

Bronchoscopy in panendoscopy: review and assessment

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Abstract

Objective: To determine the utility of bronchoscopy to identify synchronous primaries in head and neck cancer patients.

Study design: Case series with chart review.

Method: The charts of all patients undergoing bronchoscopy between January 2008 and December 2013 were reviewed. Only those undergoing bronchoscopy as part of panendoscopy for head and neck cancer were included. Operative reports, pathology reports and discharge summaries were reviewed for operative findings, complications and length of hospital stay.

Results: A total of 404 charts were reviewed and 168 were included in the study. No synchronous primaries were identified. Bronchoscopy changed clinical management in one patient. There were no complications from bronchoscopy.

Conclusion: Bronchoscopy is a safe and well-tolerated procedure commonly performed in the investigation of head and neck cancer patients, but it adds little additional useful clinical information. Routine performance of bronchoscopy in this setting should be weighed against its added costs, and tailored to the individual patient.

Key words: Bronchoscopy; Laryngoscopy; Esophagoscopy; Neoplasms, Unknown Primary

Introduction

In 1869, Billroth reported the first case of an individual with multiple concurrent malignancies.¹ The concept of synchronous primary malignancies was reinforced in the early 1900s, wherein multiple studies of patients with malignant disease revealed high rates of synchronous primary carcinomas at autopsy.¹ Most studies conducted during the last three decades of the 1900s showed rates to be between 1.4 and 7.2 per cent,^{2–8} but rates were as high as 20 per cent in other studies.⁹ Rates of second primary carcinomas are often higher when metachronous primaries are also included. Second primary carcinomas often involved other head and neck sites, followed by the lungs. These findings resulted in panendoscopy becoming routine in the initial investigation of patients with newly diagnosed head and neck cancers.

Risk factors associated with head and neck cancer have changed significantly over recent decades. Smoking and drinking were once significant contributors. Field cancerisation was postulated to explain the high rates of second primaries in smokers. However, rates of smoking in the USA have dramatically

decreased over the past few decades. As a result, there has been a reduction in the number of smoking-related cancers. Human papilloma virus (HPV)-related head and neck carcinoma now represents a significant percentage of the disease encountered by head and neck surgeons.¹⁰

In recent years, more sophisticated imaging modalities, such as computed tomography (CT) scanning, magnetic resonance imaging (MRI) and positron emission tomography (PET), have become more commonly employed in the initial investigation of head and neck cancer patients. These studies are not only valuable in detecting regional and distant metastases, but are also capable of identifying second primary tumours.¹¹ Given these recent advances, the utility of bronchoscopy in panendoscopy begs re-evaluation. The utility and safety of oesophagoscopy in the detection of synchronous primaries has been evaluated previously at our institution and shown to be of limited value in the detection of synchronous lesions.¹² In this paper, the utility of bronchoscopy was evaluated to determine its value as a method for the detection of synchronous primary tumours.

Materials and methods

This study (level of evidence of 4) was conducted with the approval of the Stanford University Medical Center Institutional Review Board.

The Stanford University Hospital and Clinics uses an electronic medical record system (Epic®). The electronic charts were queried for procedures performed in the otolaryngology department using the following procedure search words: bronchoscopy fibre-optic; bronchoscopy flexible/rigid with biopsy; bronchoscopy rigid; panendoscopy; laryngoscopy; oesophagoscopy; bronchoscopy; bronchoscopy with lesion excision; microlaryngoscopy; bronchoscopy, microlaryngoscopy; bronchoscopy with laser; bronchoscopy via tracheotomy; and bronchoscopy with/without biopsies/removal of foreign body.

A detailed review was performed using the list of possible study subjects. An operative report was found for every case. Progress notes, pathology reports, prior imaging details and discharge summaries were reviewed for every case where available. Only patients undergoing bronchoscopy as part of panendoscopy for investigation of head and neck carcinomas were included. Those in whom no bronchoscopy was documented in the operative report were excluded. The data were imported into a database using the Research Electronic Data Capture ('RedCap') online tool (Harvard Catalyst, Boston, Massachusetts, USA). The data were subsequently analysed and reviewed.

Results

A total of 404 charts were identified and reviewed. Of these, 168 patients underwent bronchoscopy as part of panendoscopy during the investigation of head and neck carcinomas. The remaining patients underwent bronchoscopy for other indications and were not included in this analysis.

Average patient age was 64 years, and 61.5 per cent of patients were male. The most common sites of tumour involvement were the oral cavity, oropharynx, unknown carcinoma primary and larynx respectively. Twenty-nine patients had carcinoma of an unknown primary, 88 had tumours staged as T₁₋₂ and 51 had T₃₋₄ lesions. Ninety-four patients had regional metastatic disease; the remainder were node-negative (N₀). Human papilloma virus status was positive in 22.7 per cent, negative in 25.9 per cent and unknown in 50.3 per cent of patients. Of the patients, 52.3 per cent were former smokers, 6.9 per cent were active smokers and 39.7 per cent had never smoked. Smoking status could not be determined in 1.1 per cent. Most patients underwent some form of pre-operative imaging for staging purposes: 62.2 per cent via PET scanning, 29.2 per cent via chest X-ray and 3.8 per cent via chest CT.

All bronchoscopies were performed under general anaesthesia, typically prior to surgical resection of the tumour. Flexible bronchoscopy through the

TABLE I
CHARACTERISTICS OF PATIENTS WITH POSITIVE BRONCHOSCOPY FINDINGS

Pt age (y), sex	Cancer stage & site	Pathology identified
84, M	T ₄ N ₀ M ₀ – larynx (SCC)	Distal tracheal inflammatory polyp
51, M	T ₂ N _{2b} M ₀ – lip (SCC)	Distal tracheal polyp (normal respiratory mucosa)
48, M	T ₄ N _{2b} M ₁ – nasopharynx (SCC); T ₂ N _{2c} M ₀ – tongue (SCC)	Unresectable lung disease from metastatic nasopharyngeal carcinoma

Pt = patient; y = years; M = male; TNM = tumour–node–metastasis; SCC = squamous cell carcinoma

endotracheal tube was the preferred method; this was used in 83 per cent of all cases. Rigid bronchoscopy was performed in all other cases.

Length of hospitalisation varied significantly, but this was generally related to the type of operation the patient underwent following panendoscopy. Patients undergoing only panendoscopy were discharged no later than 1 post-operative day, with the majority being discharged on the same day.

There were no bronchoscopy-related complications, which include, but are not limited to, oxygen desaturations, loss of airway, airway trauma, pneumothorax or pneumomediastinum. Overall, bronchoscopy was well tolerated and there were no significant post-operative issues.

Bronchoscopy identified additional findings in only three patients (Table I), but no synchronous primaries were identified. Clinical management was affected in only one patient. This was a 48-year-old, non-smoking male with a history of nasopharyngeal carcinoma (tumour–node–metastasis (TNM) staging of T₄N_{2b}M₁), who was treated with radiation therapy in 2008, with persistent disease in his left lung. In 2012, the patient was diagnosed with a T₂N_{2c}M₀ squamous cell carcinoma (SCC) of the oropharynx. Pre-operative PET/CT scanning revealed a lesion in the left mainstem bronchus; this was later biopsied, revealing nasopharyngeal carcinoma. Surgical resection of the new tongue base primary was not performed as bronchoscopy revealed extension of the bronchial lesion to the trachea and disease was deemed unresectable.

Discussion

Previously reported rates of synchronous and metachronous carcinomas in patients with head and neck cancer led to the establishment of panendoscopy as a screening tool for additional lesions. Smoking and drinking were large contributors to the development of head and neck cancer. Nevertheless, with a significant reduction in the rates of smoking, along with the increase in HPV-related head and neck carcinomas,

the pathophysiology of head and neck cancer has changed. Furthermore, with the advent of more sensitive imaging technologies such as MRI, CT and PET/CT, we are more capable of detecting small, distant pathology. Positron emission tomography/CT can effectively detect second primaries in head and neck cancers, and has also been used in the detection of primary sites in cases of carcinoma of unknown primary.

The only identified tumour pathology in our series was in a patient with a history of metastatic nasopharyngeal carcinoma, who was diagnosed with a new primary tongue base carcinoma four years later. Positron emission tomography/CT scanning performed at another institution three months earlier had identified a solitary left pulmonary lesion; this was later biopsied, revealing metastatic nasopharyngeal carcinoma. The patient was to undergo resection of his second primary only if his pulmonary lesion was deemed resectable. Bronchoscopy revealed that the tumour had grown significantly and was involving the trachea in addition to the mainstem bronchus. An intra-operative thoracic surgery consultation took place. The operation was aborted once the mass was deemed unresectable. Therefore, bronchoscopy proved useful in determining resectability, not in detection.

In an academic setting, bronchoscopy is often performed by resident surgeons, which may afford valuable training experience in airway endoscopy, and assist in the acquisition of more complex airway skills such as airway foreign body removal in children. This argument has been advanced to continue routine incorporation of the technique in the surgical evaluation and management of head and neck cancer patients. In our institution, the vast majority of bronchoscopies are performed using a flexible bronchoscope through an endotracheal tube, and, as detailed in this report, adjunctive procedures such as biopsy are rarely, if ever, performed. Based on these observations, it is difficult to argue that training advantages to residents can justify the routine use of bronchoscopy in the head and neck cancer population.

Panendoscopy has been proposed for other purposes, and may have merits in this regard. Such purposes include: initial assessment of the primary tumour; provision of a resident training opportunity in the technique of rigid endoscopy; and allowance for more careful inspection of areas that are difficult to evaluate, such as the folds of the hypopharynx and oesophagus.¹³ Past arguments put forward for panendoscopy have included: the opportunity to expose the patient to a short 'test anaesthetic' to determine fitness for a more prolonged general anaesthetic, and the opportunity to attend to diseased dentition prior to the institution of radiation therapy.¹⁴

In 1992, Haughey *et al.* demonstrated a 4 per cent incidence of synchronous primary tumours across more than 40 000 patients from 24 studies.² As

Kerwala *et al.* elegantly summarised, this translates into the detection of just 3 additional oesophageal malignancies for every 1000 patients undergoing panendoscopy.¹⁴ Thus, panendoscopy is recommended as a selective screening tool in those who present in a symptomatic manner. Lesions located in the distal airway, however, will not be amenable to discovery with endoscopy, and imaging modalities such as CT will still be required to characterise lesions at these sites.¹⁵

- **Panendoscopy has traditionally been used in the initial investigation of patients with head and neck cancer**
- **In the era of modern imaging techniques, its routine use is now in question**
- **In 168 patients evaluated in this study, no patient was found to have a synchronous second primary tumour, and treatment was modified in only 1 patient**
- **The routine use of bronchoscopy should be abandoned in favour of a more tailored approach**
- **Bronchoscopy should be used for surgical planning rather than as a purely diagnostic tool**

An interesting concept is the coupling of adjunctive procedures to improve the sensitivity of bronchoscopy. In most institutions, panendoscopy in general and bronchoscopy specifically are performed using white light. The use of autofluorescence and narrow-band imaging may serve to illuminate smaller, more subtle lesions. This may increase the detection rate of dysplastic lesions, changing the treatment and management of patients in whom such lesions are found.^{16,17} Bronchial washings are inexpensive and a simple way to retrieve cells from the distal airway. This technique could enhance the detection of bronchogenic malignancy versus bronchoscopy alone, but the potential to seed the airway distally with cancer cells shed from the passage of the bronchoscope beyond the more proximally located primary tumour may confound the interpretation of results.¹⁸

Conclusion

Bronchoscopy has traditionally been utilised as a component of panendoscopy in the staging and evaluation of head and neck cancer patients. In the modern era, with more sophisticated imaging modalities available to the clinician, the routine use of panendoscopy to detect a second primary has a very limited role. As third party payers evaluate reimbursement to physicians and hospitals, the added value of surgical procedures will continue to be scrutinised closely, and the routine performance of procedures that fail to provide clinical value are not likely to be reimbursed. The

routine use of bronchoscopy should be abandoned in favour of a more tailored approach, with the goal of using bronchoscopy for surgical planning rather than as a purely diagnostic tool.

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Dr E J Damrose takes responsibility for the integrity of the content of the paper

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