Surgery for hemoptysis

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MASSIVE HEMOPTYSIS

- Hemoptysis greater than 1,000 mL per 24 hours in the presence of malignancy carries a mortality rate of ***80 %***.
- massive hemoptysis warrants a more aggressive, expedient approach.
- These patients require ***intensive care*** and early ***consultation*** with a pulmonologist.
- In cases of massive or life-threatening hemoptysis, diagnosis and therapy must occur simultaneously.
- Airway maintenance is vital because the primary mechanism of death is asphyxiation, not exsanguination.
- ***Supplemental oxygen and fluid resuscitation are essential***.
- Assistance by a ***cardiothoracic surgeon*** should be considered because emergency surgical intervention may be needed.

Massive hemoptysis: what place for medical and surgical treatment

- Treatment was managed according to:

1- ***the patient's status***.

2-***the etiology of bleeding***.

3-**the findings of bronchoscopy**.

4-computed tomographic scan.

Therapeutic measures available

- medical treatment
- tracheal intubation (single or double lumen tube)
- interventional endoscopy
- arterial embolisation
- surgical treatment

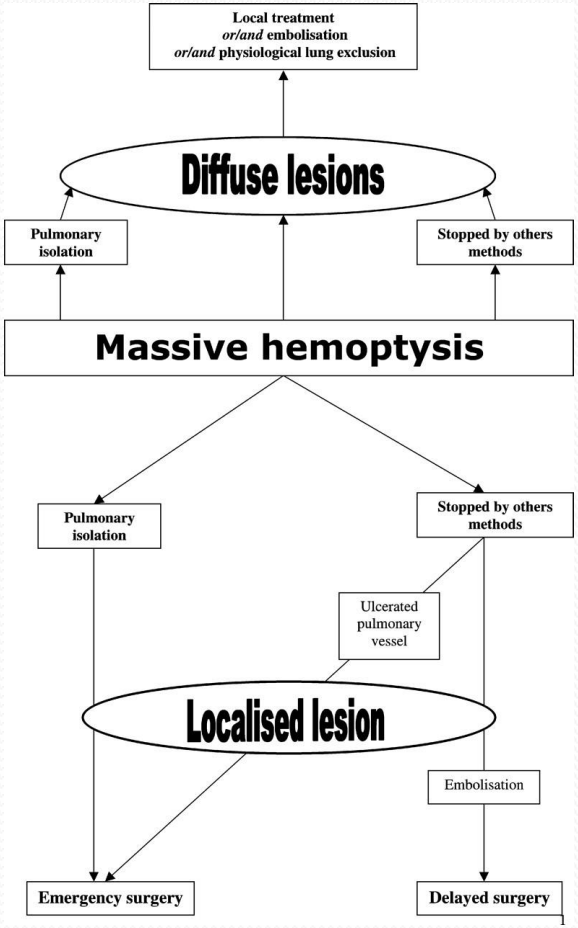
An abnormal mass on a chest radiograph

- warrants an outpatient bronchoscopic examination.
- For patients with a normal chest radiograph and risk factors for lung cancer or recurrent hemoptysis, outpatient fiberoptic bronchoscopy also is indicated to rule out neoplasm.
- High-resolution CT is indicated when clinical suspicion for malignancy exists and sputum and bronchoscopy do not yield any pathology.
- High-resolution CT also is indicated when chest radiography reveals peripheral or other parenchymal disease.

The overall goals of management of the patient with hemoptysis are threefold:

- **bleeding cessation.**
- **aspiration prevention.**
- **Treatment of the underlying cause.**

Algorithm of management for massive hemoptysis.



An emergency surgical treatment

- was applied when:
- **the site of bleeding was localized.**
- **the indication of pulmonary resection justified.**
- **other means of treatment having failed**.

- The surgical treatment was postponed as far as possible after cessation of bleeding using the other means of treatment.

- It was only considered when the patient had sufficient pulmonary reserve and when the bleeding source was clearly identified.

The most common presentation is *acute, mild hemoptysis* caused by bronchitis.

- **Low-risk patients** with normal chest radiographs can be treated on an ***outpatient basis with close monitoring and appropriate oral antibiotics, if clinically indicated.***

- If hemoptysis persists or remains unexplained, an outpatient evaluation by a pulmonologist should be considered.

Blood flooding into the tracheobronchial tree may arise from two vascular networks spreading into the pulmonary tissue:

- the ***bronchial*** and the ***pulmonary*** arterial systems.

- Bleeding coming from the former, results from neovascularisation of the lung systemic vessels, which quite often is induced by an inflammatory pulmonary disease or defect of the pulmonary arterial system .

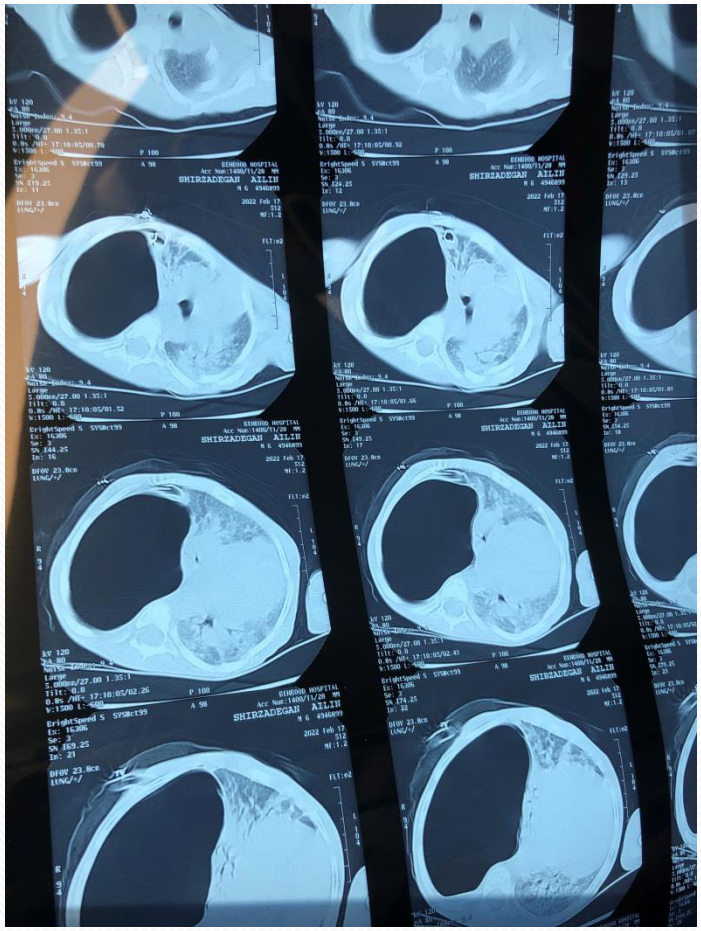
In case of massive acute bleeding

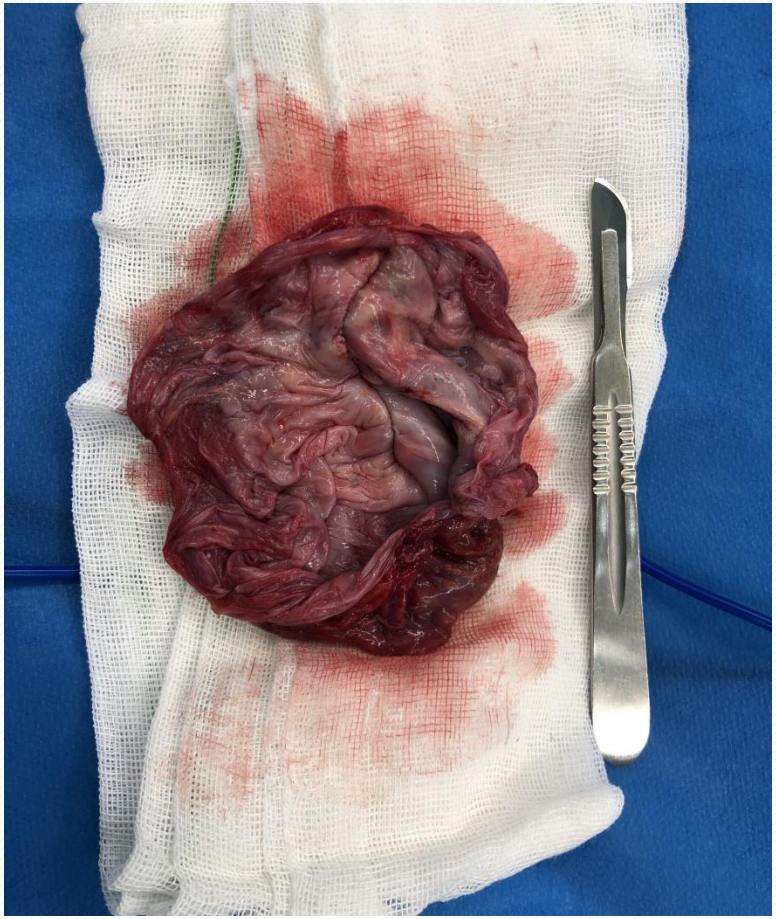
- isolation of the bleeding lung from the healthy one was achieved by the use of a double lumen endotracheal tube.
- In that case, the choice between operation or non-surgical treatment was taken after the CT-scan.

Group 1

- Immediate operation, close to the bleeding crise.
- All patients had a bronchoscopy and a CT scan before being operated
- a lung function test performed previously by their general physician.
- immediate operation was performed because of persistence of bleeding in spite of medical treatment.
- a pulmonary isolation by insertion of a double lumen endotracheal tube .
- The operation was performed after hemodynamic stabilization of the patient and after confirmation of a localized lesion.

bulla





Group 2

- delayed surgical treatment
- Cessation of hemorrhage was obtained by medical treatment by arterial embolisation .
- this stopped the bleeding and pulmonary isolation was useless.
- The lesions responsible for hemoptysis have always been localized and cardiopulmonary function was prepared for planned surgery.
- a selected pulmonary resection was performed

Group 3

- non-surgical treatment.
- Those patients had either too diffused lesions or too weak cardiopulmonary function to undergo a surgical treatment.
- with local therapy or arterial embolisation.
- Local therapy (adrenaline serum lavage) was applied during bronchoscopy when pulmonary isolation was not necessary.
- Laser electrocoagulation in inoperable lung cancer recurring after medical treatment.

Many inflammatory pulmonary diseases are able to produce such neovascularisation:

- Bronchiectasis.
- suppurative lung disease.
- mycobacteriosis, …

- Blood irruption stems from an erosion or a breaking of this hypertrophic neovascularisation.
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- These vessels are endowed with a mural musculature wall, which is able to contract (arteriolar smooth muscle).

- Vasospasm of this network may be produced either by pharmacological methods (vasoactive drug as vasopressin or aerosolized adrenalin) or by physical methods (bronchial ice-cold saline lavage) able to produce temporary slowing or cessation of the bleeding.

Indications

- ***Surgical intervention*** is recommended for the management of massive hemoptysis.
- Surgery is indicated in patients with hemoptysis who are resistant to embolization, such as:
  - Aspergilloma
  - Hydatid cyst
  - Thoracic vascular injury
  - Bronchial adenoma
  - Other lung lesions

Selection of surgery:

- Absence of tracheobronchial hemorrhage allows for safe operative intervention, with better delineation of the pulmonary disease and selection for the best economic pulmonary resection.

- Operation during bleeding crises may indeed precipitate emergency pneumonectomy.

- It is also better to operate once the bronchial tree has been effectively cleared and the pulmonary parenchymal and pulmonary vasculature reserve recovered.

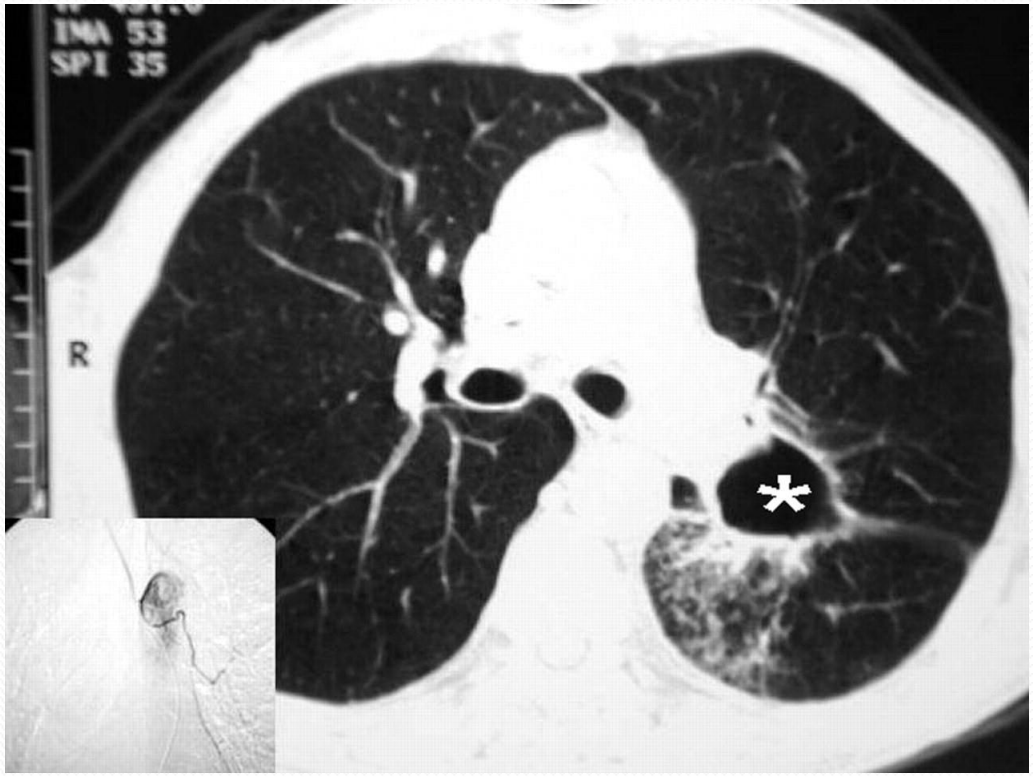
Pulmonary arterial

- Unlike bronchial vessels network, the pulmonary arterial one is not able to vasospam as powerfully as bronchial vessels.
- The wall of these vessels is thin and there is no active contraction.
- Vasoactive drugs or physical agents as ice-cold saline lavage have mild effects.
- Bleeding from these vessels generally comes through an ulceration of the vascular wall caused by destructive processes of the lung whatever the pathogenesis could be, such as, for instance, necrotizing bacterial pneumonia, necrotizing lung cancer, or aspergillus cavitazing infection.

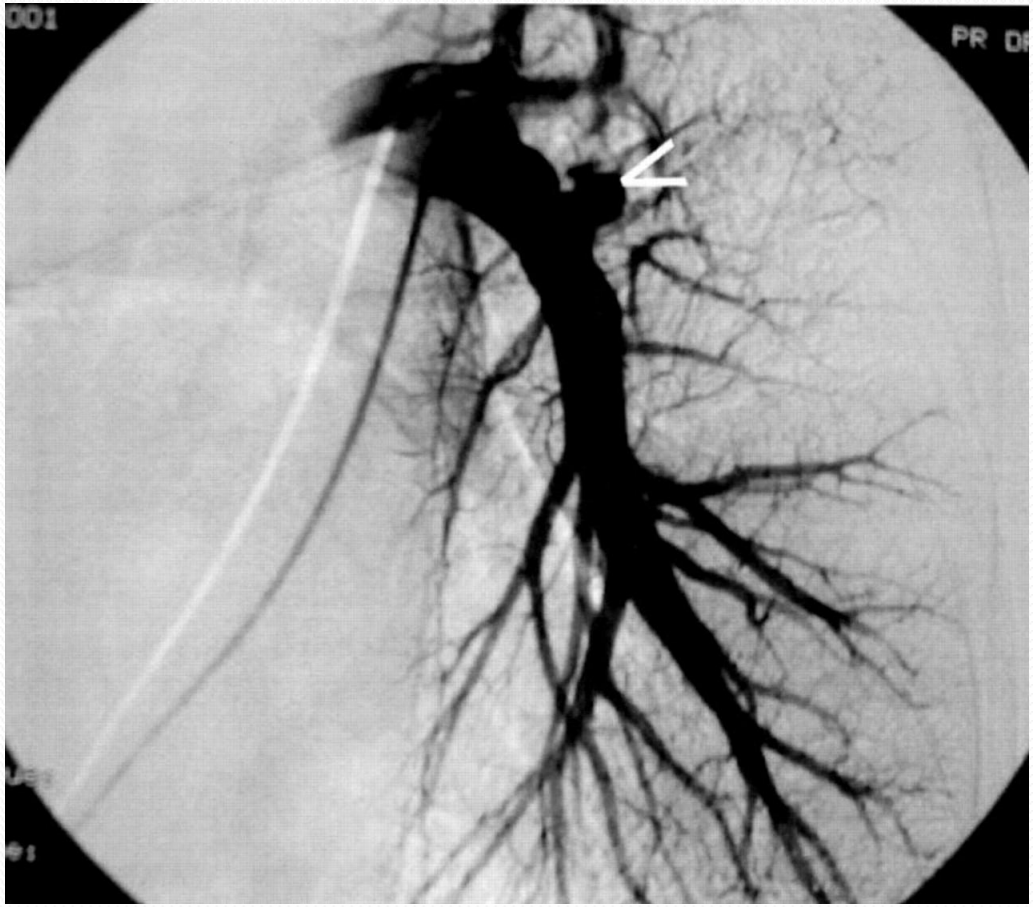
Between September 1996 and December 2001, 43 patients were treated (nine females and 34 males with mean age of 54 years, range from 32 to 79).

- The mean red cell blood transfusion per patient was 1.57 Units. The patients were classified into three groups: Group 1, 11 patients were operated on immediately close to the bleeding crise (five pneumonectomy and six lobectomy); Group 2, five patients for whom operation was delayed from the 7th to the 22nd day after cessation of bleeding (five lobectomy); Group 3, 27 patients were treated by non-surgical methods (medical treatment, endobronchial treatment, percutaneous embolisation). Fifteen patients underwent an arterial embolization, which was complete in 13 cases. Among the five patients of group 2, cessation of bleeding was obtained by bronchial embolisation in four cases. Considering the whole series, 10 (23%) patients died: three (19%) patients in group 1, zero in group 2, seven (26%) in group 3. In two patients who were suffering from tumor necrosis, hemoptysis relapsed leading to death. **Conclusion**: Emergency thoracotomy for massive hemoptysis is at high risk. In case of bleeding from the arterial bronchial vessels, embolization may enable to postpone surgery and operate secondarily. In case of bleeding from the pulmonary vessels (tumor necrosis), surgical treatment must be immediate.

CT scan showing a cavitating lesion against the pulmonary artery (star). In the corner, the bronchial



Pulmonary angiography showing a false aneurysm of the pulmonary artery (arrow).



- Surgical treatment is best performed in postponing date in case of bronchial vessels hemorrhage. In case of pulmonary vessels hemorrhage, the operation must be achieved immediately. Similarly, in case of massive bleeding requiring pulmonary isolation, immediate operation must be performed in case of localized lesion.