Original Article

Results of 3 Years' Experience in Pulmonary Embolectomy: A Single-Center Experience

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ABSTRACT

Background: Pulmonary embolism is associated with high mortality rates despite improvements in its management. The aim of the present study was to analyze the outcome of 20 patients who underwent surgical pulmonary embolectomy in our institution.

Methods: The medical records of all patients undergoing pulmonary embolectomy during a 3-year period at our institution were studied for demographic and preoperative data as well as hospital mortality.

Result: Twenty patients underwent pulmonary embolectomy. The patients were aged between 35 and 76 years old. Fourteen (70%) patients were male. The most common risk factor in these patients was a history of major surgery (55%). The hospital mortality rate was 25%.

Conclusions: Pulmonary embolectomy can be considered an effective approach in patients with pulmonary embolism and carries low mortality and morbidity. ***(Iranian Heart Journal 2017; 18(1):16-19)***

Keywords: Pulmonary embolectomy, Thromboembolism, Cardiac surgery

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Venous thromboembolism (VTE) is a relatively common disease associated with high mortality and morbidity. [1, 2] The incidence of VTE ranges from 75 to 269 cases per 100000 persons per annum. VTE includes deep vein thrombosis (DVT), which mostly occurs in the leg, thigh, or pelvis, and also its complications such as pulmonary embolism (PE). [1]

More than 90% of clinically detected pulmonary emboli are associated with lower extremity DVT, although more than half of patients with DVT and PE are asymptomatic.

VTE is a difficult diagnosis because its clinical presentations are not unique. [2]

Historically, the predisposing factors that lead to DVT are termed "Virchow's triad", which comprises immobility or stasis, hypercoagulation state, and endothelial injury. Most of the patients who suffer from DVT

have a history of prolonged immobility because of limb or pelvic fracture and major orthopedic or abdominal surgery. Other common reasons include malignancy, multiple trauma, prior VTE, and chronic heart failure. [2-4] Although VTE prophylaxis has been shown to improve the outcome of patients over time, PE remains the most common cause of in-hospital death and also the most common preventable cause of in-hospital death. [3] Treatment options in this condition include systemic thrombolytic therapy, catheter-based treatments, and surgical embolectomy. Surgical embolectomy is a valuable lifesaving treatment in patients who have not benefitted from fibrinolysis or who have an absolute contraindication for fibrinolytic therapy. [5]

We analyzed the outcome of 20 patients who underwent surgical pulmonary embolectomy in Imam Reza Hospital, in Iran.

METHODS

We evaluated 20 patients with a documented diagnosis of PE that underwent surgical intervention with pulmonary embolectomy in Imam Reza Hospital in Mashhad. The diagnosis of PE was confirmed via transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), and computed tomography (CT) angiography. The indications for surgery were instability in hemodynamic status and respiratory insufficiency.

RESULTS

The study population comprised 20 patients, aged between 35 and 76 years. Fourteen patients were male. The predisposing risk factors that lead to DVT and PE included major orthopedic and pelvic surgery in 6 patients and major abdominal surgery in 5. A history of malignancy was present in 5 patients. Some types of hypercoagulation syndrome like Pro C and Pro S deficiency were found in 3 patients. All the patients underwent pulmonary embolectomy with support cardiopulmonary bypass (CPB). After median sternotomy and opening the pericardium, heparin was administrated and aortic bicaval cannulation was initiated and at the time of the procedure. After the arteriotomy of the pulmonary artery, clot and embolic material was removed from the main, right, and left pulmonary arteries separately. Following the closure of the pulmonary artery, the aortic cross-clamp was released and the patients were weaned from CPB. For a successful weaning, usually inotropic support was needed.

Out of the 20 patients in the study, 4 patients died: 2 patients died in the operating room (they could not be weaned from CPB and developed severe right ventricular failure and high pulmonary artery pressure) and the remaining 2 patients expired in the intensive care unit in the 1st 24 hours after the procedure due to severe heart failure and unstable hemodynamics status.

DISCUSSION

PE is associated with high mortality and morbidity. An overall mortality rate of 17.4% within 90 days (365 of 2393 deaths) was reported by the International Cooperative Pulmonary Embolism Registry (ICOPER). Although there has been much advancement in the diagnosis of PE, many cases are asymptomatic and clinically undiagnosed. [6] In about 90% of the cases, DVT is formed in the lower extremities and then breaks free before it passes through the right side of the heart and into the pulmonary artery system. [2] According to the literature, the risk factors for PE can be classified into 2 groups: acquired risk factors such as major surgery, trauma, immobility, cancer, pregnancy, oral contraceptives, obesity, old age and anticardiolipin antibodies and continuation of primary hypercoagulation state. [4, 6] All hospitals have documented programs for the prevention of PE. Earlier mobilization of bed-

rest patients after any type of surgery, especially orthopedic and pelvic and major abdominal surgery, should be borne in mind. Heparin at a prophylactic dose is administrated for some high-risk patients like those with hypercoagulation state and those with a history of malignancy. The administration of subcutaneous low molecular weight heparin, fondaparinux, and unfractionated heparin is considered the initial standard therapy in hemodynamically stable patients with PE. [2, 7] Thrombolytic therapy should be performed as 1st-line treatment in patients with massive PE with circulatory shock or persistent hemodynamic instability. A meta-analysis compared thrombolytic therapy with heparin and showed benefits in high-risk cases, especially in patients with massive pulmonary emboli who presented with hemodynamic instability. It is, however, not recommended in unselected patients because it can increase the risk of bleeding and intracranial hemorrhage. [8, 9] Many antithrombotic drugs such as streptokinase, urokinase, and tissue plasminogen activator are available and can be used with varying degrees of success. This type of agents, albeit unable to prevent new clot formation, can remove the existing clot in the pulmonary vasculature. [8]

Recently, there has been a trend toward nonoperative management in most cases of clinical PE. After the initiation of anticoagulation with heparin, an antithrombotic agent is used for the lysis of the exiting embolic material in the pulmonary vasculature. For every patient with contraindications for anticoagulant administration or recurrence of PE, some prophylactic devices like the inferior vena cava filter can be inserted; however, it does not affect the free-floating proximal DVT. [7] Although the uses and benefits of this modality are not clearly defined, the analysis from the ICOPER showed a substantial reduction in the mortality rate in 3 months with inferior vena cava filters. [6]

At present, the only absolute indications for cardiac surgery intervention in cases of PE are hemodynamic instability, respiratory failure, contraindications to anticoagulation, and failure of thrombolysis. In most of these cases, there is massive saddle PE. [10, 11] Hospital mortality rates for pulmonary embolectomy vary greatly and depend on hemodynamic condition at the time of surgery. Recently, improvements in surgical techniques and perioperative care as well as proper patient selection have conferred a reduction in the mortality rate. [12] A cohort study by Kilic et al [13] demonstrated a mortality rate of 27.2% after pulmonary embolectomy. Elsewhere, Keeling and colleagues [14] reviewed data from the local Society of Thoracic Surgeons' database, which comprised 44 patients, and reported a significant improvement in morbidity and mortality rates (2.3% mortality in a 30-day period). In our study, in-hospital death occurred in 4 (25%) patients. Elsewhere, the mortality rates ranged from 23% to 40%, with the rate being lower among the stable patients. [15]

CONCLUSIONS

Pulmonary embolectomy can be deemed an effective approach in patients with PE and carries low mortality and morbidity.

Conflict of Interest: None declared.

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