The model of pulmonary embolism caused by autologous thrombus in rabbits
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Abstract
Objective: To establish a model of pulmonary embolism in rabbits by using autologous thrombosis of rabbit ear vein, to study the method of establishing acute pulmonary embolism by using autologous thrombus and to explore the diagnostic value of oxygen partial pressure in acute pulmonary embolism. Methods: Twenty rabbits were randomly divided into normal group (n=5), 7 h group, 24 h group, 1 week after model establishment Group. The arterial blood gas analysis was performed on the carotid arteries of rabbits at 7 h, 24 h and 1 W after modeling. Results: Normal group oxygen partial pressure (93.15 ± 2.26) mmHg, 7 h group oxygen partial pressure (81.98 ± 1.94) mmHg, 24 h group oxygen partial pressure (84.55 ± 2.18) mmHg, 1 W group oxygen partial pressure (92.66 ± 1.92) mmHg. Normal group oxygen partial pressure and 7 h group, 24 h group oxygen partial pressure, P value was less than 0.05 and less than 0.01, indicating that the difference was statistically significant. Normal group oxygen partial pressure and 1 week group oxygen partial pressure, P value greater than 0.05, indicating that the difference was not statistically significant. Conclusion: The oxygen partial pressure was reduced at 7 h after the establishment of the acute pulmonary embolism model and failed to return to normal within 24 h. After 1 week, the embolus began to dissolve, the respiratory and circulatory system was reestablished, and the oxygen partial pressure gradually Return to normal level. Indicating that there is a positive correlation between oxygen partial pressure and acute pulmonary embolism.

1. Introduction
Pulmonary embolism (PTE) is shedding of thrombus or other substances blocking the pulmonary artery or its branch of the pathological process, pulmonary embolism embolism is the most common bloody emboli, the other there are rare air, fat, amniotic fluid[1]. Recent studies have found that acute pulmonary embolism (APE) is very common in clinical practice, and is the mortality and misdiagnosis rate of high acute critical[2]. Studies have shown that a large number of inflammatory factors in acute pulmonary embolism (APE), the degree of embolization of embolization, and the possible instability of hemodynamics[3]. Acute pulmonary artery obstruction caused by pulmonary vascular resistance and increased right ventricular postload, and the release of vasoconstrictor factors, is the main cause of death[4]. Therefore, the diagnosis and early prevention of pulmonary embolism is particularly important. This article will introduce acute pulmonary embolism, the changes in oxygen partial pressure in rabbits, for the diagnosis of acute pulmonary embolism to provide a reference.

2. Laboratory animals and materials
2.1 Experimental animals
Healthy rabbits 20, by the Southern Anhui Medical College Animal Experimental Center, weight 2-2.5 kg. Were randomly divided into normal group (n=5), model group (group 5), model group (5 rats) and model group (5 rats). Normal rabbit feed feeding, free drinking water for 1 week.
2.2 Experimental materials

Diameter 1.5-2.0 intravenous catheter, arterial clip, 1 mL syringe, 5 mL syringe, ear vein needle, thrombin 1 000 U (solarbio), 10% chloral hydrate, ear vein needle, iodophor, alcohol, electronic scales, ABL800 Blood gas analyzer (Wannan Medical College Yijishan Hospital).

2.3 Preparation of thrombus

Choose the average body weight of rabbits about 2 kg, in the ear vein at the plucking alcohol after wiping, so that the ear vein blood filling (in the ear vein vein blood, try to keep the room temperature can not be too low, otherwise the ear vein blood is not filling; Or in the extraction of ear vein blood before the rabbit so that the full movement of the ear vein blood can be relatively filling.), With 1 mL syringe needle, 5 mL syringe needle, the rabbit ear vein blood extraction (extraction, Quiet is very important, otherwise the needle off again after the extraction is more difficult), the extraction of blood, the speed should be kept slow speed, or easy to deflated vein is not easy to take blood.

(3-4 mL) of the blood of the ear vein was poured into the 4 mL EP tube containing thrombin, and allowed to stand for several tens of minutes at room temperature and placed in a water bath in a water bath at 70 °C for several minutes[5]. Take out the refrigerator at 4 °C.

In the experiment, the thrombus was poured into the beaker containing the saline (Figure 1), and the small bolts were made with a sterile syringe inhalation syringe (Figure 2), mixed with physiological saline inhaled syringes (Figure 3).

2.4 The preparation of the model

Experiment, the rabbit ear veins after pruning, alcohol wipe, given with the current 10% chloral hydrate anesthesia, per kilogram of body weight of about 2 mL (due to each rabbit tolerance to anesthetic different per kilogram of body weight The amount of anesthetic given is different). The first rapid push into the 1ml chloral hydrate, to be reduced response to rabbits, slow injection, observe the rabbit breathing, corneal reaction, and limb muscle tension, to be deep breathing in rabbits, limb muscle relaxation and corneal reaction almost disappeared, Stop injecting anesthetic. The rabbits were fixed on the platform, cut off the neck rabbit hair, alcohol, iodophor disinfection, along the middle of the neck to do 2 cm longitudinal incision, blunt dissection exposed external jugular vein. Ligation of the distal end, the proximal end of the first with the arterial clip clip, cut in the middle of both ends of the mouth for easy catheter insertion, the diameter of 1.5 cm catheter has been mixed with a suppository before the syringe, the air after the catheter inserted Intravenous, insert the catheter while loosening the arterial clip, gently push into the catheter, slowly pushed into the already prepared emboli. While pushing the embolus to observe the rabbit breathing, heartbeat situation, to be accelerated when breathing faster, stop pushing into the emboli. The carotid arteries were isolated and the carotid arteries were sacrificed using a 1 mL syringe infiltrated with heparin for blood gas analysis. Normal group of rabbits after anesthesia directly isolated carotid artery carotid artery blood for blood gas analysis.

3. Results

3.1. Success rate of this experiment modeling

20 rabbits, due to excessive brains died 2, anesthetic overdose 1, the rest of the rabbits after modeling breathing faster, limbs trembling symptoms, to be modeled after rabbits dissected lung tissue Visible ischemic infarction, proved successful modeling. Among them, most of the right lung lobe infarction, 11 rabbits, 6 cases of left lung lobed infants. The success rate of this experiment modeling 85%.

3.2. Blood gas analysis

The results of blood gas analysis were analyzed by SPSS 18.0. The data were analyzed by F test and t test. \( P<0.05 \) was statistically significant. The results are shown in Table 1.

Table 1.

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Oxygen partial pressure (mmHg)</th>
<th>Carbon dioxide partial pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal</td>
<td>4</td>
<td>93.15±2.26</td>
<td>46.63±2.97</td>
</tr>
<tr>
<td>7 h group</td>
<td>4</td>
<td>81.98±1.94a</td>
<td>33.13±4.09a</td>
</tr>
<tr>
<td>24 h group</td>
<td>4</td>
<td>84.55±2.18ab</td>
<td>42.75±3.43</td>
</tr>
<tr>
<td>1 w group</td>
<td>5</td>
<td>92.66±1.92</td>
<td>42.02±2.46</td>
</tr>
<tr>
<td>F value</td>
<td></td>
<td>31.605</td>
<td>12.455</td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Note: Compared with the normal group: Pa<0.05, Pb<0.01.

3.3 Statistical results analysis

As shown in Table 1, blood gas analysis in experimental rabbits showed oxygen partial pressure (81.98 ± 1.94) in 7 h group, oxygen...
Partial pressure (84.55 ± 2.18) in 24 h group, oxygen partial pressure (92.66 ± 1.92), Normal group oxygen partial pressure (93.15 ± 2.26). Compared with the normal group, the oxygen partial pressure was less than 0.05 and less than 0.01, indicating that the difference was statistically significant; the oxygen partial pressure of 24 h group was less than 0.05 and less than 0.01, indicating that the difference was statistically significant; and 1 week group of rabbit oxygen partial pressure and normal group of rabbits compared with the P value of more than 0.05, indicating no significant difference. The results showed that oxygen partial pressure in the pulmonary embolism model was established after 7 h has been reduced, and within 24 h failed to return to normal, after 1 week with the passage of time, oxygen partial pressure gradually returned to normal levels. And the partial pressure of carbon dioxide only in the 7 h group and the normal group and the difference, indicating that the blood pressure analysis of oxygen pressure and pulmonary embolism time is a positive correlation between.

4. Discussion

In this paper, the use of rabbit autologous blood thrombosis process is simple, easy to learn, and autologous blood thrombosis can rule out the impact of some rejection. Thrombus production, the focus is on blood collection, there are ear vein blood collections, abdominal aortic blood collection, heart puncture blood collection; orbital venous plexus blood collection, and so on. Pulmonary embolism is a venous thromboembolism, venous blood thrombosis than arterial blood thrombosis is smaller, because the rabbit ear vein blood collection is relatively easy, and fast blood flow, trauma, easy to operate, so the experiment to take rabbits Ear vein blood collection, but try not to take blood after anesthesia, or blood collection more difficult. From the literature, it can be seen that the formation of autologous blood clots is similar to that of thrombosis[6], but autologous blood clots are not permanent thrombus, and the establishment of pulmonary embolism is time-dependent limit. Relative to the use of gel, glass microspheres made of fixed pulmonary artery obstruction, autologous thrombosis due to irregular volume is less likely to control the size of obstruction[7], easily lead to embolism is not successful or lead to large area embolism.

Blood gas analysis has been widely used and recognized, so this experiment made rabbit acute pulmonary embolism model, the use of arterial blood gas analysis to detect changes in oxygen partial pressure. Blood gas analysis results showed that the arterial oxygen pressure in rabbits within 24 h after modeling were significantly different from the normal group, the partial pressure of carbon dioxide in the 7 h and the normal group also had significant differences, and 1 W after the blood gas analysis returned to normal, confirmed that acute pulmonary embolism and oxygen partial pressure and carbon dioxide partial pressure reduction have a certain relationship, but the results of oxygen partial pressure on the diagnosis of acute pulmonary embolism more meaningful. There are also information that acute pulmonary embolism, dyspnea is the most common symptoms, blood gas analysis results often show reduced oxygen partial pressure, the sensitivity of up to 80.3%, but with the reduction of carbon dioxide partial pressure, the sensitivity of up to 91.5%[8]. Therefore, the reduction of arterial oxygen partial pressure can not be used as the basis of diagnosis of acute pulmonary embolism, combined with the analysis of carbon dioxide partial pressure, but for the future prevention of acute pulmonary embolism caused by the occurrence of a reference index to reduce the rate of missed diagnosis of acute pulmonary embolism, Timely symptomatic treatment, reduce mortality.

Reference