

Pancoast tumours: clinical assessment and long term results of combined radiosurgical treatment

G Muscolino, M Valente, S Andreani

Abstract

Background – Many oncologists have now accepted a combined radiosurgical approach as the treatment of choice in patients with Pancoast tumour but most reports show an incorrect assessment of the disease.

Methods – Stage III lung cancer was classified as Pancoast tumour if the pulmonary extent was limited to the upper apical segment and if at least one of the features of Pancoast syndrome, indicating tumour spread to the para-apical structures, was present. Between 1984 and 1988 15 consecutive patients were treated with primary radiotherapy followed by surgery or with primary excision and subsequent radiotherapy in the absence of an initial histological diagnosis.

Results – The mortality of patients given the combined treatment was 6.6% (one death due to pulmonary embolism), and the five year survival rate was 26.6% for all patients and 57% for those who underwent complete resection without N2 disease. Long term survival was 0% for those cases with incomplete resection, N2 disease, or malignant invasion of the first rib.

Conclusions – Stage III lung cancer, classified as Pancoast tumour according to strict, consistent criteria, is best treated by primary radiotherapy; combined treatment should be used only for patients with potentially resectable cancer without N2 disease and/or malignant invasion of the first rib.

(Thorax 1997;52:284-286)

Keywords: Pancoast tumours, surgery, radiotherapy.

Pancoast tumour¹ is an uncommon lung cancer arising at the level of the superior pulmonary sulcus and limited to the upper apical segment but with direct spread to the para-apical structures causing the Pancoast syndrome.² This syndrome includes radicular arm pain, typically in the distribution of the ulnar nerve due to infiltration of the brachial plexus, Horner's syndrome, and radiographic evidence of destruction of the first thoracic rib or vertebral body.

The first cure, using interstitial brachytherapy, was reported by Binkley³ in 1950 and Chardack⁴ in 1956 described the first successful resection of a Pancoast tumour. In 1961 Shaw and Paulson⁵ reported improved resectability

following low dose (30 Gy) preoperative irradiation. The value of preoperative low dose (30-40 Gy) irradiation was confirmed by Hilaris⁶ and Devine⁷ and recently Fuller⁸ reported the feasibility of high dose (55-65 Gy) preoperative irradiation using standard techniques and fractionation. Masaoka *et al*⁹ and Darteville *et al*¹⁰ designed the anterior approach as an alternative to the posterior thoracotomy described by Paulson.¹¹

In this study we present our results with combined radiotherapy and surgery in the treatment of patients with Pancoast tumour.

Methods

Stage III lung cancer was classified as Pancoast tumour if the pulmonary extent was limited to the superior apical segment and at least one of the features of the Pancoast syndrome was present, indicating tumour spread to the para-apical structures. When rib invasion was the only feature this was characterised by destruction of the first rib on the plain chest radiograph.

Between 1984 and 1988 15 patients (14 men) of mean age 57 years with Pancoast tumour were treated with combined radiosurgical therapy. Combined treatment was contraindicated in cases of supraclavicular disease, vertebral or great vessel invasion, or rib extension to more than the first two ribs. Radiotherapy followed by surgery was the standard treatment. Primary excision and subsequent radiotherapy was planned only in the absence of an initial histological diagnosis.

A preoperative pathological diagnosis was made without an invasive procedure in six patients, with transthoracic fine needle aspiration in five, and was not possible in the remaining four cases. Two patients had been successfully treated for Hodgkin's disease and laryngeal carcinoma, respectively.

Primary radiotherapy consisted of a low dose (30-40 Gy) in nine of the 15 patients and of a high dose (50-60 Gy) in two patients.

Surgery was performed according to the Paulson technique in 12 patients and according to Darteville's approach in three. The posterior approach was the standard technique whereas the anterior approach was used when the para-apical spread was directed towards the anterior arch of the first rib.

Frozen section examination of suspicious areas and careful pathological examination of the margins of the specimens showed that the main obstacle to complete resection was in-

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Received 20 November 1995
Returned to authors
11 March 1996
Revised version received
29 May 1996
Accepted for publication
22 November 1996

Table 1 Patient characteristics

Patient no.	Dominant Pancoast feature	Cell type	Dose of radiation before surgery (Gy)	Lung resection	R2	pN	pRibs	Dose of radiation after surgery (Gy)	Follow up (months)
1	Horner	Undifferentiated	0	Lobar	No	1	0	0	0†
2	Plexopathy	Adenocarcinoma	59	Lobar	No	2	0	0	5†
3	First rib	Adenocarcinoma	40	Lobar	No	2	1,2	0	7†
4	Plexopathy	Adenocarcinoma	0	Lobar	No	0	0	40	7†
5	First rib	Adenocarcinoma	30	Sublobar	Yes	0	1,2,3	20	9†
6	Plexopathy	Squamous	30	Sublobar	No	0	1	0	12†
7	Horner	Squamous	0	Lobar	Yes	0	1	30	12†
8	Horner	Adenocarcinoma	44	Sublobar	Yes	0	0	20	17†
9	First rib	Undifferentiated	49	Sublobar	No	2	1,2	0	32†
10	Plexopathy	Adenocarcinoma	0	Lobar	Yes	0	0	44	35†
11	Horner	Undifferentiated	40	Sublobar	No	2	0	0	44†
12	Plexopathy	Adenocarcinoma	30	Sublobar	No	0	0	0	85
13	Plexopathy	Adenocarcinoma	30	Sublobar	No	0	0	0	100
14	Plexopathy	Adenocarcinoma	40	Sublobar	No	0	0	0	100
15	Plexopathy	Squamous	40	Lobar	No	0	0	0	110

p = pathological assessment; R2 = residual disease; † = death.

filtration of tumour along the brachial nerve roots into the vertebral foramina.

Lobectomy was performed in eight patients and a sublobar resection in seven. From 1986 all patients underwent preoperative mediastinoscopy and those with involvement of the mediastinum were excluded from resection.

Postoperative radiotherapy was given to patients treated with primary surgery, and a further 20 Gy was given to those with incomplete resection who had received a low preoperative dose.

Results

The characteristics of the patients in the study are listed in table 1.

One patient died of pulmonary embolism following surgery giving an overall treatment mortality of 6.6%. N2 disease was 50% associated with involvement of the first rib and 0% associated with incomplete resection, whereas involvement of the first rib was 40% associated with N2 disease and 40% associated with incomplete resection. Survival curves were drawn according to the Kaplan-Meier method.¹² The median overall survival was 16.8 months and the observed five year survival was 26.6%. Survival rose to 57% if patients with incomplete resection or N2 disease were excluded (fig 1). There were no survivors among those patients with incomplete resection, N2 disease, or involvement of the first rib (figs 2-4). Locoregional relapse was the most common mode of recurrence (60%).

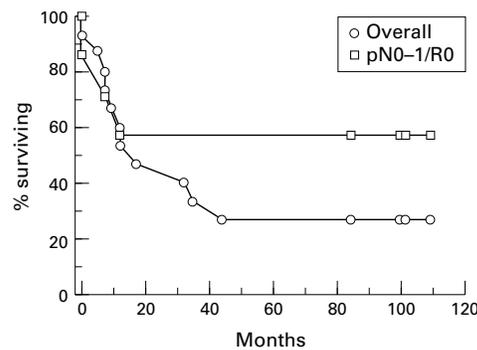


Figure 1 Survival of overall and completely resected patients without N2 disease (pN0-1/R0).

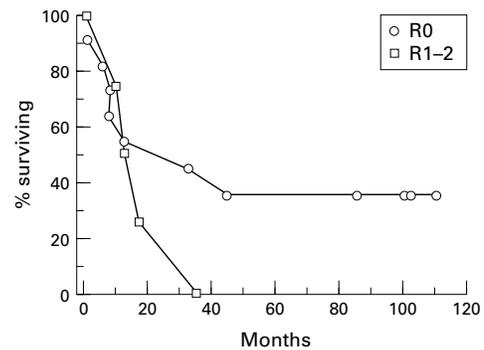


Figure 3 Survival according to residual disease.

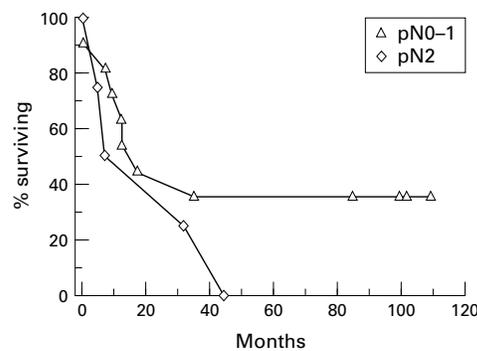


Figure 2 Survival according to N2 disease.

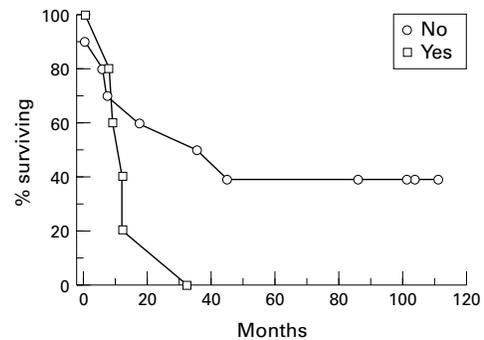


Figure 4 Survival according to involvement of the first rib.

Discussion

The diagnostic criteria for a Pancoast tumour require that the pulmonary extent is limited to the upper apical segment and that at least one of the features of the Pancoast syndrome is present. If rib invasion is the only feature, lysis of the first rib must be evident on the chest radiograph, otherwise the tumour cannot be classified as a Pancoast tumour.¹² The literature regarding the management of this tumour is, however, confused by series which include inappropriate lesions, particularly asymptomatic tumours of the upper apical segment^{13,14} and advanced upper lobe tumours with chest wall invasion below the first rib.^{15,16} These tumours are relatively common and are often suitable for primary resection whereas true Pancoast tumours are rare and associated with a low resectability rate.

The management options comprise surgery, radiotherapy, or a combined approach. Favourable results have been reported in selected patients with early and mostly asymptomatic superior sulcus tumours treated by resection alone.¹⁷ Others^{18,19} have argued that high dose radiotherapy (60 Gy), encompassing the primary lesion, the lower cervical area, the mediastinum and the thoracic vertebrae, can achieve the same results as combined treatment and therefore that surgery is unnecessary. It is generally agreed, however, that residual viable tumour can be present even after high dose irradiation,²⁰ as was observed in our series, and improved five year survival has been reported for symptomatic tumours after preoperative irradiation.⁶ On this basis definitive treatment for suitable cases would be preoperative radiotherapy followed by complete en bloc resection. Pancoast symptoms may, however, rarely be produced by benign lesions²¹⁻²³ and, in the absence of pathological confirmation of malignant disease or evidence of rib destruction, we have adopted surgery as the primary treatment and used postoperative irradiation if malignancy is confirmed.

Relatively few patients are likely to be suitable for surgery. Our data confirm previous reports^{24,25} which demonstrate that massive invasion of the first thoracic ribs and/or vertebral body, infiltration of the great vessels, and N2 disease all have a very poor prognosis and these patients should, consequently, be excluded from surgery. The presence of ipsilateral supraclavicular metastases, conversely, is not a contraindication to surgery⁴ probably because, in the context of a Pancoast tumour, this form of disease simply represents local contiguous spread.

In general, stage III lung cancer classified as a Pancoast tumour according to strict consistent criteria is best treated by primary high dose radiotherapy. Combined treatment should be planned only for patients with potentially resectable cancer in whom the presence of N2 disease has been excluded by mediastinoscopy and there is no radiographic evidence of malignant invasion of the first rib.

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