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# 腎臟替代療法與血液 淨化治療

腎臟內科

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# 學習目標

## PGY

### 知識

1. 腎臟替代療法與血液淨化治療
2. 腎臟替代療法與血液淨化治療病人的處理程序
3. 透析病人的照護
4. 透析相關併發症的防治

## UGY

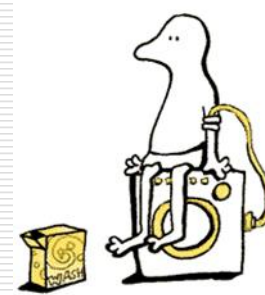
### 知識

1. 腎臟替代療法與血液淨化治療的定義
2. 透析的基本原理
3. 腎臟替代療法與血液淨化治療相關的實驗室檢查判讀，包括BUN/Cr、Ca、P、電解質、動脈血氣體分析、尿液分析、尿鈉、血清及尿之滲透壓、計算鈉離子之 fraction excretion

# 腎臟替代治療 Renal Replacement Therapy

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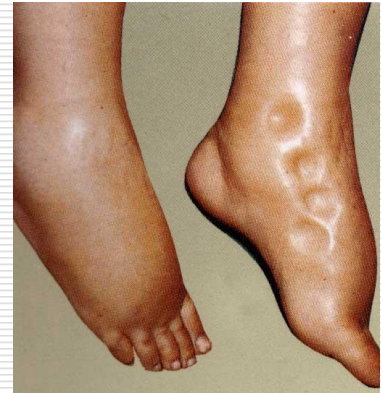
- 血液透析  
(Hemodialysis)
- 腹膜透析  
(Peritoneal dialysis)
- 腎臟移植  
(Renal transplantation)



# 緊急透析之適應症

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- **A** – Acidosis
- **E** – Electrolyte imbalance,  
esp. HyperK<sup>+</sup> 、 HyperCa<sup>2+</sup>
- **I** – Intoxication
- **O** – Fluid Overload
- **U** – Uremic symptoms,  
esp. Encephalopathy, Pericarditis



# 腎臟移植 Renal transplantation

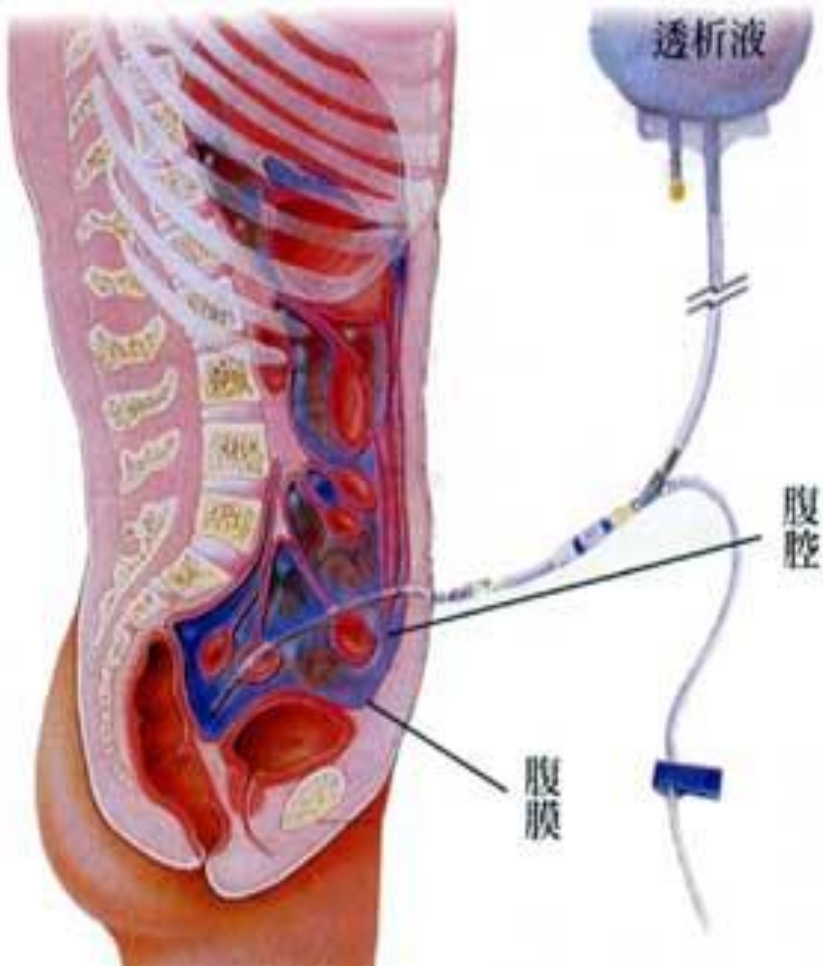


# 透析之適應症

## Indications for starting renal replacement therapy

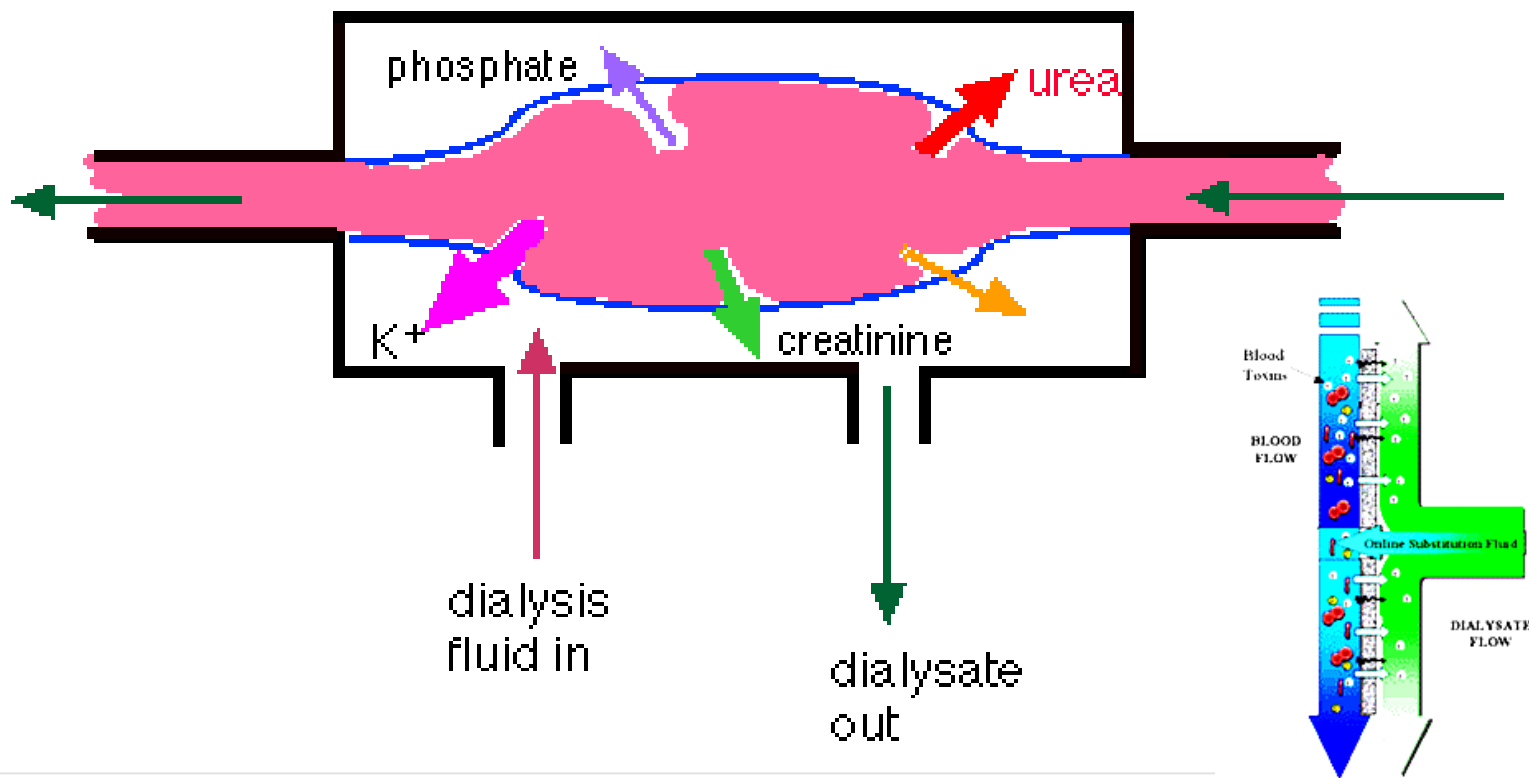
Indication	Comments
Anuria or oliguria	Urine volumes < 200 ml/12 hours
Hyperkalaemia	Serum potassium persistently > 6.5 mmol/litre
Severe acidaemia	pH < 7.1
Serum urea > 30 mmol/litre or creatinine > 300 µmol/litre	Values are not absolute, only a guide
Refractory fluid overload	Especially if compromising lung function
Uraemic complications	Encephalopathy, pericarditis, neuropathy or myopathy
Temperature control	Hyper- or hypothermia
Drug overdose	See Figure 7
Sepsis	

# 腹膜透析 Peritoneal dialysis



# 血液透析 Hemodialysis, HD

- ← direction of bloodflow
- direction of dialysis fluid flow





# 超過濾 / 對流 Ultrafiltration / Convection

□ 靜水壓 (Hydrostatic pressure)

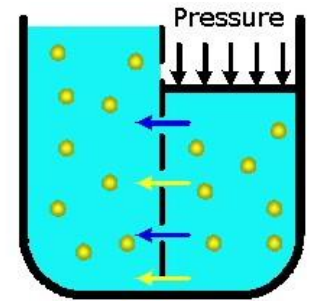
滲透壓 (Osmotic pressure)

--- 水份移動

--- 溶劑拖曳作用 (Solvent drag)

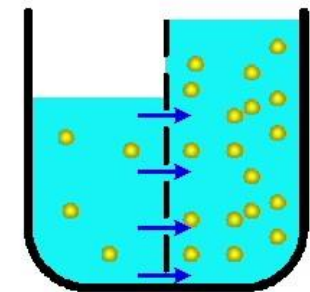
□ 血液在人工腎臟透析器中，因幫浦推動而產生**壓力差**；另外，在透析液邊加上**負壓**或**高滲透壓**物質如高濃度葡萄糖，則會使血液中的水份大量的移到透析液中，而帶離人體

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Ultrafiltration

(Solution moves by pressure gradient)

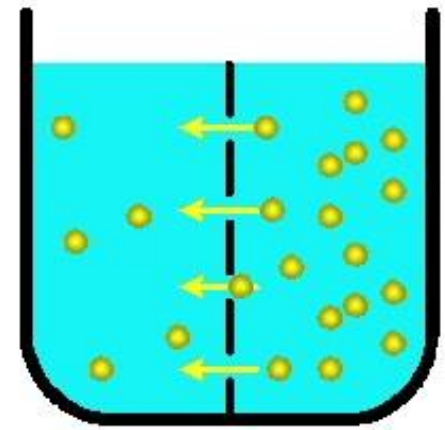


Osmosis

(Water moves by concentration gradient)

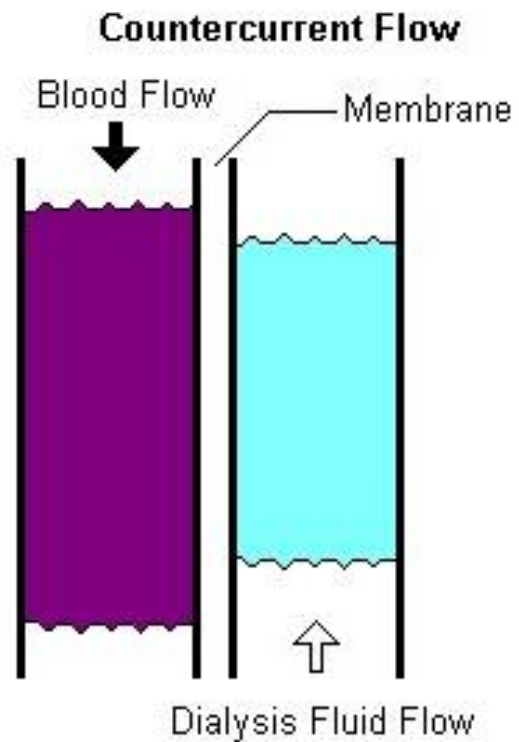
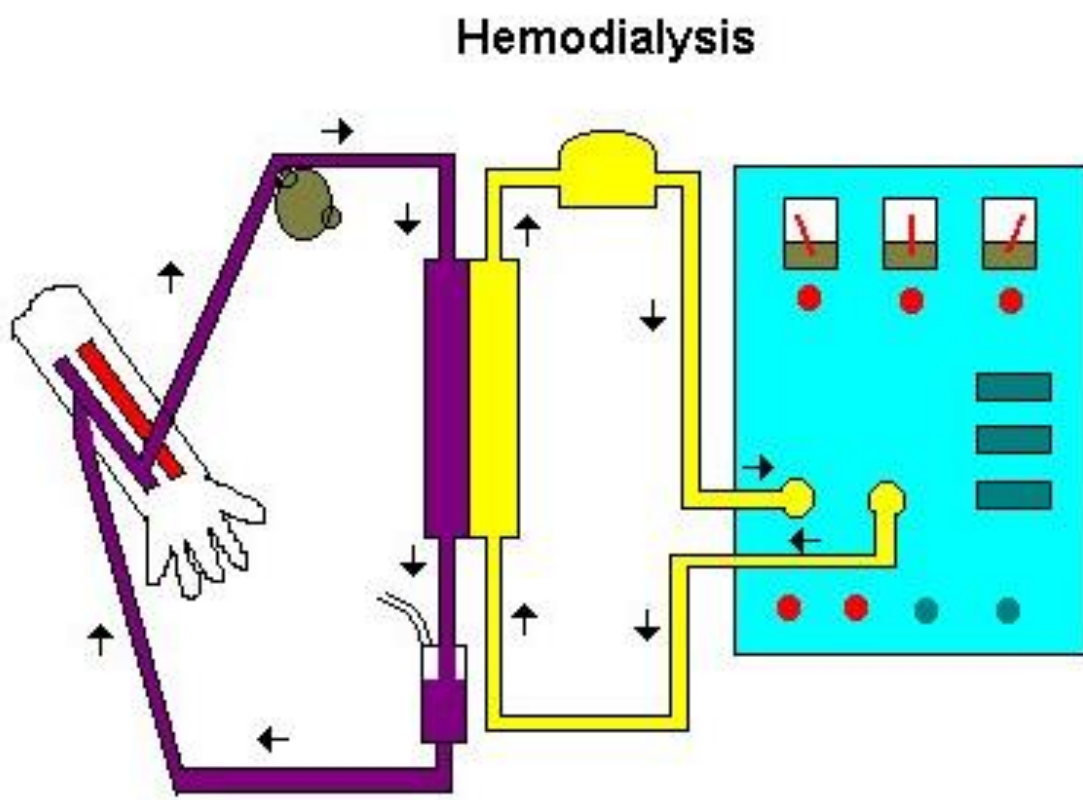
# 擴散 / 廓清 Diffusion / Clearance

- 溶質之自由移動。
- 血中尿毒經透析膜的擴散作用之大小，與其**濃度差**、**膜的表面積大小**、**膜之擴散係數**有關。
- 膜之擴散係數又由**材質**、**溫度**、及**介面電荷反應**所決定。



**Diffusion**  
(Solvent moves by concentration gradient)

# 血液透析 Hemodialysis



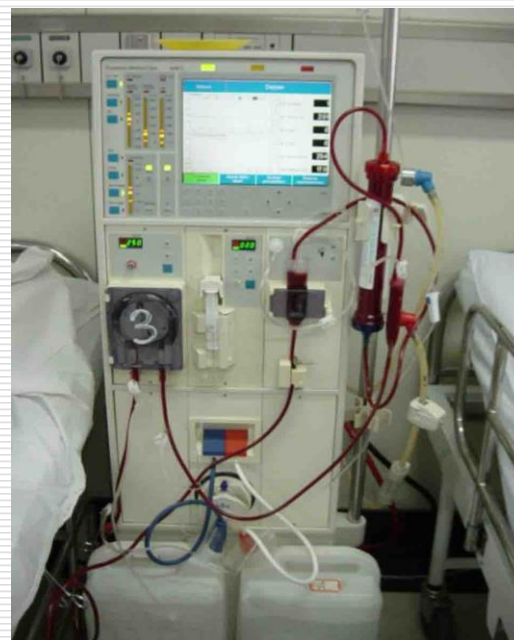
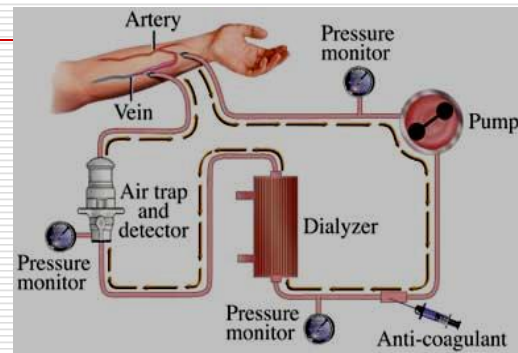
# 血液透析機

## □ 血液迴流路(The blood circuit)

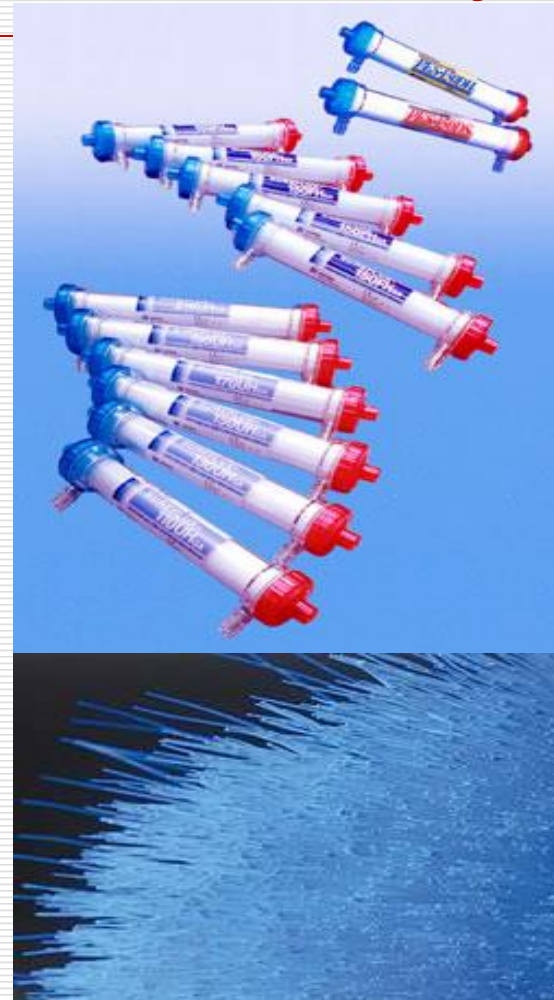
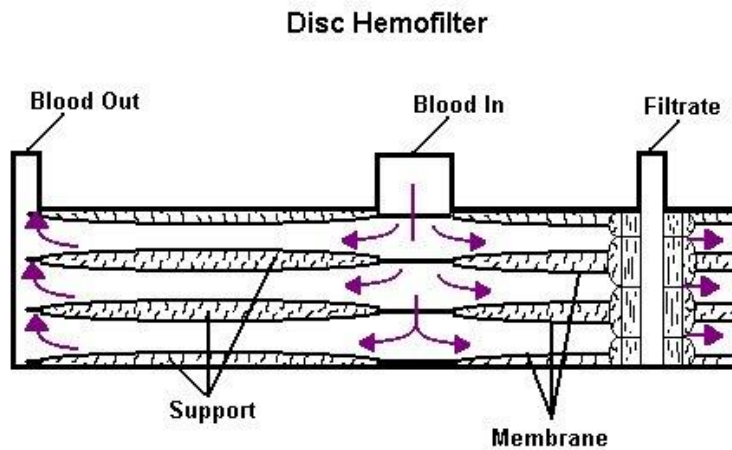
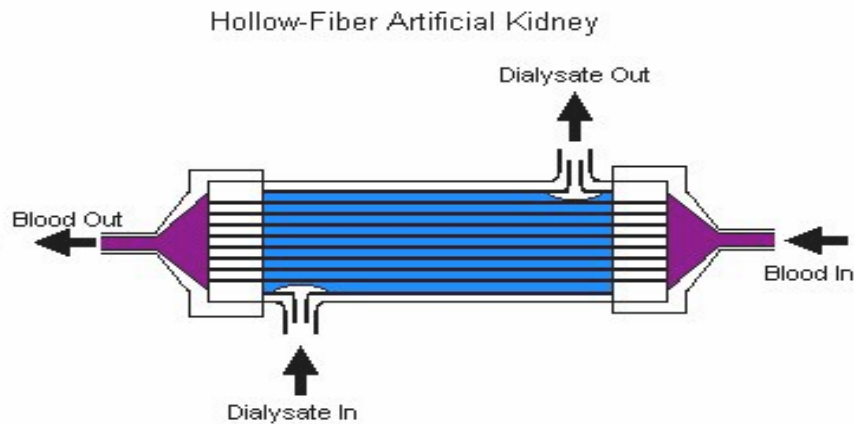
- 血液幫浦(blood pump)
- 抗凝劑幫浦(heparin pump)
- 動脈滴室(arterial chamber)
- 靜脈滴室(venous chamber)

## □ 透析液迴流路(The blood circuit)

- 透析液：加熱(heating)、混合(mixing)、空氣除去(degassing)
- 超過濾(Ultrafiltration, UF)

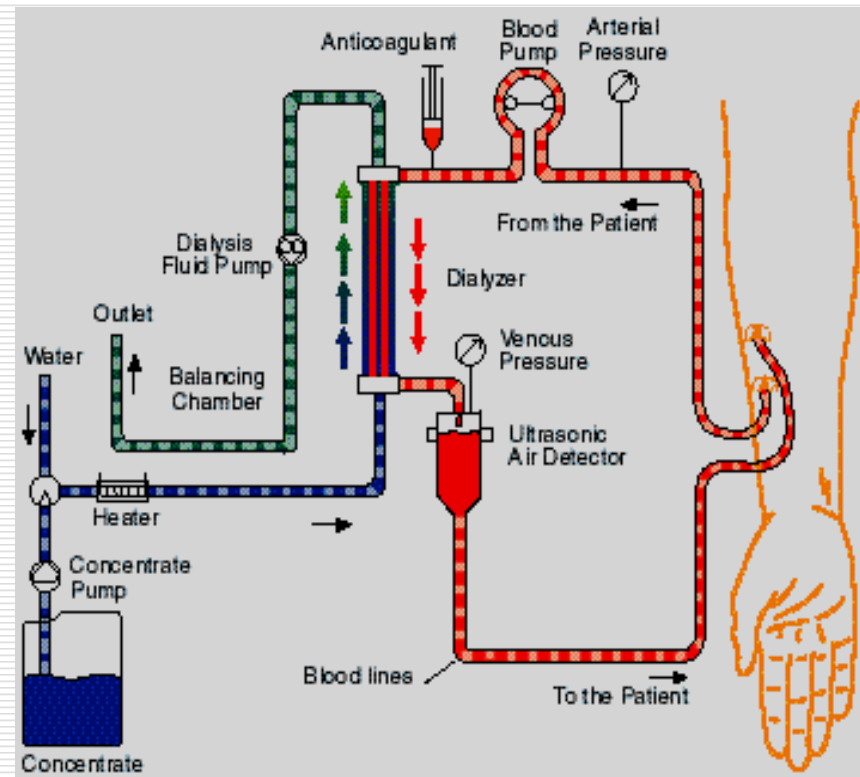


# 透析器(人工腎臟) Dialyzer; artificial kidney



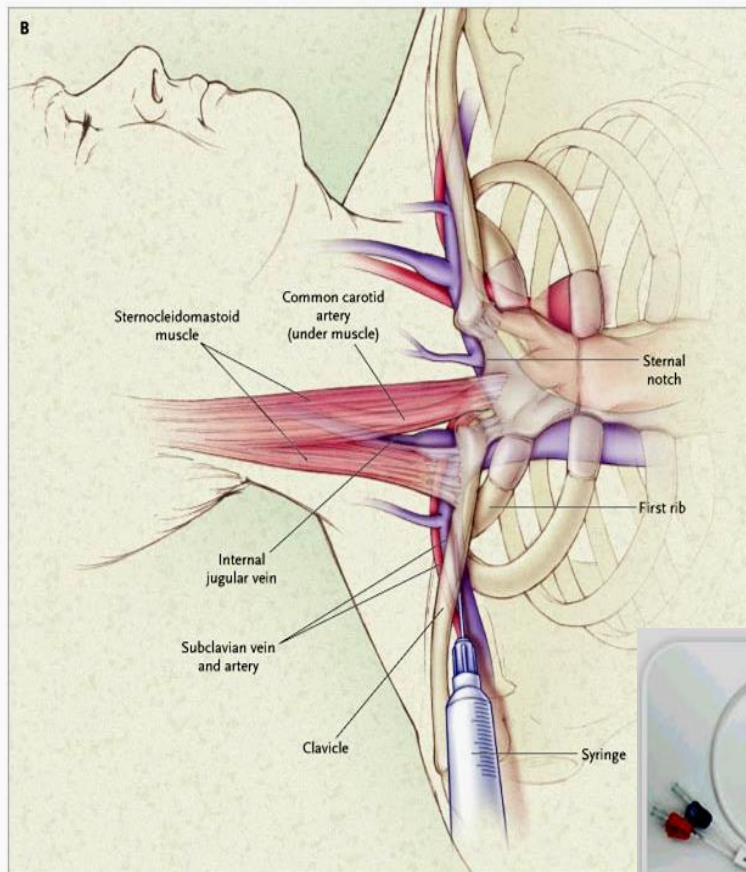
# 血液透析設備

- 血液透析機
- 透析器/人工腎臟  
(Dialyzer; Artificial Kidney)
- 血管通路  
(Vascular access)

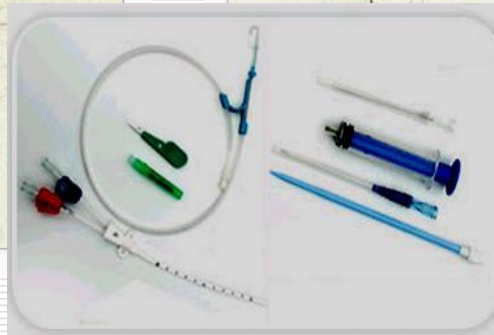
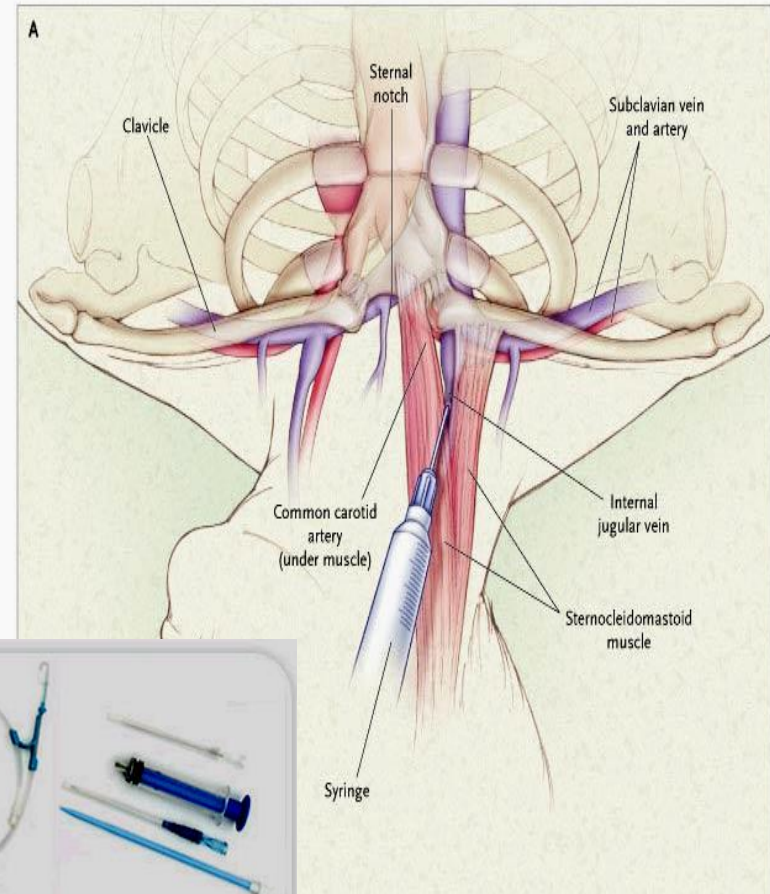


# 雙腔血液透析導管 Double-lumen catheter

- 鎖骨下靜脈 (Subclavian vein)



- 內頸靜脈 (Internal jugular vein)



# 雙腔透析導管之併發症

Atrial and ventricular dysrhythmias

Arterial puncture

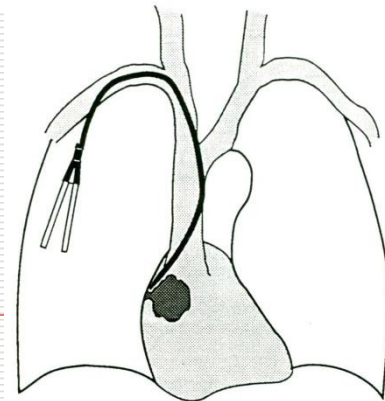
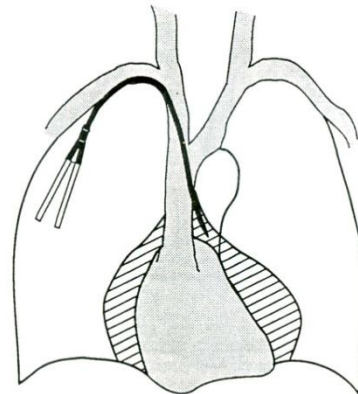
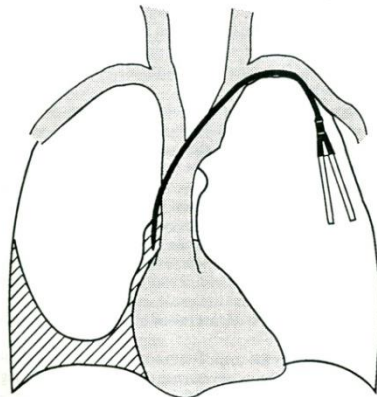
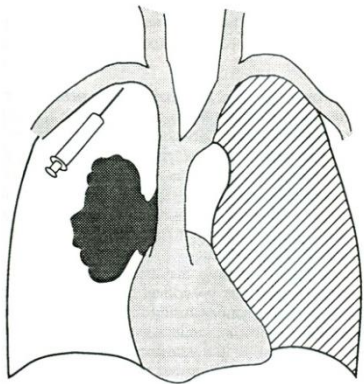
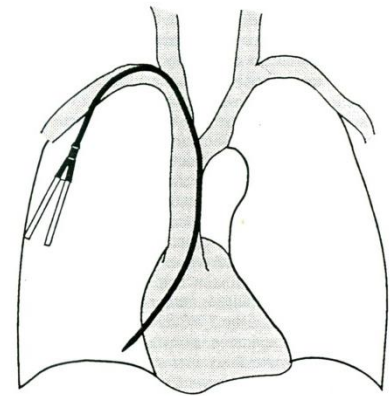
Hemothorax

Pneumothorax

Air embolism

Perforation of central vein or cardiac chamber

Pericardial tamponade

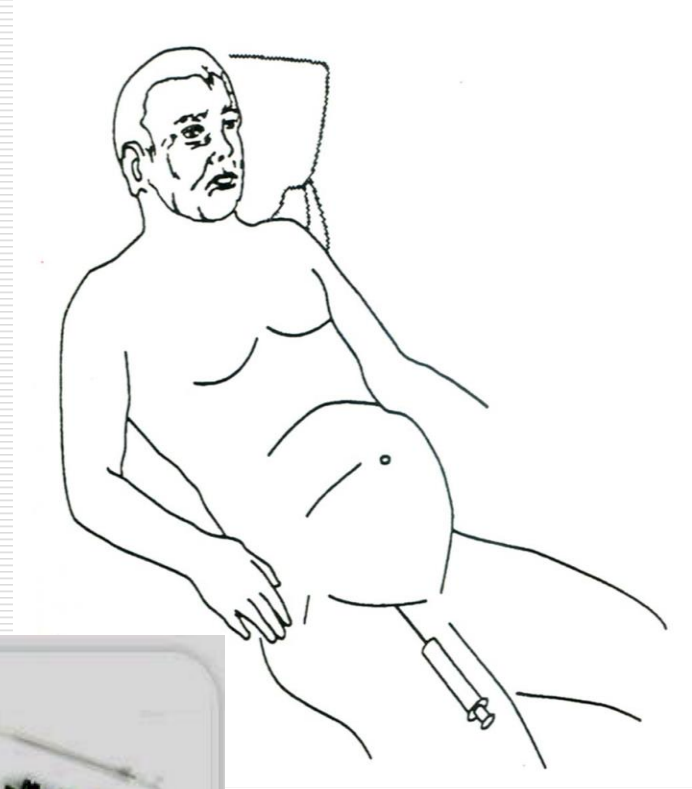




# 雙腔血液透析導管 Double-lumen catheter

- 股靜脈 (Femoral vein)

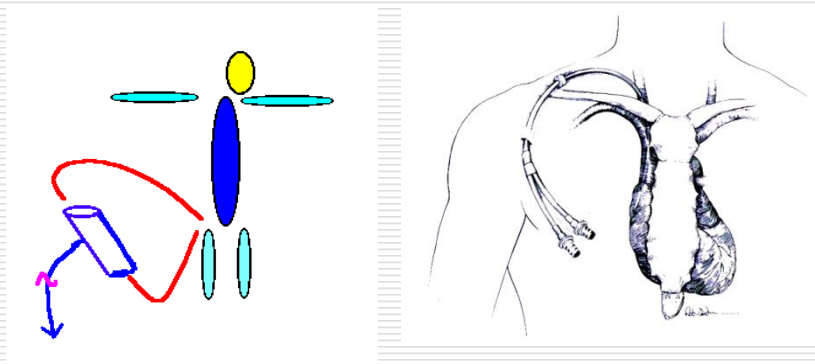
Infection  
Thrombosis  
Vascular injury  
Venous air embolism  
Hematoma



# 血管通路 Vascular access

## □ 暫時性血管通路

- 雙腔血液透析導管 (Double-lumen catheter)

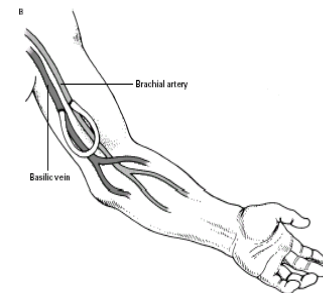
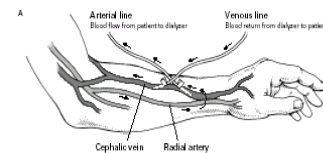
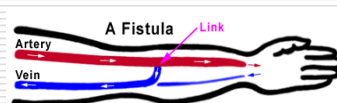


## □ 中長期血管通路

- Permcath雙腔導管

## □ 永久性血管通路

- 自體動靜脈瘻管(Native A-V fistula)
- 人工血管移植(Arteriovenous graft)



# 血液透析之併發症

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- Hypotension
  - Chest pain
  - Muscle cramping
  - Nausea / vomiting
  - Seizure
  - Disequilibrium syndrome
-

# Disequilibrium syndrome

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- Nausea
  - Vomiting
  - Consciousness disturbance
  - Rapid correction of serum osmolarity
  - High risk of brain edema
-