Author's response to reviews

Title: A rigid barrier between the heart and sternum protects the heart and lungs against rupture during negative pressure wound therapy

Authors:

Sandra Lindstedt MD, PhD (sandra.lindstedt.ingemansson@gmail.com)
Richard Ingemansson MD, PhD (richard.ingemansson@med.lu.se)
Malin Malmsjö MD, PhD (malin.malmso@med.lu.se)

Version: 2 Date: 4 June 2011

Author's response to reviews:

Vipin Zamvar
Editor in Chief
Journal of Cardiothoracic Surgery

Dear Vipin Zamvar June 4th, 2011

We are very pleased to hear that you find our paper entitled “A rigid barrier between the heart and sternum protects the heart and lungs against rupture during negative pressure wound therapy” interesting and will considerate it for publication in Journal of Cardiothoracic Surgery

We are very grateful to the reviewers for their suggestions, which we have found very constructive. We have carefully considered their comments and have tried to follow their advice and suggestions as closely as possible.

Sincerely

Sandra Lindstedt, MD, PhD

Reviewer 1

We thank the reviewer for taking the time to reviewing this manuscript, we are very grateful for the reviewers suggestions, which we have found very constructive. We have carefully considered the reviewers comments and have tried to follow the reviewer’s advice and suggestions as closely as possible.

One can always discuss if a model is valid or not. Since it is difficult to mimic a clinical situation we did our best to do so using 70 kg pigs and used the same equipment that we use clinically. We can’t see how we could get the experiment more clinical like. Petechial/bleeding/partial heart rupture/heart ruptures are symptoms origin from the same problem; heart, foam and sternal edges in to close contact with the heart. Petechial is the most benign sign, and heart rupture worst case scenario. The rest is in a scale in between. A heart that ruptures might have petechial bleedings on the epicardium, but does not have to; in the
present study the case with heart rupture had epicardial petechial bleedings. The final question is if our model is equal to a clinical situation with an infected sternum with a patient lying in weeks with NPWT. I should say that infected tissue is more fragile and a full mediastinitis could have much more damaged sternal bone (with sharp edges) than the animals in the current study have. Time aspect is also important and increases the risk for rupture. Furthermore, a patient is often mobile and movements could increase the risk. In conclusion, 2 week therapy in an infected, mobile patient with a sharp edged sternum protruding into the heart and a large heart is probably a more dangerous situation than our pig model.

Reviewer 2

We thank the reviewer for taking the time to reviewing this manuscript, we are very grateful for the reviewers suggestions, which we have found very constructive. We have carefully considered the reviewers comments and have tried to follow the reviewer’s advice and suggestions as closely as possible.

In the present article we measure epicardial bleeding after negative wound pressure therapy (NPWT) of a sternotomy wound. Petechial refers to one of the three major classes of purpuric conditions. The most common cause of petechial is through physical trauma but might also be a sign of thrombocytopenia or as vasculitis. In the present article we believe that the epicardial bleeding (petechial seen on the surface of the epicardium) is caused by trauma from the NPWT. Petechial/bleeding/partial heart rupture/heart ruptures are symptoms origin from the same problem; heart, foam and sternal edges in to close contact with the heart. Petechial is the most benign sign, and heart rupture worst case scenario. The rest is in a scale in between. We believe that the NPWT in combination with sharp sternal edges are to most important factors to complications as right ventricular heart rupture, whereas the sharp sternal edges are the most important factor.

There has been described an increasing numbers of reports of deaths and serious complications associated with the use of NPWT, where right ventricle rupture and bypass graft rupture resulting in death are the most devastating complications; the incidence being 4 to 7% of the patients treated for deep sternal wound infection with NPWT after cardiac surgery (1-3). We have previously described the cause of heart rupture in pigs using magnetic resonance imaging (4, 5). The heart was shown to be drawn up towards the thoracic wall, the right ventricle bulged into the space between the sternal edges, and the sharp edges of the sternum protruded into the anterior surface of the heart (5). Placing multiple layers of paraffin gauze over the anterior portion of the heart did not prevent deformation of the heart. However, these events could be prevented by inserting a rigid plastic disc between the anterior part of the heart and the inside of the thoracic wall (5).

Figure 1 and 3 shows the experimental setup and how the measurements of the epicardial petechial were done.

The text has been added in the manuscript.


Reviewer 3
We thank the reviewer for taking the time to reviewing this manuscript.