Is the Head and Neck Surgeon an Endangered Species?

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Contents

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1. Introduction

In England and Wales 9,200 new cases of head and neck cancer are diagnosed each year [1]. Head and neck surgeons play a vital role within the multidisciplinary team in helping to manage many of these patients. Although the majority of the workload for head and neck surgeons is cancer, they also manage a multitude of benign conditions. Becoming a head and neck surgeon requires years of dedicated training and significant financial burden. Financial pressures also exist within the National Health Service (NHS) and are beginning to influence patient management choices. Over time do we expect these pressures to become even more manifest?

Over recent years, areas including imaging, radiotherapy, targeted therapies and surgery have benefited from advancements in technology which have revolutionised the treatment of head and neck cancer. However, even with such developments in surgical technique, resections still leave patients with debilitating functional outcomes. Meanwhile, only recently have we been able to understand the link between Human Papiloma Virus (HPV) and head and neck cancers. Future treatment guidelines will have to be adjusted to differentiate between HPV positive and negative head and neck cancers**.** Whilst improving prophylactic measures such as immunisation and lifestyle changes is likely to decrease the incidence of head and neck cancer. Outcomes continue to favour a surgical approach, but for how much longer will surgeons play a leading role in the management of head and neck cancer? This essay will examine the most recent innovations and the challenges faced by head and neck surgeons to determine if the speciality is truly and endangered species.

2. Discussion

2.1 Training

To train as a head and neck surgeon requires commitment, dedication and motivation. After graduating from medical school, trainees must first complete foundation years, followed by both core surgical and specialist training years. Otolaryngology as a specialty is becoming ever more popular and is constantly evolving. The speciality offers trainees a diverse range of experiences which makes it particularly attractive to applicants. However, despite the attractive nature of otolaryngology, and in particular head and neck surgery, there are many barriers which are threatening the speciality.

Otolaryngology placements during medical school are important to provide students exposure. However, only 54% of undergraduates report receiving a formal otolaryngology placement [2]. Without sufficient experience during early training many undergraduates may not consider otolaryngology as a future career prospect. Development of the undergraduate otolaryngology curriculum is therefore imperative to increase exposure in order to help students make informed career decisions.

To become a competent head and neck surgeon, trainees must develop the necessary skills and competencies which require ample time and practice. The combination of the European Working Time Directive and the Modernising Medical Careers initiative has decreased the amount of experience a trainee can attain whilst working. This has led to the need to invest in additional courses and conferences to supplement insufficient learning [3].

The personal cost to the individual choosing to train in otolaryngology and then specialise as a head and neck surgeon is ever increasing. To be competitive when applying for training posts in otolaryngology, candidates must go to great lengths to ensure that their portfolio is outstanding. Currently it costs over £400,000 to train a surgeon in the UK. Staggeringly, over one third of these costs are covered by the candidate [3]. To progress to ST3 level alone candidates must have spent in excess of £7,700 on courses, conferences and exams [4]. Higher surgical training is thought to cost the trainee in excess of £7,905. Furthermore, study day allowance has recently been reduced by trusts, thus compounding this issue [3]. Additionally, unlike other surgical specialties, candidates must complete a diploma in head and neck surgery as part of the MRCS exams which would discourage many trainees applying to multiple surgical specialities. Currently, there is little support from the NHS to help support trainee doctors pursue a career in head and neck surgery without suffering significant financial costs. High personal costs may discourage aspiring head and neck surgeons from all but wealthy backgrounds.

Compared to other developed nations otolaryngology consultants in the UK are thinly spread. The UK has the lowest ratio of surgeons per population even though a surplus of otolaryngology trainees qualified to fill consultant posts exists. Due to financial pressure there is reluctance to create new consultant jobs within the NHS, leading to a backlog in competent trained surgeons. This is a worrying issue for candidates choosing their surgical speciality [2].

2.2 Financial

The financial burden of diagnosis, treatment and follow up care for patients with head and neck cancer is significant. In 2008, the cost to the NHS was, on average, £23,212 per patient [5]. By far the most expensive component of this is treatment. Surgical resection is more expensive than alternative treatment methods such as radiotherapy or brachytherapy [5, 6]. Additional costs are also accrued if post-operative complications occur. Costs are therefore greater for the treatment of more elderly patients due to higher post-operative complication rates [5]. In a period of austerity and the already strained NHS budget, financial decisions may begin to play a stronger role in dictating management for head and neck cancer patients in the future. If this is the case, surgical management may become a less feasible management option.

2.3 Imaging

Although there have been no new imaging modalities developed in recent years, there have been advances enabling improved head and neck cancer identification. Enhanced image resolution of computed tomography and magnetic resonance imaging help to identify smaller lesions and contrast agents are able to identify metastatic deposits in lymph nodes [7]. These advances have improved pre-operative planning, allowing more accurate surgical resection [8]. However, improvements in imaging have also benefited the field of radiotherapy, radiation beams can now be more closely contoured to the shape and volume of the tumour [7].

Previously, all patients who underwent primary chemoradiotherapy for head and neck cancer would undergo subsequent neck dissection. However, recent advancements in positron emission tomography-computed tomography have made it possible to identify patients who require adjuvant surgical treatment following chemoradiotherapy. A study has demonstrated that only 19% of patients require further neck dissection to remove persistent disease. Imaging is reducing unnecessary surgical intervention, in the long-term decreasing the exposure of patients to operative complications and risks, morbidity and cost [9].

2.4 Radiotherapy

Radiotherapy is a treatment choice for early stage head and neck cancers. Improved diagnosis and awareness of head and neck cancers means that a larger proportion of early cancers are being detected [10]. Therefore, a greater proportion of patients are eligible to receive radiotherapy as a first-line treatment. In patients with nasal cavity cancer, definitive radiotherapy achieves excellent locoregional control in the absence of deformity which often results from surgery [11]. Meta-analysis has shown that adjuvant chemo and radiotherapy improves survival and definitive local control. However, combined therapy also increases morbidity [12].

Advancements in radiotherapy techniques and planning have improved radiation delivery and reduced unwanted damage to surrounding local tissues. In particular, use of intensity-modulated and sterotactic body radiotherapy allows delivery of high dose radiation to areas in close proximity to vital structures. Radiotherapy is not without complications. Debilitating side effects of radiotherapy include xerostomia, altered taste, tissue and bone necrosis. However, with improved accuracy there has been a reduction in radiotherapy-related complications [11]. Patients who receive radiotherapy as their primary treatment report considerably higher functional outcomes regarding speech and eating compared to post-operative patients [6]. In the future, patients may benefit from proton radiation therapy which could enable more aggressive therapy in combination with a reduction of incidental radiation damage, therefore preserving function [13]. As radiotherapy techniques advance allowing more precise therapy, surgical approaches may become gradually redundant.

2.5 Targeted Therapies

Targeted agents are showing promise in the field of treating head and neck cancers. Compared to chemotherapy they have fewer cytotoxic side effects. Epidermal growth factor receptor (EGFR) inhibitors such as cetuximab and tyrosine kinase inhibitors such as erlotinib have been used with success concomitantly with chemotherapy [8]. Over 90% of head and neck cancers overexpress EGFR, with more advanced and aggressive cancers expressing the highest levels. Trials have shown improved survival and locoregional control when combining EGFR inhibitors with radiotherapy compared with radiotherapy alone [14]. However, even with advances in genetic sequencing there have been no notable developments regarding the localisation of specific mutations to target. Targeted therapies may therefore have the potential to revolutionise therapy in the future, but currently there is no evidence that they will supersede surgical management in the near future.

2.6 Surgical Technologies

Advances in surgical technology have significantly improved the ability of head and neck surgeons to resect and reconstruct head and neck cancers. Robotics has truly revolutionised the specialty, allowing minimally invasive approaches to be pursued. The advantages of robotic assistance are several-fold, summarised in *table 1*. Although endoscopic technology has advanced in recent years, there are still many limitations which robotics are able to overcome. The creation of three-dimensional images enhances depth perception and resolution, allowing more precise identification of dissection margins. Movements can be scaled down to allow more precise movements and reduce tremor. Furthermore, use of robots allows surgeons to operate globally from their console. This could enable access to specialised head and neck services worldwide. Finally, robotics can offer a virtual training environment which is extremely realistic [15].

Robotics may well revolutionise surgery in the future. However, current models are far too expensive for widespread use. There are also still disadvantages to using robotics which need to be overcome before they become mainstream practice (*table 1*).

Overall, the complex anatomy of the head and neck means that robotics are extremely useful. Continuing improvements in robotic technology will no doubt help head and neck surgeons complete more complex resections while reducing complication rates.

The development of surgical equipment continues to enable head and neck surgeons to improve surgical efficiency. Development of the harmonic scalpel, for example, has dramatically improved haemostasis whilst reducing blood loss [8]. In addition, the use of laser microsurgery has become popular amongst head and neck surgeons because of its ability to reduce functional losses and morbidity. This technique allows accurate tissue cutting while achieving haemostasis [17]. Like laser microsurgery, other microsurgical tools have led to the advancement of microsurgical procedures. The use of free tissue flap transfers using microvascular anastomosis has allowed surgeons to reconstruct more complex deficits. Free flaps allow more extensive resections and immediate repair leading to improved cosmetic appearance and functionality [11, 18]. Improving knowledge of microvascular flap reconstruction techniques can only serve to benefit head and neck surgeons in the future.

Head and neck resections leave patients with debilitating functional deficits which severely affect quality of life. Many patients would rather succumb to the disease than face such functional and cosmetic changes. Along with free flap transfers, advances in tissue engineering are helping to mitigate functional and cosmetic changes using bioengineered tissues. These tissues remove the need for donor sites so reduce operating times. Furthermore, they do not require immunosuppressive cover. Bioengineered tissues are already being used following laryngectomies and craniofacial resections with promising outcomes [19]. These advances will only strengthen the ability of head and neck surgeons to treat head and neck cancers and successfully rehabilitate patients.

Table 1. Advantages and disadvantages of robot assisted minimally invasive surgery [15, 16]

Advantages of robot assisted minimally invasive surgery	Disadvantages of robot assisted minimally invasive surgery
• Improved safety • Better or comparable outcomes • Reduced tissue damage • Quicker post-operative recovery • Reduced post-operative pain • Improved post-operative function and quality of life • Improved cosmetic appearance • Reduced infection rates	• Cost • Large equipment size • Training needed • Loss of pressure sensation

2.7 Surgical Complications

Despite significant advances in surgical techniques, all surgeries carry risk of complication, either from anaesthesia or the surgical intervention itself. In addition to the more common complications of surgery such as infection, bleeding and nausea, head and neck surgeons must contend with highly complex anatomy. The region is extremely complex meaning that removal of tissue results in disabling functional loss that greatly affects quality of life. This must be considered when treating every patient with head and neck cancer.

Neck dissections are the most common surgical procedure carried out within the specialty in which nerve and vascular injury are the most common complications. Depending on the extent of dissection required, structures may have to be removed to allow complete resection margins to be achieved. The great auricular nerve, which provides sensation to the pinna and skin posterior, can easily be damaged on skin incision resulting in numbness of this region. In 30% of patients, spinal accessory nerve lesions will occur incidentally resulting in reduced shoulder mobility, muscle atrophy and shoulder dysfunction [20]. Patients may subsequently require extensive physiotherapy to rehabilitate shoulder movement. Vascular injury commonly occurs to veins passing into the internal jugular vein. Moreover, cerebral ischemia can result if the common carotid artery is injured and when operating on the left side of the neck, thoracic duct injury may occur.

During thyroidectomy and parathyroidectomies surgeons must avoid injuring the superior and recurrent laryngeal and facial nerves. Damage to the laryngeal nerves can leave patients with vocal cord palsies. Furthermore, pharyngocutaneous fistula are common complications post-laryngectomy [20]. These are but a few of the potentially debilitating complications patients face when undergoing surgical treatment for their head and neck cancer. Patients may decide that the risk of complications is too great to proceed with such treatment. With improving surgical techniques and knowledge of anatomy, the complication rate will fall, but it will never be possible to completely eradicate the risk of surgical complications.

2.8 Incidence of Head and Neck Cancer

Smoking is the predominant risk factor in the causation of head and neck cancers [21, 22]. Smoking rates in the UK have halved since 1974 due to increased awareness of the repercussions of smoking and the increasing number of nicotine replacement prescription made annually [23, 24]. A reduction in smoking prevalence will reduce the incidence of head and neck cancers in the coming years, thus reducing the workload available to head and neck surgeons.

HPV has an oncogenic role in the pathogenesis of head and neck cancers. In the UK the incidence of HPV associated cancers is rising. In 2014, 77.1% of patients with head and neck cancer tested positive for HPV p16 [1]. HPV related head and neck cancers are more sensitive to chemotherapy and radiotherapy, making these modalities of treatment far more attractive than surgery. It is interesting that survival for oral, tonsillar and tongue cancers is improving. However, only oral and tonsillar cancers are associated with HPV [10]. This suggests that increasing survival is not only attributable to the increasing incidence of HPV-related cancers which are more susceptible to treatment. In addition, the introduction of a HPV 16 vaccination has the potential to dramatically reduce the incidence of these cancers in the future [25]. As our understanding of HPV-related head and neck cancer improves we may have to reassess the management protocols previously based on treating HPV negative patients.

2.9 Outcomes

The risk of death is clearly the most adverse complication following medical or surgical intervention. In the UK in 2014 mortality after head and neck surgery was 1.7% and 2.7% within 30 and 90 days post-operative respectively. Considering the complexity of the operations performed by head and neck surgeons this is considered safe. Patients who received chemotherapy, radiotherapy or combination had mortalities of 2.3% and 5.2% at 30 and 90 days respectively [1]. Mortality is therefore considerably higher in patients receiving non-surgical management.

Recurrence rates are one of, if not, the most important measurement of the effectiveness of an intervention. Primary surgical treatment of T3 base of tongue tumours has demonstrated lower local and regional recurrence rates compared to primary radiotherapy treatment. In addition, disease free survival is significantly higher following surgery compared to radiotherapy [6]. Surgeons can be reassured that surgical resection remains the gold standard of treatment regarding reduced recurrence when treating the majority of head and neck cancers.

3. Conclusion

It is clear that technological advancements will change head and neck cancer treatment for the better. Promising developments in radiotherapy and targeted therapies are already improving patient outcomes and will no doubt revolutionise cancer treatment in the future. There are many challenges that head and neck surgeons must overcome to prevent the speciality becoming redundant. However, the continued improvement of surgical techniques, imaging and robotics will ensure that surgeons will still play a crucial role in delivering gold-standard management for patients. Head and neck surgeon Jesus E. Medina challenged the profession to be flexible to enable it to cope and adapt to change. Head and neck surgeons must continue to embrace new technologies and help support trainees who are the future of the speciality. For the foreseeable future at least, head and neck surgeons are not an endangered species.

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