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Techniques in Interventional Bronchoscopy

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ABSTRACT

Interventional bronchoscopy is a new and non-surgical diagnostic, therapeutic and palliative approach to patient with bronchial pathologies. It consists mostly of rigid endobronchial bronchoscopy under general anesthesia, with the use of (1)Nd-YAG or KTP laser (2)Cryotherapy (3)Endobronchial prostheses (4)Photodynamic therapy (5)Brachytherapy and, (6)Thermocoagulation. The idea is to treat by non-surgical measures, most of the early stage tracheobronchial cancer (insitu or microinvasive). The other utility is to associate this technique as an adjuvant treatment with chemo-radiotherapy in advance lung carcinoma. Treatment of benign structural or endobronchial pathologies as well as control of hemoptysis and foreign body removal are the other indications. In the future, interventional bronchoscopy will be a leader to diagnose and treat bronchial diseases. (Tanaffos 2002; 1(3): 13-18)

Keywords: Interventional pneumology, Bronchoscopy, Laser therapy, Endobronchial carcinoma.

INTRODUCTION

Since 1980, multiple methods of therapeutics endobronchial bronchoscopy have been developed. The principles are as follows:

- Laser therapy: essentially the use of Nd- YAG and KTP laser to coagulate malignant lesions.
- Cryotherapy: based on the cellular cytotoxicity of low temperature.
- Endobronchial prostheses: expandable (covered/ non-covered) or silicon stent, developed for benign situation like tracheobronchial dyskinesia, post intubation stenosis and as a palliative treatment for malignant endobronchial pathologies.
- Photodynamic therapy: a new modality based on the interaction of light and a photosensitizing agent located in the tumor, specially in early stage

of lung cancer.

- Endobronchial brachytherapy: developed following the miniaturization of radioactive sources, enabling the use of fiberoptics to deliver treatment at high dose.
- Thermocoagulation: selection of the thermal effect of electrical current whilst avoiding the electrolytic and faradic effects on nerve and muscle stimulation.

Each of these methods had its own interrelation with the target tissue and it is important to know them as long as the best therapeutic is required.

INDICATIONS OF DIFFERENT TECHNIQUES

The use of endobronchial laser, thermocoagulation and tracheobronchial stents had an important role to control urgent situation with acute dyspnea; on the contrary, cryotherapy, photodynamic coagulation, and endobronchial brachytherapy had a more delayed

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action and are reserved only for less urgent situations. (1)

Some of them (cryotherapy, photodynamic therapy and endobronchial brachytherapy) had selective cytotoxic effects and was beneficial only in very cellular and/or malignant pathology. This specificity gives us a good safety to use them in limited malignant lesions.

Endobronchial laser, thermocoagulation, and prostheses are also indicated in benign pathologies

(i.e: tracheal dilatation and stenting in post-intubation stenosis or tracheobronchial dyskinesia).

Most of these methods are only effective on endoluminal lesions, but occasionally endobronchial prostheses, and rarely brachytherapy had also some efficacy on compressive extrinsic pathology.

Tables 1 and 2 show the indications and therapeutics results of each method in neoplastic lung diseases. It is not so difficult to feel the interest to use the combination of them, to get the best therapeutic result. (1)

Table 1. Therapeutic indications of different methods of interventional bronchoscopy in malignant endobronchial diseases.(1)

Indication	YAG laser	Thermocoagulation	Photodynamic therapy	Cryotherapy	Prostheses	Brachytherapy
Tracheal tumor with dyspnea	++++	++++	No	No	No	No
Tracheal or bronchial tumor without dyspnea	++++	++++	+	+++	No	+++
Distal tumor	+	+++	++	+++	No	+++
Infiltrating tumor with limited borderline	No	+++	+++	++++	No	+++
In situ & microinvasive	+	++	+++	+++	No	+++
Coagulation	+++	+++	ND _(o)	++++	possible	++++
Extrinsic compression	No	No	No	No	++++	++

Table 2. Therapeutic results of different interventional bronchoscopic techniques in pulmonary cancerology. (1)

Result	YAG laser	Thermocoagulation	Photodynamic therapy	Cryotherapy	Prostheses	Brachytherapy
Control of Hemoptysis	60%	90%	ND _(o)	65-86%	Possible	80%
Attenuation of cough & dyspnea	80-90%	50-60%	70%	66%	90%	85%
Spirometric gain	85%	73%	ND _(o)	50%	71%	80%
Edoscopic desobstruction	90%	84%	50-60%	75%	90%	80%
	immediate	immediate	retarded	retarded	immediate	retarded
Duration of well being after the procedure	2-3 mo	ND _(o)	ND _(o)	3-4 mo	4 mo	6.5mo
Possibility of reintervention (If necessary)	Yes	Yes	Yes	Yes	Yes	No
Curative effect	sometimes	Yes	Yes (77-85%)	Yes (81%)	No	Yes (84%)

In palliative situations, choices between these methods seem to be simple; however, we still don't have any comparative study to show that one is better than the others.

In therapeutic cases (in situ or micro-invasive lesions), problems are different. Early detection is still a dilemma (partially resolved by LIFE system), and the spontaneous evolution of dysplastic or in situ lesions to invasive lesions is not well known. The consequence is that we cannot justify our therapeutic endobronchial acts. The other problem is the same as in palliative situation: the lack of any comparative studies or consensus.

In benign pathology, especially in tracheal stenosis, the place of interventional bronchoscopy is better defined. A French study showed that in tracheal stenosis, the first therapeutic step could be the use of rigid endobronchial endoscopy (dilatation, laser therapy, and prosthesis)(2).

DIFFERENT ASSOCIATIONS OF ENDOBRONCHIAL BRONCHOSCOPIC TECHNIQUES

Classic associations are as follows: the use of laser or thermocoagulation on pediculated tumors with complementary cryotherapy on the implantation site, laser destruction for endoluminal tumors, combined with endobronchial stenting to retard the reobstruction, and/or fight against extrinsic tumoral invasion. The use of cryotherapy prolonged at least one month, which was benefited of desobstruction by laser therapy. (3)

Another association is the combination of laser beam and endobronchial brachytherapy. The laser has an immediate effect on the bronchial caliber and facilitates the passage of the vector catheter and brachytherapy, treat the peribronchial components. This association gives better results than laser therapy alone (4,5,6).

ASSOCIATION WITH OTHER THERAPEUTIC MEASURES

The most important associations are the combination of interventional bronchoscopy with radiotherapy and chemotherapy (in pulmonary cancerology).

Usually these patients are referred to therapeutic bronchoscopic centers after radio-chemotherapy in a final stage and with major bronchial problems (3-7). The use of interventional bronchoscopy is rarely beneficial in these cases although French study shows that, the use of interventional bronchoscopy before radio-chemotherapy is a better solution (8).

Endobronchial desobstruction before external or internal irradiation, reduce the risks of post irradiation stenosis and pneumonia, besides removing the atelectasia, helps the radiotherapist to focus the target lesion. The duration of endoluminal brachytherapy will be shorter than usual, with better results and less complications (especially wall necrosis) (1).

Chemotherapy is better tolerated after desobstruction and complications like obstructive pneumonia in leucopenic phases is less frequent (removal of atelectasia), instead the therapeutic response is logically better (reduction of tumor volume) (1).

A non-randomized study shows that patient's survival after association of interventional bronchoscopy and radiotherapy is better than radiotherapy or desobstruction alone (7,8,9,10,11). It was demonstrated that cryotherapy is perhaps, a chemo-radiosensibilizing methods. In some other studies, the percentage of remission would be better if the physician placed the use of endobronchial cryotherapy in his therapeutic planing before radio or chemotherapy (3,10,11). Homasson et al., demonstrated that "intratumoral trapping" of chemotherapeutic agents was more pronounced after endobronchial cryotherapy (13).

The combination of endoluminal prostheses and external irradiation seems to reduce both the risk of tumoral overgrowth in the upper extremity of the prostheses and the need of reintervention (12).

The association of high dose brachytherapy and external radiotherapy had also good results. Some studies show that the use of brachytherapy before external radiotherapy spares 47% of lung volume to be irradiated (14,15,16).

DISCUSSION

This brief review of endobronchial therapeutic methods shows the multiplicity of our problems to choose the best technique in different endobronchial pathologies. We feel the need of more randomized studies to prove the efficacy of each ones in palliative and curative situation.

The role of an interventional endoscopist is to diagnose and cure with the most appropriate or a combination of these methods, the early stage of bronchial carcinoma. Furthermore, he must use them as an adjuvant or palliative treatment in pulmonary cancerology. The advantage of interventional bronchoscopy is the ability to practice this technique among patients whose respiratory reserve is precarious. But it is not all ! Many benign diseases such as post intubation or corrosive gaze inhalation tracheal stenosis, tracheobronchial dyskinesia, inhalation of foreign body; and so on, need the help of an interventional endoscopist. Another important utility of interventional bronchoscopy is to obtain by deep biopsy, a histological certitude of lesions that are not histologically diagnosed by fiberoptic bronchoscopy. Something is clear; in the following years, interventional bronchoscopy will be the main stem in curative therapeutics of early stage of endobronchial neoplasia and it will also be a potent arm in palliative treatment in advance lung cancer as well as benign endobronchial lesions. The surgical

treatment will be no more the therapeutic choice in this kind of diseases.

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