

Episode 196: Urologic surgery and Renal Failure

On this episode: Drs. Gillian Isaac and Jed Wolpaw

In this 196th episode I welcome Dr. Gillian Isaac back to the show to discuss another ABA keyword. We discuss urologic surgery and renal failure.

[All Keyword Episodes](#)

Questions & Notes

Click → jump to answers/notes.

WHAT'S BEEN TESTED

TRANSURETHRAL RESECTION OF PROSTATE (TURP)

Which statement re: TURP is true?

- A. Hydrostatic pressure has minimal amount of fluid absorbed
 - B. 10-30ml/min absorbed
 - C. Use of iso-osmotic solutions ↓ risk of hyponatremia
 - D. CNS complications independent of type of irrigation used
 - E. Spinal anesthesia to T6 will mask symptoms of overhydration
- Discussion

When used for irrigation for TURP, glycine 1.5% associated with each of following EXCEPT?

- A. Hemolysis
 - B. Hyperammonemia
 - C. Cerebral edema
 - D. Hypofibrinogenemia
 - E. Visual disturbances
- Discussion

Which of following is complication of using glycine irrigation during TURP?

- A. Epileptiform activity on EEG
 - B. Peripheral neuropathy
 - C. Tachycardia
 - D. Transient blindness
 - E. Transient deafness
- Discussion

During TURP, intravascular absorption of glycine most commonly results in?

- A. Alkalosis
 - B. Hemolysis
 - C. Hypertension
 - D. Tachycardia
 - E. Wheezing
- Discussion
-

67M undergoes hyperbaric spinal, at end of 50 minute TURP procedure, level is T5-6, BP 120/70. Within 2 minutes of transfer to stretcher, pt has nausea and BP is 76/42. Which of following most likely cause of acute hypotension?

- A. Acute CHF
- B. Decreased venous return
- C. Dilutional hyponatremia
- D. Progression of sympathetic block
- E. Unrecognized bladder perforation

Discussion

During TURP under spinal anesthesia w/ sensory to T10, pt has sudden onset of upper abdominal pain and nausea. BP 120/80 → 150/90. Pt becomes diaphoretic. Most likely diagnosis?

- A. Bladder perforation
- B. Hemolysis
- C. Hypervolemia
- D. Hyponatremia
- E. Myocardial ischemia

Discussion

60M undergoes TURP in lithotomy. Surgeon reports right leg is jumping. This movement most likely caused by stimulation of which nerve?

- A. Femoral
- B. Lateral femoral cutaneous
- C. Obturator
- D. Pudendal
- E. Sciatic

Discussion

65M is disoriented, has headache and nausea 30 min after TURP under spinal anesthesia. HR 50, BP 180/110. Which of following least likely?

- A. Decreased serum osmolality
- B. Serum sodium concentration 132mEq/L
- C. Increased serum ammonia concentration
- D. Bibasilar rales
- E. Jugular venous distension

Discussion

After first 70minutes of TURP, 70M becomes tachycardic, hypertensive, and has shortness of breath. Na 116. After informing surgeon that procedure should be terminated ASAP, most appropriate next step?

- A. Administer furosemide
- B. Administer labetalol
- C. Administer 3% sodium chloride
- D. Change irrigating solution to normal saline
- E. Induce general endotracheal anesthesia

Discussion

68M 100kg undergoes TURP via GA. In PACU, is restless, confused, Na 110. How many mEq needed to raise Na to 120?

- A. 300 mEq
- B. 400 mEq
- C. 500 mEq
- D. 600 mEq

Discussion

What is complication of glycine irrigation for TURP?

EXTRACORPOREAL SHOCKWAVE LITHOTRIPSY (ESWL)

During ESWL, shockwave should be synchronized with?

-
- A. P-wave
 - B. R-wave
 - C. T-wave
 - D. Peak inspiration
 - E. End expiration
- Discussion

Which of following physiologic changes occurs w/ immersion in water with ESWL?

- A. ↓ cardiac output
 - B. ↓ central venous pressures
 - C. ↑ expiratory reserve volume
 - D. ↓ functional residual capacity
 - E. ↑ stroke volume
- Discussion

Pts who undergoes ESWL are at increased risk for?

- A. Venous air embolism
 - B. Pneumothorax
 - C. Hypotension w/ regional anesthesia at end of procedure
 - D. Post-dural puncture headache w/ spinal anesthesia
- Discussion

RENAL FAILURE

36F who undergoes peritoneal dialysis for renal failure requires emergency surgical exploration for bowel obstruction. Cr 9.8 BUN 124. Most likely coagulation abnormality?

- A. ↓ euglobulin lysis time
 - B. ↓ platelet count
 - C. Prolonged PTT
 - D. Prolonged bleeding time
 - E. Prolonged PT
- Discussion

Which of following re: cisatracurium metabolism is true?

- A. Related to cardiac output
 - B. Decreased by hyperthermia
 - C. Unaffected by ↑ in age
 - D. Decreased by low plasma cholinesterase activity
 - E. Decreased in renal failure
- Discussion

Increase in initial dose and decreased in maintenance dose of pancuronium seen in patients with?

- A. Age
 - B. Burn
 - C. Cirrhosis
 - D. Chronic renal failure
 - E. Fever
- Discussion

Which of following most sensitive indicator of renal failure following trauma?

- A. Central venous pressure
 - B. Creatinine clearance
 - C. Fractional excretion of sodium
 - D. Hourly urine output
 - E. Urine osmolality
- Discussion

Pt with renal failure, which of following muscle relaxants most prolonged elimination half-life?

- A. Atracurium
 - B. Pancuronium
-

-
- C. Succinylcholine
 - D. Tubocurium
 - E. Vecuronium
- Discussion

Which of following statements regarding muscle relaxants is true?

- A. Duration of vecuronium prolonged
 - B. Elimination of atracurium tripled
 - C. Reversal with neostigmine contraindicated
 - D. Onset of mivacurium delayed
 - E. Succinylcholine is contraindicated
- Discussion

73F w/ preop Cr 2.1 develops oliguria during enflurane anesthesia. Urine Na 10, urine osmolarity 415.

Most likely cause?

- A. Acute renal failure
 - B. Chronic renal insufficiency
 - C. Decreased renal perfusion
 - D. Fluoride nephrotoxicity
 - E. Intraop admin of furosemide
- Discussion

Each of following improves coagulation in patients with uremia except?

- A. Conjugated estrogens
 - B. Desmopressin
 - C. Dialysis
 - D. Amicar
 - E. Platelet transfusion
- Discussion

70M requires ORIF of intratrochanteric fracture 24 hours ago. Cr 1.0, BUN 40. Most likely cause of findings?

- A. Acute tubular necrosis
 - B. Chronic renal insufficiency
 - C. Acute dehydration
 - D. Obstruction of bladder outlet
 - E. Recent GI hemorrhage
- Discussion

Pt w/ ESRD has prolonged ventilatory depression after morphine administration. Most likely due to?

- A. ↑ concentration of morphine-6-glucoronide
 - B. Elimination half-life of morphine
 - C. Morphine receptors
 - D. Receptor affinity
 - E. Volume of distribution
- Discussion

Prolonged respiratory depression following administration of morphine to patient in renal failure more likely than normal kidney function because?

- A. ↓ biotransformation
 - B. ↓ protein binding
 - C. ↓ volume of distribution
 - D. Delayed excretion of morphine metabolites
 - E. Effect of acidosis on morphine ionization
- Discussion

Metabolism of which of following hypotensive agents most likely affected in patients with severe renal disease?

- A. Esmolol
 - B. Hydralazine
-

-
- C. Nitroglycerin
 - D. Nitroprusside
 - E. Trimetaphan
- Discussion

61M 70kg undergoes 4-hr resection of AAA with fentanyl and isoflurane. Infrarenal clamping required. 12 hours after, urine output is 15ml/hour with FeNa 6%. Which is most likely cause?

- A. Isoflurane nephrotoxicity
 - B. Hypovolemia
 - C. Intraop renal ischemia
 - D. Positive pressure ventilation
 - E. Unilateral ureteral obstruction
- Discussion

References

Random Recs

What's been tested

3:44

- Urologic surgery:
 - o Heavily tested: TURP and related issues
 - o ESWL: contraindications
- Renal failure:
 - o biggest topic: oliguria
 - o electrolytes, bleeding function, anesthetic management
 - o hemodialysis and labs

Transurethral resection of prostate (TURP)

5:45

- Large volumes of irrigation fluids
- Historically hypo-osmolar solutions
- Lots of exposure to venous sinuses and damage to prostatic capsule → fluid overload (CHF, pulm edema, coagulopathy, hypothermia)
- Specific additives have effects
 - o Glycine → cardiac, renal toxicity → eye involvement when absorbed
- ↑ use of bipolar scopes enabled use of electrolyte containing solutions, though ↓ incidence of TURP syndrome, still see hyponatremia, hypervolemia, pulm edema, CHF

Which statement re: TURP is true?

7:33

- A. Hydrostatic pressure has minimal amount of fluid absorbed
- B. 10-30ml/min absorbed
- C. Use of iso-osmotic solutions ↓ risk of hyponatremia
- D. CNS complications independent of type of irrigation used
- E. Spinal anesthesia to T6 will mask symptoms of overhydration

Discussion

- A is false
- B sounds reasonable
- D is false
- E symptoms still seen
- C is false b/c isotonic would be true, but an iso-osmotic solution like sorbitol but may still cause hyponatremia
- Consider this as an oral boards stem: would you run GA or spinal?

When used for irrigation for TURP, glycine 1.5% associated with each of following EXCEPT?

10:27

- A. Hemolysis
- B. Hyperammonemia
- C. Cerebral edema
- D. Hypofibrinogenemia
- E. Visual disturbances

Discussion

- As mentioned, B,C,E are true
- D from dilution
- A false b/c probably not hyperosmolar enough

Which of following is complication of using glycine irrigation during TURP?

11:25

- A. Epileptiform activity on EEG
- B. Peripheral neuropathy
- C. Tachycardia
- D. Transient blindness
- E. Transient deafness

Discussion

- D is just a fact you have to know

During TURP, intravascular absorption of glycine most commonly results in?

11:48

- A. Alkalosis
- B. Hemolysis
- C. Hypertension
- D. Tachycardia
- E. Wheezing

Discussion

- C is most common

67M undergoes hyperbaric spinal, at end of 50 minute TURP procedure, level is T5-6, BP 120/70. Within 2 minutes of transfer to stretcher, pt has nausea and BP is 76/42. Which of following most likely cause of acute hypotension?

12:14

- A. Acute CHF
- B. Decreased venous return
- C. Dilutional hyponatremia
- D. Progression of sympathetic block
- E. Unrecognized bladder perforation

Discussion

- This is applying facts of TURP syndrome to whole scenario
- Legs brought down from lithotomy likely cause ↓ venous return (Answer: B)

During TURP under spinal anesthesia w/ sensory to T10, pt has sudden onset of upper abdominal pain and nausea. BP 120/80 → 150/90. Pt becomes diaphoretic. Most likely diagnosis?

13:40

- A. Bladder perforation
- B. Hemolysis
- C. Hypervolemia
- D. Hyponatremia
- E. Myocardial ischemia

Discussion

- A – most likely to cause this symptomatology
- If bladder perforated, all the irrigation fluid will spill into peritoneal cavity

60M undergoes TURP in lithotomy. Surgeon reports right leg is jumping. This movement most likely caused by stimulation of which nerve?

14:43

- A. Femoral
- B. Lateral femoral cutaneous
- C. Obturator
- D. Pudendal
- E. Sciatic

Discussion

- What gets compressed in this position?

- C: "obturator jerk", a known reflex that is ideally blocked

65M is disoriented, has headache and nausea 30 min after TURP under spinal anesthesia. HR 50, BP 180/110. Which of following least likely?

16:28

- A. Decreased serum osmolality
- B. Serum sodium concentration 132mEq/L
- C. Increased serum ammonia concentration
- D. Bibasilar rales
- E. Jugular venous distension

Discussion

- B: this concentration is typically not this symptomatic

After first 70minutes of TURP, 70M becomes tachycardic, hypertensive, and has shortness of breath. Na 116. After informing surgeon that procedure should be terminated ASAP, most appropriate next step?

Time

- A. Administer furosemide
- B. Administer labetalol
- C. Administer 3% sodium chloride
- D. Change irrigating solution to normal saline
- E. Induce general endotracheal anesthesia

Discussion

- This sodium concentration is much lower than previous question. Not yet seizing, so very carefully correct sodium. Start with fluid restriction and loop diuretic
- C would be too rapid
- Think about this question as an oral board stem!

68M 100kg undergoes TURP via GA. In PACU, is restless, confused, Na 110. How many mEq needed to raise Na to 120?

19:39

- A. 300 mEq
- B. 400 mEq
- C. 500 mEq
- D. 600 mEq

Discussion

- You either know the equation or not!
- Multiply patient's TBW by change in sodium desired
 - o $0.6 * 100 = 60L * 10 = 600 \text{ mEq}$
- Tip: calculations are usually simple. This can give you an idea of whether you're on track.

What is complication of glycine irrigation for TURP?

21:22

- Transient blindness!

Extracorporeal Shockwave Lithotripsy (ESWL)

21:58

- Targeting urologic stones using electromagnetic shocks to break up stone into smaller fragments.
- Absolute contraindications:
 - o Pregnancy
 - o Untreated UTI or urosepsis
 - o Distal ureteral obstruction
 - o Uncorrected coagulopathy
 - o AAA near stone
- Relative contraindication
 - o Morbid obesity
 - o Skeletal abnormalities or hardware preventing positioning
 - o Renal malformation
 - o Uncontrolled hypertension
 - o Pacemaker
 - o Renal insufficiency

During ESWL, shockwave should be synchronized with?

23:01

- A. P-wave
- B. R-wave
- C. T-wave
- D. Peak inspiration
- E. End expiration

Discussion

- Like defibrillation, risk of R-on-T phenomena. Want to sync with R (Answer: B)

Which of following physiologic changes occurs w/ immersion in water with ESWL?

24:16

- A. ↓ cardiac output
- B. ↓ central venous pressures
- C. ↑ expiratory reserve volume
- D. ↓ functional residual capacity
- E. ↑ stroke volume

Discussion

- What happens when immersed in water? Compression of submerged body part.
- In this case, lower body compression will ↑ venous return → ↑ stroke volume (Answer: E)

Pts who undergoes ESWL are at increased risk for?

25:19

- A. Venous air embolism
- B. Pneumothorax
- C. Hypotension w/ regional anesthesia at end of procedure
- D. Post-dural puncture headache w/ spinal anesthesia

Discussion

- Vasodilation from spinal may be partially compensated by submerged body that increases venous return. When getting out of water, will lose that ↑ venous return then potentially results in hypotension (Answer: C)

Renal failure

27:45

- Neuromuscular blockers
 - o Rocuronium and vecuronium eliminated by liver and kidneys
 - o Elimination of pancuronium increased by 97% in patients w/ renal failure
 - o Duration of atracurium is unaffected
- Conjugation of glucuronic acid is major biotransformation of morphine
 - o M-3-G and M-6-G eliminated via kidneys
- Decreased platelet factor activity, abnormal platelet adhesion and aggregation
- GFR best overall indicator of kidney function
- Three major causes of **postop oliguria**
 - o Pre-renal: hypovolemia, low renal blood flow due to hypotension, low cardiac output, excess vascular resistance, intraabdominal hypertension
 - o Intra-renal: acute tubular necrosis, contrast dye, tumor lysis, myoglobin, hemoglobinemia
 - o Post-renal: ureteral and catheter dysfunction

36F who undergoes peritoneal dialysis for renal failure requires emergency surgical exploration for bowel obstruction. Cr 9.8 BUN 124. Most likely coagulation abnormality?

30:16

- A. ↓ euglobulin lysis time
- B. ↓ platelet count
- C. Prolonged PTT
- D. Prolonged bleeding time
- E. Prolonged PT

Discussion

- Uremia → platelet dysfunction not count (B), but bleeding time (Answer: D)

Which of following re: cisatracurium metabolism is true?

31:35

- A. Related to cardiac output
- B. Decreased by hyperthermia
- C. Unaffected by ↑ in age
- D. Decreased by low plasma cholinesterase activity
- E. Decreased in renal failure

Discussion

- Unlike rocuronium or vecuronium, will undergo Hoffman-Elimination where rate is related to temperature (↑ by hyperthermia)
- Answer: C

Increase in initial dose and decreased in maintenance dose of pancuronium seen in patients with?

33:45

- A. Age
- B. Burn
- C. Cirrhosis
- D. Chronic renal failure
- E. Fever

Discussion

- C b/c metabolism but larger volume of distribution

Which of following most sensitive indicator of renal failure following trauma?

34:40

- A. Central venous pressure
- B. Creatinine clearance
- C. Fractional excretion of sodium
- D. Hourly urine output
- E. Urine osmolality

Discussion

- Answer: B
- Creatinine clearance is slightly higher than GFR b/c both re-absorbed and secreted

Pt with renal failure, which of following muscle relaxants most prolonged elimination half-life?

35:46

- A. Atracurium
- B. Pancuronium
- C. Succinylcholine
- D. Tubocurium
- E. Vecuronium

Discussion

- B as mentioned above

Which of following statements regarding muscle relaxants is true?

36:44

- A. Duration of vecuronium prolonged
- B. Elimination of atracurium tripled
- C. Reversal with neostigmine contraindicated
- D. Onset of mivacurium delayed
- E. Succinylcholine is contraindicated

Discussion

- Answer: A – as previously discussed
- Cis/atracurium change should be minimal
- Succinylcholine in renal failure - main concern is potassium level

73F w/ preop Cr 2.1 develops oliguria during enflurane anesthesia. Urine Na 10, urine osmolarity 415. Most likely cause?

38:29

- A. Acute renal failure
- B. Chronic renal insufficiency
- C. Decreased renal perfusion
- D. Fluoride nephrotoxicity
- E. Intraop admin of furosemide

Discussion

- Targeting temptation of inhaled anesthetic association with renal failure
- Answer: C - urine sodium is low = kidney doing the right thing

Each of following improves coagulation in patients with uremia except?

40:02

- A. Conjugated estrogens
- B. Desmopressin
- C. Dialysis
- D. Amicar
- E. Platelet transfusion

Discussion

- Answer: D b/c uremia is not hyperfibrinolysis problem

70M requires ORIF of intratrochanteric fracture 24 hours ago. Cr 1.0, BUN 40. Most likely cause of findings?

41:08

- A. Acute tubular necrosis
- B. Chronic renal insufficiency
- C. Acute dehydration
- D. Obstruction of bladder outlet
- E. Recent GI hemorrhage

Discussion

- Lab findings consistent with pre-renal pathology
- Pay attention to stem – recent fracture, unable to move around → probably dehydrated (Answer: C)
- BUN:Cr > 40 associated with pre-renal cause

Pt w/ ESRD has prolonged ventilatory depression after morphine administration. Most likely due to?

42:14

- A. ↑ concentration of morphine-6-gluconide
- B. Elimination half-life of morphine
- C. Morphine receptors
- D. Receptor affinity
- E. Volume of distribution

Discussion

- As discussed earlier, morphine biotransformation products build up in renal failure (Answer: A)

Prolonged respiratory depression following administration of morphine to patient in renal failure more likely than normal kidney function because?

42:55

- A. ↓ biotransformation
- B. ↓ protein binding
- C. ↓ volume of distribution
- D. Delayed excretion of morphine metabolites
- E. Effect of acidosis on morphine ionization

Discussion

- As previous question and earlier discussion, answer is D

Metabolism of which of following hypotensive agents most likely affected in patients with severe renal disease?

43:35

- A. Esmolol
- B. Hydralazine
- C. Nitroglycerin
- D. Nitroprusside
- E. Trimetaphan

Discussion

- One of nitroprusside infusion is thiocyanate formation which is cleared by kidney (Answer: D)

61M 70kg undergoes 4-hr resection of AAA with fentanyl and isoflurane. Infrarenal clamping required. 12 hours after, urine output is 15ml/hour with FeNa 6%. Which is most likely cause?

44:44

- A. Isoflurane nephrotoxicity
- B. Hypovolemia
- C. Intraop renal ischemia
- D. Positive pressure ventilation
- E. Unilateral ureteral obstruction

Discussion

- Infrarenal clamping still affects renal perfusion, though maybe not as much as suprarenal
- Recall: FeNa > 1% is consistent with intra-renal pathology (Answer: C)

References

Barash Clinical Anesthesia 8th edition and Anesthesiahub.com

Random Recs

The Body Keeps the Score: [Link](#)

Black Klansman: [Link](#)

Axios Today: [Link](#)

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