

# Circulatory System

四川大学组织学与胚胎学教研室

## organ — system

**Organ: to have a special structure and function.**



**Tubular organ**

分层排列

**substantiality**

被膜、间质、实质

## **We need a system like this:**

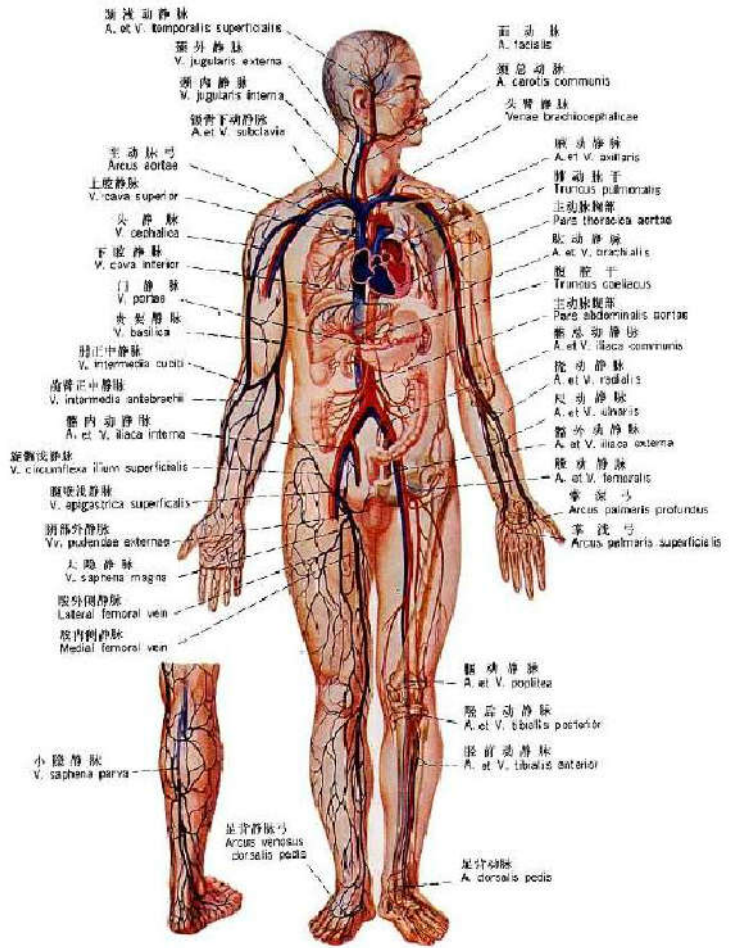
- 1. Metabolism. (transport the nutrition and the O<sub>2</sub>)**
- 2. transport hormone, distribute it to every part of our body.**
- 3. modulate the body temperature**



**transportation**

# 循环系统

circulatory system



**circulatory  
system**

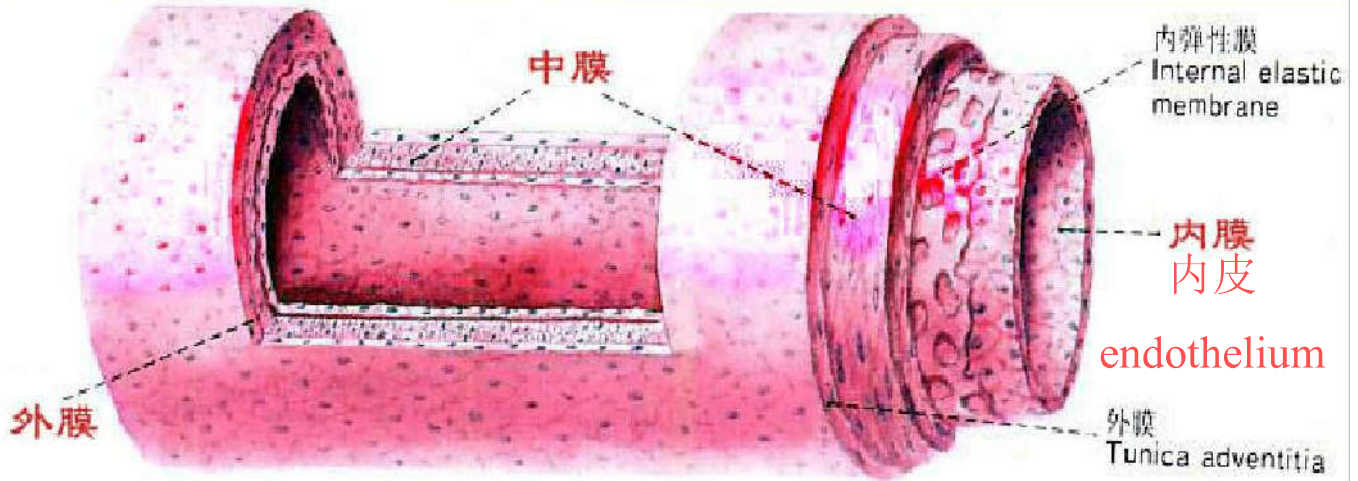
**cardiovascular  
system**

- 心脏(heart)
- 动脉(artery)
- 毛细血管(capillary)
- 静脉(vine)

**lymphatic  
system**

- 毛细淋巴管 Lymphatic capillary
- 淋巴管
- Lymphatic vessel
- 淋巴导管 Lymphatic duct

# The general structure and function of blood vessel



162.. 中动脉立体结构图

## endothelium ?

**tunica intima 内膜**

- **blood flow**

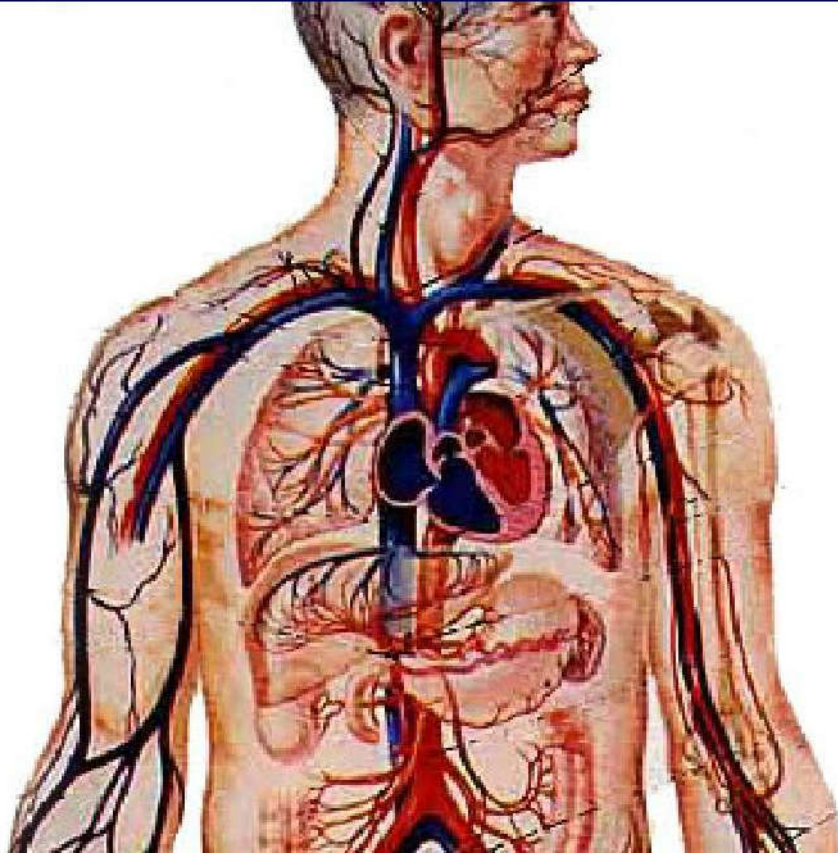
**tunica media 中膜**

- **the main physical character of  
the blood vessel**

**tunica adventitia 外膜**

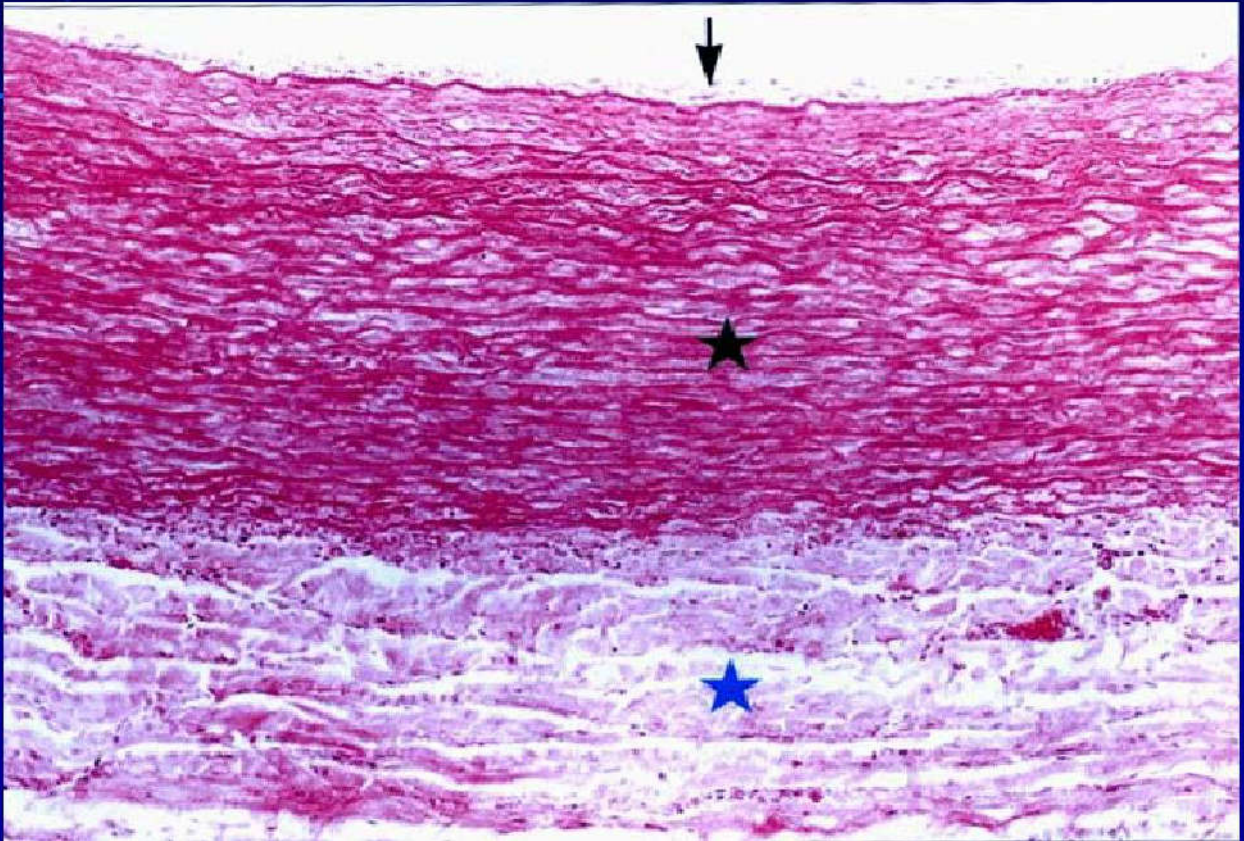
- **nutrition**

large artery 大动脉





# Large artery



## **Large artery**

**Tunica intima — endothelium, with w-p body (related to the coagulation of blood)**

**Tunica media — Elastic membrane**

**Tunica adventitia — C.T., and continued with C.T. other organs**

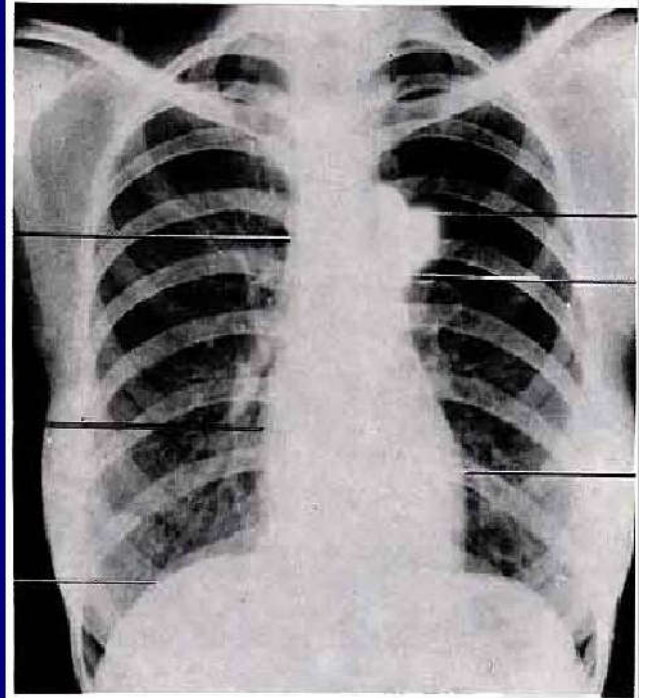
**Assistant pump**

**What is the  
main function  
of the elastic  
membrane?**

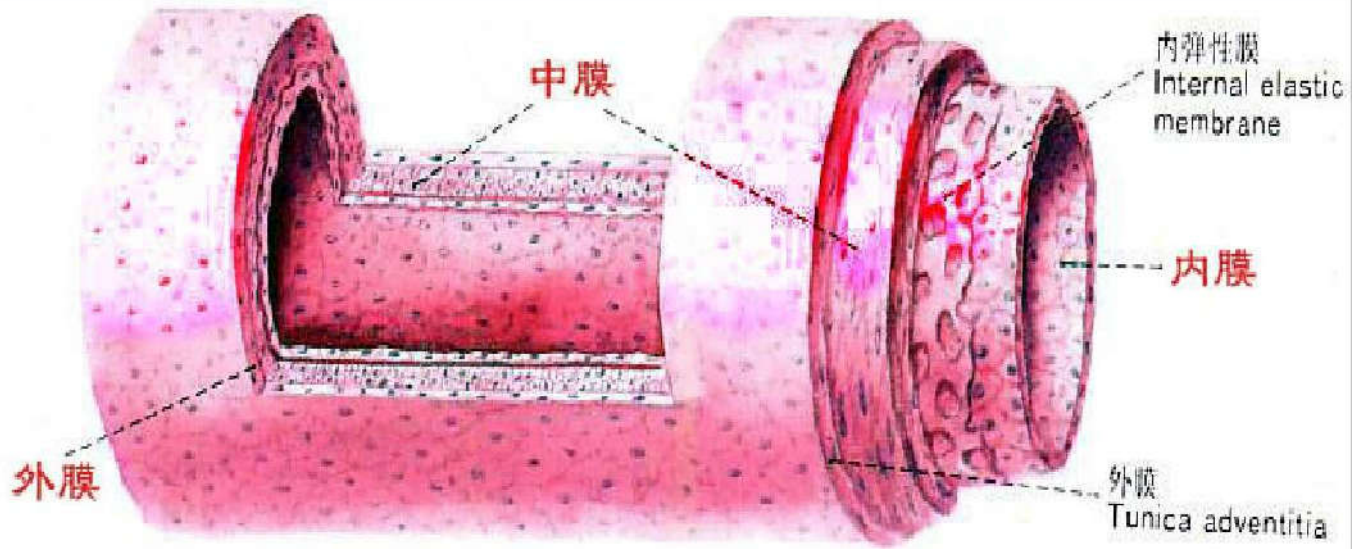
**Elastic membrane — elasticity**

**Collagenous fibers — tenacity**

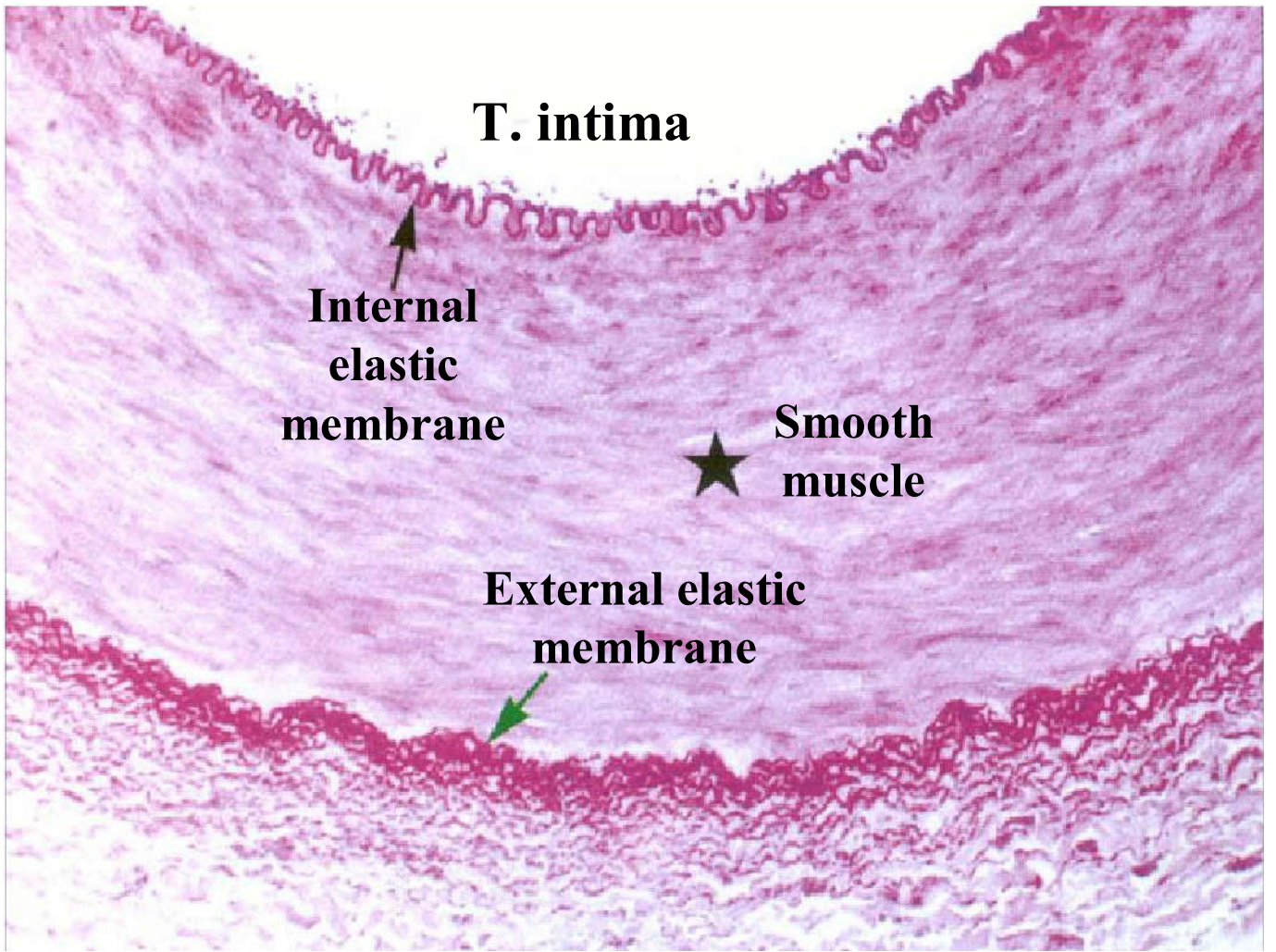
**夹层动脉瘤：** 由于某些先天的原因，造成主动脉胶原纤维强度降低，弹性纤维被强大的血流“挤”开，大动脉中膜被冲开形成一个突起。



# medium-sized artery 中动脉



162. 中动脉立体结构图



## **character of medium-sized artery**

- 1. Three layers are very distinctness**
- 2. internal elastic membrane appears a bright refractile band**
- 3. The T. media is predominantly composed of 10-40 layers of smooth muscle cells.**
- 4. A definite external elastic membrane**
- 5. Tunica adventitia is as thick as the tunica media.**

## **The Function of the medium-sized arteries?**

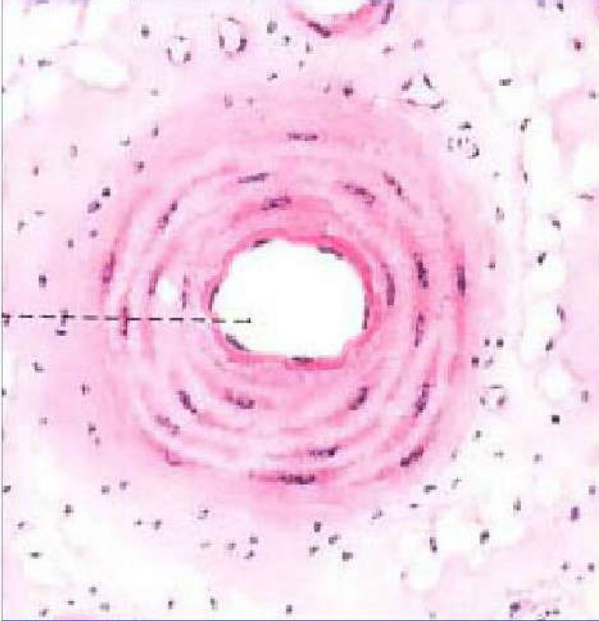
**Regulate the distribution of the blood to various parts of the body.**

**Muscular arteries !**

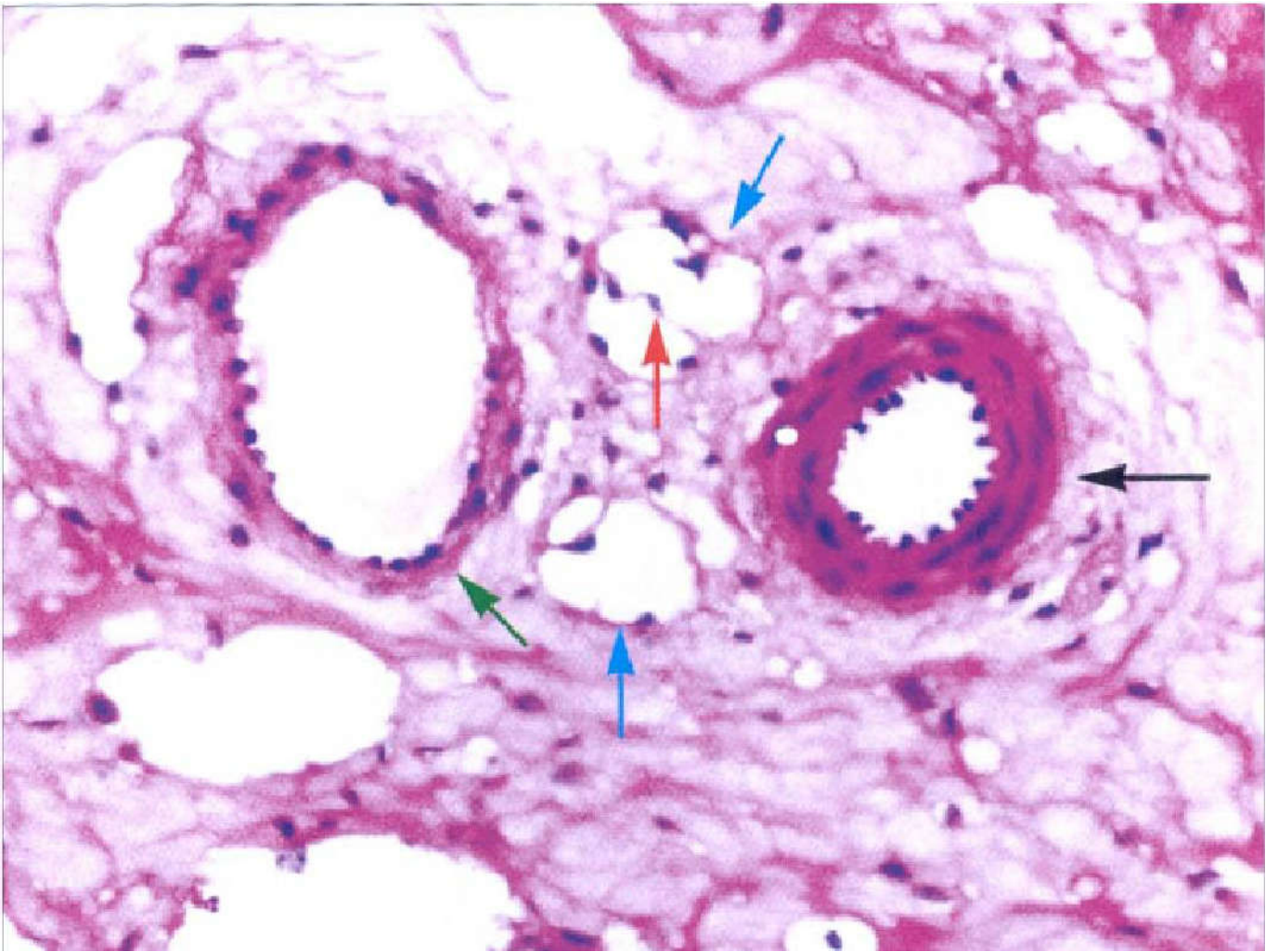
**Distributing arteries !**



## small artery 小动脉



- 1. Diameter of less than 1mm.**
- 2. Similar to medium sized arteries but the smooth muscle only 3-4 layers.**
- 3. Internal elastic membrane prominent**
- 4. No external elastic membrane**



## **arteriole 微动脉**

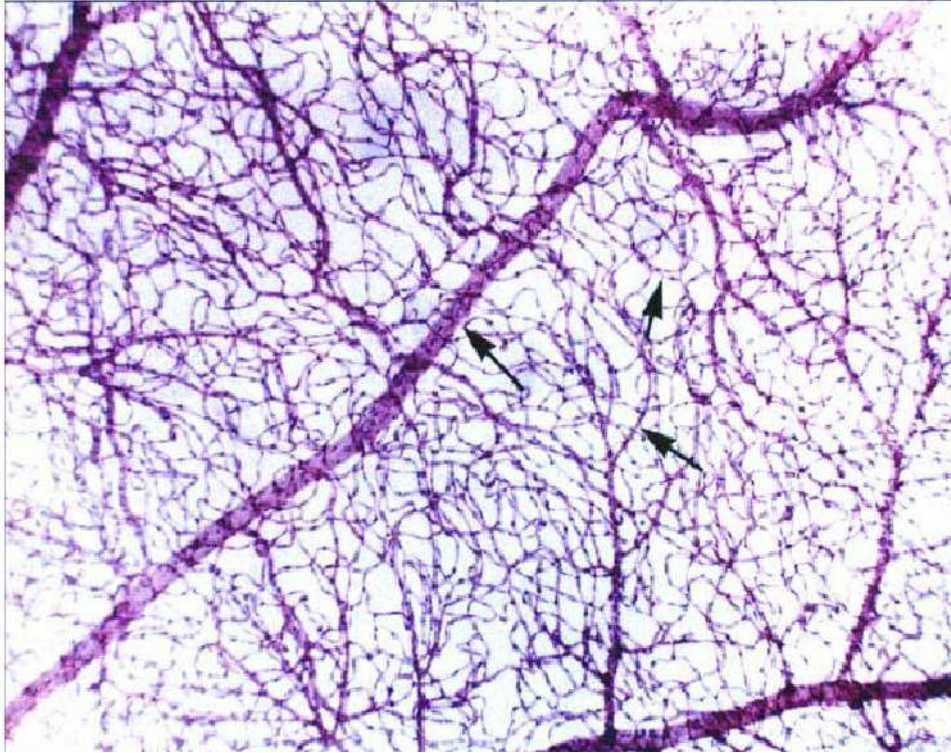
**Diameter less than 0.3mm**

**No Internal elastic membrane**

**Only 1-2 layers of smooth muscle**

**The terminal vessels of the arterial system**

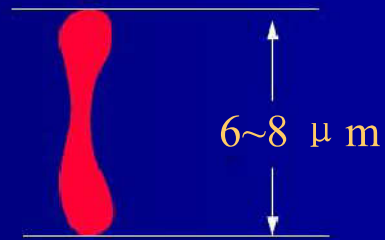
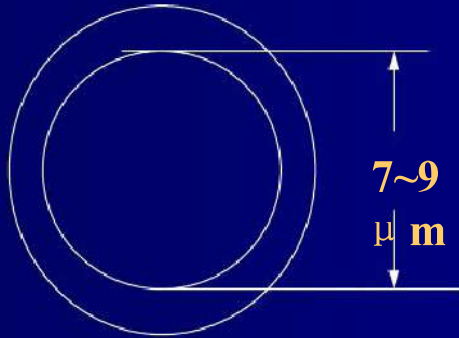
# Capillary



**The most  
thin  
vessels in  
the body**

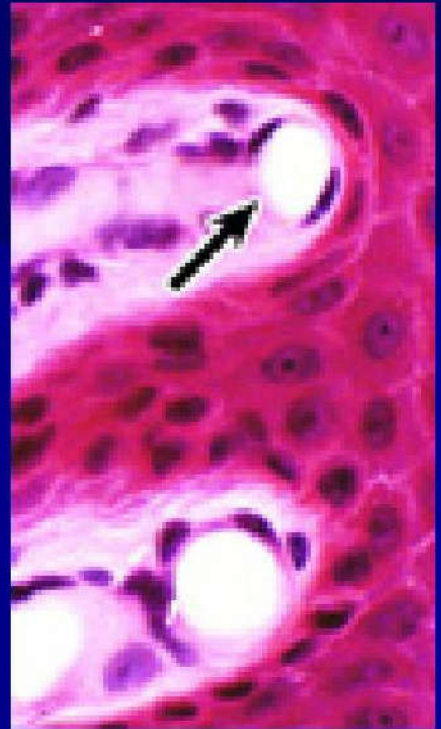
# Capillary

- arterioles
- Capillary
- Capillary

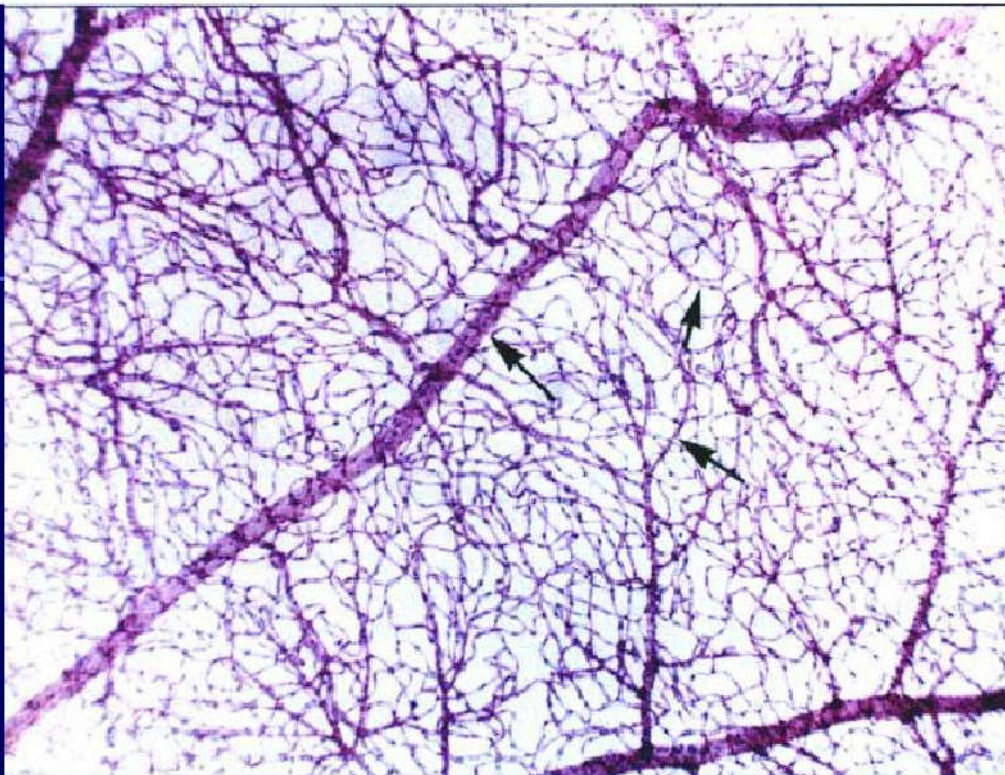


## **Slim ?**

- **One lay of endothelial**
- **One or two cells coil themselves up**

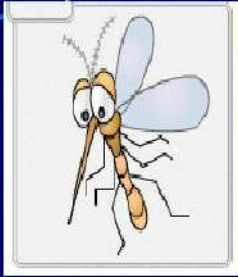


**Function: Bring the necessary nutrients to every part of our body**



**The total length of capillaries in human  
body: 10,000km**

# Capillary

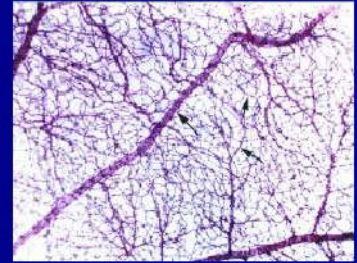


**mosquito**



Always can  
find a blood  
vessel

## Capillary



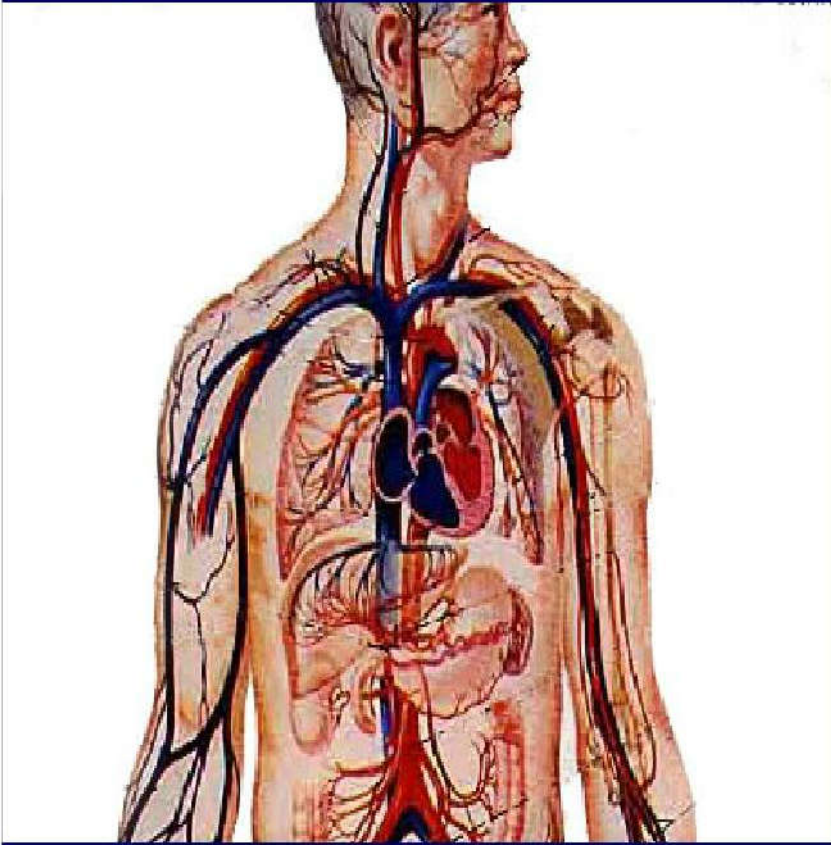
**intern**



Not so easy to  
find a blood  
vessel

**vein**





**Every part  
of our body,  
from the  
heart to the  
skin.**



**Capillary**

# Capillary

**The wall of capillary ----- very thin**

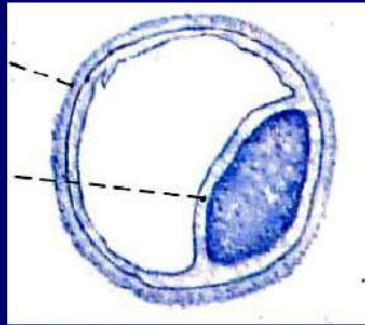
**The total length is ----- very long**

**Distribution ----- very wide**

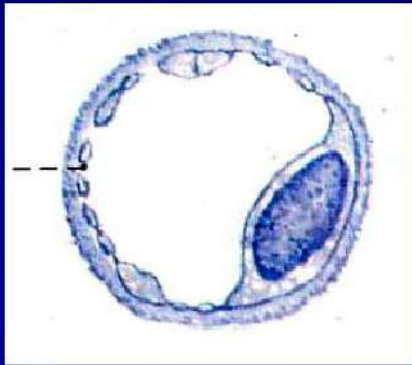
**Function : interchange substances  
between blood and tissues.**

# 3 Type Of Capillaries

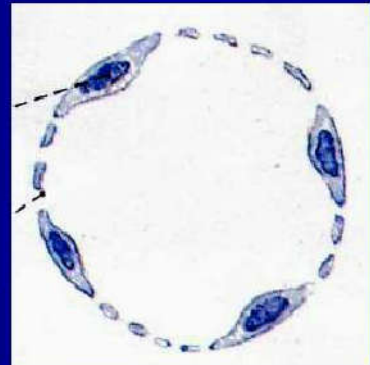
**Continuous capillary**



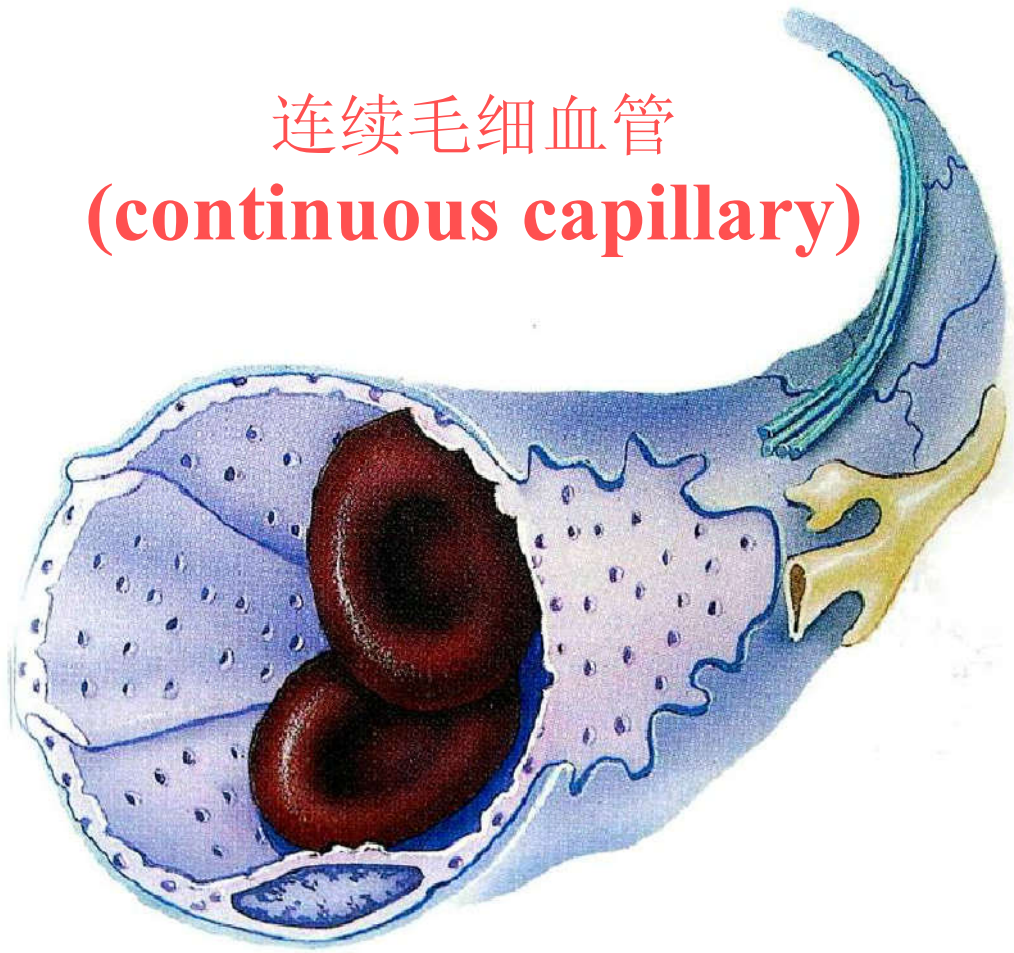
**Fenestrated capillary**

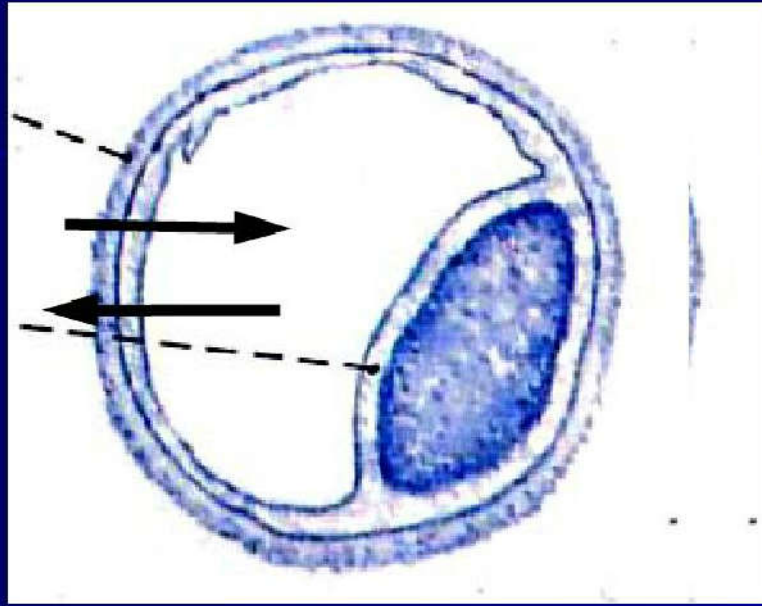


**Sinusoid**



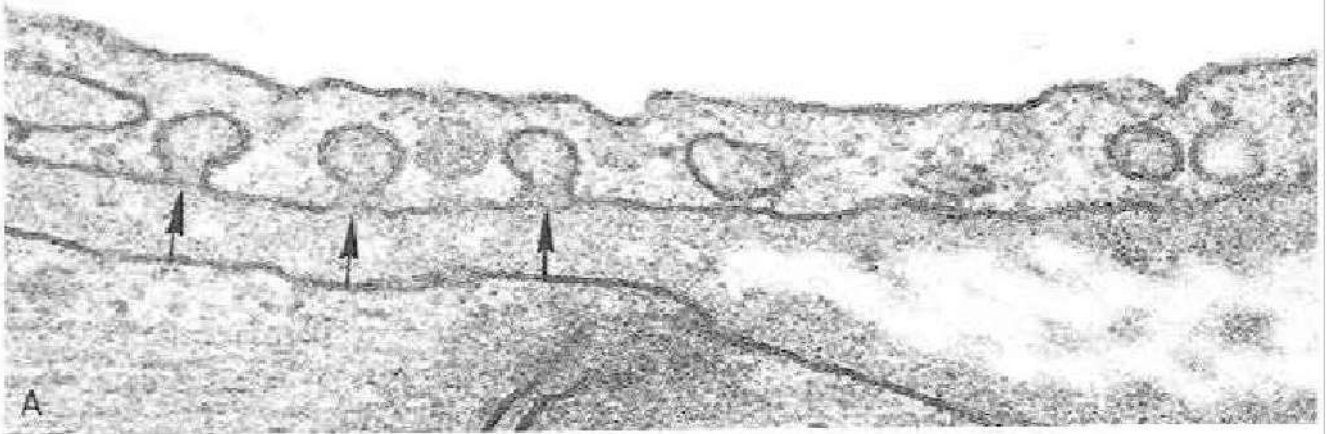
连续毛细血管  
(continuous capillary)





?

# Vesicles in the cytoplasm of continuous capillary



# **Character of the continuous capillary**

## **Distribution:**

- **muscle tissue, nervous tissue, and connective tissue in some organs**

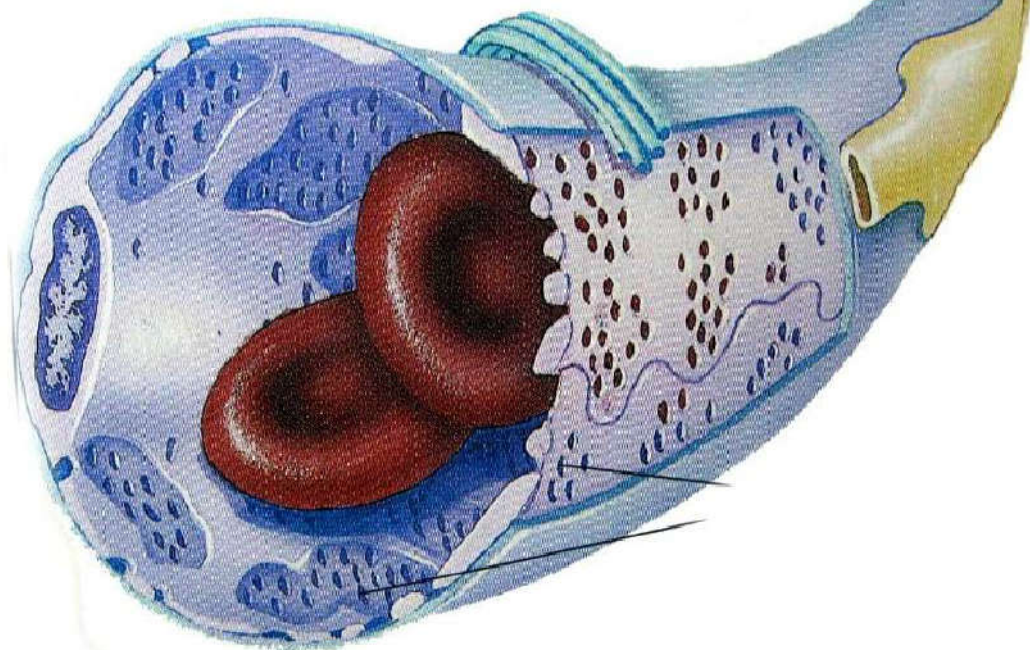
## **Character:**

- **Continuous endothelium**
- **Continuous basement membrane**
- **Tight junction**

## **Exchange of substance**

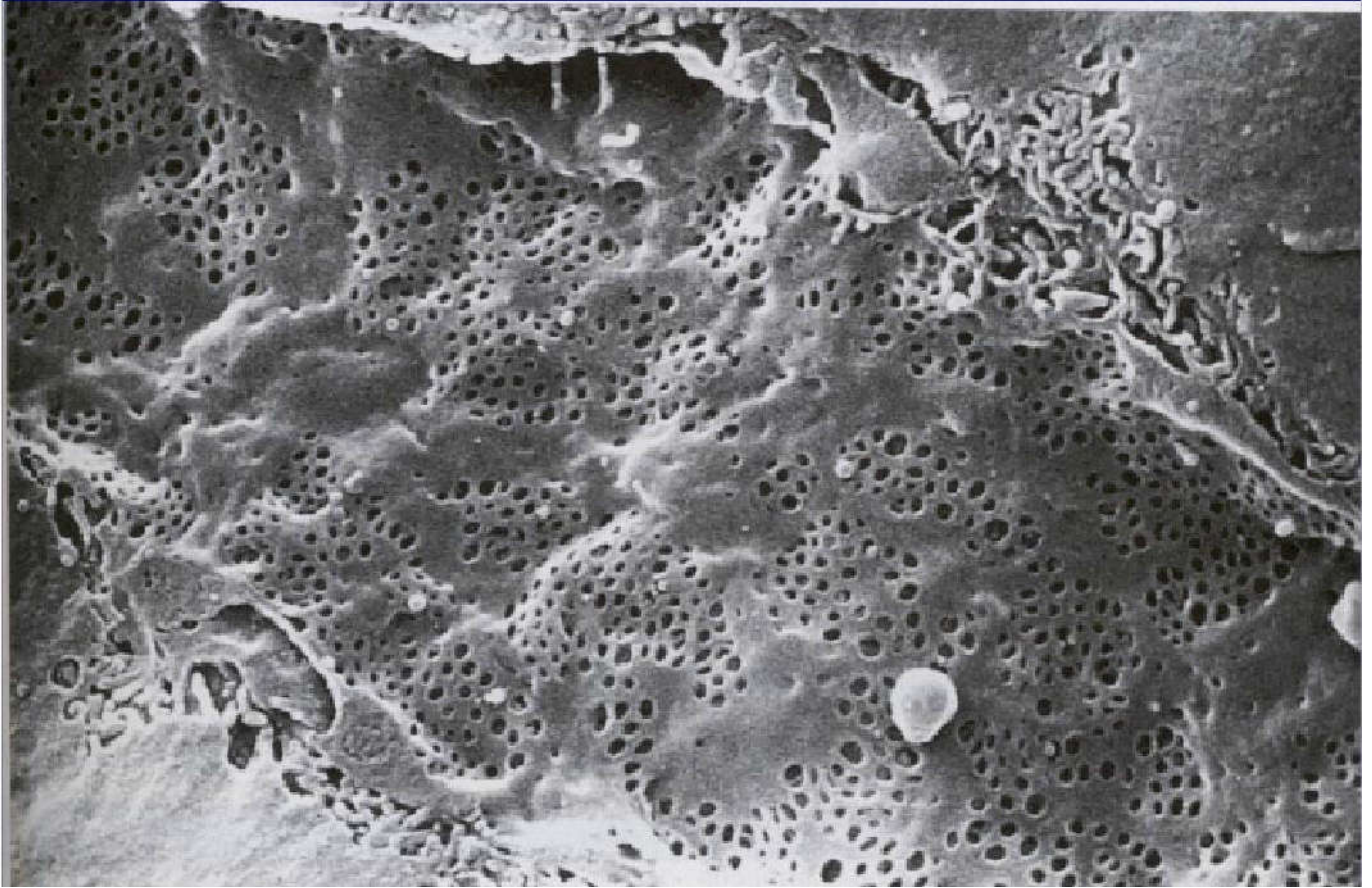
- **Pinocytotic vesicles**

有孔毛细血管  
(fenestrated capillary)





## Fenestrated capillary



## **fenestrated capillary 有孔毛细血管**

### **Distribution:**

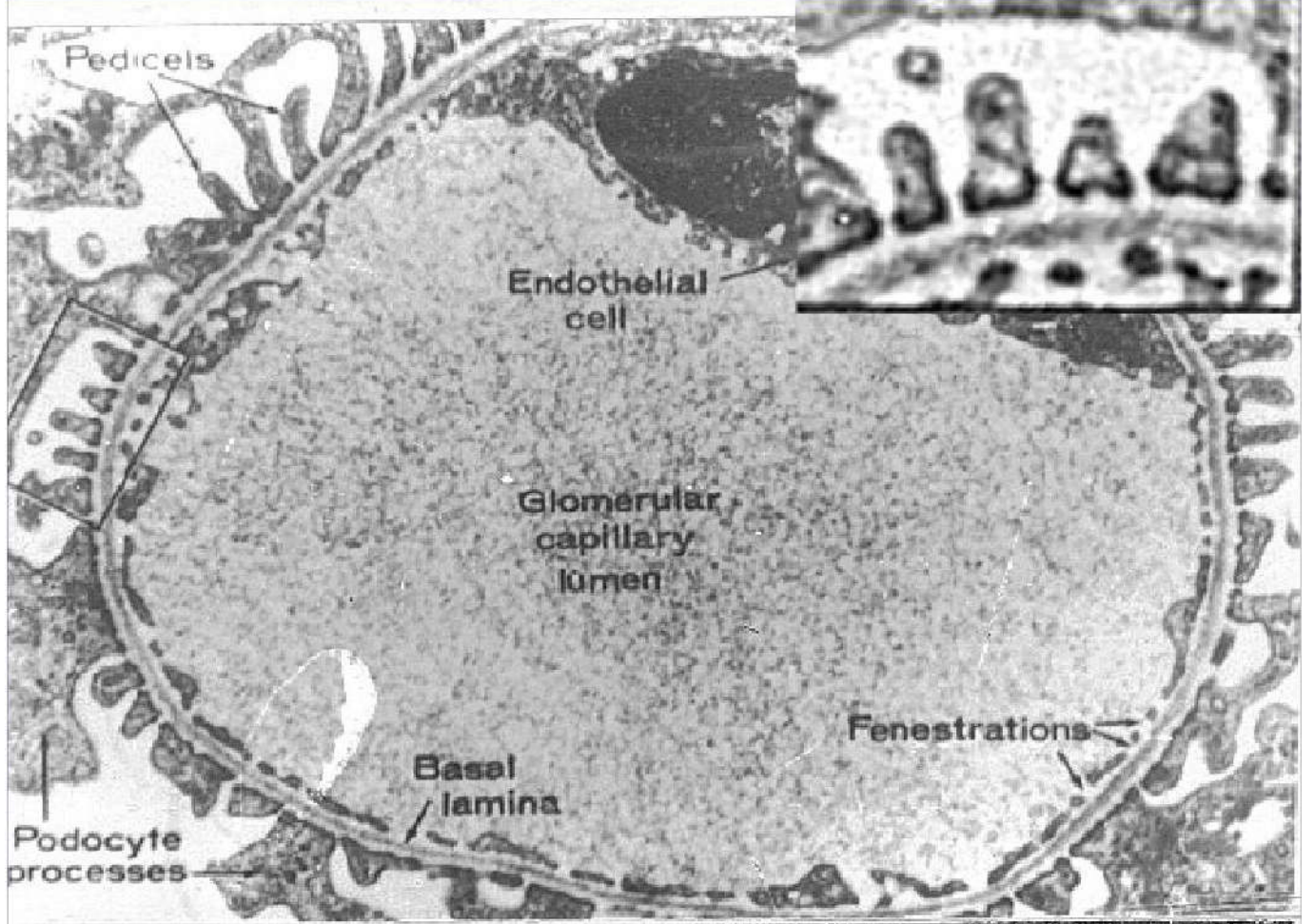
- Intestine kidney and some endocrine glands.

### **Character:**

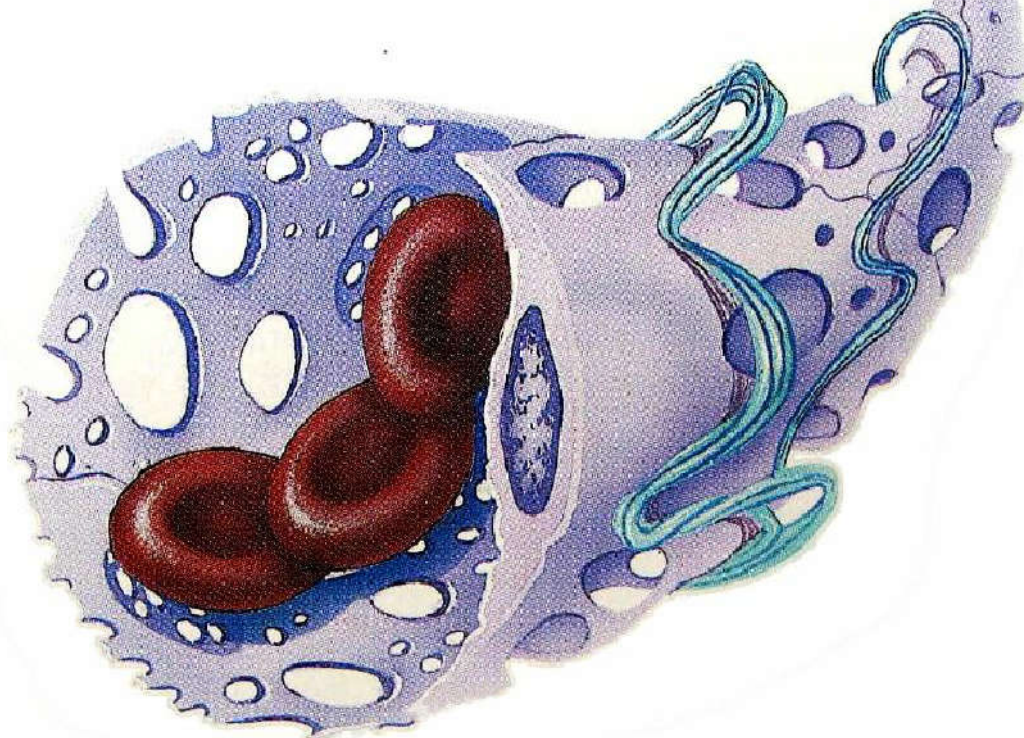
- Continuous endothelium.
- Continuous basement membrane. But in some condition there are diaphragm closed the hole except for the kidney
- Tight junction

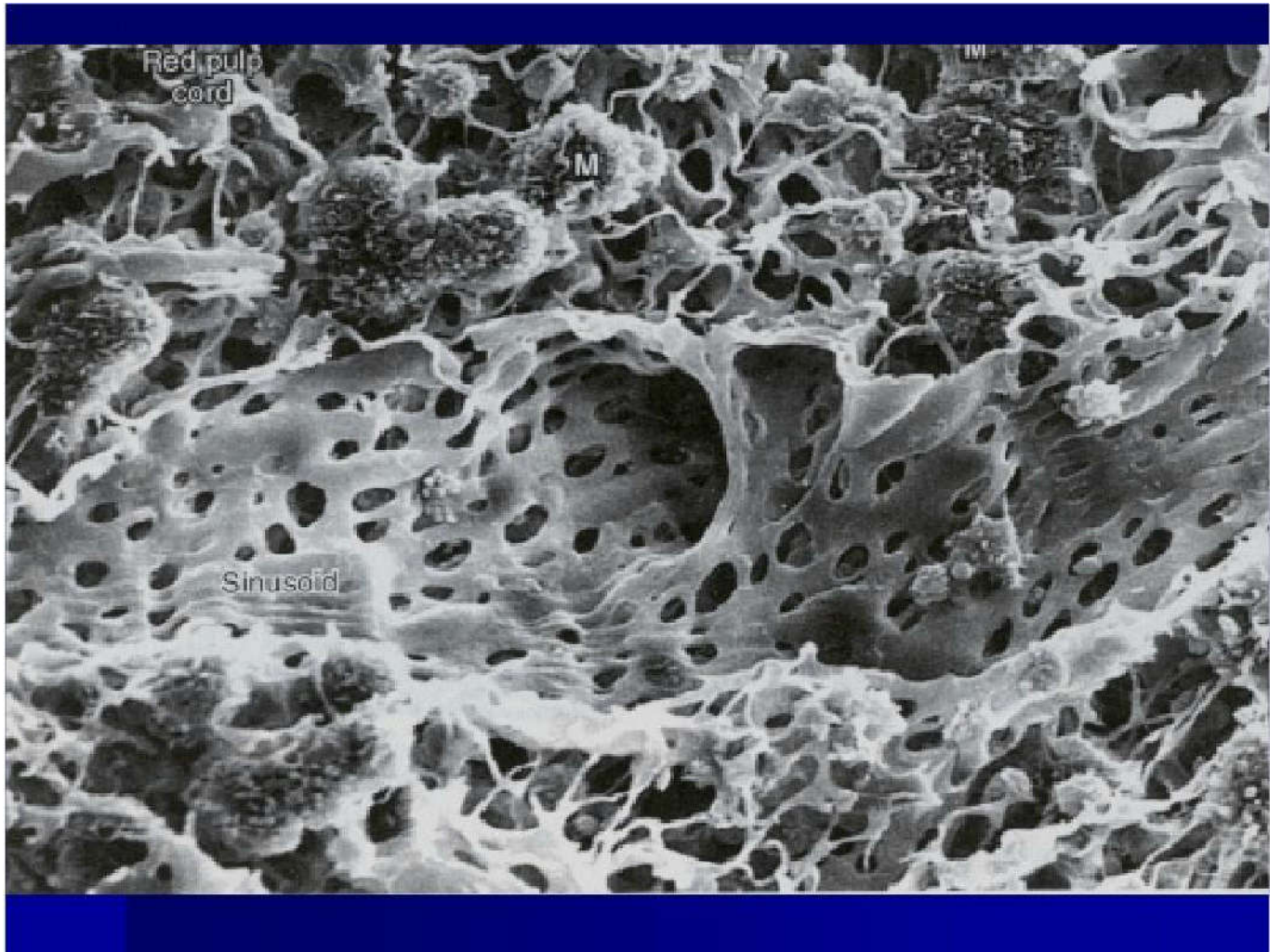
### **Function:**

- Some big molecular substance can pass the capillary wall more easily



# 血窦 (sinusoid)





# Sinusoid 血窦

## **Distribution:**

**Liver spleen and bone marrow**

## **Character:**

**\*A greatly enlarged hole in wall 30-40  $\mu$  m in diameter(no diaphragms)**

**\*Absence of basement membrane. The presence of multiple fenestrations in the endothelial cell**

## **Function**

**The interchange between blood and tissue is greatly facilitated by the structure of the capillary**