

Bleeding from the lungs: diagnostics and treatment

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Background. The objective of this study is to analyse the results of conservative and surgical treatment for lung bleeding (LB) of various etiology.

Materials and methods. We reviewed 610 patients with LB of different etiology from January 1980 through December 2003 at the Departments of Thoracic Surgery of the Institute of Oncology, and Santariskiu Tuberculosis and Lung Diseases Hospital. LB was classified in to three degrees: I° hemoptysis with or without recurrence, when up to 100 ml blood is lost, II° – lung bleeding to 500 ml, and III° – when more than 500 ml of blood is lost. Controlled hypotony (pentamin), hemostatical therapy and surgical treatment were applied. Resection of the lung was performed after arrest or reduction of LB. Such tactics has advantages over emergency operations fulfilled “at the height of bleeding”. The diagnostic investigation is based mainly on the history of the disease, chest radiography, fibroscopy and CT scan of the thorax.

Results. Over the last 20 years in the mentioned surgical departments, controlled hypotony was applied in 320 cases, bleeding was stopped to 270 patients (pts) (84.4%). By applying only hemostatical therapy, bleeding was stopped in 212 pts (34.7%). In this group, 14 (6.6%) pts died because of bleeding and concomitant diseases. Operations were done to 128 pts (20.9%): segmentectomy – 8, lobectomy – 70, pneumonectomy – 40, cavernostomy – 2, thoracoplastics – 7, probatorial thoracotomy – 1. 584 pts (95.7%) recovered: 468 pts (97.1%) were treated conservatively, 116 pts (90.6%) surgically, 26 pts (4.3%) died. Various post-surgical complications were observed in 32 (25%) cases.

Conclusions. **1.** Patients with LB of different etiology should be treated in specialized thoracic departments. **2.** In case of I°, LB conservative methods were applied, II°–III° controlled hypotony was used. Bleeding was stopped in 270 cases (84.4%) of 320 pts. In case of hemostatical therapy, bleeding was stopped in 212 pts (34.7%) (for 22 pts we used artificial pneumothorax and 8 for pts pneumoperitoneum). **3.** Bleeding from the lungs was stopped by operations in 128 pts (20.9%) (radical surgery in 117 pts (91.4%), palliative to 10 pts (7.8%), probatorial thoracotomy to 1 pts (0.7%)). In this group, 12 pts (9.4%) died of bleeding and concomitant diseases. **4.** By our methods of treatment, 584 (95.7%) patients were cured: 468 pts 97.1% conservatively, 116 pts (90.6%) by surgery, 26 pts (3.6%) died during treatment.

Key words: lung diseases, bleeding from the lung – diagnostics and treatment, pulmonary hemorrhage, hemoptysis, surgery treatment for lung bleeding

INTRODUCTION

Lung bleeding (LB) is a very dangerous and grave complication of different lung diseases. Mortality in case of intensive LB varies from 21.6% to 55.0% (1, 5) and depends mainly on the concomitant diseases and the degree of bleeding (3, 7). LB is a significant event that frightens patient and is regarded as a serious complication by the physician. Diagnostic investigation is based mainly on history, chest radiograph, fibroscopy and CT scan of the thorax (10, 13).

The most common causes of LB infections and an inflammatory process, followed by tuberculosis and lung abscess, neoplasms, pulmonary embolisms, necrotizing pneumonia, mitral stenosis, coagulopathies, bleeding due to a fungus ball and multiple systemic disorders (1, 6, 7, 10).

Nowadays the progress of thoracic surgery, anesthesia and intensive care have basically changed the tactics in LB treatment. The patient is at risk of suffocation, because of blood clots severely obstructing the airways. Most important measures are: supplemental oxygen, positioning the patient with the bleeding site down, bronchoscopical suctioning and removal of blood and clots. Coagulopathies have to be corrected. In cases of bleeding from central le-

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sions, application of vasoactive drugs may help temporarily; coagulation with laser is feasible. Heavy bleeding from the periphery requires a balloon or tube tamponade. Depending on the cause and severity of bleeding, either anti-inflammatory medical treatment, haemostatic radiation therapy or surgical procedure must be used (1, 4, 6, 10). The objective of our work was to analyse the results of conservative and surgical treatment for lung bleeding of various etiology.

MATERIALS AND METHODS

In thoracosurgical departments of the mentioned hospitals, 610 pts (499 (81.8%) males and 111 (18.2%) females) were treated from hemoptysis and LB of different etiology. In 1980–2003, 230 pts (37.7%) were hospitalized in a planned order and 380 pts (62.3%) urgently. The patients' age ranged from 16 to 87 years. 313 pts (51.3%) were physical workers, 188 pts (30.8%) mental workers, and 109 pts (17.8%) were retired people.

LB in 372 (61%) patients was caused by pulmonary tuberculosis (Table 1).

In sputum cultures, TB (+) in 302 (81.2%) cases was found. 47 pts (12.6%) had disability because of pulmonary TB, 20 pts (5.4%) had been operated on (for 16 pts lung resection and for 4 pts cavernostomy were done).

As the diagnostic methods, roentgenography, CT, bronchological and bronchographical, cytological, histological, bacteriological and general blood analyses were used.

The picture of clinical LB depends on the lung disease in the case of which the bleeding occurred, on the intensiveness, on the amount of blood lost, on the age of the patient, has general state of health and concomitant diseases. The greatest threat is not the amount of blood lost, but asphyxia with blood clots. We classified LB into 3 degrees: I° – hemoptysis with or without recurrence, when up to 100 ml blood is lost, II° – lung bleeding up to 500 ml, and III° – when more than 500 ml of blood is lost (I° – 284 (46.5%) pts, II° – 246 (40.3%) pts and III° – 80 (13.2%) pts). In 380 (62.3%) pts lung bleeding

was observed for the first time and in 230 pts (37.7%) it relapsed.

By rentgenological examination, pathology of the right side was diagnosed to 218 pts (35.7%), of the left side to 183 pts (30%), bilateral changes to 160 (26.2%) patients, in 49 pts (8.1%) no changes were observed. Obstructive changes in lung parenchyma were diagnosed in 280 (45.9%) patients. Bleeding to lung cavities occurred in 20 cases; in 16 cases aspergillomas were found in lung cavities, what caused periodical bleedings.

One of the most important diagnostic methods in establishing the reason for bleeding and its localization is bronchological examination. Bronchoscopy was done with a rigid Fridel's bronchoscope, using a flexible bronchoscope of fiberoptic type. Bronchological examination was done in 582 (95.4%) cases, and to the rest 30 pts (5.8%) endoscopy was not applied because of their performance status. Direct signs of bleeding indicating the localization of the process, bleeding site and place were diagnosed to 318 (54.7%) patients. Indirect signs of bleeding, according to which a pathology could be suspected, were present 166 (28.5%) cases. In 98 pts (16.8%) there were no signs of bleeding. For 46 pts (7.9%) with severe bleeding, bronchial tamponade was performed; positive effect was observed in 41 pts (89.1%).

RESULTS

Over the last 20 years, controlled hypotony (pentanin) has been applied in 320 cases. Bleeding was stopped in 270 pts (84.4%). By applying hemostatical therapy, alone, bleeding was stopped in 212 (34.7%) patients (in 22 pts artificial pneumothorax and in 8 pts pneumoperitoneum were used). 14 pts (2.9%) died in this group because of bleeding and concomitant diseases. Operations were done to 128 (20.9%) patients: radical to 117 pts (91.4%), palliative to 10 pts (7.8%). The methods of LB treatment are shown in Table 2.

584 (95.7%) patients recovered; 468 (97.1%) of them were treated conservatively and 116 pts (90.6%) surgically; 26 (4.3%) pts died. The following operations were done: segmentectomies – 8, lobectomies – 70, pneumonectomies – 40, cavernostomies – 2, thorocoplastics – 7, probatorial thoracotomy – 1.

Table 1. Lung bleeding caused by tuberculosis and non-specific lung diseases

Clinical forms of tuberculosis	Number of patients	Non-specific diseases	Number of patients
Focal	39 (10.5%)	Neoplasm	70 (29.4%)
Infiltrative	100 (26.9%)	Ac. pneumonia	30 (12.6%)
Tuberculoma	16 (4.3%)	Abscessus pulmonum	37 (15.5%)
Disseminated	48 (12.9%)	Bronchiectasis	29 (12.2%)
Cavernous and fibrocavernous	134 (39.0%)	Lung polycystosis	7 (2.9%)
Cirrhotic	35 (9.4%)	Bronchitis chr.	65 (27.4%)
Total	372 (61.0%)	Total	238 (39.0%)

Table 2. Methods of lung bleeding treatment

Methods of treatment	Number of patients	Results of treatment	
		Recovered %	Died %
Conservative	482 (79.1%)	468 (97.1%)	14 (2.9%)
Surgical	128 (20.1%)	116 (90.6%)	12 (9.4)
	610	584 (95.7%)	26 (4.3)

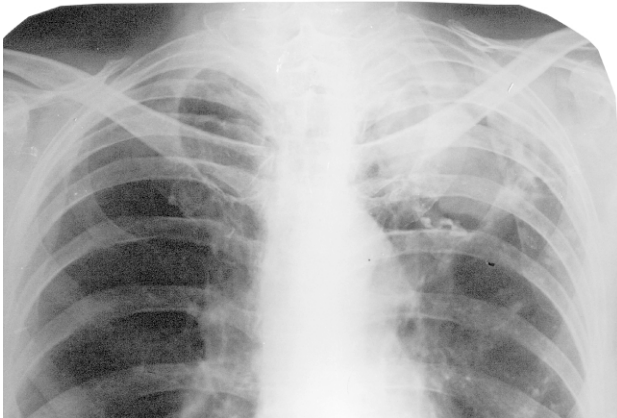


Fig. 1. Left upper lobe cavern 8×7 cm with homogeneous darkness in the middle part, periferally – crescent air tape



Fig. 2. Postoperative chest X-ray: after left upper lobectomy (lung fully expanded)

Twelve patients (10.3%) died after surgery (11 pts after lung resection and 1 after cavernostomy); 15 pts (11.7%) were operated on for I° LB, 80 pts (62.5%) – II° and 33 pts (25.8%) – III°. Extra surgery in case of bleeding was applied to 30 (23.4%) patients (after bronchus tamponade) and to the other patients within 2 weeks after bleeding had been stopped. Various postsurgical complications were observed in 32 (25%) cases. As an illustration, we present the case of a patient who underwent surgery due to massive lung bleeding.

CASE REPORT

Patient M.P., 40 years, had lung tuberculosis for 3 years. He had conservative specific treatment, but with no effect. Chest X-ray showed a lung cavern. The patient had several recent episodic bleedings from the lung. Chest X-ray showed lung aspergilloma. We observed endoscopically a bleeding from the left upper lobe. The bleeding increased, and the patient underwent bronchial tamponade and left upper lobectomy. The postoperative histological diagnosis was fibrocavernous tuberculosis and aspergilloma.

DISCUSSION

The main reasons for the haemorrhage from lungs and sputum with blood the are following: splitting of the walls of the lung blood vessels, hypertension in the little circle of the blood circulation, disorders in the blood coagulation system (hyper-coagulation), activeness of fibrinolysis and enlarged penetrability of walls of the blood vessels in the place of the pathological process (1–4).

In the active form of lung tuberculosis, haemorrhage can occur from destructive lung cavities. Haemorrhage can also occur in the case of non-active lung tuberculosis because of the scar changes in the parenchyma of lungs, dilations of small and larger arteries and varicosity, so-called aneurisms, and the appearance of fungous pathology (*Aspergillus fumigatus*) in tubercular cavities (4, 6, 7).

Intensive haemorrhage can occur when the tuberculosis lymphatic ganglion is perforated into the bronchus cutting because of the split and erosion of walls of the blood vessels (8). Often, haemorrhage can appear in patients with various infective pathologies of lungs (acute pneumonia, abscess, suppuration of bronchiectasies or cysts), haemorrhage or sputum with blood can also be found in the late phase of a central or peripheral lung cancer (5, 9, 3, 10, 4).

In patients with bronchitis, pneumonia, haemorrhage occurs because of the penetrability of the blood vessels (4, 11). Haemorrhage and sputum with blood can be found in more than 40 diseases of not only lungs, but also of other injured organs and sys-

tems. It should be stressed that haemorrhage from lungs must be distinguished from the cases, when the nasopharynx, gums, gullet or stomach are bleeding; the final diagnosis is based on the anamnesis, objective data of investigation (bronchoscopy, esophagoscopy, echoscopy, chest CT) and by other laboratory data.

The tactics of treatment in the case of lung haemorrhage depends on the cause of haemorrhage, its intensiveness, concomitant diseases, the compensation of the haemodynamic system, the age of patient, and on the degree of spreading of the lung pathology.

Considering the problem, we must evaluate all the therapeutic and surgical methods that have been and are applied in order to stop lung haemorrhage.

Artificial pneumothorax and pneumoperitoneum applied by phthisiatricians earlier are not used nowadays and have only a historical value. In the beginning of our work we applied them very limitedly, in cases when the lung tuberculosis was disseminated and the indices of external breathing were very low.

The dressing of lung arteries did not justify our hopes as an independent operation, because it does not eliminate the main reason of illness and does not protect from recurrences (2).

Eurvilaichit, Supasinsarrhir, Saenghirunvattana (in 2000), Barben, Robertson, Olinsky, Dithfield, (2003) in cases of lung haemorrhage applied selective a. bronchiale embolisation (only three cases in our practice). However, the literature shows recurrences of haemorrhage because of the newly appeared collateral blood vessels (9, 12, 13, 11).

The dressing of a split bronchus, surgical atelectasis stop the haemorrhage, but often re-canalisation of the bronchus occurs, and the haemorrhage repeats (13). From our practice we stand for the endobronchial wading of the bleeding side by a foam rubber, or by a balloon catheter.

Lately, in cases of lung haemorrhage when the conservative treatment is not effective and the haemorrhage is repeated, lung resections are made (5-7).

Among conservative means applied by phthisiatricians and doctors of general profile, and when there is the 1st degree of haemorrhage, aminocapron acid 5% 2 ml i/v, dicinon 12.5% 2 ml i/m are used. Meanwhile, in the 2nd degree of haemorrhage, more effective is the manageable hypotonia. For this purpose, such ganglia-blockades of short effect as arfonad 5% 5 ml i/v with glucose, pentamin 5% 1 ml i/v with isotonic liquid or imechin 0.1% 10.5 i/v are used.

In our practice we have used pentamin more often. If the haemorrhage does not stop, we carry out bronchoscopy and the corresponding bronchus is waded. If the mentioned methods are not sufficient, on

the basis of bronchiologic, chest X-rays, CT and other methods of investigation, the question of surgical treatment is considered.

CONCLUSIONS

1. Patients with LB of different etiology should be treated in specialized thoracic departments.

2. In case of I° LB conservative methods were applied, II°- III° controlled hypotony was used. Bleeding was stopped in 270 cases (84.4%) of 320 pts. In case of hemostatic therapy, bleeding was stopped in 212 pts (34.7%) (for 22 pts we used artificial pneumothorax and for 8 pts pneumoperitoneum).

3. Bleeding from the lungs was stopped by operations in 128 pts (20.9%) (radical surgery in 117 pts (91.4%), palliative to 10 pts (7.8%), probatorial thoracotomy to one patient (0.7%)). In this group, 12 pts (9.4%) died of bleeding and concomitant diseases.

4. Using our methods of treatment, 584 (95.7%) pts were cured: 468 pts (97.1% conservatively, 116 pts (90.6%) by surgery, 26 pts (3.6%) died during treatment.

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KRAUJAVIMO Ī PLAŪĒĪŲ DIAGNOSTIKA IR GYDYMAS

S a n t r a u k a

Đio darbo tikslas – ėvertinti kraujavimo ī plaūēī konservatyvaus ir chirurginio gydymo galimybes. Vilniaus universiteto Onkologijos institute ir Santarīkī tuberkuliozės ir plaūēī liḡ ligoninėje nuo 1980 m. sausio iki 2003 m. gruodžio mėnesio gydyta 610 ligonī su ėvairios etiologijos kraujavimu ī plaūēī. Kraujavimo intensyvumui ėvertinti pasiūlėme trijų laipsnī ligonī suskirstymo sistem̄: I° – pirminis arba pasikartojantis kraujavimas, kai netenkama 100 ml kraujo; II° – netenkama iki 500 ml kraujo; III° – netenkama daugiau kaip 500 ml.

Kraujavimas buvo stabdomas valdoma hipotonija (pentaminu), hemostatine terapija ir chirurginiu gydymu. Plaūēī operacijos buvo atliekamos sustabdytus arba sumažinus kraujavimą. Kraujavimui nenustojus po hemostatinės terapijos, prieš operacij̄ buvo tamponuojami kraujuojan̄ios plaūēī

pusės bronchai. Diagnozė ligoniams buvo nustatoma pagal ligos anamnez̄, rentgenologinī, endoskopinī, morfologinī bei kompiuterin̄ tomografijos tyrim̄ duomenis. Ī 320 ligonī, gydyt̄ valdoma hipotonija, kraujavimas sustabdytas 270 (84,4%). Vien tik hemostatine terapija kraujavimas buvo sustabdytas 212 (34,7%) ligonī. Operacijos atliktos 128 (20,9%) ligoniams (segmentektomijos – 8 ligoniams, lobektomijos – 70, pulmonektomijos – 40, kavernostomijos – 2, torakoplastikos – 7 ir probatorin̄ torakotomija – vienam ligoniui). Naudojant m̄s̄ gydymo metodik̄ 584 (95,7%) ligoniai pasveiko: 468 (97,1%) kraujavimas sustabdytas konservatyviomis priemonėmis, 116 (90,6%) – chirurginiu būdu. Mir̄ 26 (4,3%) ligoniai. Pooperacinī komplikacij̄ tur̄jo 32 (25,0%) ligoniai.

Išvados. 1. Ligoniai su ėvairios etiologijos kraujavimu ī plaūēī privalo būti tiriami ir gydomi specializuotame krūtin̄s chirurgijos skyriuje. 2. Esant I° kraujavimui taikėme konservatyvius gydymo metodus, o II°–III° kraujavimui – valdom̄ hipotonij̄. Ī 320 ligonī, gydyt̄ valdoma hipotonija, kraujavimas sustabdytas 270 (84,4%). Hemostatine terapija kraujavimas sustabdytas 212 (34,7%) ligonī (22 ligoniams, sergantiems plaūēī tuberkulioze, atliktas dirbtinis pneumotoraksas, 8 – pneumoperitoneumas). 3. Chirurginiu būdu gydyti 128 (20,9%) ligoniai (radikalios operacijos atliktos 117 (91,4%), paliatyvios – 10 (7,8%) ir vienam ligoniui atlikta probatorin̄ torakotomija). Đioje ligonī grupėje 12 (9,4%) mir̄ dėl kraujavimo ī plaūēī ir sunkī gretutin̄ liḡ. 4. Naudojant m̄s̄ gydymo metodik̄ pasveiko 584 (95,7%) ligoniai: 468 (97,1%) gydyti konservatyviai ir 116 (90,6%) operuoti. Mir̄ 26 (3,6%) ligoniai.