

Management and prognosis of massive hemoptysis

Recent experience with 120 patients

A retrospective analysis was done of 120 consecutive patients with life-threatening hemoptysis (greater than 200 ml of discharge per 24 hours) cared for between 1983 and 1990 at our institution. Seventy-nine percent of the patients (95/120) had hemoptysis exceeding 500 ml/24 hr. Inflammatory lung disease was the underlying cause in at least 85% of cases ($n = 103$); and of these, pulmonary tuberculosis was the primary diagnosis in 85% (88/103). Fifty-two patients (43%) had had a prior episode of massive hemoptysis, usually within 3 months of their admission. Urgent examination with rigid endoscope in 97 patients (81%) localized the bleeding in only 42 (43%). The overall hospital mortality rate was 10% (12/120) and was similar for those having pulmonary resection (7.1%, 3/42), and those assisted medically (11.5%, 9/78) ($p =$ not significant). However, of these hospital survivors on whom 6-month follow-up was available, 36.4% (20/55) of those with medical management and none (0/39) ($p < 0.001$) of those with surgical management had recurrent massive hemoptysis. Forty-five percent of these cases were fatal. Current management of massive hemoptysis has resulted in improved hospital outcome. However, the high risk of recurrent and often fatal hemoptysis mandates the definitive management of the bronchial arteries before discharge from the hospital. Recent reports suggest that percutaneous embolization may be effective in nonsurgical candidates. (*J THORAC CARDIOVASC SURG* 1993;105:394-7)

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Massive hemoptysis is a medical emergency associated with a 30% to 50% rate of mortality in nontrauma patients.¹⁻³ The patients frequently are very debilitated and have significantly compromised pulmonary reserve; a well-coordinated strategy is required for a successful outcome under these circumstances.^{1,3} With the effective control of inflammatory lung diseases such as tuberculosis, bronchiectasis and aspergillosis in First World countries,³ experience in the care of patients with massive hemoptysis has diminished, and recent publications on this subject are uncommon. Emergency admissions for

life-threatening hemoptysis are not uncommon in Southern Africa, however, and reflect the socioeconomic conditions and prevalence of associated inflammatory lung disease that most Third World countries experience.

We share our 7-year experience in the treatment of 120 patients with massive hemoptysis and emphasize the need for some form of definitive therapy to prevent the alarmingly high prevalence of recurrent hemoptysis.

Patients and methods

Patient population. The hospital records of all patients ($n = 120$) with a life-threatening hemoptysis (greater than 200 ml/24 hr) referred to the respiratory unit or cardiothoracic surgery unit between June 1983 and June 1990 were reviewed in December 1990. There were 77 male and 43 female patients with a mean age of 42 years (range, 16 to 74 years). One hundred ten patients were black, and 10 were white. At that time, 6-month follow-up information was available on 88% (106/120) of the patients.

The patients were arbitrarily divided into two subgroups—those with hemoptysis of 200 to 500 ml/24 hr (group 1, $n = 25$) and those with hemoptysis exceeding 500 ml/24 hr (group 2, $n = 95$). The study noted (1) occurrence of previous hemopty-

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sis, (2) pathologic findings, (3) distribution of involved lung segments, (4) management, and (5) 6-month prognosis. When relevant, results between the subgroups were compared by means of χ^2 analysis.

Management. After initial resuscitation, strict bed rest in a semi-Fowler's position was enforced and 35% humidified oxygen was administered via a loosely fitting face mask. Intravenous access was obtained, blood was cross-matched, and baseline serum chemistry, coagulation studies, and arterial blood gas analyses were done. If present, systemic hypertension was controlled. The patients were lightly sedated, and a cough suppressant was administered orally. Sputum specimens were submitted for microscopic study and culture of bacteria, acid-fast bacilli, and fungi, and cytologic examination. Roentgenograms of the chest and electrocardiograms were obtained at the bedside. Spirometry was performed once the patient had stopped bleeding.

In the absence of significant recurrence of fresh hemoptysis, medical management was continued for 24 to 36 hours, after which a rigid bronchoscope was inserted and saline lavage was done (1) for bronchial toilet and (2) to localize the source of the bleeding. Urgent bronchoscopy was thus performed on 97 patients, but accurate localization of the bleeding at endoscopy was possible in only 43% (42/97). Of the 23 patients in whom bronchoscopy was not done, 11 had persistent sputum-positive tuberculosis, 4 were extremely cachectic, 2 were known to have end-stage lung disease, 3 died soon after admission, and 3 refused the procedure.

Patients with adequate pulmonary reserve in whom the bleeding could be localized ($n = 42$) underwent surgical resection either immediately (within 24 hours) ($n = 7$), urgently (within 5 to 7 days) ($n = 14$), or electively (usually within 1 to 2 weeks) ($n = 21$). Occasionally emergency intubation and lung isolation⁴ were necessary to control hemorrhage and ensure adequate ventilation. Balloon catheter tamponade^{2,5} was also used occasionally to isolate the source of the hemorrhage while the patients were being prepared for emergency operation.

Patients with sputum-positive pulmonary tuberculosis ($n = 29$) did not undergo bronchoscopy unless localized disease was present or unrelenting hemoptysis occurred. Some of these patients ($n = 7$) had been receiving antituberculosis therapy for a few days before their current episode of hemoptysis.

Patients in whom the site of bleeding could not be localized and whose condition stabilized easily without recurrent hemoptysis ($n = 33$) underwent conservative, and often empiric, management with antituberculosis therapy. They were discharged once they were free of hemoptysis and were to be evaluated on an outpatient basis. Patients who were extremely debilitated or had inadequate pulmonary parenchymal or pulmonary vascular reserve ($n = 8$) were managed likewise.

Patients who were in poor general condition and in whom hemoptysis persisted underwent percutaneous embolization of bronchial arteries⁶⁻¹⁰ ($n = 8$).

Results

Pathology. The most common underlying cause of the hemoptysis was pulmonary tuberculosis, which accounted for 73% of our patients ($n = 88$). Of these, 61 patients had end-stage bronchiectasis or cavitation and the remaining 27 patients had noncavitary active pulmonary tuberculosis.

Seven patients (6%) had an aspergilloma-filled cavity, six patients had underlying bronchial carcinoma (5%), and five patients had end-stage suppurative lung disease of uncertain origin (most of these patients probably had underlying tuberculosis as well).

Three patients had acute necrotizing pneumonia, and one patient with critical mitral stenosis had massive hemoptysis. In the remaining 10 patients, no definitive diagnosis could be made.

Previous hemoptysis. Fifty-two patients (43.3%) had had a previous episode of major hemoptysis—13 of 25 patients in group 1 and 39 of 95 patients in group 2 (not significant). The majority of the previous episodes of hemoptysis occurred within 3 months of the patients' illness studied here (31/52). These episodes usually occurred at home and, for the most part, were managed conservatively at outlying clinics.

Distribution of involved lung areas. The lung or part of the lung from which the intrabronchial hemorrhage originated could be localized with reasonable confidence in only 76 patients (63%), by localized radiologic appearance, red blood cell-labeled isotope scanning, emergency endoscopy, or a combination of these techniques. The right lung was involved more often than the left (62% versus 38%), and 99 affected lobes were identified: right upper lobe ($n = 43$), left upper lobe ($n = 22$), left lower lobe ($n = 16$), right middle lobe ($n = 9$), and right lower lobe ($n = 9$). (If the bleeding arose from an entirely destroyed lung, then the lobes of that lung were counted separately).

Surgical procedures. Of 42 surgical procedures performed, there were 24 lobectomies, 6 bilobectomies, 9 pneumonectomies, and 2 segmentectomies. In one patient whose hemoptysis could not be localized endoscopically, a diagnosis of critical mitral stenosis was made. That patient underwent urgent mitral valve replacement and made a complete recovery.

Hospital outcome. Twelve patients (10%) died during hospitalization. There was no significant difference in the rate of hospital mortality between patients who underwent surgical (7%, 3/42 patients) and nonsurgical (11.5%, 9/78 patients) treatment. Cause of death, however, differed considerably: in 2 of the 3 patients who underwent surgical treatment, death resulted from the complications of acute pulmonary hemorrhage with widespread endobronchial plugging—hypoxic cardiac arrest in one and severe pulmonary hypertension in the other.

The third surgical patient died of acute massive recurrent hemoptysis from a radiologically normal left upper lobe a few hours after emergency resection of the right upper lobe. An isolated right upper lobe cavity was seen

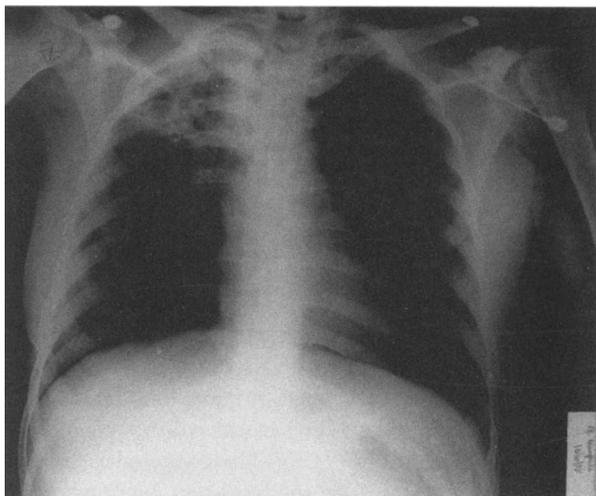


Fig. 1. Roentgenogram of the chest showing isolated right upper lobe disease. The patient died of recurrent hemorrhage from the left upper lobe a few hours after emergency lobectomy.

on the preoperative roentgenogram of the chest (Fig. 1); although the bleeding could not be clearly localized at bronchoscopy, it was assumed that it arose from this lobe.

Of the seven patients who underwent nonsurgical treatment and died, five had fatal recurrent hemoptyses, three while awaiting urgent surgery. The remaining two patients died of acute asphyxiation.

Prognosis. There were 108 hospital survivors. Six-month follow-up status is known for 87% of these (94/108), 85% of whom (80/94) were alive at that time. Seventy-four percent (41/55) of those who underwent medical treatment and for whom follow-up data were available were alive at 6 months; 20 of these (36.4%) had had a recurrent episode of hemoptysis during these 6 months, 80% of which occurred within 3 months. Almost half (9/20) of the recurrent episodes of hemoptysis were fatal. The other five patients died of progressive respiratory failure ($n = 2$), cachexia ($n = 2$), and secondary pulmonary infection ($n = 1$).

All of the patients who underwent surgical treatment and survived through discharge ($n = 39$) were alive with no recurrent hemoptysis ($p < 0.001$) at the time of follow-up.

Discussion

The management of patients with massive hemoptysis is associated with hospital mortality rates on the order of 30% to 50%, despite the advantage of newer technologies and well-defined management plans.^{1-3,6-10} Most previous reports have focused on "hemoptysis-free" discharge

of the patients^{1,3,5} without any follow-up. From our data it seems clear that, unless the source of the bleeding is dealt with *definitively* during the hospital stay, the patient is at significant risk of recurrent hemorrhage; this risk was 36.4% in our series and resulted in death in 45% of the patients. Moreover, most recurrences occurred within 3 months of discharge.

If a surgically remediable lesion is localized in a suitable patient, resection is the therapeutic option with the lowest rate of mortality and the lowest risk of recurrent bleeding.^{1,2,5,11} If the source of the hemorrhage cannot be localized endoscopically, if pulmonary reserve is inadequate, or if active pulmonary tuberculosis is present (and surgical intervention is not an initial option), percutaneous bronchial arteriography and embolization should be undertaken.⁶⁻¹⁰ This may serve to temporize, leaving open the option of more elective surgical intervention in the future, or it may very well constitute the definitive management of the hemoptysis. Our experience with bronchial artery embolization has remained rather limited, mainly because of limited financial resources and the perception that the intervention provides only temporary relief from a persistent problem.¹⁵ Recent data would indicate that more permanent palliation may be achieved with current embolization techniques^{7,8} and that early fatal recurrent hemoptysis may be averted with this treatment modality.

In the acute situation, if the bleeding does not abate promptly with conservative measures, insertion of a rigid endoscope for iced saline lavage^{1,12} and balloon catheter^{2,5,13} or Fogarty catheter¹⁴ tamponade may be attempted. We have used these measures with variable success over the years.

The timing of surgical intervention is crucial.^{1,11} If one is forced to operate immediately in the presence of active bleeding and ongoing soiling of the bronchial tree, the mortality rate can be expected to be high. All three patients in the surgically treated group who died underwent emergency operations (i.e., within 24 hours of their massive hemoptysis). It may be better to operate 5 to 10 days after the acute episode, once the bronchial tree has been effectively cleared and the pulmonary parenchymal and pulmonary vasculature reserve has recovered.^{1,11,12} Prevention of recurrence of hemoptysis during this period is the major concern, and percutaneous bronchial artery embolization may help reduce this risk.^{6-10,15}

Localizing the source of the bleeding endoscopically may be difficult, and often only a presumptive diagnosis may be made. Substitution of a flexible bronchoscope for a rigid bronchoscope, as advocated by some,^{16,17} is not a practical alternative in our opinion because it would be difficult to evacuate the copious amounts of blood clot

through a flexible bronchoscope. It would be even more difficult to deal effectively with major recurrent hemorrhage during the procedure.^{1,12}

In summary, our study seems to indicate that the rate of hospital mortality of patients with massive hemoptysis has improved in recent times, and little additional benefit may therefore be derived from emergency surgery for the routine patient whose condition stabilizes soon after a major hemorrhage. However, these patients are at high risk of recurrent hemoptysis. Therefore, if surgical intervention is contemplated, this should be effected before the patient is discharged. If the patient is not a candidate for resection some other form of management (bronchial artery embolization, for example) should be undertaken to reduce the risk of fatal recurrent hemoptysis.

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