum access procedures like anterior skull base surgery can be expanded. The rapidly developing field of robotic surgical technology has potential for expanding this specialty's clinical applications. Uncertainty surrounds the long-term benefits of robotic surgery in otolaryngology, head, and neck surgery.

## Conflicts of Interest

None

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None

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