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Efficiency of application of roentgen-endovascular hemostasis of bronchial arteries in the treatment of pulmonary hemorrhage

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ABSTRACT

In the article presents results of treatment 33 patients with pulmonary hemorrhage of different etiologies by roentgen-endovascular hemostasis. Patients underwent conventional diagnostic and therapeutic measures. Clinical evaluation of the nature and severity of pulmonary hemorrhage has been done. Efficiency and usefulness of endovascular treatment in patients with pulmonary hemorrhage have been studied.

Keywords: roentgen-endovascular hemostasis, bronchial arteries, pulmonary hemorrhage.

INTRODUCTION

Pulmonary hemorrhage is one of the gravest and most common complications of lung diseases of different etiology which gives evidence of deep damage of bronchopulmonary structures by a pathologic process. Such damages aggravate state of patient [1, 2, 3]. This complication occurs in 7% - 14% patients with different lung diseases who were admitted to the thoracic department and along with this grade III bleeding occurs in 5% of patients. Despite progress in surgical technology connected with the appearance of minimally invasive treatment method, complication of first-aid treatment to patients with pulmonary hemorrhage is that in urgent case surgeon is limited in time necessary to find a source of bleeding [4, 5]. Roentgenologic and endoscopic methods are the main for diagnostics of pulmonary hemorrhage in most healthcare facilities [6]. However, even usage of roentgenography and bronchography not always allows to determine reason of bleeding and its localization [7, 8].

The objective of this work is to study efficiency and advisability of application of roentgen-endovascular treatment methods in patients with pulmonary hemorrhages.

MATERIALS AND METHODS

Method of roentgen-endovascular occlusion of bronchial arteries is widely used in our clinic not only as independent surgery in patients with pulmonary hemorrhages, but also as way of preparation of patients with pulmonary hemorrhage for planned lung surgery.

Indications to the catheter embolization procedure of bronchial arteries are the following: conservative treatment failure, hemoptysis in patients with bilateral inflammatory processes who was not prescribed surgical treatment for a range of reasons, absence of gross structural changes, requiring lung resection, mainly in patients with oncologic lung injury, at massive and life-threatening profuse bleedings as a mean of temporary or constant hemostasis. Discussed treatment method is applied only in bleeding or within a 6 – 12 hour after its treatment. Successful result in embolization can be obtained in 77 – 100%.

Roentgen-endovascular embolization of bronchial arteries was performed using Tridoros Optimatic 1000 angiographic complex (Siemens, Germany) and Phillips Integris Allura 12C (Holland). Bronchial artery angiography consists of the following: femoral cannulation is done by Seldinger technique under topical anesthesia (0,25% solution of novocaine). Cannulation is performed by Cobra catheter with flexure 45 – 65 degrees. Catheter was inserted at T4-T5 level under control of monitor and then it is fixed in the bronchial artery or intercostal artery mouth by rotational movement of guide. 1 ml of contrast agent is added for monitoring of catheter location in required vessel. Polyurethane emboli having diameters of 450 – 720 μm were used for embolization. Emboli in combination with microcoils were inserted at a big diameter of pathologically changed vessel that enhances effect of embolization. Absence of inflow of contrast agent and enhancement of distal part of bronchial arteries were considered as criteria of effective embolization. Control contrast enhancement also allows to exclude additional blood supply of pathologically changed area of lung by anomalous vessels.

33 patients received medical treatment in V.T. Zaytsev Institute of General and Emergency Surgery of NAMS of Ukraine over a period of 2011 – 2014 years. Patients in this study ranged in age from 22 to 76 years, among them were 45 women (45%) and 18 men (54%). There was no great difference between women and men. Major causes of the pulmonary hemorrhage have been given in table below.

Reasons	Number of observations
Chronic obstructive bronchitis	14 (42%)
Chronic obstructive pulmonary disease	7 (21%)
Bronchiectasis	6 (18%)
Community-acquired pneumonia	2 (6%)
Central lung cancer	4 (12%)

RESULTS AND DISCUSSION

As a result of complete physical examination of patients with pulmonary hemorrhage, it has been established that pulmonary hemorrhage was the result of obstructive bronchitis in 14 patients (42%), there was chronic obstructive pulmonary disease in 7 (21%) patients and bronchiectasis was diagnosed in 6 (18%) patients. In 2 (6%) patients pulmonary hemorrhage was caused by community-acquired pneumonia. Central lung cancer was detected in 4 (12%) patients.

Classification of pulmonary hemorrhages proposed by Grigoryev E.G., 1983

1 grade – hemoptysis: 1a — 50 ml per day; 1b – 50 – 200 ml per day; 1c – 200 – 500 ml per day.
 2 grade - massive pulmonary hemorrhage: 2a – 30 – 200 ml per hour; 2b – 200 – 500 ml per hour.
 3 grade - profuse pulmonary hemorrhage: 3a – 100 ml per saltum; 3b – more than 100 ml per saltum + obstruction of tracheobronchial tree, asphyxia.

Classification depending on the extent of blood loss:

1. minor pulmonary hemorrhage – from 50 to 100 ml per day; middle pulmonary hemorrhage – from 100 to 500 ml per day;
2. severe pulmonary hemorrhage – more than 500 ml per day;
3. extra severe, profuse pulmonary hemorrhage – more than 500 ml per day;
4. bleeding arising per saltum or for a short period.

Angiographic signs of pulmonary hemorrhage are described in detail [2, 4], they are the following: distention of bronchial arteries, chronic inflammation of vascular wall with bacterial agents, occurrence of pathological vascular anastomosis, extravasation of contrast agent.

Examinations were performed for all patients: laboratory values, plan radiography of thoracic organs, bronchoscopy. Treatment of patients was started from the hemostatic therapy: 5% solution of EACA, solution of ethamsylate, dicynone, vicasol. In patients with pulmonary hemorrhage of II grade performed hemostatic therapy was added with introduction of albumin solution, fresh frozen plasma. Packed red cell transfusion was prescribed patients with pulmonary hemorrhage of III severity. Pulmonary hemorrhage was stopped in 14 (42%) patients with the use of roentgen-endovascular hemostasis of bronchial arteries. High efficiency of roentgen-endovascular occlusion (REO) in pulmonary hemorrhage of different etiology was noted by majority of authors. Recurrence of bleeding in the long period after REO appeared in 2 (6%) inoperable patients with central lung cancer.

CONCLUSION

Therefore bronchial artery angiography gives high efficiency in solving the problem of hemostasis in oncological and nonspecific lung diseases, for determination of localization and source of bleeding. Endovascular occlusion of bronchial arteries in pulmonary hemorrhage permits:

- to elaborate diagnosis because of the presence of specific angiographic signs of malignant tumor;
- to perform effective endovascular hemostasis;
- to gain time for stabilization the patient with the aim of planned surgical treatment.

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