

Glycine irrigating fluids and sodium levels during TURP/TURB surgery

20th May 2014

Rebecca Barr ST6
Helen Bunting (Cons)
Michael Morrow (Cons)

Introduction

- * Hyponatraemia topical
- * Recent death has highlighted potential complication of hyponatraemia during endoscopic procedures using glycine
- * Discussion at recent directorate meetings regarding consideration to intraoperative Na and Hb monitoring
- * Hypotonic solutions used for TURP/ TURBT
 - * Glycine 1.5% in water (200mOsm/L)
 - * Large volumes used to distend bladder and wash away blood/debris
- * During TURP, 20ml/min of glycine can be absorbed. Average 1-1.5L per case
 - * Resultant potential fluid overload and water intoxication
- * Almost impossible to determine accurate volume absorbed intra-operatively

Introduction

- * Tends to be in patients with significant co morbidities : *at risk population*
 - * TURP: 7% major complication and 1% mortality perioperatively

- * Glycine is an inhibitory neurotransmitter with direct cardiac and retinal effects
 - * Average decrease in CO of 17.5%
 - * Transient blindness

- * Amount of absorption determined by:
 - * Hydrostatic pressure of irrigating bag
 - * Venous pressure
 - * Blood loss (7-20 ml per gram of tissue resected)
 - * Duration surgery/ large prostate
 - * Surgical skills

Methods

- * Audit proforma in Theatre 4 for all TURP/ TURBT
- * 50 patients (25 TURP 25 TURBT)
- * Data collection on:
 - * Patient factors
 - * Cardiac Hx/ medications (affecting fluid balance)/pre op U&E and FBP
 - * Intra-operative factors
 - * Surgical grade/anaesthetic technique/length of procedure/ intraoperative Na & Hb levels if performed/ height of irrigation fluid/ IV fluids/ Irrigation fluids/ intraoperative complications

Audit Aims

- * To determine if:
 - * Patients are tending towards hyponatraemia
 - * Overlooking mild TUR syndromes
 - * Sodium drops are occurring peri-operatively
 - * Accurately recording irrigation fluids and I/O
 - * Minimizing risk of hypo-osmolality and hyponatraemia
 - * Current practice of peri-operative Na and Hb monitoring
 - * Barriers to performing peri-operative bloods

Results

- * Data collected on 50 patients (Dec 2013- March 2014)
 - * 26 TURP
 - * 24 TURBT

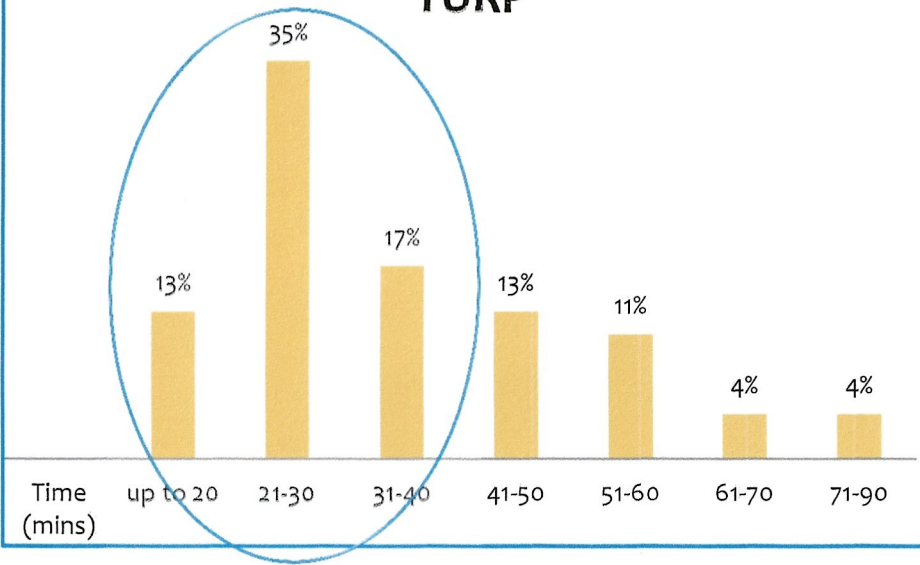
Results: Patient Characteristics

- * ASA grade:
 - * Majority ASA 2 (58%) or 3 (36%)
 - * TURBT patients more ASA 3/ 4
- * High incidence of CV co-morbidities (78%)
- * 2 patients with known history of hyponatraemia
- * 34% on drugs which affect plasma sodium
 - * ACE I/ BFZ/ SSRI/ ARB/ Furosemide
- * Echo not routinely pre-op for idea of cardiac function

Results: Surgery

- * Majority of TURP and TURBT performed by consultant surgeons (84 %)
 - * TURP = 81% vs. TURBT = 88%
 - * Rest performed by Registrar under supervision of consultant
- * Average length of procedure:
 - * TURP = 39 mins (range 13-90 mins)
 - * (Data missing for 3 patients)
 - * TURBT = 28 mins (range 10- 70 mins)
 - * (Data missing 2 patients)
- * Of interest 70min TURBT in patient with history of chronic hyponatraemia

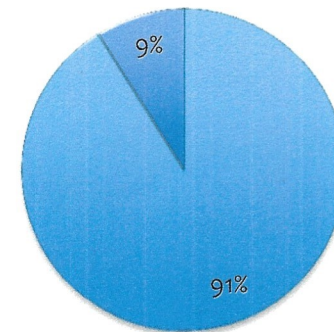
Length of surgical procedure: TURP



65% of TURP take less than 40 mins

Length of surgical procedure: TURP

■ ≤ 60 mins ■ > 60 mins



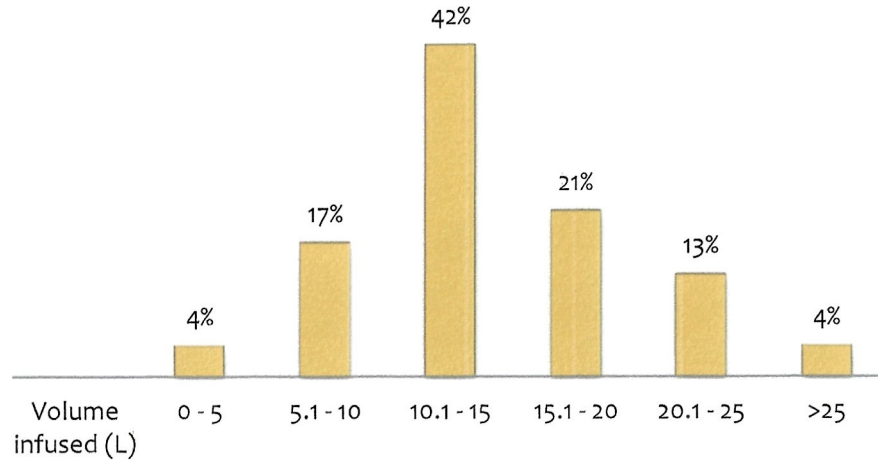
Results: Surgery

- * All glycine bags were less than 100cm from the level of the patients bed
- * Average height of bag
 - * TURP 64.3cm TURBT 72.3cm
 - * (20% no height of bag recorded)
- * Limited evidence that height of bag affects glycine absorption

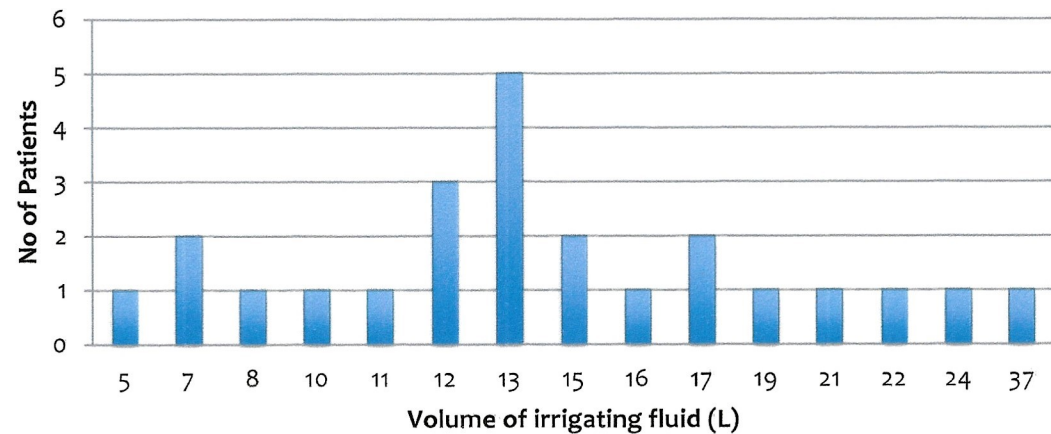
Results: Glycine administration

- * More glycine irrigation fluid is used for TURP than TURBT
 - * TURP Av. 14.7 L (4.8 – 37.3) TURBT Av. 7.9 L (2-30.5)
- * Average amount of fluid output (irrigation/ urine/ blood)
 - * TURP 15L TURBT 8.1 L
- * **Leaving average overall irrigation balance**
 - * TURP 332 mls TURBT 168mls
 - * Patient negative 332mls and 168mls
- * 26% patients have positive fluid balance i.e. glycine absorption
- * Largest amount of irrigation fluid absorbed = 3.7 L
 - * 60 min procedure
 - * TURP resulting in TURP syndrome
- * 8% (4/50) missing data for input/ output recordings for glycine – charts awaited

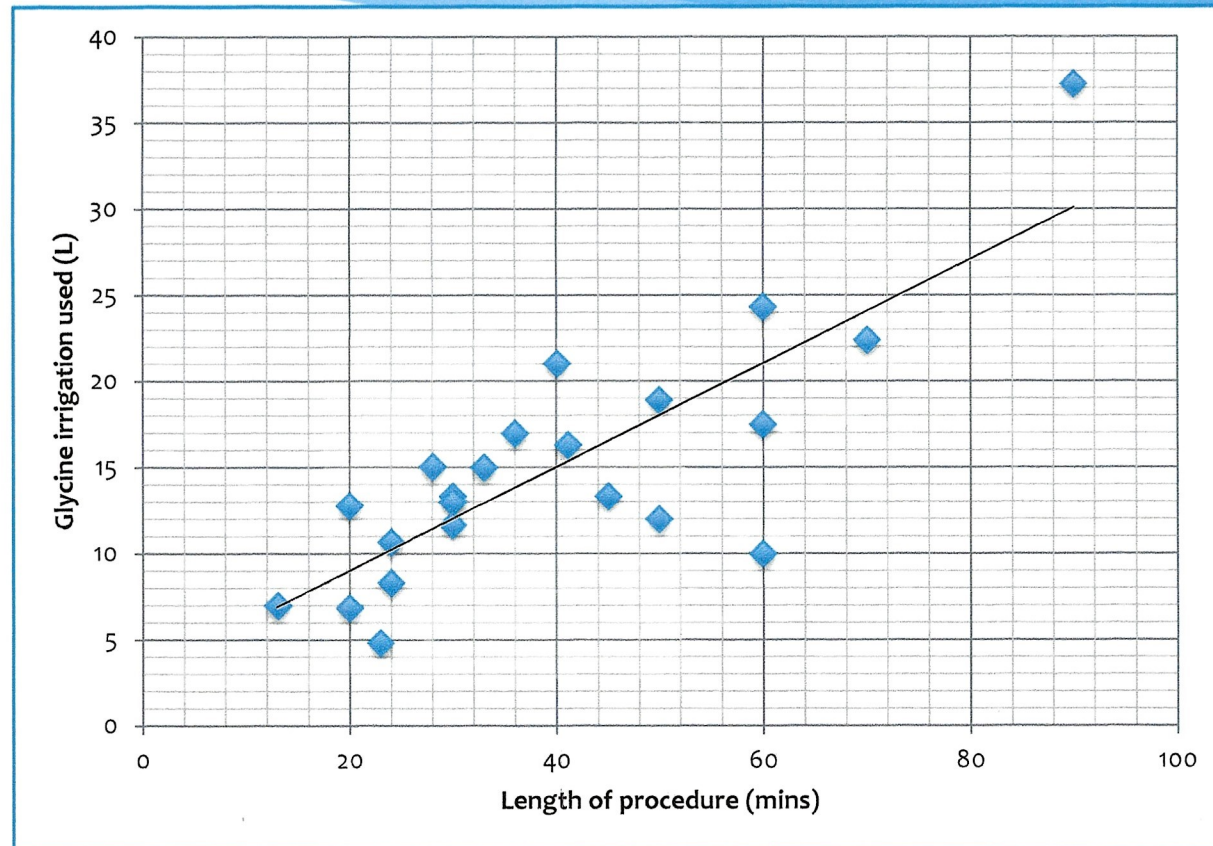
TURP: Volume of hypotonic irrigating fluid infused



TURP: Volume of hypotonic irrigating fluid infused

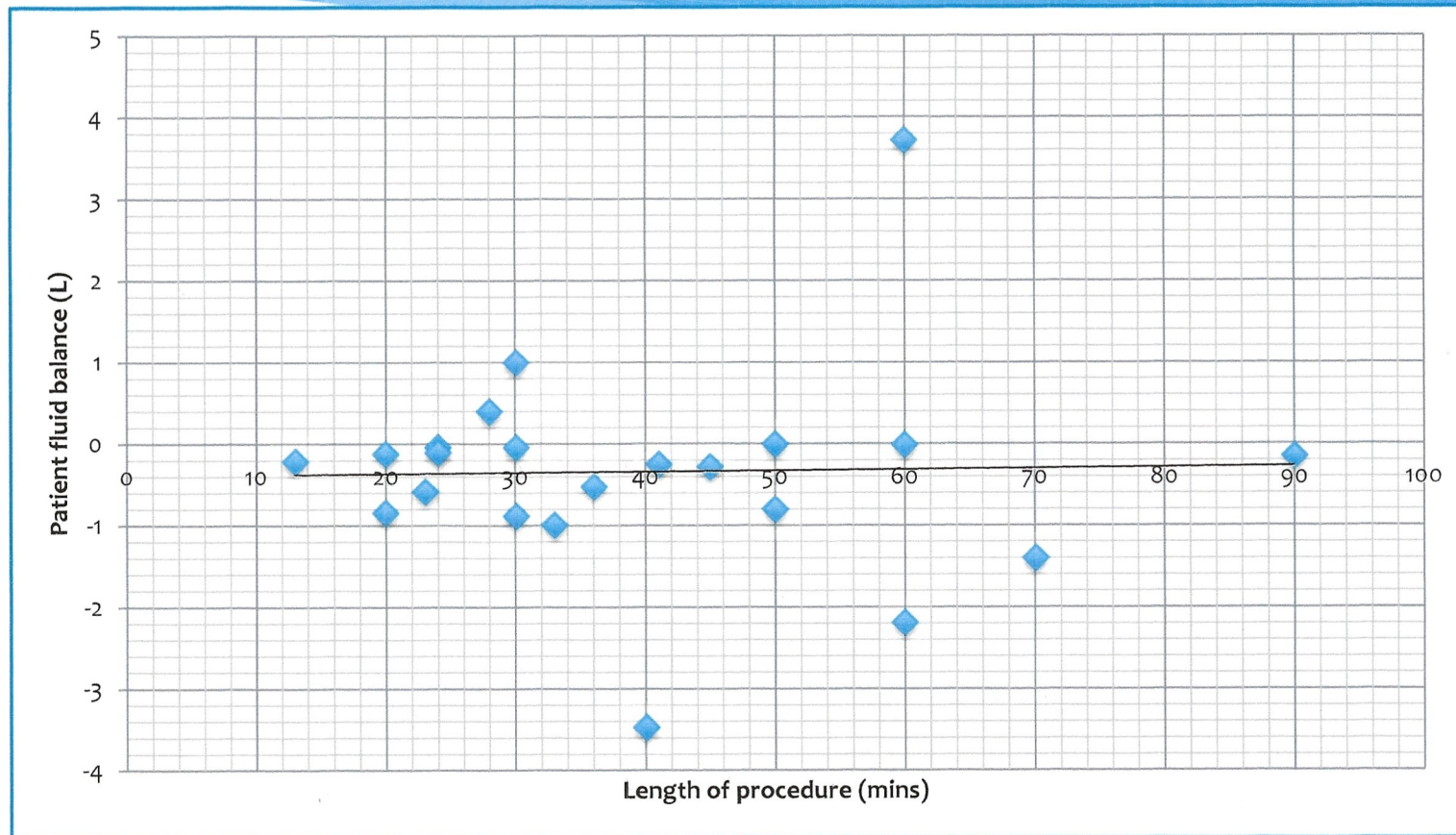


Correlation between length of procedure and amount of glycine irrigation used: TURP



Positive correlation between length of procedure and amount of glycine irrigation used

Correlation between length of procedure and glycine absorption: TURP



No correlation between length of procedure and apparent glycine absorption

Results: Perioperative Sodium monitoring and plasma levels

TURP

Na plasma level checked	Pre-op	Induction	T >30	T >60	End of procedure	Recovery	Day 1 post-op
% of patients	100	100	75 (9/12)	100 (2/2)	77	18	96
Average Na (mmol/L)	139.1	139.7	138.2	127	134.8	131.3	135.8
Range (mmol/L)	132 - 143	128 - 144	131-- 141	127-141	118-141	120-141	129-140

- Variation in practice regarding intra-operative Na checking
- Trend towards decreasing sodium peri-operatively
- **Average Drop of 5 mmol/L from induction to end of procedure**
- **Average drop of 4 mmol/L from induction to Day 1 post-op**

Results: Perioperative Sodium monitoring and plasma levels

* TURBT

Na plasma level checked	Pre-op	Induction	T >30	T >60	End of procedure	Recovery	Day 1 post-op
% of patients	100	96	100 (3/3)	100 (1/1)	90	8	75
Average Na(mmol/L)	138.8	139.3	136.3	130	138.3	140	138.1
Range (mmol/L)	132-143	128-143	128-142	130	130-143	140	130-143

- * More regular checking of Na levels especially at end of procedure (90 vs. 77)
 - * Most likely due to GA and ease of sampling
- * Little change in Na levels
 - * Shorter procedure/ less irrigation fluids

Results: Perioperative Hb monitoring and plasma levels

* TURP

Hb plasma level checked	Pre-op	Induction	T >30	T >60	End of procedure	Recovery	Day 1 post-op
% of patients	100	96	75 (9/12)	100 (2/2)	77	18	96
Average Hb (g/L)	141	144	131	127	127	134	135
Range (g/L)	84-170	88-170	98-145	125-129	110-163	121-153	78-166

- * Drop in plasma Hb seen from induction to end of procedure = av. 17g/L (1.7g/dl)
 - * Haemodilution vs. intra-operative blood loss
 - * Appears to be transient suggesting haemodilution

Results: Perioperative Hb monitoring and plasma levels

* TURBT

Hb plasma level checked	Pre-op	Induction	T >30	T >60	End of procedure	Recovery	Day 1 post-op
% of patients	100	96	100 (3/3)	100 (1/1)	90	8	75
Average Hb (g/L)	134	131	118	95	118	133	117
Range (g/L)	91-163	77-161	91-149	95	72-157	120-146	90-176

- * More regular checking of plasma Hb levels
- * Drop in plasma Hb seen from induction to end of procedure
= av. 13g/L (1.3g/dl)
- * Less marked recovery towards baseline
 - * Suggests blood loss over haemodilution

Significant plasma sodium drops

- * Significant when plasma Na decreases by ≥ 5 mmol/L
- * 4 cases of significant Na drops
- * All occurred in TURP group
- * 1 patient symptomatic requiring treatment
- * **Minimum overall incidence of significant sodium drop of 8%**
 - * 7 charts to be reviewed
 - * Incomplete intra-op monitoring of Na in 6/26 TURP and 2/24 TURBT
- * **Minimum incidence for TURP surgery:**
 - * **15% significant sodium drop**
 - * **4% TURP syndrome**

Patient 1

- * ASA 2 HTN
- * Performed by consultant
- * GA 500mls CSL
- * No height of bag recorded
- * Resection time 60mins
- * Glycine irrigation 24.3L Output 20.6 L
 - * Absorption of 3.72L hypotonic fluid
- * Sodium levels:
 - * Induction=143 T30=141 End=118 Prior to ward= 127 Next day = 137
- * Hb fall from 137 to 110
- * Asymptomatic
- * Avoidable?

Patient 2

- * Asa 2 HTN
- * Performed by consultant
- * RA 500mls CSL
- * Height of bag 80cm
- * Resection time = 28mins
- * Glycine irrigation 15.1 L Output 14.65
 - * Absorption of 400mls hypotonic fluid
- * Sodium levels:
 - * Induction =142 End=129 Next day = 136
- * Hb level drop 153 - 130
- * Asymptomatic
- * Avoidable?

Patient 3

- * Asa 2
- * Performed by SPR
- * RA 500mls CSL + 500mls NaCL
- * Height of bag 40cm
- * Resection time = 33mins
- * Glycine irrigation 15 L Output 15.99
 - * Negative balance 1L
- * Sodium levels:
 - * Induction =143 T30 =137 Next day = 137
- * Hb level drop 143 - 132
- * Asymptomatic
- * Should we stop procedure?

Patient 4

- * Asa 2 HTN/IHD/DM
- * Performed by consultant
- * RA 300mls CSL
- * Height of bag not recorded
- * Resection time = 70 mins
- * Glycine irrigation 22.4 L Output 23.8
 - * ??? Negative balance -1.4L
- * Sodium levels:
 - * Induction =141 T30 = 138 T60 = 127 End = 124 Recovery = 127 Prior to ward = 139
 - Next day = 136
- * Hb level drop 165 - 130
- * Symptomatic – furosemide/ hypertonic saline
- * Avoidable?
 - * Long procedure – continued 10mins after Na 127 noted
 - * ? Accuracy of input/ output recording

- * 4 cases raise questions as to:
 - * Clinical significance of peri-operative hyponatraemia
 - * When should we be stopping surgery?
 - * How feasible for surgeons to stop resection immediately?
 - * Need time to achieve haemostasis/ expedite procedure
 - * Importance of length of procedure
 - * Large amounts of glycine can be absorbed very quickly
 - * Long procedures not always associated with large amounts of glycine absorption

Conclusion

- * Patients presenting for TURP/TURBT are high risk population
 - * CV co-morbidities
 - * 1/3 are already on medications which affect plasma Na levels
- * Anaesthetists happy to give Hartmanns solution rather than NaCl
- * Current clinical practice to minimise risks of peri-operative hyponatraemia is very good
- * Close monitoring of glycine irrigation input/ output is routine
 - * However only minority of patients had evidence of any glycine absorption ???accuracy

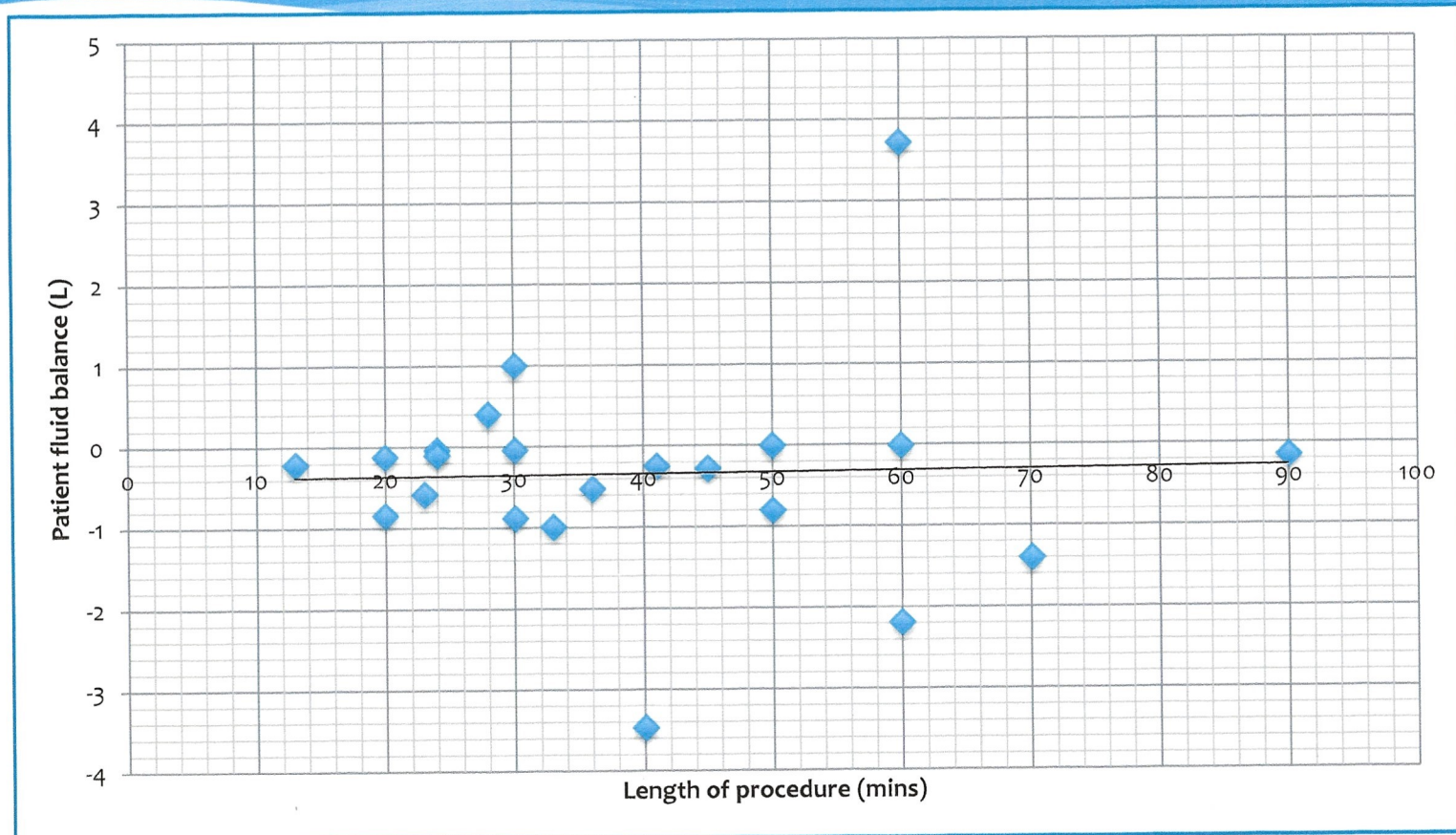
Conclusion

- * Variation in practice regarding checking of intra-operative Na and Hb levels
- * More likely to check bloods when patient under GA
- * Definite trend towards decreasing plasma Na levels during TURP
- * 4% incidence of TURP syndrome
- * 15% incidence of significant Na drops during TURP
- * 8% incidence of significant Na drop overall

Discussion

- * NaCl vs. Hartmanns
- * Use of diathermy/ laser techniques (surgeons)
- * Frequency of hyponatraemia
- * Clinical significance of hyponatraemia and how do we manage results/ patients
- * Recommendations for minimum blood sampling
- * Indications for stopping surgery and how is it achieved
- * Fluid irrigation management systems
- * Point of care testing
- * Presentation at surgical M&M

Correlation between length of procedure and glycine absorption: TURP



No correlation between length of procedure and apparent glycine absorption

References

Hahn R G, Ekengren J. Absorption of irrigating fluid and height of fluid bag during TURP. Br J Urol 1993; 72 (1) 80-3

Van Renen, Reymann U. Comparison of the effect of two heights of glycine irrigation solution on serum sodium and osmolality during TURP. Aust N Z J Surgery 1997; 67 (12): 874-7

Titze F. Transurethral resection of the prostate: Anaesthetic considerations

Hahn R G. Fluid absorption in endoscopic surgery. BJA 2006; 96 (1): 8-20
Gravenstein D. TURP syndrome: A review of the pathophysiology and management. Anaesthesia and Analgesia 1997; 84: 438- 336

Anaesthesia for TURP. CEACCP 2009; 9 (3): 92-96