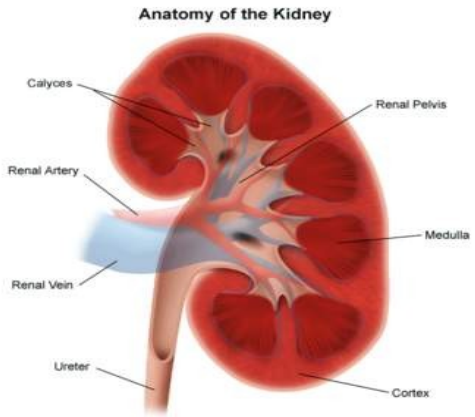
Medical fitness of renal patients



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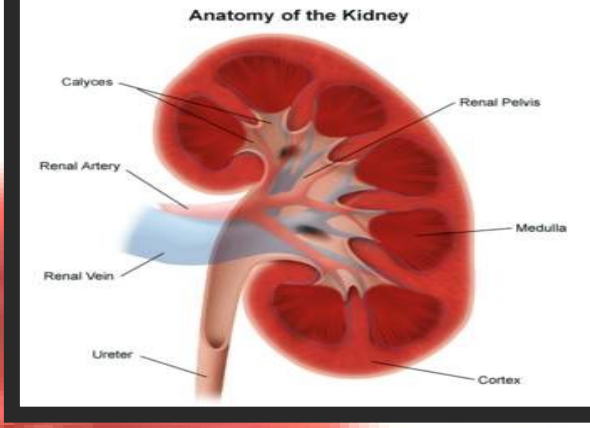
Topics



- **Intruduction**
  1- main problems
  2- GA and operative effects
  3- factors increasing morbidity
- **Preoperative assessment**
- **Preoperative care** : Strategies to reduce surgical risk
  * pt on conservative managements
  * pt on dialysis
- **Operative care**
- **Post-operative assessment and care**
- **Hints on hepatopathies and surgery**

Medical fitness in renal patients

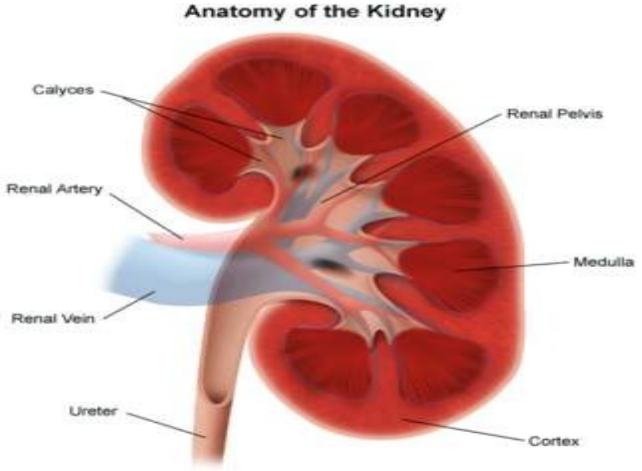
Main problems

- ***Impairment of the excretory function of the kidney result in: ↑BUN , creatinine ,acid ,salt (hyperkalemia) and water (volume overload)***

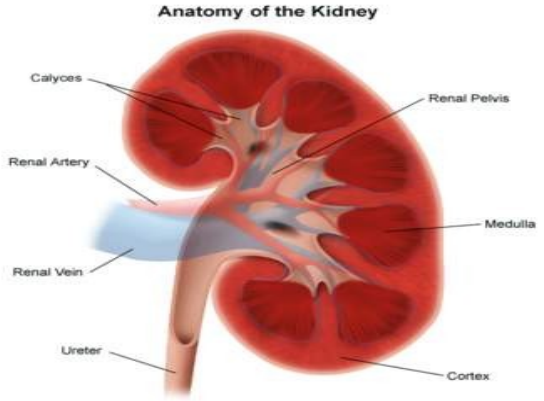
- ***Impairment of the synthetic function result in decrease in production erythropoietin (anemia) , active Vit D3 (hypocalcaemia, hyperphosphatemia)***

- ***Platelet dysfunction promoting bleeding***

- ***Others : hypertension , infection malnutrition , hemodilutional***



Medical fitness in renal patients



1- GA effects on renal pt may induce

a reduction in blood flow in up to 50% of patients resulting in the impaired excretion of nephrotoxic drugs , in addition the function of cholinesteras an enzyme responsible for breaking dov certain anesthetic agents resulting in prolonged respiratory muscle paralysis if neuromuscular blocking agents are used

- **Surgical risk on renal patients - as in all other patients -depend on :**

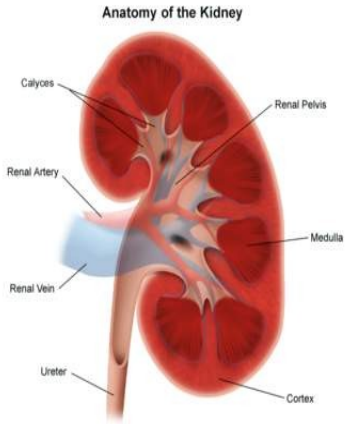
1. **type of surgery and whether the procedure in routine or performed on an emergency basis**
2. **The extent of renal impairment and the use of dialysis also affect outcome and subsequent morbidity .**

Responsibility for preoperative care of patients with renal disease especially CKD :patients s

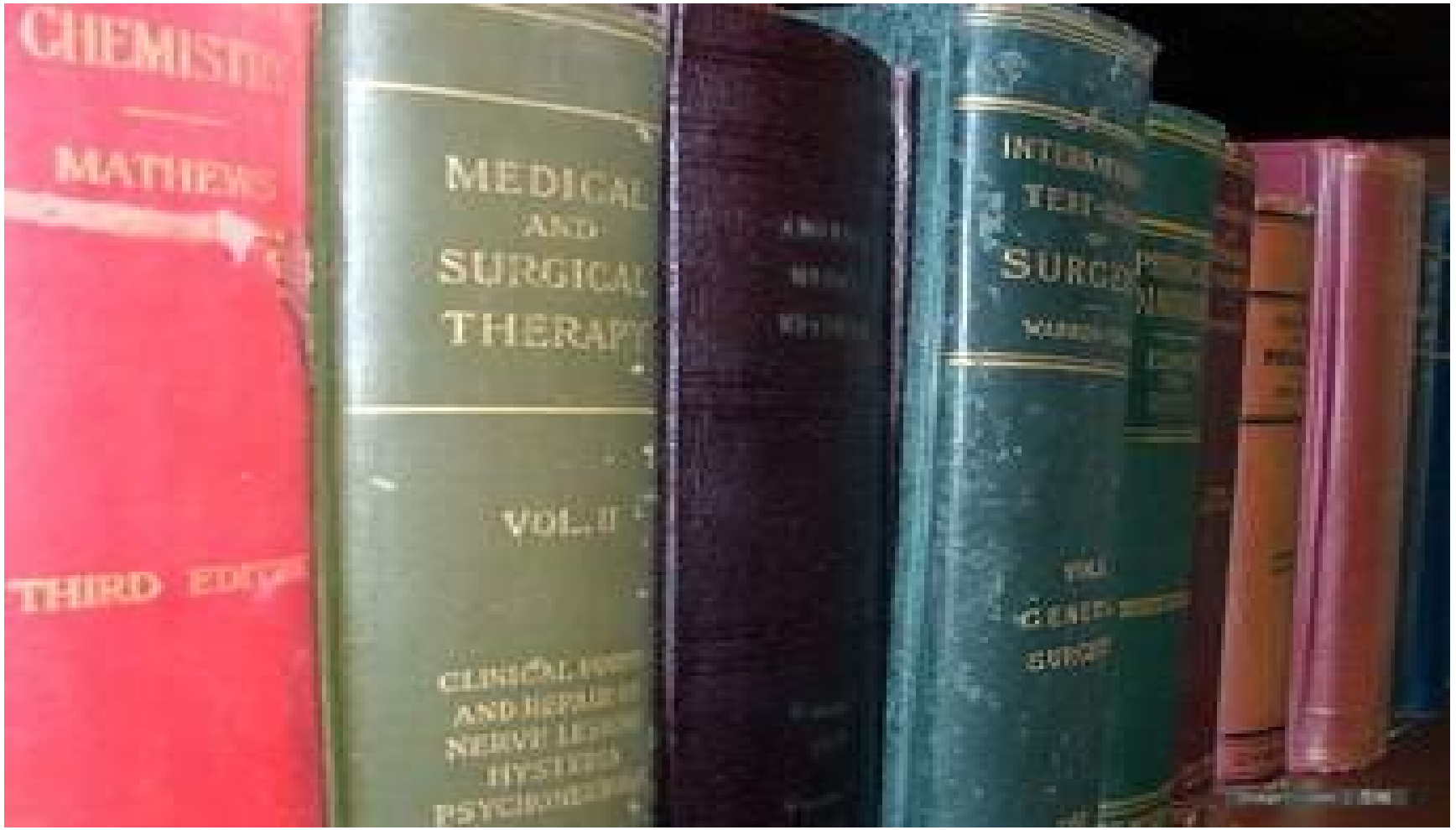
1. ***Family physician (PCP)***
2. ***Nephrologists***
3. ***Operation team (Anesthesiologists plus S***

Pre operative **assessment**

- **AKI are not undergo dialysis**
- **CKD dialysis not yet been initiated**
- **Stable patient CKD on HD or PD**
- **Pt undergo kidney transplantation have impaired RF**



Pre operative assessment

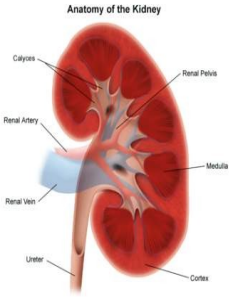


Pre operative **assessment**

- **complete history and physical examination paying special attention to symptoms and sings of main renal problems (mentioned before), Presence of co-morbid disease.**
- **Findings of renal disease complications : CHF, precarditis , Site for venous and arterial access**

- **A complete past medical history should include a history of prior renal insufficiency , prior BUN and creatinin levels, prior urinalysis ,degree of proteinuria, Prior surgical experience, Use of potentially nephrotoxic drugs**

Pre operative **assessme**



Typical pre-operative diagnostic testin in patients with renal diseases

1. **CBC to evaluate anemia**
2. **renal panel (Na, K, Cl , urea ,creatinin , Ca and bicarbonate levels.**
3. **ABG if bicarbonate levels is below 18 mEq\l**
4. **BT if uremic bleeding is a concern**
5. **Repeat electrolytes level 2-3 hrs before surgery**
6. **Chest radiography to evaluate fluid status**

Medical fitness in renal patients

The causes of increasing morbidity in the cardiac ? and general su

- COMMON

1. Hypertension

2. hyperkalemia

3. hemodynamic instability

4. bleeding

5. arrhythmias

6. infection

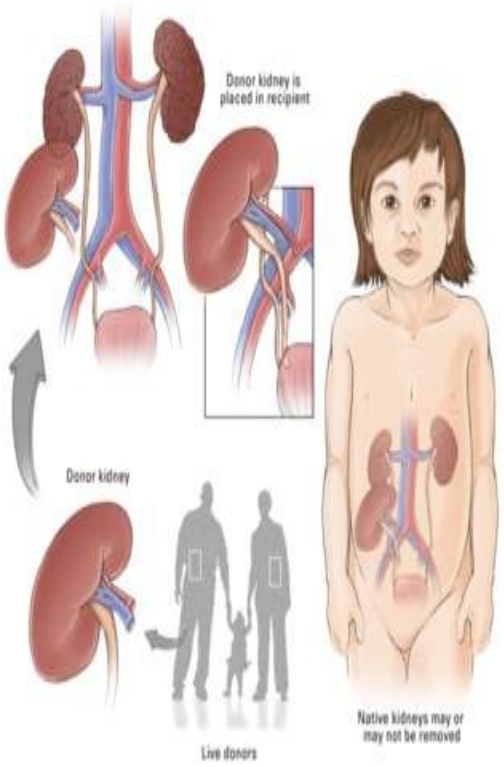
- UN-COMMON

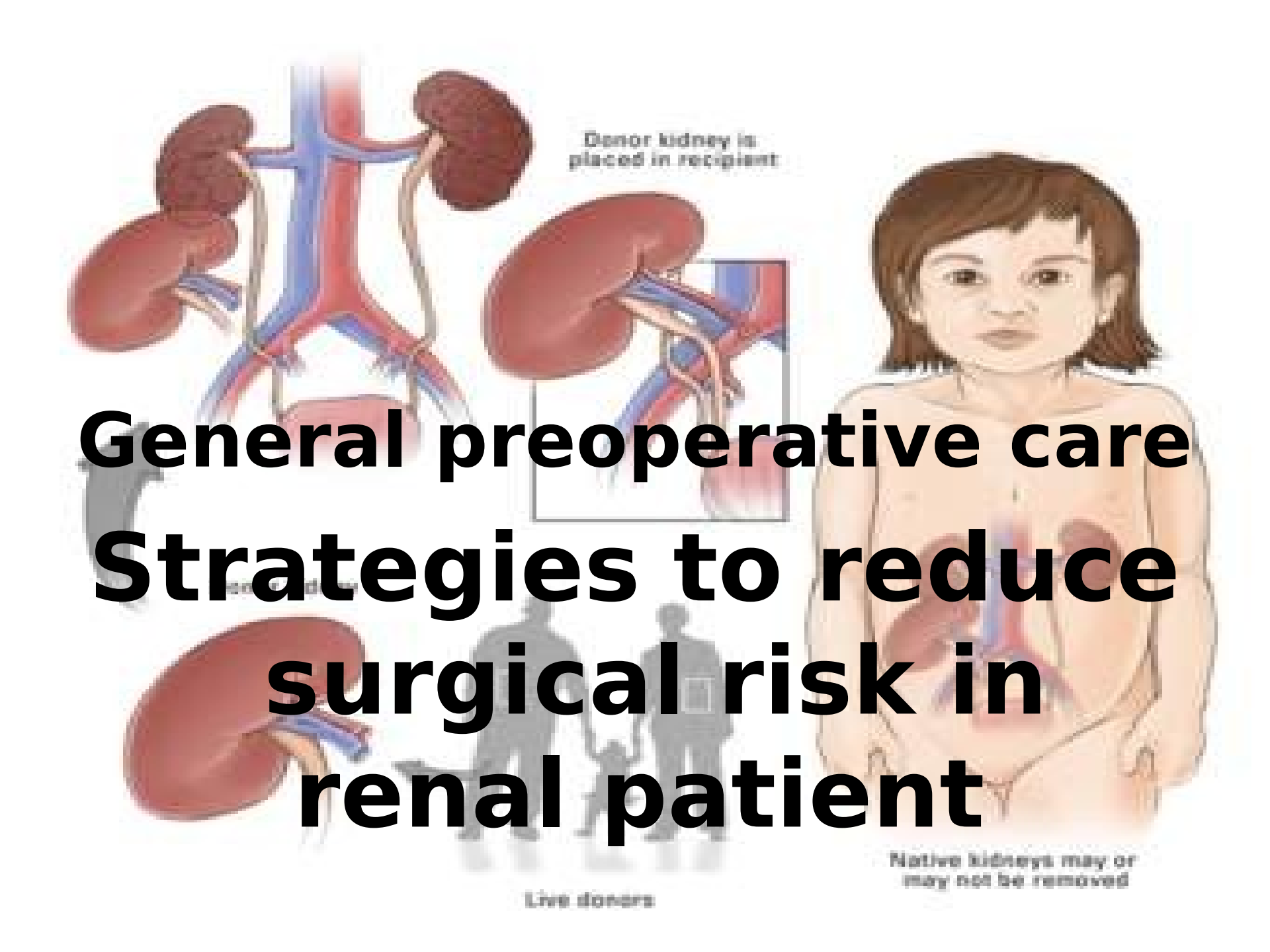
1. anemia

2. Pericarditis

3. Neuropathy

4. Clotted vascular access ports and infection





General preoperative care

Strategies to reduce surgical risk in renal patient

Hypertension

Strategies to reduce surgical risk

Hypertension – effects and course

- **Preexisting hypertension is the most medical reason for postponing surgery and can induce a variety of cardiovascular responses that potentially increase the risk of surgery including LVH, systolic dysfunction leading to CHF, renal impairment and cerebrovascular and coronary occlusive disease.**
- **Hypoglycemia may also cause HTN as a result of catecholamine release for mobilization of glycogen store.**
- **During induction of anesthesia blood pressure rise 20-30 mmHg & heart rate rise 15-20 b\m in normotensive individual .**
- **as the period of anesthesia progresses The mean arterial pressure tends to fall episodes of intraoperative hypotension**

Hypertension – actions

- **Replaced Oral agents by IV three days before surgery**

- **Unless diuretics are being used for volume management (CHF or nephrotic syndrome) they should be discontinued 2-3 days before surgery discontinuation is necessary to avoid possible volume depletion and intraoperative decrease in Bp which may worse RF .**

- **Abrupt withdrawal some medications NSAIDs, antihistamine decongestant may cause rebound HTN hence sudden discontinuation of these agents should be avoided immediately before surgery**

- **Correct Hypoglycemia**

Hypertension – Actions

With few exception patients who have kidney disease and HTN should continue antihypertensive drugs throughout the surgical period

The preoperative care depend on The classification of hypertension (hypertensive emergency , urgency and chronic HTN)

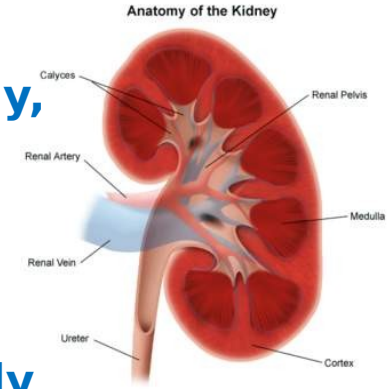
- **HTN emergencies (severe elevation in Bp >180\110 complicated by evidence of impending or progressive target organ dysfunction) blood pressure should be reduced by 10%-15% within the first hour with a continued decrease toward 160\100 over the next 2-6hrs as tolerated by the patient.**

- **HTN urgencies are those situations associated with severe elevations in Bp without progressive target organ dysfunction , hypertensive urgencies require less rapid reductions in pressure hours to days**

- **Chronic hypertension pt already on his antihypertensive agents need to adjust the dose according Bp .**

Fluid status

Close attention should be paid to establishing the correct 'dry weight' for the patient, i.e .the weight at which they are euvolemic.



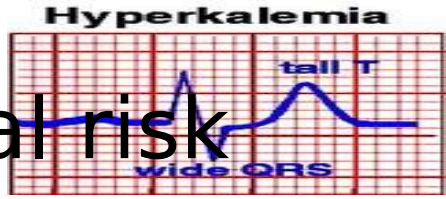
1. **If the patient is above their dry-weight preoperatively, they risk pulmonary edema and poorly controlled hypertension perioperatively and poor tissue healing postoperatively.**

2. **If under their dry weight they may become profoundly hypotensive during anesthesia, which will be exacerbated by blood loss.**

Fluid replacement in the Perioperative period depends on whether the patient is with or without diuresis

3. **As for the patient without diuresis loss caused by surgery and 3thd space fluid loss are replaced by physiological saline and glucose,**
4. **if with diuresis fluid is replaced in the same way as the patients without diuresis but replace addition fluid loss due to diuresis**

potassium level



Strategies to reduce surgical risk

potassium level – effects and course

Although no recommendations exist for safe pre operative potassium value but some new studies suggested avoiding GA In renal patients with serum potassium 5.5 mEq\l

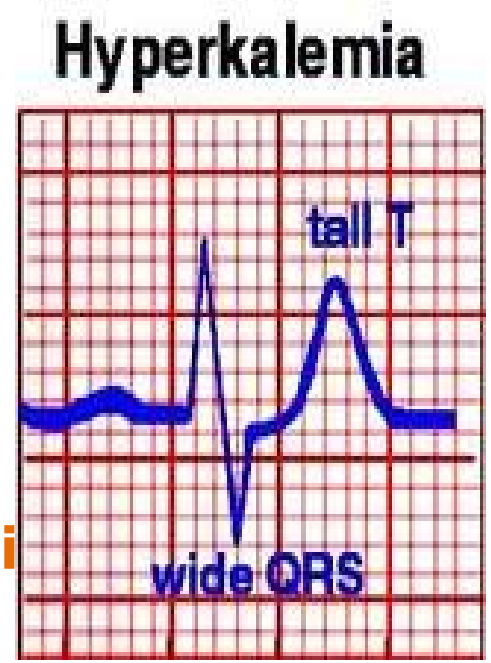
Conditions that may lead to life- threatening hyperkalemia in ESRD include catabolic stress (major trauma, major surgery , sepsis) acute acidosis , drugs (NSAID, ACE inhibitors, spironolactone , beta- blockers, heparin) tissue breakdown, transfusions, acidosis, and rabdomyolysis

Hypokalemia is more risk in arrhythmia comparing hyperkalemia due to tolerance of chronicity elevated potassium level in these patients Hypokalemia is sometimes followed concomitantly with hypomagnesaemia

SO ACCEPTABLE POTASSIUM LEVEL WITHIN RANG BEFORE SURGRY

Drugs that may cause hyperkalemia and high serum creatinin and are commonly used :

- **Drugs that inhibit Renin-angiotensin-aldosteron system**

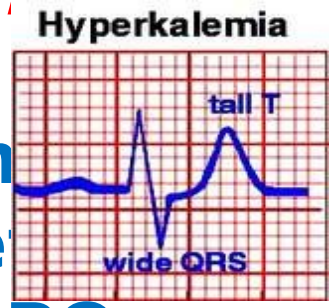


1. **Inhibitors of renin synthesis**
   Beta blockers ,clonidine, methyl dopa
2. **Inhibitors of Angiotensin 2 synthesis**
   ACE inhibitors
3. **Inhibitors of aldosteron synthesis**
   Angiotensin 2 receptors blocker , hepari
4. **Inhibitors of aldosteron receptors**
   Potassium sparing diuretics

- **Drugs that cause release of potassium from muscle**

1. **Succinylcholine , antipsychotic drugs (haloperidol**

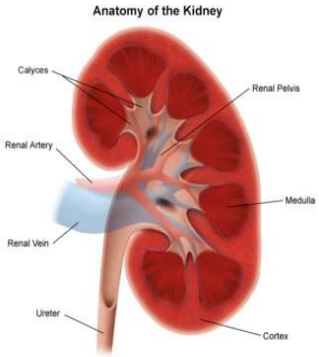
Managements of hyperkalemia



- **To remove excess store of potassiun Polystyrene binding resins orally be operation but if patient is already NPO give the dose rectally 1-2gm \kg**

- **To shift K to cells in urgent situations (but level may re-bound with time) : insulin- dextrose, Sodium bicarbonate, Calcium gluconate**
- **These managements in renal patient may not adequate and the need of renal replacement therapy .(HD or PD)**

Bleeding- effects and course

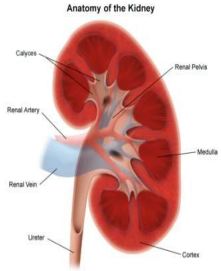


Chronic uremia (or more accurately the cl presence of uremic toxins) is associated platelets dysfunction due to :

1. **defective platelet granule release of serotonin and thromboxane A2 (activation defect)**
2. **reduced activity of platelet surface receptor (aggregation defect)**
3. **reduced vonWillebrand factor activity (adhesion defect)**

Anemia alters the normal pattern of flow in vessels, where red cells are predominantly found centrally and platelets are thrust outward towards the vessel wall.

bleeding – actions



Bleeding time is the most sensitive indicator of the extent o platelet dysfunction , while BT more than 10-15 min have been associated with high risk of hemorrhage.

1. **To minimize uremic complication patients with ESRD should undergo dialysis on day before surgery**

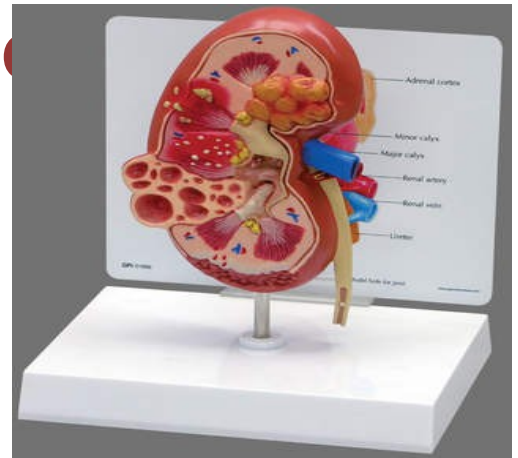
2. **Anti platelet agents should not be given within 72hr before surgery in patients with ESRD or uremic CKD ,**
3. **Administration of Desmopressin (dDAVP) releases factor VIII and von Will brand factor from the endothelium, and this action lasts for between 4 and 12hours**

Small amount of heparin is used during hem dialysis with residual anticoagulant effect lasting as long as 2and 1\2 hr

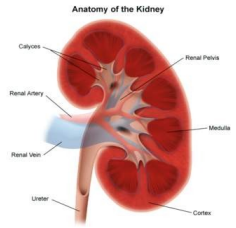
- **The effect of this heparin on intraoperative bleeding not clear Therefore unless heparin free dialysis is used it is prudent to wait at least 12 hrs after last hemodialysis with heparin before an invasive surgical procedure is performed .**

Acid- base disorder

- **Chronic metabolic acidosis in patient with ESRD has not been associated increase risk during anesthesia**
- **Acidosis in patients with renal impairment decrease effectiveness of some lo anesthesia**



Anemia



- **While there is no published standard for safe preoperative hemotacrit levels in patients with impair renal function study demonstrated increase intraoperative complications in patients with ESRD preoperative hemotacrit level ranging from 20-26%**

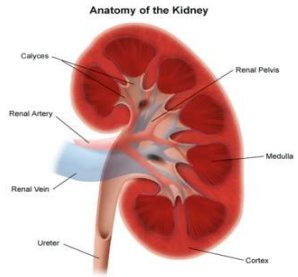
- **Correcting severe -hemodynamically significant- anemia may help to avoid complications .**

1. **transfusion is necessary in some circumstances ; BUT the result of blood product transfusion is antibody formations which may decrease patients future chances of successful transplantation**

2. **If the surgery is elective erythropoietin may be administration to raise hemotacrit to acceptable value iron stores should be checked in all patients receiving erythropoietin for max effectiveness of erythropoietin .**

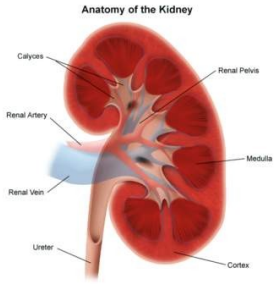
Infection control- course

- **Renal failure patients are at increased risk of bacterial colonization and infection by virtue of altered neutrophil and monocyte function, impaired lymphocyte activation or number cytokinemia and abnormal path recognition**



- **This risk naturally extends to organisms such as MRSA (methicillin-resistant Staphylococcus aureus) , VRE(vancomycin-resistant enterococcus) and ESBL (Extended-spectrum beta-lactamase producing gram-negative organisms**)

Infection control- actio



- **Many patients with renal disease especially CKD receive prophylactic ABs for surgical procedures particularly dialysis graft procedures .**

- **First generation cephalosporin in a adjusted dosage appropriate for renal function would be a better choice for empiric therapy .**

- **Even with minor procedures (dental care) antibiotics prophylaxis using standard endocarditic regimens is recommended for first several months after the placement of synthetic vascular access graft , the purpose to avoid bacterial seeding of the grafts before epithiliezation occurs**

Preoperative care with renal patients who treated **conservatively**

Preoperative care with renal patients who treated **conservatively**

We have to establish the level of renal function impairment(RIFLE INDEX)
and whether the elevation in BUN and creatinin is prerenal , intrarenal post renal or a combination ,

patients who are euvolemic, responsive to diuretics therapy and have no significant electrolyte abnormalities or bleeding have uncomplicated cases and do not require dialysis before surgery

Patients with volume-overload; (edema , CHF or pulmonary congestion) need further cardiovascular evaluation then combination diuretic therapy can help treat theses patients to achieve euvolemic prior surgery

If postoperative dialysis is imminent the surgeons should advice to place a temporary catheter intraoperative . Avoid femoral cannulation (which carry risk of infection) and sub-clavian (maintain a site for AV-shunt)

Preoperative care with renal patients who treated **conservatively**

- **Further deterioration in renal function can be avoided by identifying and elimination potential nephrotoxic agents , these include substitution or dosage adjustment antibiotics, sedative and muscle relaxants. NSAIDs should be avoided as should radiocontrast materials.**

- **Electrolyte abnormalities must be identified and corrected preoperatively**

Preoperative care with renal patients who already **on dialysis**

Preoperative care with renal patients who already **on dialysis**

- **The following need to be determined :**

1. **Dialysis adequacy**
2. **Preoperative dialysis need**
3. **Postoperative dialysis timing**
4. **Dosage requirements for all medications**

- **Patients on hemodialysis usually require preoperative dialysis within 24 hrs before surgery to reduce the risk of volume overload, hyperkalemia and excessive bleeding .**

- **Patients with peritoneal dialysis who undergoing abdominal surgery should be switched to hem dialysis until wound healing is complete.**
- **Peritoneal dialysis should be continued for those undergoing non abdominal surgery** .

Preoperative care with renal patients who already **on dialysis**

- **The goals of dialysis therapy for these patients are to achieve euvolemic or dry weight , normalize serum potassium level and increase serum bicarbonate levels to attenuate metabolic or respiratory acidosis**

  The dialysis treatment preceding surgery also will optimize control of the uremic environment which in turn mitigates platelet dysfunction , impaired immune function , malnutrition and possibly impaired wound healing.

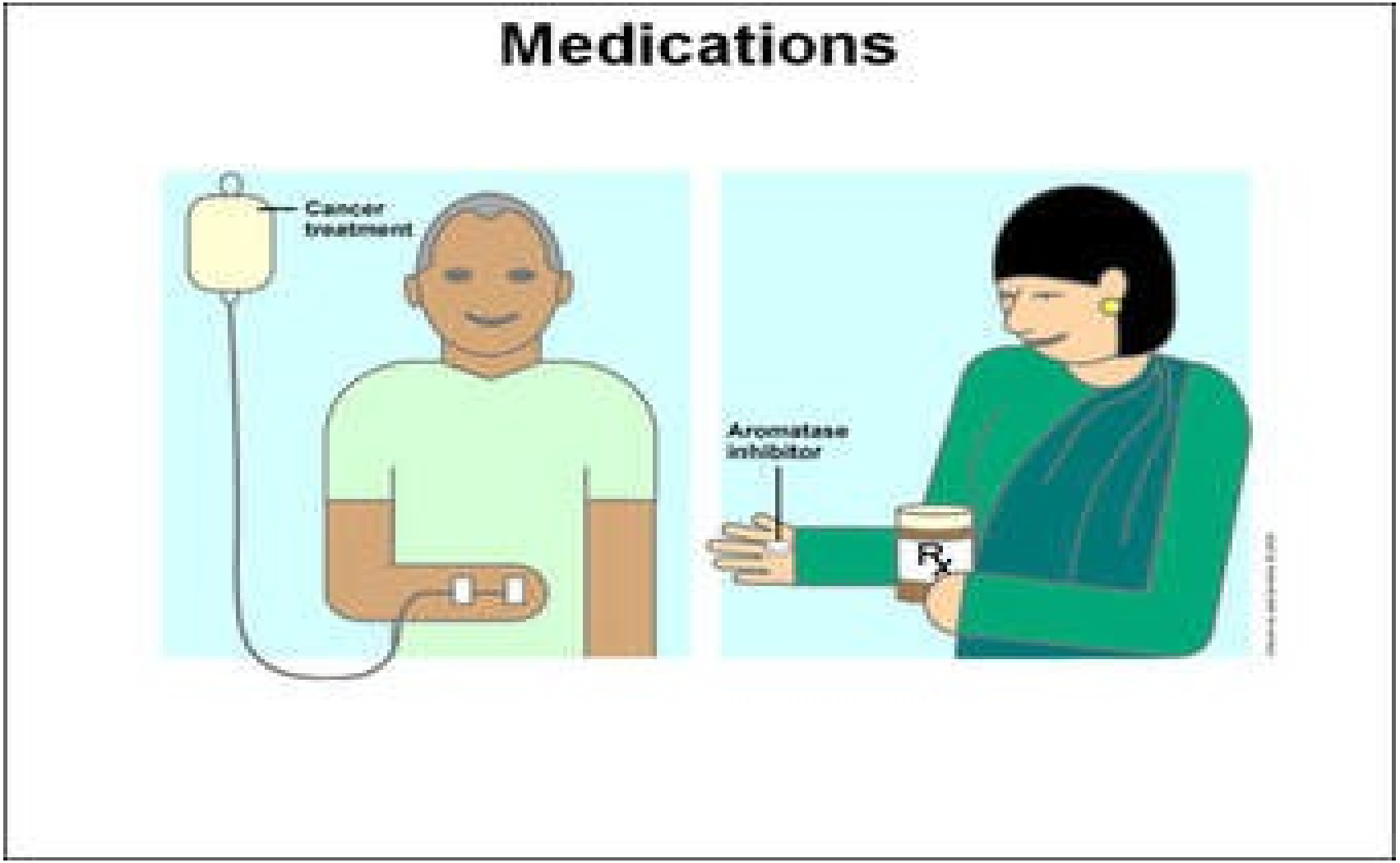
- **Patients who are chronically under dialyzed and hypervolemic may benefit from daily dialysis for few days preceding elective surgery**

Preoperative care with renal patients who already **on dialysis**

- **Under dialyzed patients are at increased risk of developing Pericarditis which obviously should be avoided preoperatively**

- **Inadequate dialysis may cause intravascular hypovolemia (even in the presence of peripheral edema) and electrolyte**

Operative care



Operative care

- **Position of the patient on the operation table also influence kidney function , positioning of patient primarily in anti – trendlenburg position because flexed lateral or sedentary**

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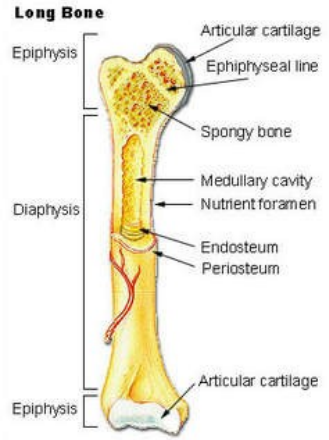
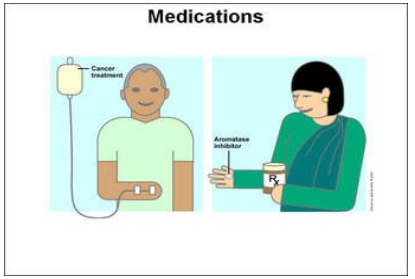
Operative care

- **You would ask anesthetist to supervise transfer of the patient to and from the table as they could suffe**



- **Intravenous access and blood pressure monitoring should avoid the AV fistula arm.**

Operative care



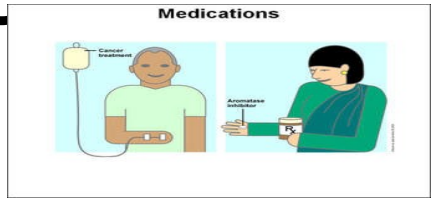
Anesthetic drugs

- **Propofol is an intravenous induction agent, which can also be administered by continuous infusion to he pharmacokinetics of bolus administration , and of maintenance infusion, do not seem to be markedly altered in ESRD patients (including those dialyzed 12 hours prior to surgery)**
- **Succinylcholine is depolarising agent that may release potassium from the muscle**

The non-depolarising muscle relaxant drug atracurium, and the stereoisomer cis-atracurium, undergo a process called Hofmann elimination which is independent of renal and hepatic function, making these agents useful neuromuscular blockers for the renal failure patient

Operative care

Opioid analgesics

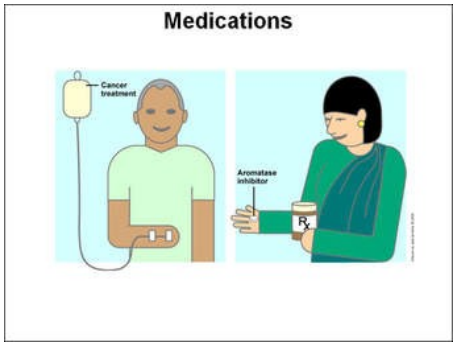


- **When considering Perioperative analgesic requirements for HD patients it is important to recognize the effect of renal failure both on the clearance of both parent drug and its metabolites e.g. morphine**

- **Although end stage renal failure prolongs the elimination half-life and reduces the central clearance of remifentanil, the clinical significance of these findings appears to be minimal intraoperative**

- **use of such an agent requires additional techniques to provide post-operative analgesia**

Operative care



Use of regional and neuraxial anesthesia and analgesia

- **Regional anesthetic techniques have been used to aid creation of arteriovenous Fistulae**

In chronic renal failure patients with low bicarbonate values the onset of action of local anesthetics may be delayed

Platelet number/function and coagulation profile should be checked before any regional technique is carried out in these patients

Post operative care

Post operative **assessment**

- **Whether or not to admit the patient to a high dependency or intensive care unit post-operatively will depend on the nature of the surgery and specific patient factors (determined at preoperative assessment) that may place them at higher risk of cardio respira Complications**

- **Evaluation of fluid balance, electrolytes and coagulation is mandatory**
- **Electrolyte, urea and creatinin levels should be checked in the early postoperative period and as indicated thereafter.**

Post operative care

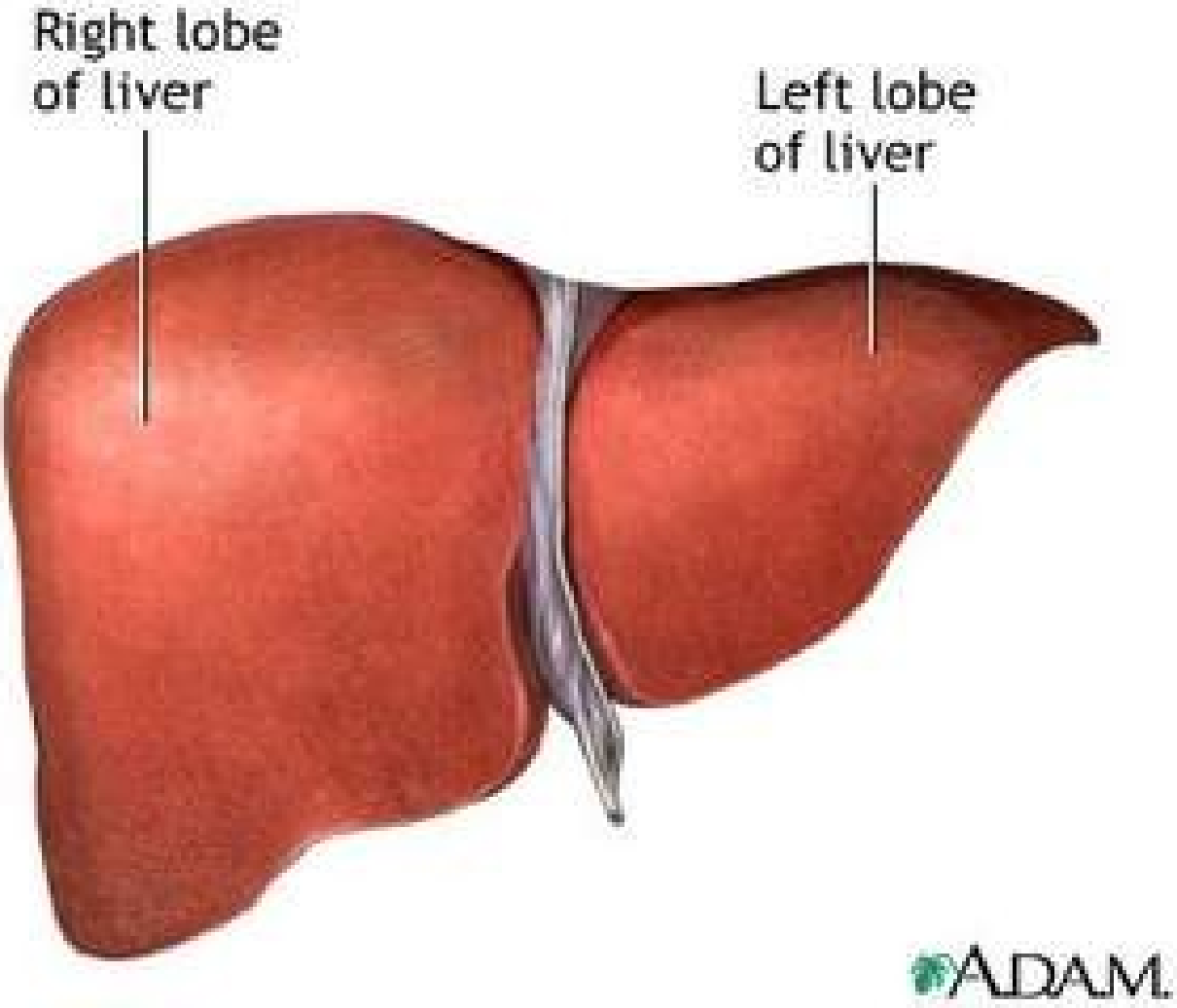
- **The patient usually undergoes dialysis as a scheduled**
- **Haemodialysis should ideally be delayed until the risk of fluid shifts and hemorrhage has fallen(some suggest at least 24 hours post-operatively)**
- **however in case of significant imbalance in body fluid , hydration status , coagulation caused by surgical intervention , the patient may also be dialyzed in the immediate post operative period**

- **Potassium solutions should not be used in the post operative period due to risk of hyperkalemia**
- **Use of some agents like meperidine for postoperative pain control should be avoided because accumulation of its metabolites can cause seizure in patients CKD epically those on dialysis**

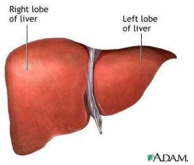
Post operative care

- **The immediate post-operative period will require close attention to fluid and electrolyte balance .As with intraoperative fluids, we tend to give a low background maintenance fluid infusion(taking into account native urine output and insensible losses) supplemented by bolus doses of crystalloid or colloid to maintain hemodynamic stability, and help reduce the likelihood of fluid overload.**

Liver diseases and surgery



Hepatopathies and surgery



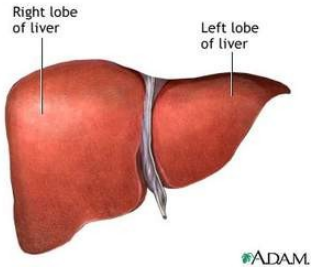
- **The liver is vital for protein synthesis, coagulation homeostasis, glucose homeostasis, bilirubin excretion, drug metabolism, and toxic removal, among other critical functions**

- **In general, the liver has substantial functional reserve because of its dual blood supply: portal-venous (75%) and hepatic-arterial (25%). Hence, clinical manifestations of liver damage occur only after considerable injury**

- **patients with liver disease have an inappropriate response to surgical**

- **Patients with liver disease are accordingly at an increased risk of bleeding, infection, impaired wound healing, postoperative hepatic decompensation, including hepatic coma or death. Therefore, the decision to perform surgery in these patients must be heavily weighed.**

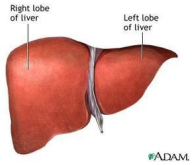
Preoperative Assessment and Management



Asymptomatis patients

Acuity of the liver disease

Chronic liver disease



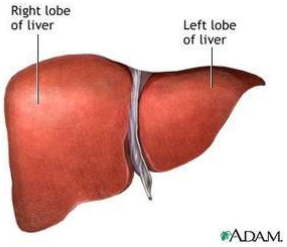
- ***The evaluation of any patient undergoing surgery should include thorough history taking and physical examination***

Asymptomatic patients

- **In asymptomatic patients, this is an extremely valuable screening tool. Risk factors (pervious blood transfusions,, illicit drug use, sexual history,, and personal or family history of jaundice) for liver disease should be explored.**

- **complete medication review and herbal agents should be performed.**

- **Asymptomatic patients with significantly abnormal liver function should have their elective surgery postponed and their liver disease investigated**



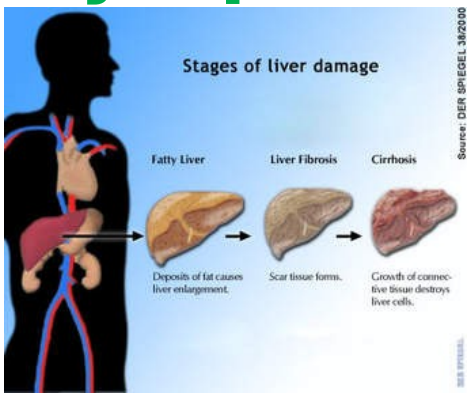
Acuity of liver disease

patients with fulminant hepatic failure have been associated with an increased risk of

surgical morbidity and mortality Patients with these conditions tend to have morbidity rates higher than those with chronic cholestatic disease. Therefore, it is prudent to postpone surgery, especially elective surgery, until transaminitis is resolved

Chronic liver disease

- ***The appropriate* preparation *of these patients include manage the following***
- **Coagulopathy and thrombocytopenia**
- **Ascites**
- **Encephalopathy**
- **Renal dysfunction**
- **Pulmonary disease**
- **Malnutrition**

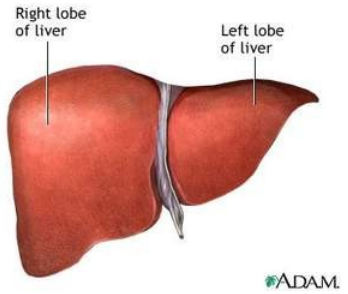


Coagulopathy and thrombocytopenia

1. hepatic synthetic dysfunction :all of the coagulation factors (with the exception of von Willebrand factor) are produced in the liver
2. malnutrition and vitamin K malabsorption

- Vitamin K supplementation and administration of fresh-frozen plasma (FFP) are recommended to correct coagulopathy
- before surgery
- Cryoprecipitate might also be required to r

the prothrombin time



A prolonged bleeding time can also be corrected with diamino-8-D-arginine vasopressin (DDAVP)

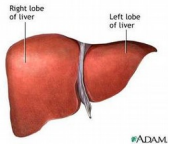
Finally, platelet transfusion may be necessary based on the patient's platelet level

Ascites

- **Ascites is important to assess and manage before surgery because it can lead to wound dehiscence, abdominal wall herniation, and respiratory compromise secondary to reduced lung expansion**

- **In general, Ascites should be treated aggressively with diuretics and/or large-volume paracentesis before surgery. A low sodium diet is another important component of Ascites management**

- **Ascites fluid can also be removed intraoperative at laparotomy It is important to take note of the volume of fluid removed and the patient's baseline renal function and to consider albumin replacement to maintain intravascular volume and preven paracentesis-induced circulatory dysfunction**



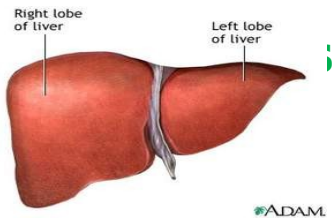
- **Ascetics fluid should also be analyzed to rule out spontaneous bacterial peritonitis.**

Encephalopathy

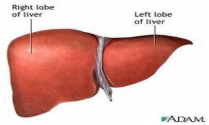
- **Multiple factors in the preoperative and postoperative periods may precipitate encephalopathy, such as infection and/or sepsis, diuretics, hypokalemia, metabolic alkalosis, constipation, use of central nervous system (CNS) depressants such narcotics and benzodiazepines, hypoxia, azotemia, and gastrointestinal bleeding**

- **Addressing the underlying precipitant through correction of electrolyte abnormalities, treatment of infection, management of gastrointestinal bleeding, and restriction of sedatives may help prevent or decrease encephalopathy**

- **Hepatic encephalopathy is also often tre[illegible] administering lactulose or poorly absorb[illegible] such as rifaximin**



Renal dysfunction



- **Patients with chronic liver disease are at risk for renal dysfunction at baseline due to the propensity for hemodynamic derangements that increase the risk of renal hypo perfusion**

- **This risk is increased by diuretics, nephrotoxic agents including no steroidal anti-inflammatory drugs (NSAIDs), large-volume paracentesis performed without albumin supplementation, infections, and gastrointestinal bleeding**

- **Hepatorenal syndrome is another concerning occurrence in this patient population.**

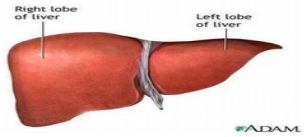
Renal dysfunction

- **The risk of renal dysfunction in the postoperative period is increased because of hemodynamic changes and fluid shifts or losses, particularly if Ascites fluid is removed at laparotomy**

- **Renal function should be closely monitored pre- and postoperatively, with appropriate measures taken to address or eliminate potential insults**

- **Attention should also be given to the fact that serum creatinin levels often overestimate the glomerular filtration rate (GFR) in patients with cirrhosis**

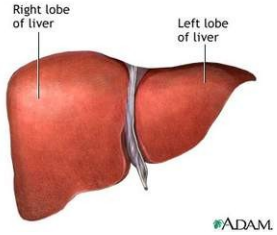
Pulmonary disease



- **Pulmonary complications of end-stage liver disease include hepatopulmonary syndrome, port pulmonary hypertension, and hepatic hydrothorax**

- ***Hepatopulmonary syndrome* is associated with vascular shunt, and the risk of hypoxia and ventilation-perfusion mismatch should be addressed before surgery**
- ***Porto pulmonary hypertension* can eventually lead to right heart failure and hypoxia**
- **Hepatic hydrothorax, usually unilateral and in the right hemi thorax, can occur and impair ventilation**

Intraoperative care



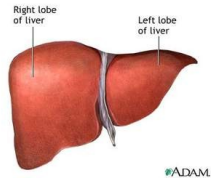
Anesthesia

Patients with liver disease are more likely than patients without liver disease to have hepatic decompensation with the use of anesthesia

General anesthesia **reduces total hepatic blood flow, especially the contribution of the hepatic Anesthetics causing sympathetic blockade further blunt this response. The result of this reduction in hepatic perfusion is a drastic loss of their remaining marginal hepatic function.**

artery

Intraoperative care



- all the inhaled anesthetics, halothane and enflurane appear to reduce hepatic artery blood flow the most because of systemic vasodilatation and a mild negative isotropic effect

- Halothane is also associated with the greatest risk of hepatotoxicity
- Isoflurane has fewer effects on hepatic blood flow and less hepatic metabolism ; it is the preferred anesthetic agent in patients with liver disease

- Newer halo alkanes, such as sevoflurane and desflurane, also undergo less hepatic metabolism than halothane or enflurane.

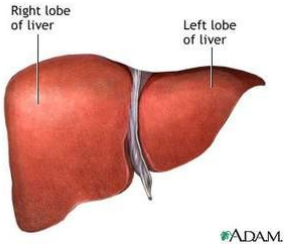
Intraoperative care

- **The drug effects of neuromuscular blocking agents may be prolonged in patients with liver disease because of impaired biliary excretion**

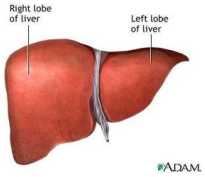
- **Atracurium has been recommended as the agent of choice because it relies on neither the liver nor kidney for excretion**

- **morphine, meperidine, benzodiazepines, and barbiturates of their dependence on the liver for metabolism should be used with caution**

- **Fentanyl is the preferred**



Postoperative care



- **Patients must be observed closely for signs of acute hepatic decompensation, such as worsening jaundice, encephalopathy, and Ascites**

- **Sedatives and pain medications should be carefully titrated to prevent an exacerbation of hepatic encephalopathy**

- **Poor stooling, for example due to postoperative ileus or narcotic- or immobility-related constipation, despite lactulose dosing, can also contribute to postoperative encephalopathy.**

- **Renal function should also be monitored because of the risk of hepatorenal syndrome and fluid shifts that occur due . These**

- **patients should also be monitored for surgical site complications such as infections, bleeding, and dehiscence to surgery**

References

- **American academy of pediatric – textbook**
- **Nelson 19 text book**
- **Up-to-date (medical management of dialysis patients)**
- **Medscape (preoperative evaluation of renal diseases)**
- **E-medicine (preoperative assessments of renal patients**

My lovely patient