Stenting for Critical Airway Stenosis under Percutaneous Cardiopulmonary Support

Airway stenting for severe central airway stenosis is inherently a dangerous procedure. There is the risk of critical airway obstruction due to bleeding, tumor debris, and airway perforation during the procedure. Once such situations occur, percutaneous cardiopulmonary support (PCPS) can be one of the most valuable rescue options to prevent critical hypoxic complications. At our institute, four of 49 patients who received stenting or other airway intervention required PCPS support (8%). Two of these cases required PCPS to be performed in an emergency setting during the procedure while the procedure was elective in the other 2. All procedures were performed effectively and safely without any complications caused by PCPS, including massive airway bleeding due to anticoagulant treatment. Patients were able to be weaned off PCPS uneventfully. PCPS is considered to be a valuable procedure in remedying critical hypoxic situations during airway intervention. (Jpn J Thorac Cardiovasc Surg 2004; 52: 592-596)

Key words: airway stenosis, stent, percutaneous cardiopulmonary support, airway intervention

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Severe and critical central airway stenosis, irrespective of the disease, requires emergency relief of airway patency. Several interventional treatment procedures have recently become available, including balloon bougie, laser ablation, or so-called “core out” using a rigid bronchoscope. After successful primary treatment of reestablishing airway patency, surgical resection or stenting is considered for a curative or conservative intent.

Extremely severe stenosis hinders the patient from receiving adequate ventilation. As a result, the risk of critical hypoxic complications during the procedure is increased. Such a situation itself is critical. Moreover, above-mentioned extended interventional treatment may cause a secondary airway problem due to massive bleeding, tumor breakdown, or airway perforation. These treatment-induced complications tend to jeopardize the patient’s oxygenation, which can cause the situation to become fatal. A safe treatment strategy for maintaining minimum oxygenation during the procedure should be carefully designed to avoid such a critical accident.

Percutaneous cardiopulmonary support (PCPS) is a technique originally developed to ensure adequate tissue oxygen delivery in patients suffering from pulmonary and/or cardiac failure. PCPS can both provide adequate oxygenation during airway intervention and allow extra time to reestablish airway patency even if the patient is having severe ventilation difficulties or ventilation is completely impossible. When airway intervention, including stent insertion, is attempted for severe central airway stenosis, a high level of surgical risk may always exist. PCPS is extremely helpful in remedying such a condition in both emergency and elective settings. In this paper, we present our experience with airway intervention for critical airway stenosis that required PCPS to complete the interventional airway treatment, and discuss the indications, advantages, and disadvantages of PCPS.
Cases

From July 1994 to June 2003, 49 patients with malignant or benign airway obstruction were treated in our institute (malignant disease, n=39; benign disease, n=10) for interventional treatment. There were 32 cases requiring airway stent (dynamic stent=14, metallic stent=8, Dumon stent=6, T-tube=4) and 17 cases requiring laser treatment with or without core-out using a rigid bronchoscope. Of these cases, 4 required immediate relief of stenosis because of critical ventilation difficulties leading to hypoxia with or without hypercapnia. Patients background, treatments, and outcomes are summarized in Table I. There were 2 cases requiring PCPS in an emergency setting during intervention while 2 of the procedures were carried out in an elective setting. Details of those four PCPS patients are described below.

**Patient 1.** A 59-y/o female presented with severe dyspnea. Chest computed tomography (CT) demonstrated severe lower tracheal and carinal obstruction due to advanced esophageal cancer involving both main bronchi (Fig. 1). The patient occasionally suffered from sudden suffocation due to sputum. Dynamic stent insertion was considered to be suitable although critical ventilation difficulties were considered to be a risk during the procedure. Thus veno-venous (V-V) PCPS was introduced from the femoral vein under minimum sedation using Propofol. A fiberoptic bronchoscope was inserted and both the right and the left main bronchi were bougied with a silastic balloon. The dynamic stent was then carefully inserted. Adequate oxygenation was maintained through the procedure without ventilation support. There were no complications due to PCPS. The patient was uneventfully weaned off bypass and subsequently became free from respiratory symptoms.

**Patient 2.** A 57-y/o male presented with severe dyspnea with haemosputum production. Radiographic and fiberbronchoscopic examinations demonstrated extended non-small cell lung cancer oriented from the right upper lobe involving the carina, and had spread widely into both main bronchi (Fig. 2). The fiberoscopic...