Problem-based Nephrology Orientation

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基本住院需知

- Check I/O , body weight QD
- 病況穩定的病人, 減少IV的量, 洗腎病患以40cc/hr為上限
- Regular F/U renal function and electrolyte
- 避免腎毒性的藥物 , 或依腎功能調節劑量
- 初次血液透析病患,需確認解釋及permit之完成
- 使用3%NaCl需精密計算劑量 , check serum Na至少q4h
- 減少不必要的輸血
- 腎功能不全的病人應儘量避免使用含鎂antacid, NSAID, aminoglycoside, and Demerol, Fleet enema,除非病人已長期無尿。即使已經洗腎的病人若餘尿>100cc/day 也禁用aminoglycoside and NSAID 除非主治醫師同意。

Introduction Case

- 54y/o female , underlying DM and chronic renal insufficiency with OPD control for more than 8 years
- Baseline renal function 3 months ago : BUN/Cr 45/2.4
- Complaint progressive nausea , vomiting and general weakness in recent 2 weeks
- Besides , decreased urine output was also noted
- PE : bilateral lower leg edema , basal rales(+)

- Lab : Hb 6.4gm/dl MCV 85 BUN/Cr 108/7.5

What's your next step ?

Admission order for this patient

Exam :

- CBC/DC/Plt
- MAR : 加測iCa , P , iPTH , Iron profile
- EKG , CXR
- ABG
- U/R , S/R
- Check retinopathy
- 24hr urine for total protein , Cr
- Record I/O , BW QD
- Specific survey cause of renal failure :
  - Renal echo
  - FeNa

Medication :

- Avoid nephrotoxic agent
- Dose adjustment according to GFR
- Hypertension control
- Sugar control
- Diuretics
- EPO ?
- Sodium bicarbonate ?
- Dialysis ?

Why should we check retinopathy ?

IDDM

- Onset usually well known and progress stage by stage.
- HTN always after stage 3.
- >90% with retinopathy
- Non-DM renal disease was low

NIDDM

- Onset usually not known and may present in ant stage.
- HTN may precede nephropathy.
- 60% with retinopathy.
- Non-DM renal disease was high.

Differential Dx of ARF

- DDx between acute renal failure & acute on chronic renal failure :
  - Renal anemia
  - Renal echo
    - Size : CRF may have smaller long axis(<8cm , exception : *DM , multiple myeloma , polycystic kidney disease , collagen storage disease*)
    - Echogenicity : increased in CRF and acute inflammation
    - Cortex width : thin(<2mm) in CRF
    - Structure abnormality
- Classification : Pre-renal , intrinsic and post-renal

Fractional Excretion of Na

- The FeNa evaluates only the fraction of filtrated Na that is excreted and is not affected by changes in water reabsorption.

$$FENa = \frac{UNa \times Pcr}{PNa \times Ucr} \times 100\ \%$$

DDx in ARF

Type	U/A	UNa	FENa	BUN/Cr
Pre-renal	↑ SG	<20	<1%	>20:1
ATN	↓ SG	>40	>1%	<20:1
Vascular	Hematuria	>20	>1%	<20:1
GN	Proteinuria, RBC cast	>20	> 1%	<20:1
Interstitial nephritis	Hematuria, WBC cast	>20	>1%	<20:1
Post-renal	Hematuria or normal	>20	>1%	< 20:1

Dose Adjustment According to GFR

Drugs not requiring adjustment :

- Antibiotic: clindamycin, doxycycline, nafcillin
- Anticoagulant: heparin, warfarin
- Anticonvulsants: tegretal, phenytoin, deparkin
- Anti-fungal agent: ketoconazole, miconazole
- Anti-TB: rifampin, INH

Drugs Use in Renal Failure

- Oral hypoglycemic agent :
  - Sulfonylurea: glibenclamide (Daonil), gliclazide (Diamicron), glimeepiride (Amaryl)➔ ↓ elimination in renal failure *May Induce hypoglycemia in renal failure*
  - Gliquidone (Glurenorm), NovoNorm (Repaglinide)➔ hepatic metabolism ➔ no accumulation in renal failure
  - Metformin (Bentomin)➔ metabolic acidosis in severe renal failure
- Antibiotics :
  - ß-lactam : potent convulsant➔ reduce dose
  - Aminoglycoside & Vancomycin : nephrotoxicity ➔never use unless starting dialysis
  - Imipenem: watch for neurological complication

Drugs Use in Renal Failure

- Analgesic agent :
  - NSAID : nephrotoxicity➔never use unless starting dialysis
  - Demerol : metabolite accumulate in brain may induce conscious change ➔avoid use in renal failure

- Others ：
  - Muscle relaxant: baclofen (baclon) ➔ contraindicated in uremia patients
  - Antiviral agents: acyclovir (zovirax), gancyclovir, valaciclovir (valtrex), amantadine (PK-Merz) ➔ ↓ to 1/3 to 1/7 dosage

Diuretics

- Thiazide & spironolactone have only little effect when Ccr < 30 cc/min (serum Cr about 2-2.5 mg/dl)
  - Spinolactone → no use in hyperkalemia
  - Thiazide → no use in hypercalcemia
- Loop diuretic is drug of choice

ACEI or ARB

- ACEI or ARB (angiotensin II receptor blocker) → drug of choice in hypertension with proteinuria
- Hyperkalemia: a common side effect, especially in CRI or CRF
  - Serum Cr > 3 → use with caution
  - Serum Cr > 6 → stop use , unless dialysis
  - Serum Cr 3-6 → F/U potassium, kalimate / diuretics use

When to use EPO & $NaHCO_3$?

- EPO :
  - Indication : Cr > 6.0mg/dl with Hct < 31% or Hb <11gm/dl
  - Target : Hct 33~35%
  - Dosage :
    - Darbepoetin alfa (Aranesp , 25mg)1Amp QW ➔ used in pre-dialysis stage & PD
    - Erythropoietin beta (Recommen) ➔ used in HD room (EPO as HD room routine)

- $NaHCO_3$:
  - Indication : Chronic renal failure with metabolic acidosis
  - Reserve for ABG : PH < 7.2 , HCO3 < 16

When is the time of blood transfusion ?

- Hct < 20%
- Hct < 24% + Recognized symptoms or signs due to anemia (angina , dyspnea , weakness , hemodynamics change)
- The Epoetin-resistant patient who has chronic blood loss

值班時～

- This patient is dyspnea with chest tightness
- Vital sign : T/P/R　37.1˚C /105/25
- ABG : Respiratory alkalosis & metabolic acidosis
- EKG : sinus tachycardia
- PE : basal rales(+)
- CXR : bilateral pulmonsry edema

What's your next step ?

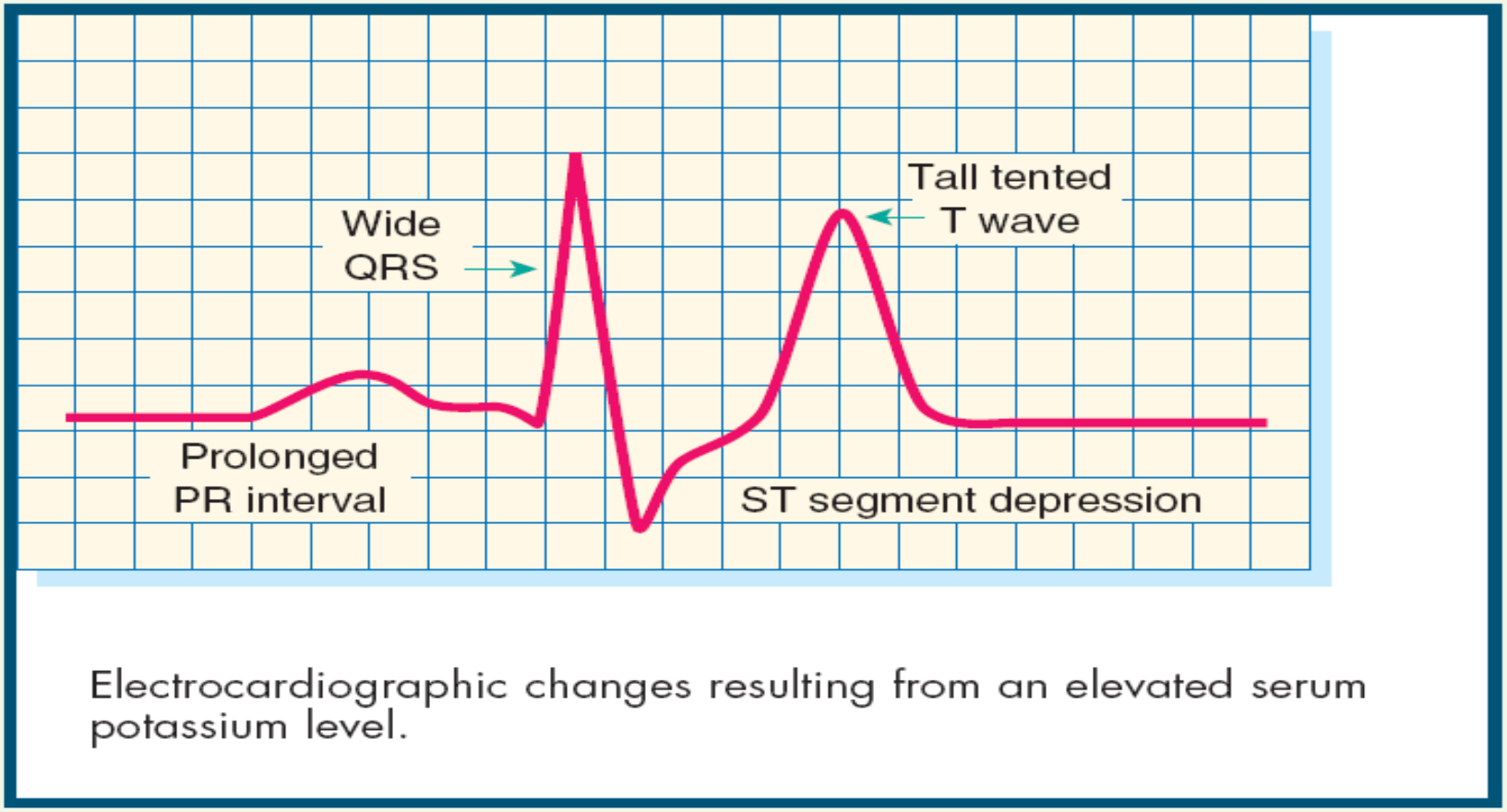
Dyspnea

- Differential Dx :
  - Cardiogenic
  - Pulmonary
  - Metabolic
  - Anemia
  - Psychiastric
- Routine check : *checked before you call for help*
  - PE : crackles , rales , rhonchi , murmur
  - ABG
  - CXR
  - EKG
  - Cardiac enzyme

When to start dialysis ?
~ It's time to call CR

- Fluid overloading refractory to medication
- Hyperkalemia (K>6 - 6.5 meq/L) : medical treatment first
- Severe metabolic acidosis
- Uremic symptoms (nausea, vomiting, conscious change, seizure)
- Uremic Pericarditis
- Uremic encephalopathy

ECG Change in Hyperkalemia



Electrocardiographic changes resulting from an elevated serum potassium level.

Medical Treatment of Hyperkalemia

- Ca gluconate
- NaHCO3
- Insulin and 25-50% glucose
- ß2 agonist inhalation
- Diuretic
- Cation exchange resins (Kalimate)
- Dialysis

Medical Treatment

- Calcium gluconate
  - EKG有變化時
  - 10% 10cc (1支) 滴 2-3 分鐘
  - 5-10分鐘後如果沒效可再打一支
  - 藥效短 (30-60分鐘)
- Insulin + glucose
  - 10-20U RI + 25-50g glucose (50-100cc D50W)
  - 15-30分鐘開始作用,可維持數小時
- Loop and thiazide diuretics

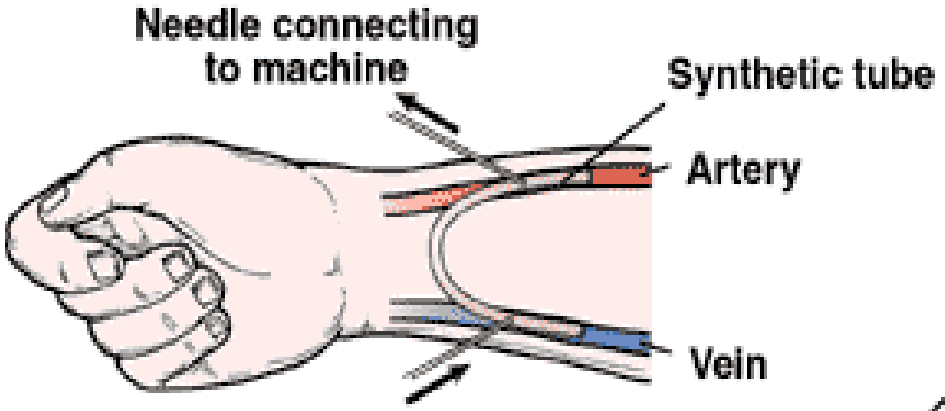
- NaHCO3
  - 嚴重高血鉀合併酸血症
- ß2-agonist
  - 靜脈注射或吸入
  - 30分鐘作用,持續2-4小時
- Kaysalate :
  - Romove K via GI tract
  - Kalimate 2pk po TID or 4pk in N/S 100cc enema

How to dialysis ?

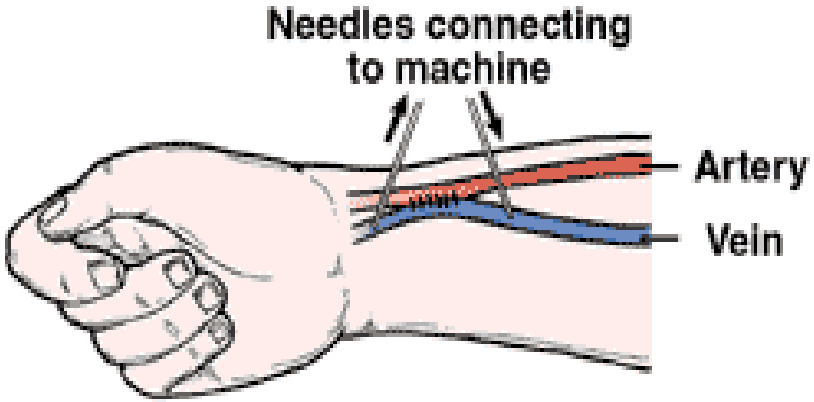
- Hemodialysis
  - AV graft : 2~3週可使用, 平均使用3~5年
  - AV fistula : 4~6週可使用, 平均使用5~7年
  - Perm-Cath : inserted by CVS , 馬上可用
  - Double lumen : inserted by CR , 馬上可用, 使用期為一個月
- Peritoneal dislysis : inserted by GS , 10天~2週可用
  - If PD started in *< 10 days* following catheter placement,

    →do *low-volume, supine dialysis*.

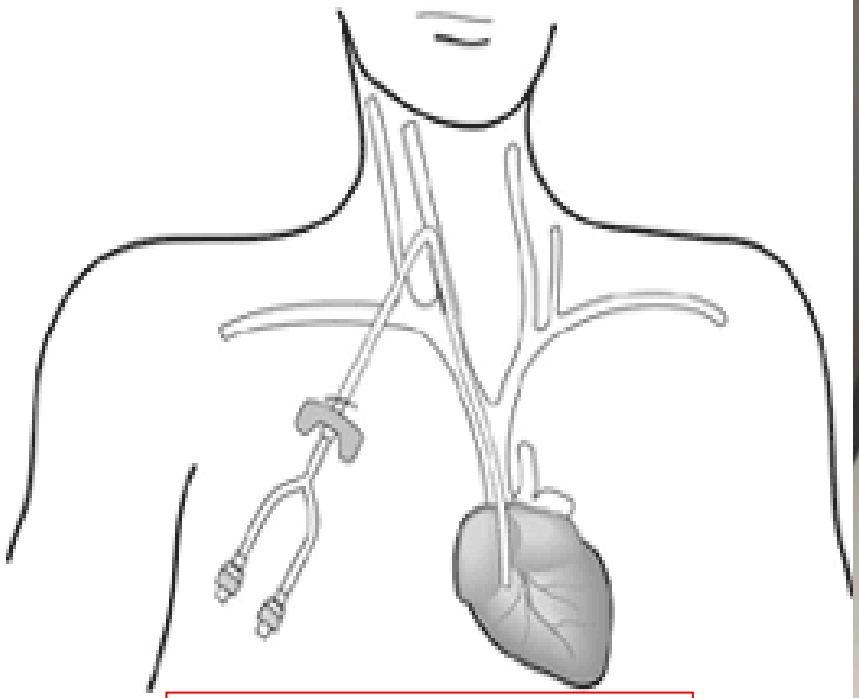
Types of Access for Dialysis



Graft

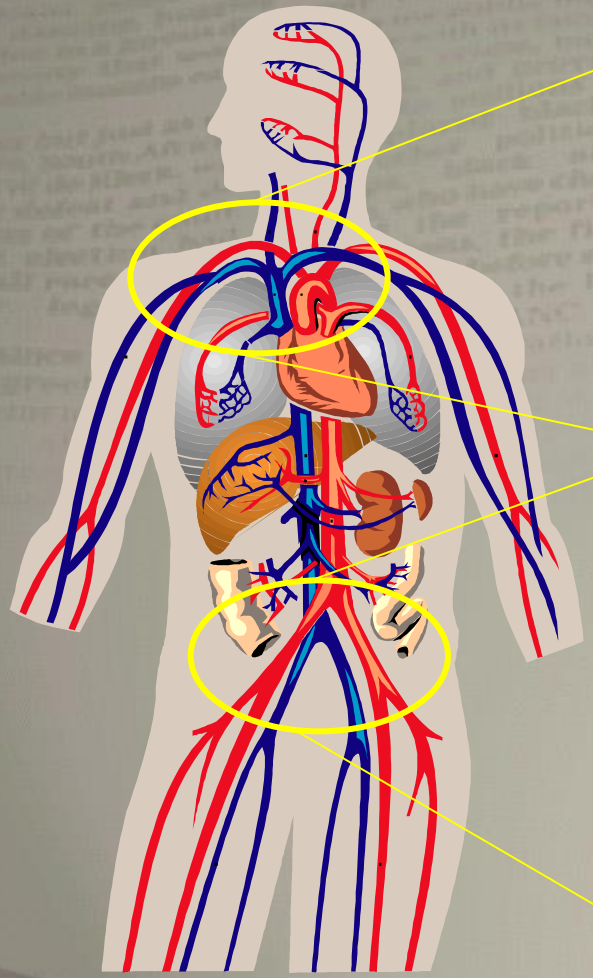


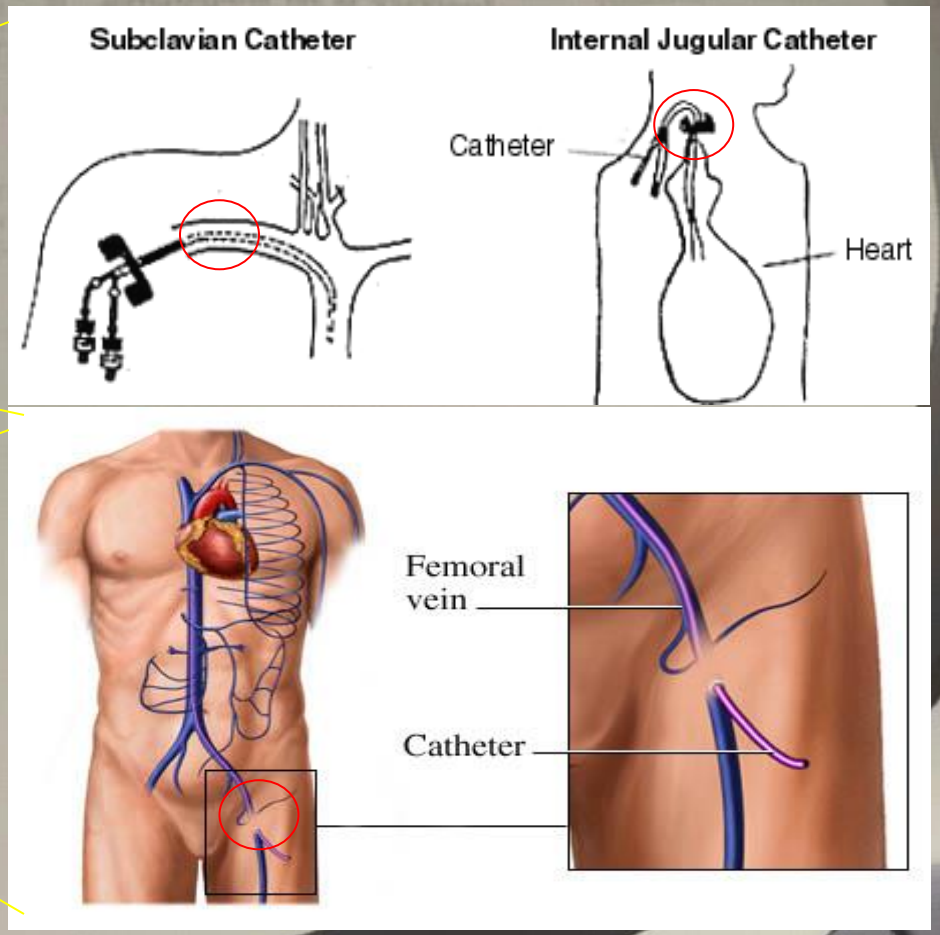
Fistula



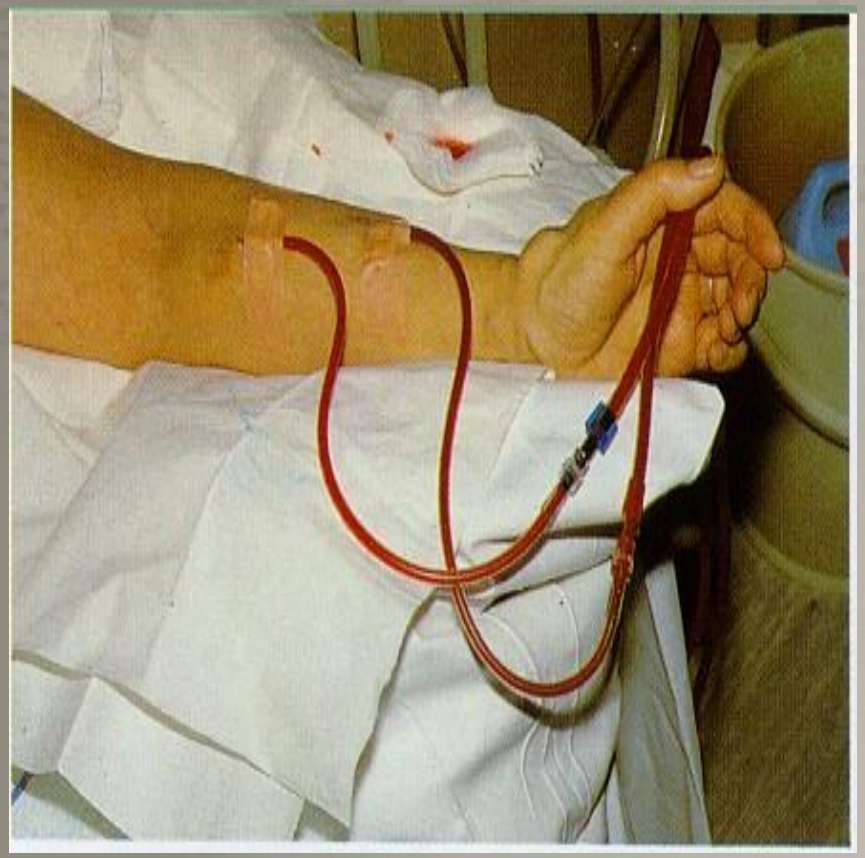
Catheter in neck

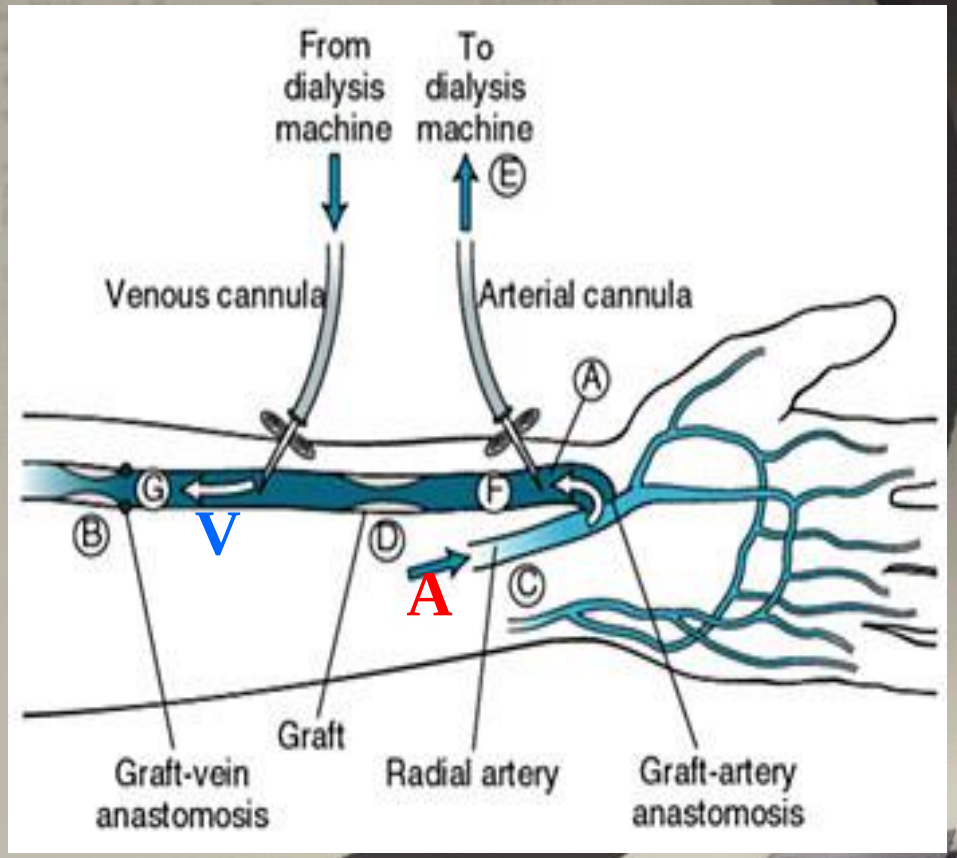
Temporary vascular access





Standard of A-V Fistula





After HD ~

- Patient felt comfortable and no more dyspnea was complainted
- Double lumen insertion site blood oozing even after compression for 30mins

What's your next step ?

Evaluation of vital sign

- Tachycardia +/- shock
  - Clinical evidence of volume depletion
  - Fluid challenge
  - Blood transfusion ➔ use whole blood if shock is present
- No tachycardia , no shock

What is the cause of bleeding tendency ?

- Anti-coagulant use (local or systemic) during HD
  - Plt count normal , PT normal , aPTT prolong
  - Antagnoist use : Protamine , FFP transfusion
- Uremic bleeding
  - Plt count normal , PT normal , aPTT normal
  - Cause :
    - Platelet : abnormal Ca flux ↓ ADP and serotonin ,dense granula uremic toxin: iPTH
    - Platelet–vessel wall interaction : altered adhesion and vW Factor
  - Management

Therapeutic Strategies for Uremic Bleeding

TX	Dosage	Start	Peak	Recommend use
DDAVP	0.3μ/kg	1 hour	2- 4 hours	4Amp in N/S 100cc drip >30min st
Cryoprepictate	10 Units	1 hour	4 - 12 hours	2U TID
Platelet	12-24 Units			12-24 Units st
EPO	50-150 U/kg			As previous use
Estrogen	0.6/kg/d x 5 days	6 hour	5 - 7 days	Premarin 1# po TID

Sudden onset of conscious change ~

- After HD , she felt nausea and vomit some food substance
- Sudden onset of conscious change with coma status was noted by nurse

What's your next step ?

Step by step

- Always check vital sign at first
- DDx of conscious change un post-HD patient :
  - Shock ➔ iv , inotropic agent use
  - Arrhythmia ➔ ACLS
  - Stroke ➔ hemorrhagic & non-hemorrhagic
  - Electrolyte unbalance ➔ check Na , K , iCa , P
  - Dialysis Disequilibrium Syndrome(DDS)

Dialysis Disequilibrium Syndrome (DDS)

- Most in first dialysis with high BUN level
- Risk factors : old age or children , previous brain damage , severe metabolic syndrome
- Clinical features : neusea , headache , hypertension , conscious change , seizure , coma , death
- Pathophysiology : faster removal of BUN in blood & slower removal in CSF

  ➔Water shift to brain

  ➔ Brain swelling or osmolytes accumulate
- Management : mannitol 100~250mg iv st

Thank you for your attention !