REFERENCE

1. Bert AA, Singh AK. Right ventricular function after normothermic versus hypothermic cardiopulmonary bypass. *J THORAC CARDIOVASC SURG* 1993;106:988-96.

12/8/58954

Reply to the Editor:

Dr. Regragui and his colleagues report no difference in myocardial rewarming among three groups of patients undergoing hypothermic, moderately hypothermic, and normothermic cardiopulmonary bypass (CPB) perfusion. We¹ found a clinically small (mean temperature difference of 4.0° to 6.3° C) but significant enhancement of myocardial rewarming in our normothermic patients before redosing with cold blood cardioplegia. Although the surgical techniques used in both studies were similar (two-stage venous cannulation, single aortic crossclamping period), the cardioplegia composition and conduct were not identical. Both studies initiated electromechanical arrest with 1000 ml of 6° to 8° C crystalloid cardioplegic solution and achieved nearly identical (approximately 10° C) myocardial cooling in all groups. Thereafter our cardioplegia protocol included multidose cold (10° to 12° C) blood cardioplegia after construction of each distal anastomosis, which resulted in a mean temperature difference of 1.8° to 4.0° C between the hypothermic and normothermic groups after each run of cardioplegia and absolute myocardial temperatures of less than 17° C in both groups. Dr. Regragui's study redosed with colder crystalloid cardioplegic solutions at 30-minute intervals or earlier if electrical activity occurred and achieved absolute myocardial temperatures of 18° to 20° C in all groups before removal of the aortic crossclamp. At that time both studies found no significant myocardial temperature differences between hypothermic and normothermic perfusion groups. Additionally, myocardial cooling was augmented in Dr. Regragui's patients with 1000 ml of ice-cold saline solution, a significantly greater volume than contained in our topical saline slush. These differences in cooling techniques most likely resulted in the observed differences in our findings.

We note with gratification that the work described by Dr. Regragui and his associates confirms our findings that clinically protective levels of myocardial hypothermia can be maintained in patients undergoing normothermic CPB. The outcome data presented in their letter also support our findings that normothermic CPB will not compromise myocardial protection and result in post-CPB ventricular dysfunction if myocardial temperatures are maintained sufficiently cold.

Arthur A. Bert, MD
Providence, RI 02903

REFERENCE

1. Bert AA, Singh AK. Right ventricular function after normothermic versus hypothermic cardiopulmonary bypass. *J THORAC CARDIOVASC SURG* 1993;106:988-96.

12/8/59357

Surgical management for metachronous bronchogenic cancer occurring after pneumonectomy

To the Editor:

It is with greatest interest that we perused the outstanding report on resection of metachronous bronchogenic cancers on single lungs, which has been published by Dr. Westermann and colleagues.¹ We would like to share our experience, although it is less extensive, inasmuch as we dealt with only four similar patients during the past 7 years.

All four patients were men, with ages ranging from 51 to 61 years (Table I), and had strong smoking histories. Pneumonectomy had been done because of squamous cell cancer: stage I in one patient and stage II in three patients. One of them had undergone postoperative radiotherapy because of in situ carcinoma involvement of the resection margin. The second cancers were follow-up diagnoses at an interval ranging from 12 to 71 months. The staging procedure (computed tomographic [CT] scan of head, chest, and abdomen; abdominal ultrasonography, and technetium bone scan) did not reveal distant metastases. Postoperative forced expiratory volume in 1 second (FEV₁) was predicted to exceed 1 L in all patients. Three patients were operated on through a median sternotomy: a regular middle lobectomy was done in two and a segmental resection of the lingula in one. The fourth patient underwent a wedge resection through a short muscle-sparing lateral thoracotomy. In this particular case, we were able to block the right upper lobe bronchus with a balloon catheter positioned under bronchoscopic guidance. Only two patients had a smooth postoperative outcome. Two others, both operated on through a median sternotomy, had respiratory failure and required transient tracheostomy. Their discharge from the hospital was delayed until postoperative days 27 and 65, respectively.

On January 1, 1994, two patients were alive and well at 5 and 67 months after operation. A third patient died 5 months after resection of the lingula with brain metastases. The fourth patient had a third malignancy in the right upper lobe 10 months after middle lobectomy and received focal radiotherapy; he remained in complete remission until his death from an unrelated cause 29 months after operation (Table II).

We may consider that all four patients had metachronous cancer, because their tumors occurred at least 6 months after treatment of a first lesion.² However, only one of them had a tissue diagnosis that was different from the first cancer. We have to admit that the distinction from a single metastasis is nearly impossible. Preoperative work-up was limited to screening for distant metastases. In our standard staging described previously,³ we perform mediastinoscopy only when mediastinal CT scanning reveals contralateral adenomegaly. None of the patients in the present series underwent mediastinoscopy. Perhaps it should be considered routinely in these particular cases, in which mediastinal dissection during the procedure is necessarily shortened and incomplete in cases of an anterior approach.

It is generally admitted that surgical resection is the best treatment option for metachronous bronchogenic cancer.²⁻⁴ However, whenever the first cancer has been

Fig. 1. Chest CT scan in patient seen with a right middle lobe mass 34 months after left pneumonectomy. Pronounced retrosternal shift of middle lobe because of anterior transmediastinal herniation is observed.

Table I. Patient demographics

No.	Sex	Age (yr)	Side	First cancer		Second cancer delay (mo)	Pulmonary function test	
				TNM	Histologic type		FEV ₁ (ml)	VC (ml)
1	M	60	L	T2 N1	Squamous	34	1320 (55%)	2530 (75%)
2	M	61	R	T2 N0	Squamous	71	1670 (52%)	2320 (55%)
3	M	53	L	T1 N1*	Squamous	26	1545 (61%)	1800 (55%)
4	M	51	L	T2 N1	Squamous	12	2230 (80%)	2970 (95%)

The delay indicates the time lag in months elapsed between the first and the second cancer diagnosis. VC, vital capacity; M, male; L, left; R, right.

*This patient underwent postoperative radiotherapy for a microscopically invaded resection margin.

Table II. Operative procedure and results

No.	Location, TNM	Approach/resection	Outcome	Follow-up
1	RML, T2 N0	Sternotomy lobectomy	No complication	Third primary at 10 mo, deceased at 29 mo (unrelated)
2	RML, T1 N0	Sternotomy lobectomy	Respiratory failure, transient tracheostomy	No further related problems, alive and well at 67 mo
3	Lingula, T1 N0	Sternotomy segmentectomy	Respiratory failure, transient tracheostomy	Brain metastases at 4 mo, deceased at 5 mo
4	RUL, T1 N0	Lateral thoracotomy wedge	No complication	No further related problem, alive and well at 5 mo

RML, Right middle lobe; RUL, right upper lobe.

resected with a pneumonectomy, the second procedure will carry the challenge of an operation on a single lung, whose function has to recover entirely in the immediate postoperative period. Two factors directly interfere with the postoperative respiratory function: the extent of resection and the parietal restriction effect of thoracotomy. Our general guideline is to plan a resection that leaves an FEV₁ of at least 1 L after operation. Therefore we would not propose operation to a patient with an FEV₁ less than 1.2 L. The resection should be as economic as possible and should probably be restricted to patients with T1 lesions. We considered that a middle lobectomy or a lingular resection was the permitted maximum; we were thus able to resect a small T2 lesion (Fig. 1).

To decrease as far as possible postoperative parietal restriction, the accurate choice of surgical approach is of paramount importance, and we entirely subscribe to the authors' choice of sternotomy or muscle-sparing lateral thoracotomy. Quite obviously, a standard posterolateral thoracotomy should be avoided. In our first three patients, we elected a median sternotomy, which is renowned to convey fewer respiratory side effects and decreased postoperative pain.⁵ Furthermore, these three patients had lesions located in the middle lobe or lingula, which had switched into a retrosternal position by transmediastinal herniation after pneumonectomy (Fig. 1). This approach has been discussed in a case report published previously by our group.⁶ We were disappointed with unpredictable cases of postoperative respiratory failure that complicated the outcome of two patients.

A muscle-sparing lateral thoracotomy is an elegant alternative for posteriorly located lesions; this incision needs to be just large enough to permit easy insertion of the palpating hand and stapling devices. The ideal way would be video-assisted thoracoscopic surgical resection, because the thoracotomy would be limited to some stab wounds. However, the perioperative need for pneumothorax and immobility of the lung would require the use of cardiopulmonary bypass and would add another factor of morbidity. We demonstrated that lobar exclusion with a bronchial blocker is feasible during a limited-access thoracotomy; this would probably be insufficient for adequate exposure for a video-assisted thoracoscopic surgical procedure.

Surgical resection is the most satisfactory treatment option for bronchogenic cancer. It may be done successfully after pneumonectomy in patients who are seen with T1 second primary cancer and may yield significant long-term survival. However, the operative risk is considerable in these patients and should therefore be balanced with the less satisfactory treatment of focal radiotherapy, which is a valuable alternative in high-risk patients.

Again, we would like to compliment Dr. Westermann and his colleagues for their excellent results.

Gilbert Massard, MD
Jean-Marie Wihlm, MD
Georges Morand, MD

Department of Thoracic Surgery
University Hospital of Strasbourg
F-67091 Strasbourg, France

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12/8/5777

Reply to the Editor:

Massard, Wihlm, and Morand describe four patients seen in a period of 7 years and we observed eight patients in 4 years: the condition apparently is rare.

The postoperative problems that occurred in two of their four patients indicate the importance of careful preoperative evaluation of pulmonary and cardiac function.

We think that mediastinoscopy is mandatory in all surgical candidates because operation on the remaining lung after previous pneumonectomy should not be done in N2 cases. If necessary, repeat mediastinoscopy is a safe procedure in experienced hands (Meersschaut D, Vermassen F, Brutel de la Rivière A, Knaepen PJ, van den Bosch JMM, Vanderschueren RGJRA. Repeat mediastinoscopy in the assessment in new and recurrent lung neoplasm. *Ann Thorac Surg* 1992;53:120-2).

We fully agree that resection should be economic, but resection of several segments or a lobe is sometimes possible. We also favor median sternotomy whenever the tumor can be reached through this approach. Video-assisted thoracoscopic surgery (VATS) is a routine procedure in our hospital for pneumothorax, lung biopsy, or benign lesions. However, we do not use the thoracoscopic approach for resection of bronchial carcinoma because VATS violates several principles of oncologic surgery. In patients after pneumonectomy, the intrapleural space needed for VATS will not be sufficient.

We are grateful to Massard, Wihlm, and Morand for their contribution because we think that many patients