

Mediastinoscopy in the surgical management of lung carcinoma

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París, F., Tarazona, V., Blasco, E., Cantó, A., Casillas, M., and Pastor, J. (1975). *Thorax*, 30, 146–151. **Mediastinoscopy in the surgical management of lung carcinoma.** Up to December 1973, we had performed 100 mediastinoscopies for lung carcinoma. Fifty-two were positive and 48 negative. In 80 cases there was clinical or radiological suspicion of mediastinal invasion. With radiological evidence of mediastinal node involvement exploration was positive in 32 out of 35 cases, when chest radiography findings were equivocal in 19 out of 45, and when radiology of the mediastinum was normal in only one of 20 cases. Mediastinoscopy was more frequently positive when the carcinoma was oat-cell or anaplastic. Of 48 patients with negative biopsies, 41 were explored. In 26 the carcinoma extended beyond the lung.

In 1973 we circularized 83 thoracic surgeons concerning (1) the use of mediastinoscopy for patients with lung carcinoma assessed for surgery, (2) the significance of mediastinal node involvement, (3) the results of radiotherapy alone in patients rejected for surgery, and (4) the survival rate in patients with positive mediastinal nodes treated with surgery alone or together with radiotherapy. The replies to the questionnaire are summarized. The authors emphasize the usefulness of mediastinoscopy but state that care must be taken when deciding to withhold operation for a possible cure.

Various therapeutic policies have been adopted in the surgical treatment of carcinoma of the lung. Radical pneumonectomy with en bloc resection of the lung and mediastinal lymph nodes using an intrapericardial approach was advocated by Allison (1946), Brock (1948), and Caham, Watson, and Pool (1951). Initially it was recommended as the best method for the treatment of lung carcinoma, based on the principles accepted at that time for cancer surgery. Today the routine use of radical pneumonectomy is not in fashion, as the results are no better than with other more conservative surgical procedures.

Nevertheless extensive surgery may increase the resectability rate in certain forms of advanced carcinoma of the lung, removing the neighbouring structures invaded by carcinoma. This policy attempts to cure a great number of cases and has been advocated by many surgeons (Abbey Smith, 1957; Chamberlain *et al.*, 1959; Fégiz, Di Paola, and Tonelli, 1970; Sulzer *et al.*, 1971; Naef, 1974).

Opposed to this aggressive policy is that of selectivity suggested by Delarue and Starr (1967), Paulson and Urschel (1971), and Pearson *et al.* (1972), who selected patients for operation with the object of avoiding unnecessary explorations and extended resections. These authors consider some extended operations to be without benefit as regards survival and to have additional operative risk.

Mediastinoscopy is a simple method of exploration of the superior mediastinum with minimal trauma through a cervical suprasternal incision. This method, introduced by Carlens (1959), has been advocated for preoperative evaluation of patients with cancer of the lung by many European and American surgeons (Akovbiantz and Aeberhard, 1964; Gironés, 1965; Maasen *et al.*, 1965; Sarrazin and Voog, 1965; Jepsen, 1967; Bilgutay *et al.*, 1969; Goldberg *et al.*, 1970; Hájek and Homan van der Heide, 1970; Kirschner, 1971; Otto, Zaslonka, and Lukianski, 1972; Gibbons, 1972; Pearson *et al.*, 1972). Sometimes

mediastinoscopy is replaced by anterior exploration of the mediastinum (mediastinotomy), as advocated by McNeill and Chamberlain (1966), Stemmer *et al.* (1965), Evans, Hall, and Kent Harrison (1973), and Jolly *et al.* (1973).

The purpose of this paper is to present our experience with mediastinoscopy and to compare it with the opinion of others.

MATERIAL AND METHOD

Up to December 1973, 100 mediastinoscopies were carried out with a view to surgery for lung cancer. In 80 cases mediastinal invasion was suspected because of the width of mediastinal shadows in the radiograph or tomogram, superior vena caval obstruction, phrenic or recurrent nerve palsy, or abnormal findings at bronchoscopy. In 20 cases the procedure was done as a routine preoperative examination in patients without any signs of mediastinal involvement.

The large number of patients with clinical involvement of the mediastinum accounts for the large number of oat-cell and anaplastic carcinomas (Table I).

TABLE I
HISTOLOGICAL TYPE OF BRONCHOGENIC CARCINOMA IN 100 PATIENTS UNDERGOING MEDIASTINOSCOPY

Cell Type	No.
Anaplastic and oat-cell	49
Squamous-cell	32
Cell type uncertain	13
Adenocarcinoma	5
Bronchiolar-cell	1

RESULTS

Of the 100 mediastinoscopies, 52 revealed tumour invasion of the nodes. When there was radiological evidence of mediastinal involvement (Table II), mediastinoscopy was positive in 32 of 35 cases (91%). When the chest radiographic findings were equivocal, mediastinoscopy was positive in 19 of 45 cases (42%). Of the 20 cases without radiographic evidence of involvement of the mediastinum, only one was positive.

TABLE II
MEDIASTINOSCOPIC FINDINGS RELATED TO RADIOLOGICAL EXAMINATION

Radiological Evidence of Mediastinal Invasion	Mediastinoscopy			
	Positive		Negative	
	No.	%	No.	%
Definitive	32/35	91	3/35	9
Equivocal	19/45	42	26/45	58
None	1/20	5	19/20	95

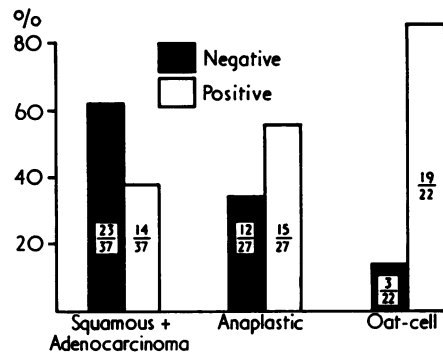


FIGURE Mediastinoscopic findings related to the cell type of the tumour ('unidentified' cell type and bronchiolar cell carcinoma excluded).

Mediastinoscopy was most frequently positive when the carcinoma was oat-cell, and anaplastic more frequently than squamous (Figure).

Of the 52 patients with positive findings, only three were explored. In one an extended resection was possible and in the other two the carcinoma was not resectable. The remaining 49 patients were not submitted to surgery, 32 because of the type of nodal involvement (perinodal invasion and fixation to neighbouring structures) or the poor histological prognosis (oat cell). In 17 patients other criteria of inoperability were present; some were poor-risk patients.

Of 48 patients with negative biopsies, 41 were explored and seven were not. The carcinoma was confined to the lung in 15 cases. In 26, the carcinoma extended beyond the lung in spite of a negative mediastinoscopy. It was impossible to remove the tumour in seven cases, extended resection was necessary in 15, and non-curative resection in four cases (Table III).

TABLE III
THORACOTOMY FINDINGS AND TYPE OF OPERATION IN 41 PATIENTS WITH NEGATIVE MEDIASTINOSCOPY

Carcinoma confined to Lung (15)	Extension beyond Lung (26)
15 Standard resections	7 Thoracotomies only 4 Non-curative resections 15 Extended resections

In 10 negative mediastinoscopies it appeared that the nodes should have been accessible to the mediastinoscope as shown by subsequent thoracotomy. The surgeon's experience of mediastinoscopy greatly influences the incidence of a positive result. In 16 cases, the tumour or the nodes were

definitely beyond the reach of the mediastinoscope, although extension to the heart or pericardium and pararenal nodes, great vessels, subaortic zone, oesophagus and adjacent lymph nodes, posterior subcarinal group of nodes, chest wall or diaphragm was seen at operation, and an extended operation was necessary or thoracotomy only was performed.

DISCUSSION

Mediastinoscopy is an important aid in the study of patients with cancer of the lung, reducing the number of exploratory thoracotomies, but in our opinion its excessive use is as unwise as its too infrequent use.

When there has been no clinical or radiological evidence of mediastinal invasion, we have found only one case from 20 patients with positive mediastinoscopy. Naef (1974) believes that tomography allows the surgeon to assess the extent of mediastinal invasion in almost every case. Peace and Price (1973) state that the absence of mediastinal nodes in inclined frontal tomograms can be accepted with confidence as true absence of mediastinal involvement. Their findings were confirmed by thoracotomy.

Pearson (1974) considers tomography to be less reliable. False negative results arise in 20%, and he noted the special difficulty of diagnosing node involvement on the left side. Of 27 of Belcher's (1974) positive mediastinoscopies nine had normal tomograms. These conflicting views could be explained by differences in technique and interpretation of the tomograms. In our series, only 5% of patients with negative radiology had positive mediastinoscopy. We think that routine mediastinoscopy is unnecessary when the patient's radiographic findings do not show upper mediastinal node involvement. Conversely, negative mediastinoscopy is no guarantee that the tumour is confined to the lung (Table III). In addition, the presence of involved mediastinal nodes is not for some surgeons a sign of inoperability.

In order to find the role of mediastinoscopy, in 1973 we circularized 83 thoracic surgeons in many countries. Forty-three (51%) answered the following questions:

Question 1: Do you use mediastinoscopy as a routine procedure in every patient before surgery, or only if radiology and other data suggest invasion of the mediastinal nodes? We obtained 43 replies to this question which are summarized (Table IV).

Question 2: Do you consider the presence of subcarinal or paratracheal nodes a sign of inopera-

TABLE IV
USE OF MEDIASTINOSCOPY IN PREOPERATIVE ASSESSMENT OF LUNG CARCINOMA (43 replies)

Used routinely	Used only when Mediastinal Invasion suspected	Rarely used
14	17	12 ¹

¹One considers it to be too time consuming.
One uses it only to confirm definitive inoperability in advanced cases.
One considers the risk of mediastinoscopy higher than that of thoracotomy.
One uses it only if contralateral node involvement is suspected.

bility or only an indication of a worse prognosis. We obtained 42 replies (Table V); 36% (15/42) replied that the presence of mediastinal node involvement confirms inoperability, 40% (17/42) consider this involvement to be a sign of worsening prognosis but not of inoperability, and 24% (10/42) state that if the carcinoma is squamous celled and the involvement is only intranodal the condition is operable.

TABLE V
SIGNIFICANCE OF MEDIASTINAL NODE INVOLVEMENT (42 REPLIES)

Confirms Inoperability	Worsens Prognosis but not Inoperable	Operability dependent on Cell Type and Type of Invasion ¹
15 ¹	17	10 ²

¹Two state inoperability except in a few selected cases.
²Depends on cell type, location of the nodes and whether involvement is intranodal or perinodal.
³Two state inoperable if massive invasion or node palpable with finger tip through mediastinoscopy incision.

Using mediastinoscopy it is obvious that higher percentage of patients with a chance of cure will be operated upon. Mediastinoscopy improves the resectability rate and the five-year survival of resected patients. It is, however, not possible to improve the total survival of all patients with carcinoma by excluding potentially curable patients because of a positive node finding at mediastinoscopy.

Otto *et al.* (1972) believe that the use of mediastinoscopy in assessing patients with lung carcinoma depends on the temperament of the surgeon. The more aggressive the surgeon, the more extensive will be the operations attempted, and the results of mediastinoscopy will be less important.

Sarin and Nohl-Oser (1969) and Paulson (1974) do not usually operate on patients with involvement of mediastinal nodes. They consider that such patients should be treated with radiotherapy because a comparison of the survival rates after

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surgery and radiotherapy in these patients showed similar results. These opinions led us to formulate the following questions:

Question 3: What are the results of radiotherapy alone in patients rejected for surgery? Nine surgeons reported no five-year survival with radiotherapy. One reported less than 1%, six 1-2%, four 5-6%, and one less than 10%.

Question 4: What is the five-year survival rate in patients with positive mediastinal nodes treated with surgery alone or additional radiotherapy? Four surgeons reported no five-year survival. One reported 2-3%, four 5-6%, and four 7-9%. However, nine surgeons described a five-year survival of over 9% (29.5%, 20%, 19.5%, 19%, 16%, 15%, 14%, 13%, 10%).

Kirsh recorded no survival without radiotherapy, but 20% with postoperative radiotherapy, for similar cases with mediastinal node metastases of various cell types. In patients with squamous-cell carcinoma and involvement of the mediastinal nodes who received postoperative radiotherapy, the five-year survival rate was 29%. In patients with adenocarcinoma and positive mediastinal nodes treated by pulmonary resection and post-operative radiotherapy, the five-year survival ranged between 6 and 10%.

Pearson replied that in a few selected cases of squamous-cell carcinoma without perinodal invasion (but positive mediastinoscopy) preoperative radiotherapy was given. The five-year survival was 20%.

Bergh stated that the prognosis was much better in cases of intranodal involvement detected by mediastinoscopy than in cases of perinodal invasion. The three-year survival rate for the first group was 62.5%. No patient with perinodal growth was alive two years after the operation.

From these replies on the influence of node involvement on five-year survival and the published series of Caham *et al.* (1951), Bergh and Larsson, (1971), Kirsh *et al.* (1972), Larsson (1973), and Abbey Smith (1974), the policy of withholding operation from patients with nodal involvement remains an open question. Our policy is to use mediastinoscopy only if there is clinical or radiological upper mediastinal involvement. If the nodes are negative we explore. A poor-risk patient with a positive mediastinoscopy is considered to be inoperable. Otherwise our attitude when nodes are positive is shown in Table VI.

The great merit of Paulson and Urschel's (1971) work is to prove that the survival rate is higher when cases are selected, but care must be exer-

cised in deciding not to operate on a patient who may survive a long term.

TABLE VI
OUR PRESENT ATTITUDE TO MEDIASTINOSCOPY
Histology and Type of Involvement

Contralateral Node Involvement	Ipsilateral Node Involvement		
	Perinodal	Intranodal	
		Non-squamous	Squamous
Inoperable	Inoperable	Inoperable	Operable

We are indebted to the following surgeons who kindly completed our questionnaire:

Aleman (Zaragoza); Beattie (New York); Belcher (London); Bergh (Goteborg); Bickford (Liverpool); Björk (Stockholm); Couraud (Bordeaux); Den Otter (Amsterdam); Dittrich (Münster); Esteban (Madrid); Fégiz (Rome); Forster (Strasbourg); Fryjordet (Oslo); Galofré (Barcelona); Gonzalez (Zaragoza); Grillo (Boston); Homan van der Heyde (Groningen); Hardy (Mississippi); Harley (Cardiff); Hoffman (Wuppertal); Inberg (Turku); Jones (California); Kirschner (New York); Kirsh (Michigan); Le Brigand (Paris); Longuefait (Marseille); Maasen (Essen); McCormack (Edinburgh); McHale (Birmingham); Manresa (Barcelona); Nohl-Oser (London); Oschner Jr. (New Orleans); Paulson (Dallas); Pearson (Toronto); Saegesser (Lausanne); Sagaz (Jaen); Serrano (Madrid); Shields (Chicago); Swierenga (Leiden); Thomeret (Paris); Widow (Berlin); Witz (Strasbourg).

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