

MODERATED POSTER

Erythrocyte Sedimentation Rate as a Predictor of Success of Trial of Voiding Without Catheter After Transurethral Electrosurgical Resection of Benign Prostatic Hyperplasia

Fidel Tomas M. Manalaysay III, MD; Gavino N. Mercado Jr., MD, FPUA and Samuel Vincent G. Yrastorza, MD, FPUA

Department of Urology, East Avenue Medical Center

Introduction: Erythrocyte Sedimentation Rate (ESR) is an acute phase reactant and an indirect measure of inflammation inside the body. Transurethral electrosurgical Resection of the Prostate (TURP) is the current gold standard for management of patients with Benign Prostatic Hyperplasia (BPH) with moderate to severe lower urinary tract symptoms. The success of operation is determined when after resection of the prostate following removal of indwelling Foley catheter several days postoperative, the patient is able to void freely without catheter. It is not mentioned whether the edema of the postoperative site or the persistent inflammation of the prostate after resection may cause the failure of trial of voiding without catheter (TWOC).

Objective: The primary objective of this study was to determine if ESR can be a reliable predictor of success of in patients who underwent TURP for BPH.

Methods: On the day of planned catheter removal, 4 milliliters of blood was extracted from the patient, placed in an Ethylenediaminetetraacetic acid (EDTA) tube and sent to laboratory for ESR determination. One milliliter of EDTA-anticoagulated blood was placed in the Westergren tube. After 60 minutes, measurements were taken of the distance the red cells traveled to settle at the bottom of the tube. After catheter removal, patients were observed whether they can void freely without catheter or not. Patients who were not able to void within 4 to 6 hours were re-catheterized.

Results: From January 2015 to April 2016, 135 patients with BPH who underwent TURP in East Avenue Medical Center were included in the analysis. Success of trial voiding without catheter was observed in 117 of 135 patients (87%; $p=0.000$). Patients ages varied from 49 to 80 years, overall. Among these patients, the average ESR was significantly lower (48 mm versus 56 mm, range = 17-109 mm; $p=0.012$). Presence of urinary retention (61%), history of cigarette smoking (56%), hypertension (61%), diabetes mellitus (50%), trabeculations in cystoscopy and prostate size less than 20 grams (17%) were more common among patients with unsuccessful TWOC. ESR ($p=0.012$) was an independent significant predictor of TWOC. Based on univariate analysis, Diabetes Mellitus (DM) ($p=0.003$), trabeculations in cystoscopy ($p=0.000$) and UTI ($p=0.000$) were also significantly associated with TWOC. Among the significant independent covariates, DM was a significant factor affecting the success rate of TWOC ($p=0.005$) based on multivariate analysis. Patients without DM were about 16 times more likely to have a successful TWOC (OR=15.750, 95% CI=2.335, 106.227).

Conclusion: Erythrocyte Sedimentation Rate was significantly lower in patients with success of trial voiding without catheter. ESR is a reliable predictor of success of TWOC in patients who underwent TURP for BPH.

Key words: Erythrocyte sedimentation rate, benign prostatic hyperplasia, transurethral resection of the prostate (TURP)

Introduction

Lower Urinary Tract Symptoms (LUTS) is one of the most common reasons of Urologic consult in the emergency room and in the outpatient department. There are varied conditions that can present with LUTS and among the most common causes of LUTS in aging men is BPH.

Benign Prostatic Hyperplasia (BPH) is a pathologic process characterized histologically by an increased number of epithelial and stromal cells in the periurethral area. When the prostate becomes enlarged, urethral resistance increases which results in compensatory changes in bladder. Obstruction-induced changes in detrusor function, compounded by age-related changes in both bladder and nervous system function, lead to LUTS such as urinary frequency, urgency and nocturia.¹

According to the International Consensus Guideline (2009) algorithm for the management of LUTS in a patient who presented with persistent bothersome after a failed trial of medical therapy, it is recommended to offer Minimally Invasive Surgical Treatment (MIST). Currently, the most commonly done MIST in the local setting is TURP. Transurethral resection of the prostate (TURP) is a surgical procedure that uses the resectoscope, a combined visual and surgical instrument, that is inserted through the tip of the penis and into urethra. It involves cutting away a section of the prostate that is obstructing the urinary flow. It is the current gold standard for management of patients with BPH with moderate to severe lower urinary tract symptoms that haven't responded to medication.

The success of operation is determined when after resection of the prostate of men with BPH, the patient is able to void without catheter following removal of indwelling Foley catheter several days postoperative.

It is not mentioned whether the edema of the postoperative site or the persistent inflammation of the prostate after resection may cause the failure of TWOC. The goal of the study was to investigate if ESR, a blood examination, can be a reliable predictor of success of TWOC in BPH patients who underwent TURP.

Erythrocyte Sedimentation Rate (ESR) and C-Reactive Protein (CRP) are acute-phase reactants, substances in the blood that increases as a response to acute conditions such as infection, injury, tissue destruction, some cancers, burns, surgery, or trauma. Both are indirect measure and non specific marker of inflammation inside the body. ESR is chosen instead of CRP because it is readily available in the hospital and the results can be obtained in an hour. ESR is also cheaper as compared to CRP.

ESR is a measure of the settling of red blood cells in a tube of blood in one hour. There are two known methods in determining the ESR: Westergren and Wintrobe. The main difference depends on the tube used and the reference range. The reference range depends on the age (adult or child) and the gender (male or female) of the patient. Using the Westergren method, the normal ESR values for adults are as follows: men under 50 years old: < 15 mm/hr; men over 50 years old: < 20 mm/hr; women under 50 years old: < 20 mm/hr and women over 50 years old: < 30 mm/hr. For children: newborn: 0-2 mm/hr and newborn to puberty: 3-13 mm/hr.

This study aimed to determine the relationship between ESR and success rate of TWOC and to explore the different factors that may affect success rate of TWOC. Factors that were included in the study included age, presence of urinary retention, history of smoking, presence of comorbidities like Diabetes mellitus (DM), Hypertension (HTN), Pulmonary tuberculosis (PTB), Cerebrovascular accident (CVA), presence of urinary tract infection (UTI) as documented by urinalysis, estimated prostate size in grams as seen in ultrasound and the presence of urinary bladder trabeculations as visualized in cystoscopy.

Materials and Methods

Immediately after TURP, a large bore (French 24), 3-way catheter was inserted transurethraly. Continuous bladder irrigation with normal saline (0.9% PNSS) was started and the patient was transferred to the recovery room. Patient's blood pressure, pulse rate, respiratory rate, temperature and urine output were monitored hourly. Once the

patient was stable with normal vital signs, able to move extremities and was already awake, he was then transferred to the wards. In the wards, monitoring of the vital signs and urine output was continued.

On the day of planned catheter removal, 4 milliliters of blood was extracted from the patient, placed in an Ethylenediaminetetraacetic acid (EDTA) tube and sent to the laboratory for ESR determination. In this study, the Westergren method was used by a designated medical technologist. One milliliter of EDTA-anticoagulated blood was placed in the Westergren tube. Westergren tube (Figure 1) is a straight glass pipette 30 cm long with an internal diameter of 2.5 mm. The tube was marked in millimeters from 0 to 200. The blood specimen was left undisturbed for exactly one hour. (Figure 2)

The red cells settled toward the bottom of the tube, and the plasma rose to the top. After 60 minutes, measurements were taken of the distance the red cells traveled to settle at the bottom of the tube. Normal value for male patients under 50 years old is less than 15 millimeter/hour (mm/hr). For men over 50 years old, normal range is less than 20 mm/hr.

After catheter removal, patients were observed whether they can void freely without catheter or not. Patients who were not able to void within 4 to 6 hours were re-catheterized. Results were recorded.

Statistical Analysis

Regression analysis

Inclusion Criteria

Men with BPH who underwent TURP

Exclusion Criteria

1. Patients diagnosed with prostate cancer or any other malignancy
2. Neurogenic bladder
3. Incomplete resection after TURP

Study Design

Prospective, cohort

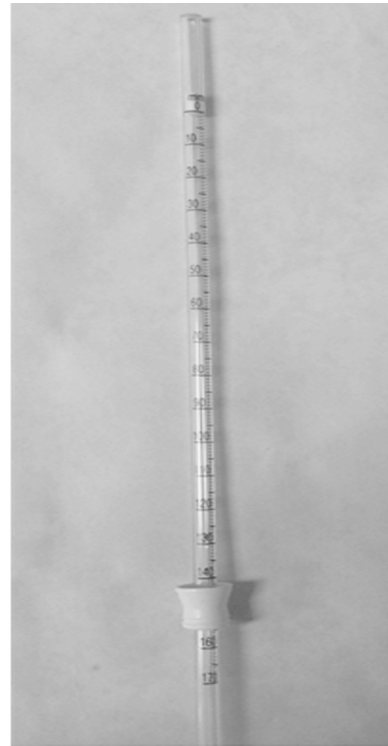


Figure 1. Westergren tube.

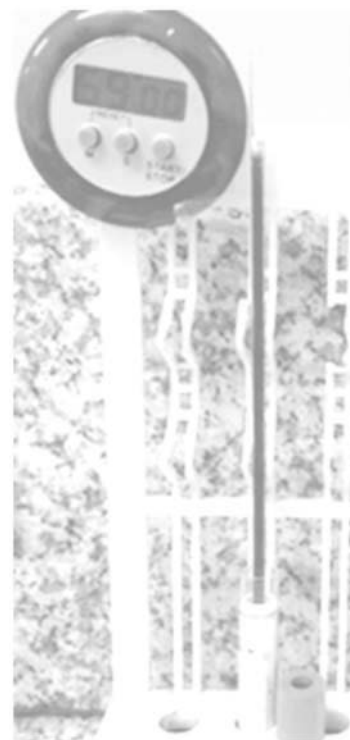


Figure 2. Westergren tube with EDTA-anticoagulated blood specimen.

Results

From January 2015 to April 2016, 135 patients with BPH and who underwent TURP in East Avenue Medical Center, were included in the

analysis. Missing values were not replaced or estimated during the statistical analysis of outcome variables. Checks for homogeneity of sample population and normality assumption of quantitative patient demographic and clinical

Table 1. Demographic and clinical characteristics of patients by outcome of TWOC.

	Successful TWOC n = 117	Unsuccessful TWOC n = 18	p-value	OR (95% CI)
Age in years, median (range)	67 (49-80)	68 (60-79)	0.307	-
Urinary retention, n (%)				
Without	51 (44%)	7 (39%)	0.801	1.1214 (0.440,3.353)
With	66 (56%)	11 (61%)		
History of cigarette smoking, n (%)				
Without	78 (67%)	8 (44%)	0.112	2.500 (0.914,6.837)
With	39 (33%)	10 (56%)		
Hypertension, n (%)				
Without	73 (62%)	7 (39%)	0.073	2.607 (0.941,7.221)
With	44 (38%)	11 (61%)		
Diabetes Mellitus, n (%)				
Without	98 (84%)	9 (50%)	0.003*	5.158 (1.811,14.687)
With	19 (16%)	9 (50%)		
Diabetes Mellitus, n (%)				
Without	98 (84%)	9 (50%)	0.003*	5.158 (1.811,14.687)
With	19 (16%)	9 (50%)		
PTB, n (%)				
Without	96 (82%)	15 (83%)	1.000	0.914 (0.243,3.445)
With	21 (18%)	3 (17%)		
CVA, n (%)				
Without	108 (92%)	18 (100%)	0.607	-
With	9 (8%)	-		
Trabeculations in cystoscopy, n (%)				
Without	110 (94%)	7 (39%)	0.000*	24.694 (7.310,83.413)
With	7 (6%)	11 (61%)		
UTI, n (%)				
Without	90 (77%)	1 (6%)	0.000*	56.667 (7.207,445.554)
With	27 (23%)	17 (94%)		
Prostate size in grams, median(range)	49 (18-148)	35 (15-82)	0.072	-
Prostate size, n (%)				
< 20 grams	6 (5%)	3 (17%)	0.130	
20 - 30 grams	13 (11%)	3 (17%)		
≥ 30 grams	98 (84%)	12 (67%)		
ESR in mm, median (range)	48 (17-109)	56 (28-95)	0.012*	

characteristics were performed. Summary statistics are presented in tables as median (range) for quantitative characteristics (e.g. age, ESR in mm) and as n (%) for qualitative outcome measures (e.g. presence of urinary retention, history of cigarette smoking, co-morbidities, presence of trabeculations in cystoscopy, prostate size in grams, presence of UTI and success of TWOC). Mann Whitney U test was used to compare averages. Chi-square test or Fisher's exact test was used to compare proportions. Spearman's rho or chi-square test of association was used to determine presence of relationships between characteristics of patients and TWOC. Univariate and multivariate logistic regression analysis was used to determine characteristics with significant association with success rate of TWOC. Odds-ratios and 95% confidence intervals were estimated. Statistical significance was based on p-values ≤ 0.05 . SPSS v20 was used in data processing and analysis.

Success of trial voiding without catheter was observed on 117 of 135 patients (87%; $p=0.000$). Patients' age varied from 49 to 80 years, overall median age at 67 years. Among these patients, the average ESR was significantly lower (48 mm versus 56 mm, range = 17-109 mm; $p=0.012$). Presence of urinary retention (61%), history of cigarette smoking (56%), hypertension (61%), diabetes mellitus (50%), trabeculations in cystoscopy and prostate size less than 20 grams (17%) were more common among patients with unsuccessful TWOC. (Table 1)

ESR ($p=0.012$) was an independent significant predictor of TWOC. Based on univariate analysis, Diabetes Mellitus (DM) ($p=0.003$), trabeculations in cystoscopy ($p=0.000$) and UTI ($p=0.000$) were also significantly associated with TWOC. Among the significant independent covariates, DM was a significant factor affecting the success rate of TWOC ($p=0.005$) based on multivariate analysis. Patients without DM were about 16 times more likely to have a successful TWOC (OR=15.750, 95% CI=2.335, 106.227).

Discussion

Among patients with BPH with bothersome LUTS, surgery is warranted to relief symptoms

for those who failed medical management. For these cases, TURP is the most common surgical procedure done in the local setting. The success of operation is determined when after resection of the prostate of men with BPH, the patient is able to void without catheter following removal of indwelling Foley catheter several days post-operative.

Currently, there is no known predictor of successful trial voiding without catheter after TURP. Several factors are enumerated in different articles that may affect TWOC. McKinnon, et al. cited that factors such as prostate weight, clot retention, urinary tract infection and acute urinary retention prior to surgery influenced success of TWOC after TURP.³

In the study by Lodh, et al. age, transition zone volume, Transition Zone Index, residual urine volume, and intravesical prostatic protrusion are identified as important independent predictors of unsuccessful TWOC. The transition zone index is the ratio of the transition zone to total prostate volume. TRUS was used for volumetric measurements of the prostate using the ellipsoid formula keyed into the ultrasound machine (SonoAce X6, Medison). Intravesical prostatic protrusion was measured by calculating the vertical distance from the protruded tip to the circumference of the bladder at the prostate base taken at the mid-sagittal view.⁴

In a study by Lee, et al. older age and spinal surgery are said to be risk factors for unsuccessful TWOC for postoperative urinary retention. Also, the presence or absence of intraoperative indwelling catheterization was noted to be an important factor influencing the success of TWOC in patients with a retention volume of ≥ 600 mL but not in those with a retention volume of < 600 mL.⁵

Associating ESR and DM, according to Elias and Domurat, the degree of elevation of ESR correlates with the serum globulin concentration, the albumin-globulin ratio, the serum fibrinogen concentration, and the percent glycosylated hemoglobin (HbA1c). Their data indicate that the ESR in diabetic patient may be elevated in the absence of overt infection.⁶

Linking ESR and UTI, in a trial by Dr. Cram and Dr. Gershel, factors like leucocytosis (WBC

count >15 000) and elevated ESR (>30), were not useful for identifying UTI in infants without bacteremia.⁷

Erythrocyte Sedimentation Rate (ESR) or Sed rate is an acute-phase reactant, a substance in the blood that increases as a response to acute conditions such as infection, injury, tissue destruction, some cancers, burns, surgery, or trauma. It is a measure of the settling of red blood cells in a tube of blood during one hour. ESR is an indication of inflammation and increases in many diseases. It is increased in rheumatoid diseases, most infections, and cancer. An advanced rate doesn't diagnose a specific disease, but it does indicate that an underlying disease may be present. ESR can be used to monitor a person with an associated disease. When the disease worsens, the ESR increases; when the disease improves, the ESR decreases.

ESR is a non-specific marker of inflammation. Increased rate may be due to the following: anemia, cancers such as lymphoma or multiple myeloma, kidney disease, thyroid disease, autoimmune disorders including lupus, rheumatoid arthritis, allergic vasculitis, giant cell arteritis, hyperfibrinogenemia, macroglobulinemia - primary, necrotizing vasculitis, and Polymyalgia rheumatica. Also, elevated ESR can be found in patients with infections namely: systemic infection, bone infections, infection of the heart or heart valves, Rheumatic fever, Erysipelas and tuberculosis.

ESR is chosen instead of CRP because it is readily available in the hospital and the results can be obtained in an hour. ESR is also cheaper as compared to CRP.

The primary goal of this study was to determine if urologists can use ESR as a predictor of success of trial voiding without catheter in patients with BPH and who underwent TURP. All other factors that may affect TWOC were noted like age, presence of urinary retention, history of smoking, presence of co-morbidities like Diabetes mellitus (DM), hypertension (HTN), pulmonary tuberculosis (PTB), cerebrovascular accident (CVA), presence of urinary tract infection (UTI) as documented by urinalysis, estimated prostate size in grams as

seen in ultrasound and the presence of urinary bladder trabeculations as visualized in cystoscopy.

In this trial, ESR was noted to be an independent significant predictor of TWOC. Based on univariate analysis, Diabetes Mellitus (DM), presence of urinary bladder trabeculations in cystoscopy (p=0.000) and UTI (p=0.000) were also significantly associated with TWOC. Among the significant independent covariates, DM was a significant factor affecting the success rate of TWOC (p=0.005) based on multivariate analysis. Patients without DM were about 16 times more likely to have a successful TWOC (OR=15.750, 95% CI=2.335, 106.227).

Conclusion

Erythrocyte Sedimentation Rate was significantly lower in patients with success of TWOC. ESR is a reliable predictor of success of TWOC in patients who underwent TURP for BPH. Among the factors enumerated, the presence of Diabetes Mellitus is a significant factor that affects the success rate of TWOC.

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