

PGE₁ Effect on Bronchial Anastomosis Healing

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PGE₁ effect on healing of the bronchial anastomosis was experimentally evaluated by means of microangiography and measurement of tensile strength of bronchial anastomotic site on day 7.

In conclusion, it is our impression that PGE₁ plays a role in enhancing the development of neovessel connection across the bronchial anastomotic site and in supplementing the adaptation force of the bronchial anastomosis.

INTRODUCTION

It has become known that prostaglandin E₁ (PGE₁) exerts on vasodilation and antiaggregation of platelet, and is applied for dealing with acute or subacute arterial occlusive diseases as well as various shock states in the field of surgery. It is obvious that PGE₁ helps enhance the therapeutic effects to increase the tissue blood flow.

This study was undertaken to make clear the effect of PGI₂ on enhancing the bronchial healing at an anastomotic site on dogs.

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METHOD AND MATERIAL

Eight mongrel dogs weighing 8 to 15kg were anesthetized with 25mg/kg of sodium pentobarbital, intubated with a cuffed endotracheal tube and ventilated with room air using a volume respirator (HARVARD). The left thoracotomy was made to expose the left main bronchus.

The left main bronchus was cut off circumferentially at a length of 2 cartilages and the bronchial cut edges were sutured with use of 3-0 Dexon.

In the 4 dogs PGE₁ was given at a dosis of 20ng/kg/min iv for 7 days after surgery.

The wound healig process of the bronchial anastomosis was tested in relation to the PGE₁ role by microangiography and tensile strength in comparison with the control of 4 dogs for which PGE₁ was not used.

The dogs were anesthetized with pentobarbital (25mg/kg) on day 7 to perform microangiography. A 5000u heparin and a 40ml barium sulfate mixed with 1% seratin-agar were given via the descending aorta after a complete isolation of the bronchial artery from the descending aorta by ligation at two points just below the left subclavian artery and just above the diaphragma.

The grade of developing the neovasculatures was classified into three, that is, grade I is few neovessel seen across the anastomotic line (Fig. 1), grade II is a few neovessels (Fig. 2) and grade III is abundant neovessels (Fig. 3).

Tensile strength of anastomosis healed on day 7 was evaluated by SHIMAZU autograph (DCS-500) with use of a strip (1cm wide, 3cm long, apart from an anastomosis proximally and distally) of the bronchial specimen.

RESULT

The grade of developing neovessel communication across the bronchial anastomotic site after bronchoplasty was evaluated by microangiography in terms of PGE₁ effect as shown in Table 1.

The development of neovasculature was manifest in the PGE₁ group as compared to the non-PGE₁ group.

By giving PGE₁, the grade II of developing neovasculature were demonstrated despite grade I in the non-PGE₁ group (Table 1).

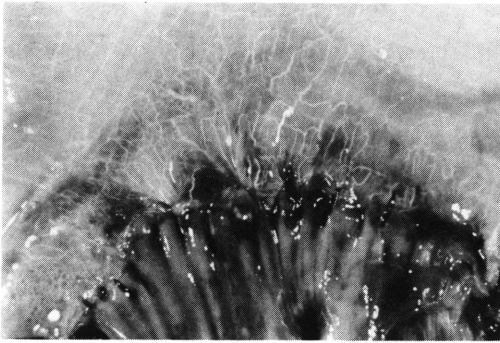


Fig. 1. Microangiographic finding in grade I in which neovessel across the anastomosis is not seen.

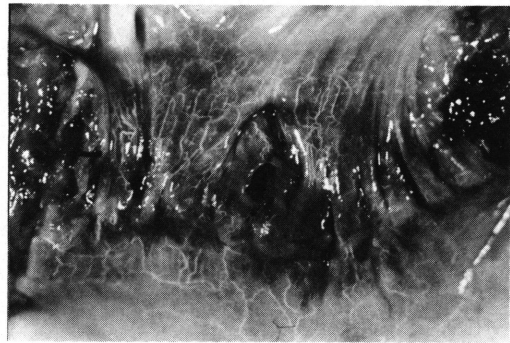


Fig. 2. Microangiographic finding in grade II in which neovessel develops between grade I and III.

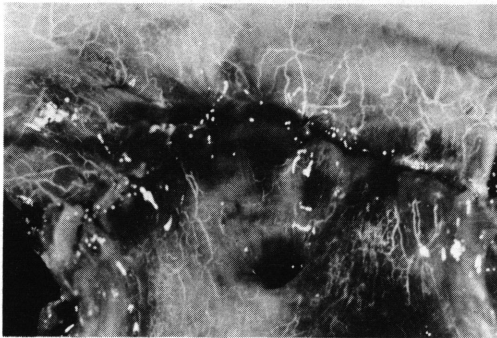


Fig. 3. Microangiographic finding in grade III in which well development of neovessel occurs.

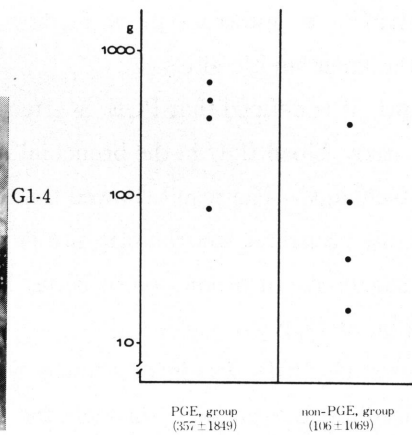


Fig. 4. Tensile strength at 7 days after performing bronchial anastomosis.

Table 1. The degree of developing neovessels across the bronchial anastomosis, indicating as grade I, II and III between PGE₁ and non-PGE₁ groups.

	EGE ₁ group	non-EGE ₁ group
grade I	3	2
grade II	1	1
grade III	0	1

Fig. 4 presents data relating to the values of tensile strength at 7 days after performing bronchial anastomosis. The results showed a varying variety with a wide range, averaging $357 \pm 184\text{g}$ in the PGE_1 group and $105 \pm 106\text{g}$ in the non- PGE_1 group. Adaptation at the bronchial anastomotic site which was shown as the value of tensile strength in the PGE_1 group was superior to that in the non- PGE_1 group.

The results of this study show that bronchial anastomosis is enhanced by administration of PGE_1 .

DISCUSSION

Major complication after bronchial anastomosis is anastomosis insufficiency and/or stenosis at anastomotic site by granulation formation. It is known that these complications mainly contribute to interruption of feeding vessels to the tracheobronchial tree and tension to the anastomotic site.

Recently it is defined that PGE_1 is effective to increase the tissue blood flow¹⁾²⁾. In the present study, blood flow in the bronchial anastomosis was assessed by using microangiographic technique. The result showed that by giving PGE_1 , development of the neovessels around the bronchial anastomotic site is much more enhanced.

It is suggestive of promotion of better healing at the bronchial anastomotic site by administration of PGE_1 .

In this study PGE_1 was intravenously administered. In general, it is said that PGE_1 is metabolized by the passage through the lung. GOLUB³⁾ pointed out that one time circulation to the lung results in a reduction of PGE_1 activity to two thirds of the initial one and it takes place in proportion to an initial PGE_1 concentration⁴⁾, the higher the concentration of PGE_1 prior to the passage through the lung, the greater the reduction of PGE_1 activity.

It is obvious that PGE_1 plays a key role in enhancing the neovasculature around the bronchial anastomosis even if its activity would be reduced by the lung.

It is emphasized that tensile strength is increased by PGE_1 administration. It is well known that bronchial healing is adequate for a tension of less than 1700 to 1800g⁴⁾⁵⁾.

It, therefore, is anticipated to be safer within 400g/cm tension from a result of this study. The tensile strength showed a safety limit ensuring a good healing of bronchial anastomosis in the PGE_1 group. In contrast, the tensile strength in the non- PGE_1 group was out of a safety limit of ensuring adaptation of the bronchial anastomosis with varying

variety.

KIKUCHI⁷⁾ *et al.* reported that tensile strength of the bronchial anastomosis reached 400g/cm at 2 to 3 weeks after surgery. Such indicates that wound healing at the bronchial anastomotic site is not complete even on day 7 and is compensated by tensile strength supplemented with the suture material. One must take it into consideration that since bronchial anastomosis shows the nadire of tensile strength on day 2 or 3 even though could be enhanced thereafter, PGE₁ administration at this time is still more useful to enhance the healing of the bronchial anastomosis.

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