Original Article

Transurethral Resection in benign Prostatic Hyperplasia; An Observational Study Highlighting the Correlation of the Resected Tissue with Electrolytes and Hemoglobin

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ABSTRACT

OBJECTIVE: To determine the correlation of serum sodium and potassium levels before and after transurethral resection of the prostate with weight of resected tissue in BPH patients.

METHODOLOGY: A prospective observational study was conducted on 75 male patients aged 40-70 years, presenting with benign prostatic hyperplasia and undergoing transurethral resection of the prostate at Department of Urology, Liaquat University of Medical and Health Sciences, Jamshoro. Ethical permission was taken before conducting this study from the university. Blood samples were obtained before and 24 hours after surgery for assessment of sodium and potassium levels. SPSS version 20.0 was used for data analysis. Pearson Correlation was applied for inferential analysis whereas p-value of < 0.05 was taken as significant.

RESULTS: No correlation exist between baseline sodium level before resection(r=0.116 p=0.304) and 24 hours after the resection of prostate (r=0.219, p=0.051) and between baseline potassium level before resection (r=0.059, p=0.604) and 24 hours after the resection of prostate (r=-0.058, p=0.611) whereas moderate negative correlation (r=-0.310, p=0.005) exist between changes in potassium level with respect to weight of resected tissue. No correlation exist between exist between pre-operative hemoglobin level with respect to weight of resected tissue. (r=0.182, p=0.106). Moderate negative correlation (r=-0.309, p=0.005) exist between post-operative hemoglobin level whereas strong positive correlation (r=0.690, p=0.001) exist in operative time with weight of tissue resected.

CONCLUSION: The results of the study showed that moderate negative correlation exists between changes in potassium level and post-operative hemoglobin level and strong positive correlation exists in operative time with respect to weight of resected tissue.

KEY WORDS: Transurethral resection, electrolyte imbalance

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a usual condition in men more than 40 years of age. It is characterized by urinary urgency, incontinence, frequency, nocturnal, a weak urine flow and intermittency[1]. The etiology by which BPH occur is still unknown. It is believed that the long-term effects of the synthesis of testosterone has role, while some authors believe that there is a hereditary hypothesis[2]. BPH is considered when the size of the prostate is bigger than normal and is associated with obstructive symptoms while micturation. The normal size of the prostate is approximately about 20g[3]. In adult male, benign prostatic hyperplasia (BPH) is a exceedingly common condition, 50% of male over 60 years having histologically proven prostatic hyperplasia while at least half reporting moderate to severe form of BPH. BPH causes vary symptoms from mild to severe obstructing symptoms depending on the size of gland and it also causes urinary tract infection. The surgical gold standard for the treatment of benign prostatic hyperplasia (BPH) is transurethral resection of the prostate (TURP)[4]. Preoperative morbidity for this procedure ranges in between 18% and 26% and the mortality rate maybe as high as 1% [5].

During TURP significant hyponatremia occurs in about 11-41% of patients. The incidence of serum sodium level is less than 125mEq after TURP which may reach approximately up to 15% with mortality rate of 40% [6]. During TURP through the prostatic venous sinuses some amount of irrigation fluid (20 ml/min to several L) is absorbed. While during irrigantion penetration of about one liter irrigant in circulation for a period of 1 hour leads to an acute reduction in serum sodium concentration of 5-8 mmol/L, suggesting that there is a risk of hyponatremic symptoms associated with absorption[7]. Acute

hyponatremia that is low plasma sodium concentration (115–120 mEq/L) is a potentially serious condition[8]. Plasma hypo-osmolarity and hyponatremia may result in intravascular hemolysis leading to increase in serum potassium[9]. Early complications include urinary tract infection, prostatic capsule perforation, secondary haemorrhage and temporary urinary incontinence[10]. Other complications include electrolyte imbalance and hypervolemia called as TURP syndrome which are because of absorption of large quantities of the irrigating fluid[6] leading to confusion, restlessness, tightness in chest, shortness of breath fatigue, irritability, nausea, headache, abdominal pain,bradycardia with hypertension, seizures and eventually coma[11]. There are different mechanisms that seem to be associated with theexpansionof BPH. Even though, implicated mechanism is ageing. The current observations also focused the importance of metabolic syndrome, changes in hormones and inflammation[12-14].

The evaluation for serum electrolytes following TURP can play a preventive role to the patients from acquiring life threatening complications. The objective of this study was to determine the correlation of serum sodium and potassium levels before and after transurethral resection of the prostate with weight of resected tissuein BPH patients.

METHODOLOGY

A prospective observational study through non-probability convenient sampling technique was used. The study was conducted from January 2017 to July 2017 in Liaquat University of Medical and Health Sciences, Jamshoro, at Department of Urology. Prior ethical permission was obtained from hospital concerned authorities to conduct the study. Verbal and the written consents were also taken from selected patients. Confidentially of data was ensured that except academic purpose data will not be utilized for other purpose. A total of 75 malepatients aged 40-70 years; presenting with benign prostatic hyperplasia undergoing transurethral resection of the prostate were included.

Exclusion criteria includes those patient that previously present with abnormal digital rectal examination or ultrasonography with suspicion of prostate cancer unsuccessful surgery or recurrent strictures, neurogenic bladder, bladder calculi, history of prostate cancer, previous urethral or prostate surgery, urethral stricture, and patients on anticoagulant therapy were excluded. Blood samples were obtained before and after 24 hours of surgery for assessment of sodium and potassium levels. Data was analyzed using SPSS version 20.0. Chi square test was used to see the significance. The quantitative variables i.e. age, BMI, duration of BPH, weight of resected tissue, baseline, postoperative and change in serum sodium and potassium levels were presented as mean ± standard deviation. Frequency of patients with reduced, normal or greater than normal levels of sodium and potassium were also reported.

RESULTS

In the total of 75 patients selected for this study, the mean age was 59.71±7.13 years having a mean BMI of 21.99±4.40 kg/m^2, 6.92±1.16 days is the mean time during which patient remains symptomatic. The mean level of sodium before TURP was 141.60±2.02 meq/L and after 24 hours of TURP was 140.44±2.69 meq/L. The mean level of potassium before TURP was 4.29±0.51meq/L and after 24 hours of TURP was 4.65±0.61 meq/L. The mean pre-operative haemoglobin level was about 13.92±0.65 g/dl while the mean post-operative haemoglobin level was about 12.59±0.91 g/dl. No correlation exist between baseline sodium level before resection (r=0.116, p=0.304) and 24 hours after the resection of prostate (r=0.219, p=0.051) with respect to weight of resected tissue. No correlation exist between baseline potassium level before resection (r=0.059, p=0.604) and 24 hours after the resection of prostate (r=-0.058, p=0.611) with respect to weight of resected tissue while moderate negative correlation (r=-0.310, p=0.005) exist between changes in potassium level with respect to weight of resected tissue. No correlation exist between exist between pre-operative hemoglobin level with respect to weight of resected tissue. (r=0.182 p=0.106). Moderate negative correlation (r=-0.309, p=0.005) exist between post-operative hemoglobin level with respect to weight of resected tissue. Strong positive correlation (r=+0.690, p=0.001) exist in operative time with respect to weight of resected tissue.

TABLE I: BASELINE DESCRIPTIVE STATISTICS OF PATIENTS UNDERGOING SURGERY

Variables		Mean±SD
Age (years)		59.71±7.13
BMI(kg/m^2)		21.99±4.40
Duration of Symptoms(days)		6.92±1.16
Weight of resected Tissue (gram)		44.43±7.84
Operative Time in (Minutes)		64±11.09
Sodium meq/L	Baseline	141.60±2.02
	After 24 hours	140.44±2.69
	Change	-1.16±2.06
Potassium meq/L	Baseline	4.29±0.51
	After 24 hours	4.65±0.61
	Change	0.35±0.21
Hemoglobin g/dl	Pre-operative	13.92±0.65
	Postoperative	12.59±0.91

TABLE II: CORRELATION OF ELECTROLYTE IMBALANCE BEFORE AND AFTER THE SURGERY

Variables	Weight of resected tissue	
	R	p-value
Baseline Sodium	0.116	0.304
After 24 hours Sodium meq/L	0.219	0.051
Change in Sodium meq/L	0.172	0.127
Baseline Potassium meq/L	0.059	0.604
After 24hours Potassium meq/l	-.058	0.611
Change in Potassium meq/l	-.310**	0.005
Pre op Haemoglobin g/dl	0.182	0.106
Post op Haemoglobin g/dl	-.309**	0.005
Operative Time in Minutes	.690**	<.001

DISCUSSION

Total 75 patients undergoing TURP were selected for our study. The results of our study showed that levels of sodium before and after 24 hours of TURP (p value 0.127) did not show considerable difference while substantial difference in the levels of potassium before and after 24 hours of TURP (p value 0.005) was noted. Significant changes in potassium were observed post-operatively in which mean potassium level before and after the resection was 4.29±0.51 and 4.65±0.61 respectively with the increase of about 0.35±0.2 meq/l and moderate negative correlation exist between change in potassium level(r=-0.310, p=0.005). One of the study by Altaf J 2016[15] in which they selected 150 patients undergoing TURP, 93 patients (62%) were found to have no electrolyte imbalance while 57 patients (38%) were noted to have disturbance in their electrolytes. Substantial mean preoperative and postoperative hypokalemia was reported (2.82±0.5) mmol/L and (3.8±1.6) mmol/L (p-value 0.03). In our study changes in sodium levels were observed post-operatively in which mean sodium level before and after the resection was 141.60± 2.02 and 140.44±2.69 respectively with the decrease of about 1.16±2.06 meq/l and no correlation exist between changes in sodium level. In study by Karadeniz MS et al[16], among 52 TURP patients, significant difference was found in sodium levels of patients undergoing monophasic TURP (p value 0.001) while no substantial difference was seen in sodium levels of patients undergoing biphasic TURP (p value 0.59). Most of the patients did not have significant levels of change in potassium levels either undergoing monophasic (p value 0.87) or biphasic (p value 0.82) TURP. Another study carried by Aziz W 2015[17] reported that out of total of 280 TURP patients significant change in the electrolyte levels were presentamong 66 (23.5 %) patients (p value 0.001 for sodium and 0.002 for potassium). In one of the study carried by Desai A 2017[18] documented that non-significant changes in levels of sodium and potassium, pre and post-operative were found (p value 0.38 and 0.58) respectively. The basis for the beginning of TURP syndrome has been assumed to be water intoxication with hyponatremia, because of continuous irrigation during TURP, in prostatic bed fluid absorption from venous channels occur. TURP syndrome is thought to be because of fluid absorption which leads to the changes in serum electrolytes level. During resection on keeping irrigation fluid column at constant height per minute a constant amount of fluid is absorbed[19]. Amount of fluid that is absorbed depends on number of different factors that includes number of opened prostatic venous sinuses, duration to which venous sinuses are being exposed to irrigation fluid and it also depends on hydrostatic pressure of prostatic bed. Different studies have been proposed in regard of this but none of them are capable to eliminate these complications. One of the proposed study suggested that the chances of fluid absorption can be minimize if the resection time is kept below 60 min, their study also noted that when time of resection exceed more than 15 minutes then the TURP syndrome is documented[20]. In order to do fluid balance in every patient, monitoring is necessary. Nowadays, recently introduce techniques that include bipolar resectors and vaporizing the tissue instead of resection tissue, they have also decrease chances of fluid absorption and its consequences on electrolytes derangement, so this help in decreasing the burden of strict routine monitoring in these case. One of the studies documented that with improvement in technology and use of non-hemolytic isotonic solution, electrolytes derangement is rare, especially when bipolar and isotonic solutions were used[21].

Monitoring of electrolytes should be considered in patients having risk factors for increased fluid absorption. The mixed approach of our study has assured that we have sampled the extensive range of patients undergoing transurethral resection. However, the study might not be immune from practice and observer bias. Considering the findings of our study and to what range these observations are consistent with the hemodynamic variables of the patient would be revealing to discover more facts about the electrolyte balance in these patients.

CONCLUSION

Electrolyte derangement after transurethral resection of the prostate in benign prostatic hyperplasia is frequent. The results of the study showed that

moderate negative correlation exists between changes in potassium level and post-operative hemoglobin level and strong positive correlation exists in operative time with respect to weight of resected tissue. However no significant correlation existed in the sodium levels. The need for monitoring electrolyte following TURP should be individualized, taking into account the weight of resected tissue and increasing age.

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