

Peer Review File

Article information: <https://dx.doi.org/10.21037/jtd-23-247>

Reviewer A

Comment: The authors raise an important question in their study, how to manage a left atrial injury during resection of lung cancer with cardiac proximity in an institution where cardiopulmonary bypass is unavailable. The study creates and investigates a type of injury quite different from the more complex, larger injury that occurs in clinical reality. These injuries threaten life and resist control because the atrial muscular wall is torn, and the tear enlarges during initial attempts at control. Massive blood loss is the problem, and the amounts of blood shed in the three groups does not come even close to what is typically lost. Such injury is quite different from the artificial scenario realized here.

Having created an injury with limited relevance to reality, control by atrial balloon insertion appears to be a valid method of achieving hemostasis under the condition of this study. However, the differences between the three methods of control are minor and probably not of clinical significance.

The authors create an intricate perfusion system for their study that permits bleeding from a localized injury. In clinical practice, applying a clamp to the left atrium alters the dimension of the atrium and reduces left ventricular filling; this often leads to systemic hypotension. Does their model take this variable into account? Does the application of a vascular clamp to the atrial wall cause impairment of left ventricular filling dependent on the amount of clamped wall?

Reply: We would like to thank you for the detailed review of our work and the constructive questions. After the clamp was set, we saw a drop in the systemic pressure of the perfusion circuit, but change was not different between the groups. On the other hand, we compensated and added volume to the circuit at any time, just like in reality what the anesthetist would do. Pinching out a large part of the left atrium would of course lead to a reduced filling of the left ventricle and at the same time to a volume overload of the pulmonary circulation. However, these emergency situations also require a different strategy in management. Beside of the patient's hemodynamics, acute bleeding results in volume depletion and shock, which ultimately has the same consequences as compromising left ventricular filling. Due to our experience in the OR in case of infiltrating growing tumors, we need a simple tool available quick, safe and simple to stop such an acute bleeding This was our intension.

Of course, this animal model does not come close to representing reality, but offers the potential of an atraumatic balloon in this situation compared to a digital compression or a

surgical clamp, which potentially enlarge the defect. On the other hand when we think about clinical aspects then we think about laser extraction of long implanted pacemaker leads, there is an commercial ballon available which controls bleeding of tears in the VCS. The endovascular occlusion balloon is a compliant, low-pressure plastic balloon designed to provide hemostasis in the SVC in the event of a tear during transvenous lead extraction. This technique stabilizes hemodynamics until the injury can be repaired via a thoracotomy, despite blocking venous flow to the heart from the upper half of the body.

Reviewer B

I carefully read and appreciated the paper titled “Reduction of volume loss after left atrial injury by balloon occlusion - an experimental study”. The Authors present an ex-vivo experimental method (balloon occlusion), comparing it to other two already known strategies (finger occlusion and clamping) to manage a left atrium damage. The study is well conducted, it is reproducible and methods are accurately described. To better understand the study findings, I would like to ask some questions:

Comment 1: How many surgeons participated to the study? This detail, especially if there were more and less experienced operators, could be important in the evaluation of timings and blood loss in each group.

Reply: Thanks for the comments. There was all the time one person, an experienced heart surgeon, involved in performing the operative procedures of the experiments. That means the organ preparation, the connection of the heart-lung machine and the creation of defects and their repair .

Comment 2: Was the lesion created always in the same site of the left atrium?

Reply: Anatomically, the defects were created at the free wall of the left atrium in relation the the left auricle (approximately 1 cm below)

Comment 3: Is the initial pressure in the system the same as that is in the left atrium?

Reply: The pressure measurement was derived from the arterial cannula of the heart-lung machine in the atrium and monitored.

Comment 4: What kind of suture was performed in the balloon group? A purse-string suture and/or a running one?

Reply: Various suturing techniques were initially used in the balloon group. The application of a purse string suture proved to be the best technique, but a running suture technique also proved to be sufficient. Performing a purse string suture in the balloon group was then finally used as standard procedure and evaluated.

Comment 5: When the balloon is deflated, how did the Authors control the bleeding?

Reply: By using this kind of purse string we did not see any significant volume loss when deflating the balloon that had to be controlled by other techniques. However, in a few cases it was found that the suture or the needle itself could injure the balloon and this had led to a considerable loss of volume.

Comment 6: How and when the Authors recommend to choose the right size balloon?

Reply: There are a number of blockable balloon catheters that fulfill different medical tasks. The blockable volume varies from 5-30 ml. Here you have to consider that too much volume in the balloon can enlarge the defect, but it is so that you can vary and control the volume manually via the application syringe. So, the experience of the investigator gave the guideline. Our goal is to develop a balloon which does not reduce the diameter of the atrium too much. Conceivable would be disk shaped balloon, which can also be drawn to the inner wall of the atrium by gently pulling

Comment 7: Do the authors think that the balloon strategy can be used also in larger atrial tears?

Reply: It is possible to use a balloon as a bail-out strategy even for large defects, but this will inevitably lead to hemodynamic compromise in the patient. Such a technique should be kept ready to control a life-threatening hemorrhage in order to remedy the volume depletion shock of acute hemorrhage. However, the next step is to decide whether to use a heart-lung machine to stabilize the circulatory system and safely repair the atrial defect, if one is available on site.