Bronchoscopic instillation of autologous platelet-rich plasma for massive hemoptysis at the Lung Center of the Philippines

Plugging the Leak

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Pulmonary tuberculosis is common in developing countries like the Philippines. At the Lung Center of the Philippines, a tertiary hospital for lung and other chest diseases, patients presenting with hemoptysis are quite common. Most of these patients have the sequelae of a previously treated pulmonary tuberculosis like bronchiectasis and pulmonary aspergilloma. During a three-year period, 103 lung resections were performed for hemoptysis secondary to post-tuberculous bronchiectasis. In a nine-year period, 111 consecutive patients underwent lung resection for complex symptomatic pulmonary aspergilloma with 95% of these patients presenting with hemoptysis.

Although lung resection is the surgical treatment of choice, the patient has to be stabilized first by various methods – fiberoptic bronchoscopy-guided blockade of the involved segmental bronchus with vena caval balloon catheters or bronchial blockers, bronchoscopy-guided application of glue or topical hemostatic tamponade therapy using oxidized regenerated cellulose when we ran out of balloon catheters.

In our pilot study of eight patients with massive hemoptysis, bronchoscopy-guided instillation of 10mls of autologous platelet-rich plasma (PRP) divided into three batches (Fig. 1) was used to plug the involved bronchus. Excluded were patients who were septic, those who were intubated for acute respiratory failure from aspiration of blood, and those with a recent myocardial infarction or stroke. The PRP was infused by a plastic catheter through the suction channel of the fiberoptic bronchoscope; the bronchoscope was retained for five minutes following infusion. Likewise, the second and third batches of PRP were infused in the same manner. Hemostasis was then confirmed bronchoscopically. Recurrence of massive hemoptysis was monitored whether massive, non massive or no hemoptysis at all for seven days. The cessation of massive hemoptysis was noted to be instantaneous (Fig. 2) and all except one patient had two recurrences of massive hemoptysis. Two patients later underwent definitive lung resections later.

Platelets are known to perform multiple functions during injury and tissue repair and one of these is to initiate the body's response to a normal sequence of events that provide clotting and healing of the damaged tissue. Platelets may be considered as "autologous biomaterials" distinguishing them from synthetic "biomaterials" like oxidized regenerated cellulose which we also used previously. Acceleration of the wound healing process requires proper preparation of the specimen to yield a product with minimal red blood cells (RBC) and with platelet concentration that is four to five times above the baseline value. The use of PRP in the bleeding bronchial segment has been shown to be feasible in this pilot study. Furthermore, the procedure can be repeated. Of course, the definitive treatment for massive hemoptysis is still lung resection.

In conclusion, this method can be added to the armamentarium of the thoracic surgeon and pulmonologist in developing countries who deal with hemoptysis on a daily basis.

Fig 1. Autologous platelet rich plasma (PRP) used for bronchial instillation

Fig. 2: Clotted blood formed in the bronchus after instillation of autologous PRP

Temporary caval stenting for routine use

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Temporary caval stenting has been identified as most promising approach for improving venous drainage during remote access CPB for minimally invasive cardiac surgery, complex cardio-thoracic procedures, and ECMO. As a matter of fact, up to 50% higher flows can be achieved with the self-expanding smartcanula® (Fig. 1) introduced through relatively small peripheral veins into the caval axis and the right atrium. In addition, it was shown be experimental and clinical studies, that longer self expanding cannulas providing caval support for a longer distance provided even better venous drainage.

In order to make these performance increases available for routine use, a new synthetic smartcanula "P" was devised for venous drainage by temporary caval stenting in cardio-pulmonary bypass. For this design, specific fibers with memory effect are extruded, braided, and mounted to 3/8 sleeve that allows for connection to the venous line.

The 43cm long synthetic smartcanula® "P" designed for central cannulation and routine use requires a 30F access orifice and opens up to 45F (Fig. 2) within the right atrium and the caval axis. As a result, its venous drainage performance equals that of a 56F two stage venous cannulas with gravity drainage alone. Furthermore, atrial chatter can be reduced, as the venous blood can enter the cannula lumen at any point and localized cannula orifice occlusion due to excessive negative pressure can be avoided (Fig. 3). More on www.smartcanula.com

Fig. 1: Despite a small access orifice, the self-expanding smartcanula takes advantage of its increase in luminal diameter and provides superior drainage

Fig. 2" The new smartcanula "P" is designed for performance increases in central cannulation and routine use

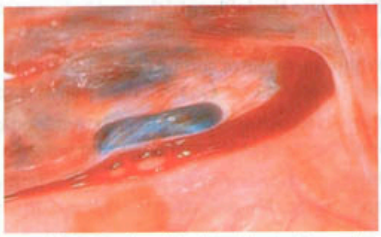

Fig. 3: Cannula orifice obstruction due to excessive negative pressure can be avoided by the "wall-less" smartcanula design