POSTOPERATIVE OLIGURIA

Susan Garwood, M.B.ChB, B.Sc., FRCA

Urine flow is an indicator of blood flow to the kidneys. Oliguria is defined as urinary output <0.5 ml/kg/hour. Postoperative oliguria is a bad prognosticator when it indicates perioperative acute renal failure (ARF) (Table 1). Perioperative ARF has a poor outcome, with up to a 90% mortality rate in some series. Perioperative ARF accounts for 50% of all new dialysis patients. Postoperative oliguria must be aggressively pursued. It is better to prevent postoperative oliguria and perioperative ARF than to deal with it once it has become established. Recognize patients at risk and procedures liable to be associated with this problem.[1] Review patient data and establish baseline renal function. Monitor renal performance vigilantly from the outset; measure urine output half hourly and act aggressively in managing a falling output. Recognize what is "normal" for each patient.

TABLE 1 Indices Differentiating Prerenal from Intrinsic Renal Failure

	Prerenal failure	*Intrinsic renal failure*
Osmolality	—	<400 mOsm/kg H_2O
U/P osmolality	—	<1.5
U/P creatinine	>40	<10
U/P urea	>14	<10
Urinary sodium	<20	>40
Renal failure index	<1	>1
Fe_{Na}	<1%	>1%
Free water clearance	≤20 ml/hr	≥20 ml/hr
Creatinine clearance	>25 ml/min	<25 ml/min

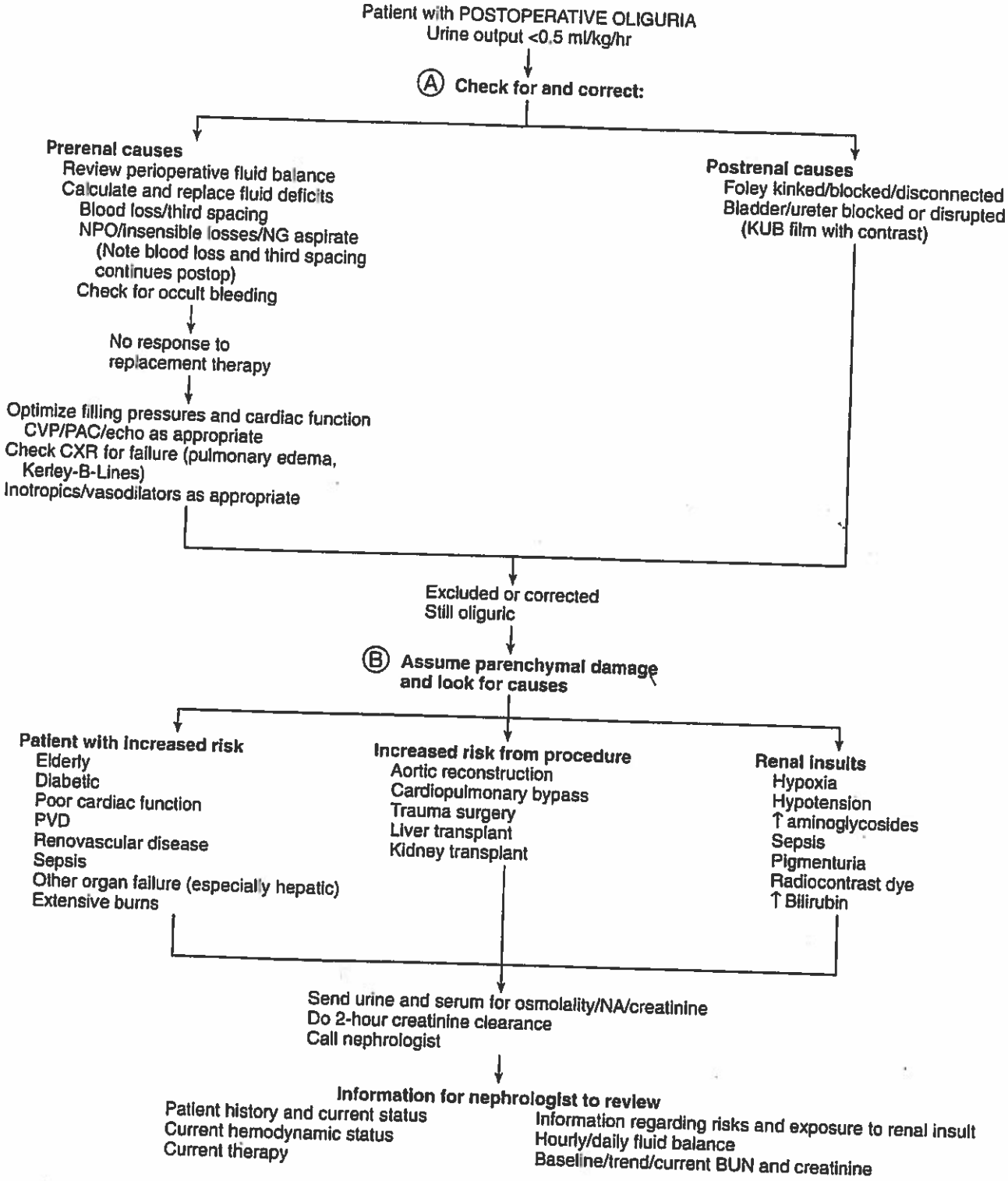
From Garwood S, Hines RL. Int Anesth Clin 1996; 34:175.
U = urine; *P* = plasma; Fe_{Na} = fractional excretion of sodium.

A. Traditionally, postoperative oliguria is divided into prerenal, renal (parenchymal), and postrenal etiologic classifications. Prerenal causes are the most common and result in reduced renal perfusion. These problems need to be immediately addressed; renal hypoperfusion can rapidly result in renal parenchymal damage and established ARF. Under most circumstances, renal perfusion is better preserved by increasing cardiac output than by increasing blood pressure with vasoconstrictors.[2] Postrenal causes are usually the most easily remedied and need to be corrected; urinary tract obstruction can also lead to renal parenchymal damage.

B. Renal causes of oliguria are the most difficult to diagnose and treat. If oliguria persists after exclusion of, or meticulous correction of, pre- and postrenal causes, then assume there is renal parenchymal damage. First, establish the patient's baseline, preoperative renal function. Review the chart for ischemic periods (hypotension, hemorrhage, hypoxia), nephrotoxic exposure, and patient history of renal insufficiency. (A patient with poor renal reserve may be tipped into ARF by even small perturbations.) Call for a nephrology consult early. It has been known for 25 years that the sooner therapy commences, the better the outcome.[3] The conversion of oliguric to nonoliguric renal failure with the help of drugs (furosemide, mannitol, dopamine) is very controversial. Their mechanisms of action are not yet fully understood, and treatment is not always beneficial.[4] Do not initiate this therapy without (1) first measuring baseline serum and urine parameters for derived renal indices,[5] (2) careful consideration of the effect of these drugs on the cardiorespiratory system, and (3) advice from a nephrologist.

References

1. Novis BK, Roizen MF, Aronson S, et al. Association of preoperative risk factors with postoperative acute renal failure. Anesth Analg 1994; 78:143–9.
2. Andersson L-G, Bratteby L-E, Ekroth R, et al. Renal function during cardiopulmonary bypass: influence of pump flow and systemic blood pressure. Eur J Cardiothorac Surg 1994; 8:597–602.
3. Kleinknecht D, Jungers P, Chanard J, et al. Uremic and nonuremic complications in acute renal failure: evaluation of early and frequent dialysis on prognosis. Kidney Int 1972; 1:190–6.
4. Gelman S: Does mannitol save the kidney. Anesth Analg 1996; 82:899–901 (editorial).
5. Garwood S, Hines RL. Renal function monitoring. Int Anesth Clin 1996; 34:175–94.


Patient with POSTOPERATIVE OLIGURIA
Urine output <0.5 ml/kg/hr
Ⓐ Check for and correct:
Prerenal causes
Review perioperative fluid balance
Calculate and replace fluid deficits
Blood loss/third spacing
NPO/insensible losses/NG aspirate
(Note blood loss and third spacing continues postop)
Check for occult bleeding
No response to replacement therapy
Optimize filling pressures and cardiac function
CVP/PAC/echo as appropriate
Check CXR for failure (pulmonary edema, Kerley-B-Lines)
Inotropics/vasodilators as appropriate
Postrenal causes
Foley kinked/blocked/disconnected
Bladder/ureter blocked or disrupted
(KUB film with contrast)
Excluded or corrected
Still oliguric
Ⓑ Assume parenchymal damage and look for causes
Patient with increased risk
Elderly
Diabetic
Poor cardiac function
PVD
Renovascular disease
Sepsis
Other organ failure (especially hepatic)
Extensive burns
Increased risk from procedure
Aortic reconstruction
Cardiopulmonary bypass
Trauma surgery
Liver transplant
Kidney transplant
Renal insults
Hypoxia
Hypotension
↑ aminoglycosides
Sepsis
Pigmenturia
Radiocontrast dye
↑ Bilirubin
Send urine and serum for osmolality/NA/creatinine
Do 2-hour creatinine clearance
Call nephrologist
Information for nephrologist to review
Patient history and current status
Current hemodynamic status
Current therapy
Information regarding risks and exposure to renal insult
Hourly/daily fluid balance
Baseline/trend/current BUN and creatinine