Synchroneously occurring lung cancer (stages I–II) and coronary artery disease: concomitant versus staged surgical approach

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Abstract

Objective: The assessment of the best surgical approach in patients with synchroneously occurring lung cancer (stages I and II) and coronary artery disease: concomitant or staged. Methods: A retrospective, observational study was conducted in a tertiary centre for cardiothoracic surgery. From 1988–1995, 34 patients underwent pulmonary resection for stages I–II primary bronchogenic carcinoma and open-heart surgery (almost always coronary-artery bypass grafting), either concomitantly (n = 24) or in a staged procedure (n = 10). Mean interval between operations was 33.9 ± 34.7 days (range: 12–120 days). Results were statistically computed. Results: Preoperatively both groups were perfectly matched. Follow-up was 100%. Long term survival, median 4.2 years, was comparable in both groups (log-rank test: χ² 0.30; df = 1; P = 0.58), indicating no influence on survival from performing either a concomitant or staged procedure. No relation could be demonstrated between survival and age, histopathology or extent of tumour; nor in the concomitant operated group between survival and timing of lung resection in relation to extra-corporeal circulation. Overall peri-operative mortality was 6/34, 17.6%, but a large difference was noted between the two groups (5/24, 20.8% vs. 1/10, 10%; P = 0.64), underscoring the greater risk involved in the concomitant procedure, although this difference was not statistically significant because of small numbers. Conclusions: No difference in survival between the two groups, one operated upon in a staged procedure, the other concomitantly, could be demonstrated. However, the greater perioperative risk makes the concomitant procedure less attractive, and the staged approach the preferred one. Interval between operations can be individualized according to the clinical status of the particular patient to a period as short as 2 weeks. © 1997 Elsevier Science B.V.

Keywords: Coronary artery disease; Primary bronchogenic carcinoma; Surgery

1. Introduction

The simultaneous occurrence of surgically amenable coronary artery disease and primary non-small cell bronchogenic carcinoma is relatively rare, particularly so in view of a shared etiological factor, smoking. Mostly an asymptomatic pulmonary nodule is discovered during preoperative screening for open-heart surgery, but occasionally a patient may present with pulmonary complaints. Lung resection without addressing the cardiac problem adequately beforehand poses an unacceptable high risk to these patients, which can be reduced by performing 'prophylactic' coronary revascularization [5,7,11,18]. Instead of a staged procedure, however, the combined, simultaneous surgical approach seems to offer a logical solution, and some 20 years ago the first reports regarding the feasibility of concomitant pulmonary resection together with coronary-artery bypass grafting (CABG) are published [2,6]. Later more case reports and small series [1,4,8–10,12,14,16,17,19–21], and one larger study [3], specifically addressing this combined approach, appear in the literature, and even though the overall results are posi-
tive, the small number of patients involved precludes firm conclusions to be drawn. For the individual patient, the obvious advantages of a concomitant approach—less morbidity and an immediate definitive solution of his or her condition—have to be weighed against the alleged greater operative risk of this strategy, where on the other hand postponing the resection of a carcinoma should, if possible, be avoided. To make the problem even more complex, concern has been expressed, that the extracorporeal circulation (ECC), used in open-heart surgery, can promote the growth and spread of co-existent bronchogenic carcinoma [3,17,21].

Thus, a number of questions remains to be answered, one of the foremost being whether either strategy, concomitant or staged surgical approach, should give favourable results compared to the other, in terms of perioperative mortality and long term survival, for this would have major implications for the choice of treatment. This controversy still has not been settled [14–16], and until now no formal analysis in this respect has been made in the literature. We therefore examined our own experience, with special reference to this topic, on which we like to report here.

2. Materials and methods

From 1 January, 1988, through 28 February, 1995, 36 patients with simultaneously occurring coronary-artery (34 patients) or valvular disease (2 patients), warranting open-heart surgery, and primary non-small cell bronchogenic carcinoma (stages I and II), for which lung resection was indicated, were operated upon in our institution. Two of them proved to have T3 tumour (stage IIIa), and consequently were excluded from analysis, leaving a total of 34 patients. Twenty four patients were operated concomitantly, and 10 patients underwent a staged procedure. This staged procedure was planned beforehand in 3 patients, part of an emergency-CABG in 4 patients developing unstable angina while awaiting a one-stage operation, whereas in 10 patients after closing the sternotomy a posterolateral incision for the lung resection was performed. In the 1 patient after sternotomy lung resection preceded heart operation. In all staged procedures the correction of the heart condition was given priority over lung resection; the second operation was performed after 12, 13, 14, 18, 31, 36, 48, and 120 days, respectively (mean 33.9 ± 34.7 days), after appropriate recovery of the clinical condition of the patient, as estimated by the attending physician.

By reviewing medical files the following features were recorded: age; gender; heart operation; location of lung tumour; extent of lung resection; histopathology (squamous carcinoma, adenocarcinoma, or other); pTNM (using standard TNM-classification [13]), perioperative complications (none, minor complications like supraventricular arrhythmias or respiratory infections, or major complications, like rebleeding necessitating reoperation, and pulmonary embolism or myocardial infarction causing death); hospital stay postoperatively; perioperative mortality (defined as within 30 days after the operation or in the same hospitalization period); and long term follow-up (Table 1). If any features could not be obtained from the medical file, the primarily responsible general practitioner, or the referring institute, or the Registry Office supplied the missing information. Long term follow-up could be obtained for all patients. Zero time was the date of lung resection, the final censoring date regarding survival was 1 July, 1995.

The results were statistically computed. Comparisons were made using χ2-test, Student’s t-test, Fisher’s exact test, or Wilcoxon signed-rank test. Actuarial survival curves were plotted according to Kaplan and Meier, with the perioperative deaths included in the analysis. Survival curves of various groups of patients were compared using the log-rank test. Statistical significance is < 0.05, unless stated otherwise.

3. Results

A total of 34 patients was eligible for analysis. As stated, a concomitant approach was performed in 24 patients, 10 patients were operated upon in a staged procedure. The characteristics of these patient groups are listed in the table. Both groups were fully comparable with respect to age, gender, location and extent of tumour; there was, however, a slight mismatch with regard to histopathology (more ‘other’ carcinomas in the group undergoing a staged procedure), and type of...
Table 1
Pre- and perioperative characteristics of patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Staged procedure</th>
<th>Concomitantly operated</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>10</td>
<td>24</td>
<td>—</td>
</tr>
<tr>
<td>Age (years) mean (± S.D.)</td>
<td>66.8 ± 7.5</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Gender male/female</td>
<td>8/2</td>
<td>23/1</td>
<td>ns</td>
</tr>
<tr>
<td>T 1/2</td>
<td>4/6</td>
<td>13/11</td>
<td>ns</td>
</tr>
<tr>
<td>N 0/1</td>
<td>7/3</td>
<td>20/4</td>
<td>ns</td>
</tr>
<tr>
<td>Lung left/right</td>
<td>5/5</td>
<td>8/16</td>
<td>ns</td>
</tr>
<tr>
<td>Lobectomy/bilobectomy/pneumonectomy</td>
<td>5/2/2a</td>
<td>22/2/0</td>
<td>0.034/ns/0.068</td>
</tr>
<tr>
<td>Squamous carcinoma/adenocarcinoma/other</td>
<td>5/1/4</td>
<td>14/8/2</td>
<td>ns/ns/0.047</td>
</tr>
<tr>
<td>Complications none/minor/major</td>
<td>4/3/3</td>
<td>5/13/6</td>
<td>ns</td>
</tr>
<tr>
<td>Postoperative hospital stay (in days) mean (± S.D.)</td>
<td>17.6 ± 8.5</td>
<td>29.5 ± 35.7</td>
<td>ns</td>
</tr>
<tr>
<td>(range)</td>
<td>(12–25)</td>
<td>(1–72)</td>
<td></td>
</tr>
</tbody>
</table>

One patient died before undergoing lung resection.

The overall perioperative mortality was 6/34, 17.6%: this rate showed a great difference between the concomitant (5/24, 20.8%), and the staged procedure (1/10, 10%). This latter patient died 28 days after coronary-artery bypass grafting, mitral and aortal valve replacement, and tricuspid valvuloplasty, and so was a poor risk; the other patients died of myocardial infarction and hypovolemic shock after rebleeding, 1 and 2 days postoperatively, respectively, and of multiple organ failure, possibly related to sepsis, 8, 24 and 57 days after the operation. Because of the small numbers involved, this difference did not reach statistical significance (P = 0.64).

A special analysis was made of a possible association between survival and age (≤ 68 vs. > 68 years—this being the median age of the patients, $\chi^2 = 0.10$, df = 1, P = 0.75); histopathology (squamous carcinoma vs. adeno- and other carcinoma, $\chi^2 = 1.25$, df = 1, P = 0.26; adenocarcinoma vs squamous and other carcinoma, $\chi^2 = 0.12$, df = 1, P = 0.73); and extent of tumour (stage I vs. stage II, $\chi^2 = 0.01$, df = 1, P = 0.94), but such a relationship did not exist. There was also no influence on survival of the timing of lung resection in relation to extracorporeal circulation (during ECC vs. after, $\chi^2 = 0.22$, df = 1, P = 0.64), or the use of a second separate incision for the lung resection (sternotomy vs. ster-
notomy plus posterolateral incision, χ² 0.07, df = 1, P = 0.79) in the concomitantly operated group.

4. Discussion

A retrospective analysis of a nonrandomized observational study, such as presented here, has of course strong limitations, and therefore the results must be interpreted with caution. Yet, a considerable effort has been made to reduce the influence of the nature of this study: the patients involved represent a consecutive sample from a cohort operated upon in one single institution, and the two separated groups are preoperatively fully comparable in every respect. Since it seems very unlikely that prospective studies regarding this subject will ever be conducted, one simply has to rely on this kind of material for obtaining guidelines for the approach of this type of patient. The patient who presents with coronary-artery disease and primary bronchogenic carcinoma at the same time, is of course seriously ill, and he, or occasionally she, faces a tough period with the prospect of being operated on both heart and lungs, whether it be concomitantly or in a staged fashion. Optimal treatment for both conditions is mandatory, aiming at total revascularization for the coronary-artery disease and appropriate resection for the pulmonary cancer, as in our series. The prospect of solving the problem as quickly as possible is of course appealing to both patient and doctor, but they both will like to make use of evidence-based information to make their choice, if possible, not only on psychological grounds.

Long term survival, the ultimate end-point of our study, does not seem to play a major role in choosing between these two approaches, even though this statement is based on a rather limited number of patients involved in our series, which still is, to date, the second largest reported. The technical feasibility of the concomitant approach, and the overall satisfying results, as pointed out before by others, are also apparent in our series. In another series [3], survival is shorter when lung resection is performed during extracorporeal circulation. This relationship is not found in our series, so the suspicion that ECC enhances the growth of lung tumour is not confirmed overhere. Rebleeding caused the death of a patient where lung resection was performed during ECC, but the fact that this happened on the second postoperative day makes a causal relationship less clear. Bleeding complications are repeatedly used as an argument against the combined approach [16,20], and although others reported no problems in this respect [3,17,21], caution seems to be warranted. Elsewhere combined surgery through two incisions was abandoned because of an unacceptable high hospital mortality, leading to a significantly shorter estimated mean survival for this subgroup of patients [3], but the use of a second incision caused no such problems in our hands. Postoperative hospital stay is not merely a reflection of morbidity, but strongly influenced by other factors as hospital logistics, patient wishes and, sometimes illogical, habits of attending physicians. The absence of a relationship between survival and age, histopathology and extent of tumour is in accordance with a previous study [3], and reflects the probably limited importance of these factors in clinical practice. It is usually recommended to postpone the lung resection for 4–6 weeks after open-heart surgery, when a staged approach is chosen [15,17]. Our experience, where this is individualized according to the clinical condition of the patient, suggests that a shorter period is well tolerated in selected patients. The results in the group of patients undergoing a staged procedure, which included patients who underwent an emergency-CABG because of unstable angina or whose operation, originally intended as one-staged, was stopped because of hemodynamic instability besides patients where this procedure was planned, implicate an equally good prognosis for these patients. A matter of serious concern, however, is the high overall perioperative mortality in our series, particularly in comparison to rates not exceeding 10%, as reported by others [3,4,16,17,20,21], even though a higher rate related to the presence of atherosclerotic disease has been reported before [19]. One has to bear in mind, that our institution, being a tertiary centre for cardiothoracic surgery, sometimes accepts patients that are rejected in other centres before because of a poor operative risk, as for instance the patient who dies postoperatively in the group of patients undergoing a staged procedure, which may well have had a negative influence on this result. The substantial difference in perioperative mortality, though not statistically significant, between the two groups, underscores the much greater risk involved in the one-staged approach. This is even more striking regarding the fact, that the patients in the group subjected to a staged procedure underwent more pneumonectomies and were in part regarded as greater risks, and on that basis initially precluded a concomitant approach.

We therefore conclude, that in the decision about the eventual surgical approach to be used in the individual patient long term survival does not seem to play a major role, since no difference could be demonstrated in long term survival between groups of patients operated upon in a concomitant or staged procedure; but that the concomitant approach is associated with a substantially higher perioperative mortality, albeit not significant in this series because of small numbers, which should well be taken into account, and makes the staged approach the preferred one; the interval between operations can be individualized according to the clinical status of the particular patient to a period as short as 2 weeks.
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References