Trans-diaphragm Approach for Implantation of Pulmonary Artery PressureTelemetry in a Pulmonary Hypertension Rat Model

Xiaohan Shen,1 Lingming Yang,2 Alexandra L. Wickham,3 John Ronan,1 Zadok Ruben,1 Joseph M. Metzger,2 Richard Hajdu,2 Emily J. Hickey,2 Bernard J. DeMoura,1 Christopher V. Johnson1

Mercer Research Laboratories, Departments of1 Animal Laboratory Resources and 2Lead OP Pharmacology, P. O. Box 2000, RY808-100, Rahway, NJ 07065

Introduction

Pulmonary hypertension is characterized by elevated pressure in the pulmonary arteries. It can be a severe disease with a marked decrease in exercise tolerance and potentially contributes to heart failure. To better understand its physiopathology, and to test potential new therapies, pressure monitoring in freely moving animals is required. While many different telemetry models have been developed, the major challenge remains in finding a method that allows for sustained and reliable PAP measurement in native rat models such as the Sprague-Dawley rat. Therefore, the goal of this study was to develop a new approach allowing continuous PAP monitoring in rats for at least 6 weeks following surgery.

Materials and Methods

Animals

Sprague-Dawley rats were used in the study. The Sprague-Dawley rat is a common laboratory animal that is well suited for cardiovascular research, as it has a relatively large pulmonary artery pressure in rats: a useful tool in pulmonary hypertension research. Handoko ML, et al. A refined radio-telemetry technique to monitor right ventricle or freely moving rats.

Post-operative care

Animals were monitored for initial 24 hours following surgery. The rats were observed closely to ensure their normal behavior. The rats were given water and food ad libitum. All procedures were approved by Institutional Animal Care and Use Committee (IACUC). The Sprague-Dawley model was used due to its large size and ease of handling.

Post-operative care

Results

The results of the model evaluation

Table 1: Summary of compound effects

PDE5 attenuated the compound A effects (reducing the increased PAP)

With the success of the long-term measuring of the PAP in conscious rat models, it became possible to assess the efficacy of different PDE5 inhibitors in vivo.

<table>
<thead>
<tr>
<th>Compound</th>
<th>PDE5</th>
<th>PAP</th>
<th>POE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle+PDE5</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>Vehicle</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Compound A</td>
<td>25</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

Figure 1: Live pressure waveform to confirm proper right ventricle catheterization

Figure 2: Insertion catheter tip to confirm proper right ventricle catheterization

Figure 3: The pressure waveforms confirmed correct placement of the catheter in the pulmonary artery

Figure 4: The placement of the telemetry transmitter

Acknowledgments

This study was supported by grants from Merck Research Laboratories, Departments of Animal Laboratory Resources and Lead OP Pharmacology, P. O. Box 2000, RY808-100, Rahway, NJ 07065.

References


Summary

The Sprague-Dawley rats were implanted with the PAC-10 telemetry system in Sprague-Dawley rats for the first time.

The Sprague-Dawley model was used due to its large size and ease of handling.

The Sprague-Dawley model was used due to its large size and ease of handling.

With the success of the long-term measuring of the PAP in conscious rat models, it became possible to assess the efficacy of different PDE5 inhibitors in vivo.