by interposition of a polytetrafluoroethylene graft (Fig 2). Thereby, the en bloc resection of the tumor with the cervicothoracic structures involved (eg, subclavian artery, first rib, lung) is safely achieved. In metastatic tumors, a single lung wedge resection can be sufficient to perform a radical operation; in primary lung cancer, an upper lobectomy with dissection limited to the upper mediastinal lymph nodes can also be performed through this approach and may be adequate for apical tumors.⁷

Korst and Burt² recently reported the largest series of resections of cervicothoracic tumors by the hemi-clamshell approach, clearly reviewing in the discussion the different techniques. They acknowledged that no single technique is without drawbacks and no agreement exists as to what constitutes the optimal approach; however, in the conclusions they stated that the hemi-clamshell technique has significant advantages over the other approaches.

In agreement with the authors, we prefer the hemi-clamshell approach for resection of anterolateral tumors with chest and mediastinal invasion. However, those accustomed to the hemi-clamshell technique know how difficult it is to control and resect the subclavian artery through this approach, and Figs 2 and 3 in the article by Korst and Burt give an idea of such a problem. As a matter of fact, in that large series, no cases of subclavian artery resection were reported.

The choice among the different approaches for apical chest tumor should be based on the tumor localization, as well as on the structures that have to be resected. When tumors are clearly located in the apical chest region invading the first rib and subclavian artery and crossing the border of the thoracic inlet to reach the cervical structures, we prefer the transmanubrial osteomuscular sparing approach. This technique may be combined with classic posterolateral thoracotomy or with anterolateral muscle sparing thoracotomy when extensive lymph node dissection and lung resection are required; finally a midline posterior approach should be used when hemivertebrectomy is required.

Lorenzo Spaggiari, MD, PhD
Ugo Pastorino, MD
Department of Thoracic Surgery
European Institute of Oncology
Milan, Italy

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12/8/95018

Reply to the Editor:

We agree with Spaggiari and Pastorino that exposure of the subclavian artery for resection, although not commonly indicated, plays an important role in the operative approach to apical chest tumors. However, we believe that the hemi-clamshell approach provides adequate exposure to this vessel.

To expose the subclavian artery adequately through a hemi-clamshell incision, two maneuvers must be stressed. First, the incision and dissection must extend well up into the neck, similar to the cervical portion of the transmanubrial approach described by Spaggiari. This cervical dissection will expose the first several centimeters of the subclavian artery, well past the origin of the vertebral artery. Second, the anterior scalene muscle must be divided, which helps expose more length of the subclavian artery. The operative diagrams in our article¹ do not depict the division of this muscle because vascular resection was not indicated in that particular patient. These two components of the dissection allow the subclavian artery to be exposed adequately for resection when involved by tumor.

Robert J. Korst, MD
Attending Surgeon
Thoracic Service
Memorial Sloan-Kettering Cancer Center
1275 York Ave
New York, NY 10021

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Well-differentiated thymic carcinoma: Is it thymic carcinoma or not?

To the Editor:

We read the article titled "Thymic Carcinoma: Current Staging Does Not Predict Prognosis" by Blumberg and associates of Sloan-Kettering Cancer Center (*J Thorac Cardiovasc Surg* 1998;115:303-9). Thymic carcinomas in this article consisted of type II malignant thymoma¹ and well-differentiated thymic carcinoma.² Our Nagoya City University series of thymic carcinoma consisted of 19 patients treated in

1980 through 1995. Inasmuch as there were 62 thymomas and 3 thymic carcinoids in the same period, the incidence of thymic carcinoma was 22.6% in thymic epithelial tumors. Because thymic carcinoma coincides with type II malignant thymoma according to our criteria, well-differentiated thymic carcinomas are excluded from our series. Histologic subtypes of our thymic carcinomas were as follows: squamous cell carcinoma, 11 cases; undifferentiated carcinoma, 3 cases; small cell carcinoma, 2 cases; lymphoepithelioma-like carcinoma, 1 case; papillary adenocarcinoma, 1 case; and unclassified carcinoma, 1 case. Associated diseases were observed in 2 patients: hypergammaglobulinemia in 1 patient and Cushing syndrome with hypogammaglobulinemia in another. Myasthenia gravis was not present. Applying the classification of thymoma to our thymic carcinomas yields the following stages: stage I, 1 case; stage II, 0 cases; stage III, 9 cases; stage IVa, 4 cases; and IVb, 5 cases. Follow-up results revealed a 42.7% 5-year survival and a 21.4% 10-year survival. The most important factor influencing survival was histologic subtype. Five-year survival was 65.6% in squamous cell carcinoma and 14.3% in the other types of carcinoma.

On comparing our results with those of the Sloan-Kettering series, we observed some differences. First, survivals in our series were inferior to those of Sloan-Kettering. Second, advanced stages of disease (stages III and IV) were prevalent in our series, as in that of Hsu and associates,³ which consisted exclusively of type II malignant thymoma. Accordingly, it is impossible to compare survivals of the patients with early and advanced stages of disease in our series. Third, none of our patients had associated myasthenia gravis. The explanation for these differences seems to be that our series excludes well-differentiated thymic carcinoma.

We think that well-differentiated thymic carcinoma is distinct from type II malignant thymoma (proper thymic carcinoma) because of differences of some markers (cytokeratins,⁴ bcl-2, and Fas antigen⁵) and associated diseases. Well-differentiated thymic carcinoma has been considered to be epithelium-rich thymoma by most pathologists. It is related to cortical thymoma (Müller-Hermelink) or polygonal cell thymoma (Rosai) and frequently is associated with myasthenia gravis. Designation of well-differentiated thymic carcinoma has caused striking confusion, because it overlaps with well-differentiated squamous cell carcinoma.⁶ The latter belongs to the category "proper thymic carcinoma" and constitutes a low-grade category of thymic carcinoma, together with well-differentiated mucoepidermoid carcinoma and basaloid carcinoma. We agree with Suster and Moran's proposal⁷ to designate well-differentiated thymic carcinoma as "atypical thymoma." Clinical results of "atypical thymoma," well-differentiated squamous cell carcinoma (low-grade), and other types of thymic carcinoma (high-grade) should be evaluated separately. Although the article by Blumberg and associates revealed no significant difference between survivals of patients with well-differentiated thymic carcinoma and type II malignant thymoma, we expect that an increase in the number of patients and longer observation times may reveal a difference.

Table I. *TNM classification of thymic epithelial tumors*

T factor	
T1	Macroscopically completely encapsulated and microscopically no capsular invasion
T2	Macroscopic adhesion or invasion into surrounding fatty tissue or mediastinal pleura, or microscopic invasion into capsule
T3	Invasion into neighboring organs, such as pericardium, great vessels, and lung
T4	Pleural or pericardial dissemination
N factor	
N0	No lymph node metastasis
N1	Metastasis to anterior mediastinal lymph nodes
N2	Metastasis to intrathoracic lymph nodes except anterior mediastinal lymph nodes
N3	Metastasis to supraclavicular lymph nodes
M factor	
M0	No hematogenous metastasis
M1	Hematogenous metastasis and/or extrathoracic lymph node metastasis except supraclavicular nodes

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Patients with proper thymic carcinoma usually have an advanced stage of the disease. Accordingly, it seems almost meaningless to compare results of each stage in patients with proper thymic carcinoma. We think that the TNM classification may be useful in thymic carcinomas. Table I shows the TNM classification system of thymic epithelial tumors, which is revised minimally from the one described in our previous article.⁸ T factors mimic the stages. N factors are arranged according to the lymph node stations along the lymphatic route from the thymus. TNM numbers of 5 cases of stage IVb in our series were as follows: T2 N1 M0, T3 N1 M0, T3 N0 M1, T3 N3 M1, and T4 N0 M1. Three cases were N-positive and 3 cases were M-positive. However, evaluation of the N factor was not always complete, especially in the patients from the early period of our study. Therefore N-positive cases might be more frequent than our results indicate. As cases accumulate, this TNM classification system may become more useful.

Akira Masaoka, MD

Yosuke Yamakawa, MD

Yoshitaka Fujii, MD

Department of Surgery II

Nagoya City University Medical School

Nagoya, Japan

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12/8/95928

Reply to the Editor:

My colleagues and I thank Masaoka and his associates for their letter and discussion. The authors point out one of the problems in dealing with tumors of the thymus: a variety of pathologic classifications have been devised, and the recent introduction of new classifications has caused a significant amount of confusion. A single classification of thymic tumors is greatly needed.

We agree that well-differentiated thymic carcinoma is different from type II malignant thymoma. The point of our article was that both of these malignant diseases can be aggressive. We found that the tumors with the worst prognosis were those invading the innominate vein. Regardless of the pathologic diagnosis, fewer than 50% of patients treated for such tumors with complete resections will be disease-free at 5 years, despite surviving. As Fig 1 in our original article demonstrates, even stage I and II thymic carcinoma will have a propensity to recur. In 10 years, 90% of thymic carcinomas of either type will recur, despite complete resection.

We therefore concluded that either of these entities requires a much more aggressive management and might benefit from multimodality therapy.

Robert J. Ginsberg, MD
Department of Thoracic Surgery
Memorial Sloan Kettering Cancer Center
1275 York Ave
New York City, NY 10021
12/8/95927

Controlled cardiac reoxygenation in adults with ischemic heart disease

To the Editor:

We read with fascination the report by Kai Ihnken and associates¹ printed in the August 1998 issue of the Journal, in which standard, hyperoxic arterial PO_2 s were compared with "normoxic" PO_2 s during cardiopulmonary bypass (CPB) and found to cause measurable biochemical evidence of injury at the cellular level. We would like to ask several questions and to comment. Our questions relate to the initiation of anesthesia in the patients who were subjected to normoxic CPB. The

common practice is for anesthesiologists to intubate and hyperoxygenate every patient, both during and after induction. Is this the way the patients in this group were handled? If so, could they not also have had an initial "reoxygenation" injury occurring at the time of anesthesia induction, if the PO_2 of arterial blood was allowed to rise to extremely high levels before the initiation of CPB? Might the biochemical evidence of injury in the group subjected to hyperoxic bypass have been even more pronounced, by comparison, had prebypass PO_2 s been controlled to physiologic levels upon intubation and induction of anesthesia in the other group of patients? Furthermore, might all of us be unintentionally contributing to injury of the heart in other clinical situations as well?

We are in full agreement that the way in which oxygen is administered to adult patients with ischemic heart disease needs to be rethought. From our reading, it appears that this work represents a prolog to the introduction of "controlled cardiac reoxygenation," a concept borrowed from congenital heart surgery and used successfully in cyanotic children,^{2,3} into another clinical area in which it may be applicable. This study suggests that, even in the adult patient with coronary heart disease and a "normoxic heart," considerable and certainly measurable cellular injury is occurring because of some of the known, toxic effects of high levels of molecular oxygen introduced abruptly into the coronary circulation.

We would like to share our experience with the use of a strategy of controlled cardiac reoxygenation with 6 consecutive patients taken to the operating room in the setting of advanced, evolving myocardial infarction. All were referred for emergency revascularization because catheter-based therapies either were judged to be not feasible by the cardiologist or had failed to successfully interrupt the unstable syndrome. Half were in cardiogenic shock (pulmonary capillary wedge pressure > 18 mm Hg, cardiac index < 2.0 L/min per square meter) at the time of entry to the operating room. All had multivessel coronary disease, profound diffuse myocardial contractile dysfunction (mean preoperative left ventricular ejection fraction was 28%), and had been having active symptoms for greater than 6 hours. Coexistent medical conditions were what would be expected for such a patient population with a mean age of nearly 68 years. An average of 4 bypass grafts was accomplished. In all 6 patients, deoxygenated blood cardioplegic solution was administered for initial warm induction and the PO_2 of the reperfusate (initially 35-45 mm Hg) was gradually raised over 20 minutes by altering the FIO_2 of the membrane oxygenator and by changing the admixture of venous and arterial blood in the cardioplegia circuit. The pH of the initial cardioplegic solution, although from the venous side of the bypass circuit, was controlled in the normal range by adding bicarbonate or tromethamine as needed. The operations were completed with the use of intermittent doses of cold (4°C) hyperoxygenated blood cardioplegic solution and a "hot shot" at the end of the crossclamp interval. In this group of patients, whom we expected to do relatively poorly on the basis of previous experience, we have had no deaths and the mean time to discharge from the hospital was 8 days. The mean time to extubation for the group