Fibreoptic bronchoscopic electrosurgery under local anaesthesia for rapid palliation in patients with central airway malignancies: a preliminary report

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Abstract

***Background* – Obstruction of a major airway by tumour causes serious morbidity. There is still scope for a widely applicable, simple and effective treatment to provide rapid palliation.**

***Methods* – A fibreoptic bronchoscope prototype with an insulated inner sheath was used under local anaesthesia in 17 patients with locally advanced tracheobronchial malignancies. An insulated flexible electrosurgery probe was used to coagulate intraluminal tumour mass using standard electrosurgery equipment.**

***Results* – Immediate reopening of the airway was obtained in 15 of the 17 patients. Two appeared to have extraluminal disease. Eleven patients had an obvious bronchoscopic response in whom a >75% reopening of the normal airway diameter was achieved. Eight patients had subjective improvement of their dyspnoea, but only in four cases was there an objective improvement in physiological parameters. Haemoptysis resolved in four. There were no deaths resulting from treatment. Minor bleeding occurred in one patient and an aspiration pneumonia occurred in one. Three patients received additional treatment.**

***Conclusions* – Fibreoptic bronchoscopic electrosurgery is a simple technique for rapid palliation and immediate tumour debulking in patients with central tracheobronchial tumours. Further work is needed to compare its efficacy with other techniques.**

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Prototype fibreoptic bronchoscope (Olympus) with insulated/electrically grounded inner sheath (white tip visible) and insulated ball probe catheter protruding out of the suction channel. This monopolar ball probe can be used to coagulate tumour base along the bronchial wall by gentle palpation manoeuvres.

Tumour in the central airways can cause serious morbidity. Dyspnoea, haemoptysis, and pneumonia due to obstruction by the tumour in the tracheobronchial tree can be palliated by bronchoscopic techniques including mechanical tumour removal, cryosurgery, Nd-YAG laser, brachytherapy, and photodynamic therapy.[1–5] The availability of a special fibreoptic bronchoscope prototype which is electrically grounded has enabled us to undertake a pilot study in 17 patients with obstructing tumour in the large airways treated for palliation under local anaesthesia with bronchoscopic electrosurgery.

Methods

PATIENTS

Seventeen patients of median age 65 (range 48–85) years were entered in the study. They were referred to our hospital because of symptoms caused by tumour obstruction, as diagnosed by the referring physicians. All patients were considered to have advanced inoperable tumour and many had low performance status because of advanced age and/or poor prognostic signs such as weight loss, stage IIIB locally advanced tumour, and end stage recurrences after radiotherapy (table 1). Many patients were regarded as high risk candidates for any kind of intraluminal treatment.

PROCEDURE

All treatment sessions except one were performed under local anaesthesia. The rigid bronchoscope system was also readily available.[6] All patients received midazolam intravenously for mild sedation. Oxygen saturation was monitored by pulse oximetry and supplementary oxygen was given by nasal prongs. The fibreoptic bronchoscope was a prototype (Olympus, diameter 6 mm, diameter suction channel 2·6 mm) with an insulated and electrically

Table 1 Clinical data of patients with tracheobronchial malignancies treated with fibreoptic bronchoscopic electrosurgery under local anaesthesia

Patient no.	*Age*	*Main symptoms*	*Karnofsky score*	*History and tumour characteristics*
1	82	Obstructive pneumonia	50	NSCLC BI, atelectasis
2	57	Dyspnoea, obstruction	60	Recurrence NSCLC LMB
3	71	Dyspnoea, obstruction	40	Recurrence T4 trachea and RMB
4	78	Dyspnoea, stridor obstruction	60	NSCLC LMB
5	58	Dyspnoea, obstruction	50	NSCLC LMB recurrence
6	53	Obstructive pneumonia	40	NSCLC LMB; lymphangitis carcinomatosa
7	70	Haemoptysis	70	Stump recurrence LUL, ribs metastases
8	63	Dyspnoea, obstruction	70	2nd primary NSCLC LLL after right pneumonectomy
9	48	Dyspnoea, obstruction	70	Recurrence NSCLC LMB, extensive mediastinal disease
10	48	Dyspnoea, obstruction	70	Recurrence NSCLC LLL
11	51	Dyspnoea, obstruction	60	Carcinoid recurrence distal LMB
12	85	Dyspnoea, obstruction	70	Endobronchial metastasis RLL of a hypernephroma
13	72	Obstruction	70	NSCLC RUL
14	76	Haemoptysis	50	Recurrence NSCLC MC
15	57	Haemoptysis	60	Recurrence NSCLC LMB
16	82	Obstruction	40	NSCLC RMB/LMB
17	68	Haemoptysis	70	Recurrence NSCLC BI

MC = main carina; RMB/LMB = right/left main bronchus; RUL/LUL/LLL = right upper/left upper/left lower lobe; ML = middle lobe; BI = bronchus intermedius; NSCLC = non-small cell lung cancer.

grounded inner sheath (figure). After bronchoscopic confirmation of the airways obstruction a flexible electrosurgery probe (Olympus, diameter 1·2 mm) was used for coagulation with standard electrocautery equipment. Energy at 25–45 W was applied for a variable duration, depending on the visible coagulative effect on the intraluminal tumour mass.

The probe was gently pressed against the tracheobronchial wall and slowly advanced and retracted through the tumour during the coagulation procedure until coagulation appeared to be sufficient. The tip of the bronchoscope was then used to shear off necrotic tissue and repeated washing and suction was applied to clean up all tumour debris. A treatment session continued until >75% reopening of the normal airway lumen had been achieved, or 30 minutes treatment time elapsed. If there was insufficient reopening due to probable extraluminal compression the session was terminated.

RESPONSE CRITERIA

A bronchoscopic response was considered significant if a reopening to >75% of the normal airway diameter was achieved. Subjective symptoms after treatment were scored by asking the patient before discharge (2–5 days after treatment) whether their dyspnoea and haemoptysis were worse, the same, or better in comparison with their pretreatment status. Lung function parameters and/or arterial blood gas tensions were analysed where available. A >15% change from baseline values was considered significant. Response duration and survival data were collected from the referring physician at follow up.

Results

Tumour obstruction was confirmed in 13 cases and the combination of obstruction and haemoptysis was found in another four patients. Twenty bronchoscopic electrosurgical sessions were carried out, usually immediately after the bronchoscopic examination. One session needed to be repeated under general anaesthesia because of continuous coughing and poor sedation with midazolam.

BRONCHOSCOPIC RESPONSE (table 2)

In two patients (nos 5 and 9) extraluminal compression caused treatment to be discontinued. In four patients (nos 7, 14, 15 and 17) haemoptysis resolved for at least four weeks after treatment and, in addition, in one (no. 15) clearance of tumour was also achieved. Substantial clearance of tumour with a reopening of the airway lumen to >75% of its initial diameter was seen in 11 patients. However, only eight of these patients reported subjective improvement.

LUNG FUNCTION AND ARTERIAL BLOOD GAS ANALYSIS (table 2)

Lung function data before treatment were incomplete due to the poor condition of many patients and the fact that electrosurgery was performed immediately after bronchoscopic confirmation of the tumour obstruction. No patient had a major deterioration after treatment, however. Four of the eight patients with subjective improvement showed improved physiological parameters (nos 3, 4, 5, and 13).

Table 2 Results of fibreoptic bronchoscopic electrosurgery under local anaesthesia in patients with advanced tracheobronchial tumours

Patient no.	*Bronchoscopic results*	*LF/BG*	*Symptoms*	*Response duration (months)*	*Survival (months)*	*Follow up (months)*
1	Two sessions, clearance	=/=	=	1	Alive	Gradual extraluminal tumour progression (3)
2	Clearance	NA/=	=	–	2	Died
3	Two sessions, clearance	NA/↑	↑	2	4	Additional HDR, died
4	Clearance	↑/NA	↑	8	Alive	RT and additional HDR
5	Partial, extraluminal	NA/↑	↑	2	4	Disease progression, cachexia
6	Clearance	NA/=	=	1	2	RT, aspiration pneumonia
7	Haemostasis	=/NA	↑	2	2	No haemoptysis
8	Clearance	NA/=	↑	3	6	Additional HDR
9	Partial	NA/=	=	–	2	Bronchial necrosis
10	Clearance	=/=	↑	1·5	Alive	Cutaneous metastasis (6)
11	Clearance	=/=	↑	4	11	Lung abscesses, died
12	Clearance	NA/NA	=	1	Alive	Recurrence, YAG laser (4)
13	Clearance	↑/=	↑	3	Alive	RT mediastinal disease (6)
14	Haemostasis	=/NA	↑	2	2	Died without haemoptysis
15	Haemostasis	NA/=	↑	4	4	Died without haemoptysis
16	Clearance	NA/NA	↑	1	?	Lost to follow up
17	LA failed, GA haemostasis	=/=	↑	4	6	Alive, tumour abscess right tracheal region (4)

NA = not available; ↑ = improvement; = = same according to the response criteria; HDR = high dose brachytherapy; RT = radiotherapy; LA/GA = local/general anaesthesia; LF/BG = lung function/blood gases.

COMPLICATIONS

There were no deaths related to the treatment and no episodes of respiratory failure. Patient no. 11 with a progressive carcinoid tumour bled 100 ml which was managed by repeated cold saline lavage via the rigid bronchoscope. Patient no. 6 developed a pneumonia in the contralateral lung due to aspiration of pus immediately after tumour debulking.

ADDITIONAL TREATMENT

Three patients (nos 3, 4, and 8) were additionally treated with high dose brachytherapy after bronchoscopic electrosurgery, and two received palliative radiotherapy after reopening of the lumen had been achieved (nos 4 and 6). The combination of high dose brachytherapy and radiotherapy resulted in eight months of local control in patient no. 4.

Discussion

The Nd-YAG laser is the usual treatment for the palliation of patients with obstructing endobronchial tumours.[3 6] In most centres the standard procedure is with general anaesthesia, although local anaesthesia is possible in selected cases.[7] In patients in whom there is a need for rapid relief of symptoms, electrosurgery seems to provide a cost effective alternative.[8–10] A recent report confirmed the efficacy of a rigid diathermic loop for relief of large airway obstruction by tumour under general anaesthesia.[10] However, despite the encouraging early report by Hooper *et al.*[8] electrosurgery has not been widely used. The introduction of the Nd-YAG laser, the fact that a standard fibreoptic bronchoscope is not electrically grounded, and the unpredictable amount of necrosis have led to the assumption that bronchoscopic electrosurgery is an unsafe and unreliable technique.

However, electrosurgery equipment is widely available and is less costly than an Nd-YAG laser. At fibreoptic bronchoscopy gentle palpation with the electrosurgical probe along the tumour base and the bronchial wall gives direct feedback to the bronchoscopist compared with the non-contact mode with the Nd-YAG laser. In our experience with different bronchoscopic therapeutic techniques electrosurgery is a simple extension of a standard fibreoptic procedure, but to prevent perforation it is important to understand its principle.[8 11] The depth of necrosis depends on the voltage difference between the probe and tissue and the duration of contact. Too high an energy level applied for too long over a small contact area may cause perforation.

Most patients with tracheobronchial malignancies have a poor prognosis and are high risk candidates for any kind of bronchoscopic intervention.[6] Our main purpose was to provide immediate palliation in patients with a very poor prognosis, and bronchoscopic electrosurgery seemed to result in no more complications than other palliative techniques, despite the use of local anaesthesia in almost all cases.

The bronchoscopic results in our series did not always correlate with the subjective and objective responses of the individual patient, probably because many of them appeared to have significant extraluminal disease and presented with end stage recurrences after external irradiation. The patient population and the setting of our institution did not always allow physiological measurements before admission, resulting in incomplete data for analysis of the objective response.

In summary, fibreoptic bronchoscopic electrosurgery seems to provide a cheap and safe alternative for immediate intraluminal tumour debulking. It is easy and quick to perform, even under local anaesthesia, using standard electrosurgery equipment. However, the need for a special bronchoscope and the relatively unpredictable depth of necrosis are clear disadvantages. Further study is needed to compare its value with other treatments such as laser therapy.

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