Original Article

Outcome of Transurethral Resection of the Prostate (TURP) using 5% Dextrose Water as Irrigant

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Abstract

Background: TURP remains the gold standard for simple prostatectomy presently. Different fluids have been used for irrigation while performing monopolar TURP. The choice of irrigation fluid depends on a lot of factors. **Aim:** We sought to find out if the outcome of monopolar TURP using 5% dextrose water in our setting compares with findings in other studies using different fluids as irrigation fluid in monopolar TURP. **Materials and Methods:** This was a prospective study of 220 patients who had monopolar TURP using 5% dextrose water as irrigation fluid from 2015 to 2020. **Results:** The study was completed by 220 patients. The mean age was 66.25 yrs. The mean weight of prostate was 53.2 g, and mean resected weight was 30.10 g using a mean irrigation volume of 45.35 liters, 5% dextrose water over a mean resection time of 66.08 mins. The mean changes in International Prostate Symptom Score/quality of life score (IPSS/QOLS) were statistically significant. Early complications recorded were postoperative hematuria with clot retention (1.4%), urinary tract infection (UTI) (13.2%), and secondary hemorrhage (10%). TURP syndrome was not recorded. Late complications seen within 2 years follow-up were transient urinary incontinence (6.4%), urethral stricture (4.1%), and bladder neck contracture (2.3%). There was no repeat TURP for residual adenoma within this period. **Conclusion:** TURP using 5% dextrose water has comparable outcomes to other irrigation fluids for monopolar TURP. It is a good alternative to any other irrigation fluid.

Keywords: *Benign prostatic hyperplasia (BPH), monopolar TURP, 5% dextrose irrigation fluid*

Introduction

Transurethral resection of the prostate (TURP) remains the gold standard for simple prostatectomy done for benign prostatic hyperplasia (BPH).[1,2] Monopolar and bipolar systems exist for TURP. However in resource-poor environment like ours, it is easier to procure the monopolar system because of cost. Treatment outcomes are basically the same[3,4] except that TURP syndrome is believed to be obviated by bipolar system making it possible to resect bigger volumes of prostate above 100 mls.

Several irrigation fluids have been used for TURP including 1.5% glycine, sterile water, mannitol, sorbitol, 5% dextrose water, etc., However for a resource-poor country like ours, the cost of some irrigation fluids like 1.5% glycine, mannitol, and sorbitol is prohibitive. There is now increasing evidence highlighting the toxicity of both sorbitol-mannitol and glycine solutions when absorbed during TURP.[5-7] The irrigation fluid 5% dextrose water is affordable, already sterilized, and available in our environment. Issues of sterilization noted sometimes in using water as irrigation fluid is obviated. Moreover, sterile water was observed to be associated with higher chances of intravascular hemolysis and acute renal failure compared with other irrigating fluids.[8,9]

Many studies recorded no incidence of TURP syndrome with 5% dextrose compared with other fluids.[10,11] However, some complained of its viscosity. So there is no

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ideal irrigation fluid and the consensus on the best irrigation fluid for TURP remains controversial and is guided largely by tradition.[12] In this study, we report the surgical outcome of monopolar TURP using 5% dextrose water.

Patients and method

This was a prospective study carried out at the 82-division military hospital, Enugu, southeast, Nigeria from 2015 to 2020. Ethical clearance was obtained from 82 div military hospital health ethics committee. This study was carried out according to their guidelines and regulation. Informed consent was obtained from the participants in this study. A total of 223 patients who met the indications for TURP were recruited into the study. These consisted of patients evaluated for lower urinary tract symptoms with established BPH who had indication for TURP. These patients were optimized for surgery. Patients on blood thinners like vasoprin, clopidogrel were asked to discontinue the drugs 4 weeks prior to surgery. Patients with urinary tract infections (UTIs) were treated based on culture and antibiotic sensitivity and urine confirmed sterile on culture. Blood pressure and blood sugar were controlled in patients with hypertension and diabetes, respectively. Patients on anticoagulants or impaired renal function not corrected by continuous drainage were excluded from the study. Demographic data were obtained. Preoperative variables obtained were pretreatment International Prostate Symptom Score (IPSS) and quality of life score (QOLS), transrectal ultrasound (TRUS) preoperative size of prostate, and status of catheterization.

Spinal anaesthesia was used for all patients. The sterilized container with 5% dextrose irrigation fluid was placed in a constructed shelf at a height of 60 cm from the operating table. Karl Storz continuous flow resectoscope size 26 fr was used with diathermy machine placed at 120 w for cutting and 80 w for coagulation. Light source was from NIDHI light source equipment. All resections were done by a single urologist. Time at commencement of resection was recorded, and time at withdrawal of resectoscope was also noted to ascertain length of time of resection. The volume of irrigant fluid used over this time was also recorded by noting down the number of one-liter bag poured into the sterilized container and subtracting the remaining volume in the container after TURP. After resection, size 22 fr 3-way silicone catheter was passed and irrigation with normal saline commenced until effluent is clear. Signs of TURP syndrome (TURP syndrome defined by hyponatremia with two or more symptoms or signs such as nausea, vomiting, bradycardia, hypotension, hypertension, chest pain, mental confusion, anxiety, paresthesia, or visual disturbances)[9] were watched out for throughout the procedure and immediate postoperative period and samples for serum sodium estimation taken if any of the signs presents. Capsular perforation, bladder injury, and transfusion rate were recorded. Weight of resected prostate was recorded using a weighing scale in grams and resected tissue sent for histological analysis. Patient commences oral feeding immediately spinal anesthesia wears off. Postoperatively, parameters recorded include incidence of bleeding necessitating take back to theatre, clot retention requiring evacuation, presence of TURP syndrome, acute urinary retention on the removal of catheter, incidence of UTI, secondary hemorrhage. Voiding outcome was assessed with IPSS, QOLS done at 6 weeks and 3 months postop. Patients were followed up for two years. Worsening IPSS over this period will necessitate urethrocystoscopy to document incomplete resection, recurrent adenoma, urethral stricture, or bladder neck stenosis (BNS).

Data were analyzed using SPSS version 20 with the help of a biostatistician. Inferential statistics for quantitative variables were done with *t*-test, paired *t*-test, ANOVA where indicated.

Results

This study was completed by 220 patients, and they were analyzed. The mean age was 66.25 yrs. The age distribution is shown in Table 1.

Table 1: Age

Variables	Frequency	Percentage	Mean (SD)
Age			66.25 (8.27)
Less than 51	3	1.4	
51-60	61	27.7	
61-70	99	45.0	
71-80	47	21.4	
81-90	9	4.1	
Above 90	1	0.5	
Total	220	100.0	

Table 2: Some Pretreatment variables

Variables	*n*	Range		Mean	S. D.
		Minimum	Maximum		
Age	220	46	93	66.25	8.27
Patients weight (kg)	220	9	120	73.47	13.35
Trus weight of prostate (g)	220	13	126	53.21	22.19
Pretreatment ipss score	220	14	34	25.90	5.05
Bother impact index	220	5	6	5.74	0.44

Table 3: Presence of catheter prior to TURP

	Frequency	Percent
On catheter	78	35.5
Not on catheter	142	64.5
Total	220	100.0

Table 4: Resected prostate weight parameters/ volume of irrigation fluid

	n	Minimum	Maximum	Mean	Std. Deviation
Volume of irrigant fluid used (liter)	220	20	70	45.35	9.500
Resected weight (g)	220	8	70	30.10	13.141
Resection time (min)	220	25	128	66.08	21.456
Parameter	**Mean**	**S. D.**		***t***	***P***
Trus weight of prostate (g)	53.21	22.191		24.48	0.000*
Resected weight (g)	30.10	13.141			

*Significant $P<0.05$

Table 5: Perioperative outcomes and early adverse events

Variables	Frequency	Percentage
Incidence of blood transfusion period		
Yes	0	0.0
No	220	100.0
Total	220	100.0
Intraoperative capsular perforation		
Yes	0	0.0
No	220	100.0
Total	220	100.0
Intraoperative bladder perforation		
Yes	0	0.0
No	220	100.0
Total	220	100.0
Immediate postop hematuria/clot retention		
No	215	97.7
Yes clot retention	3	1.4
Yes, no clot retention	2	0.9
Total	220	100.0
Urinary retention		
No	215	97.7
Yes	5	2.3
Total	220	100.0
Take back for bleeding		
Yes	0.0	0.0
No	220	100.0
Total	220	100.0
Turp syndrome		
Yes	0	0.0
No	220	100.0
Total	220	100.0
Uti		
Yes	42	13.2
No	178	80.9
Total	220	100.0
Secondary hemorrhage		
Yes	22	10.0
No	198	90.0
Total	220	100.0

The mean weight of the prostate using TRUS was 53.21 g. The mean pretreatment IPSS and bother impact index were 25.9 and 5.74, respectively. Their details are shown in Table 2. Some of the patients presented on catheters because of acute, chronic, or acute on chronic urinary retention but some were never catheterized before surgery. The distribution of catheterized versus uncatheterized patients prior to surgery is shown in Table 3. Intraoperatively, the mean volume of 5% Dextrose water used as irrigant fluid was 45.35 liters. The mean resected weight of prostate and the resection time were 30.10 g and 66.08 mins, respectively, as depicted in Table 4.

Table 5 shows the perioperative outcomes and early; <30 days adverse events seen in this study. No patient needed blood transfusion because of blood loss. There were neither capsular perforations nor bladder perforation. Very few patients had immediate postop hematuria; 5 (2.3%) and associated with clot retention in 3 (1.4%) but no patient required take back to theatre because of bleeding. No patient also had symptoms suggestive of TURP syndrome in this study. We found out that five patients (2.3%) developed acute urinary retention on the removal of catheter and were recatheterized. However, all voided urine on the removal of catheter after 2 weeks.

In this study, 42 patients developed UTI postoperatively documented on urine culture despite preop negative culture. In 22 patients, secondary hemorrhage occurred and was managed conservatively without need for blood transfusion. There was a positive association between UTI and secondary hemorrhage as depicted in Table 6.

Tables 7A and 7B gives a summary of voiding outcomes in this study. Table 7 shows the voiding outcome which was assessed with IPSS at 6 weeks and 3 months and bother impact index at 3 months. The pretreatment IPSS and initial bother impact index were compared with postoperative IPSS and bother impact index as indicated. The mean postoperative IPSS were 4.71 and 2.73 at 6 weeks and 3 months, respectively, and 1.42 for bother impact index. The improvements were statistically significant at $P < 0.005$.

The long-term complications are depicted in Table 8.

Table comparing prostate weight before surgery and resected weight.

Table 6: Test of association secondary hemorrhage and UTI

Secondary hemorrhage	UTI		Total	Chi-Square	*P*
	No	Yes			
NO	169	29	198	25.321	0.000*
	94.9%	69.0%	90.0%		
YES	9	13	22		
	5.1%	31.0%	10.0%		
Total	178	42	220		
	100.0%	100.0%	100.0%		

*Significant $P<0.05$

Table 7A: Comparison of IPSS scores (ANOVA)

Period	Mean±S. D.	*P*
Pre-treatment	25.90 ± 5.05^{c}	0.000*
6 weeks	4.71 ± 1.90^{b}	
3 months	2.73 ± 1.33^{a}	
Total	11.12±10.97	

*Significant $P<0.05$, mean values with the same alphabet superscript differ significantly from each other

Table 7B: Mean comparison of bother impact index and IPSS

Parameters	Time	Mean	S D	*t*	*P*
Bother impact index	Initial	5.74	0.44	64.087	0.000*
	3 months	1.41	0.87		
IPSS	6 weeks	4.71	1.90	16.035	0.000*
	3 months	2.73	1.33		

*Significant at $P<0.005$

Table 8: Long-term complications

Urinary incontinence	Frequency	Percentage
Yes	14	6.4
No	206	93.6
Total	220	100.0
Urethral stricture		
Yes	9	4.1
No	211	95.9
Total	220	100.0
Bladder neck contracture		
Yes	5	2.3
No	215	97.7
Total	220	100.0
Repeat turp for residual adenoma		
Yes	0	0.0
No	220	100.0
Total	220	100.0

Discussion

TURP remains the gold standard for the treatment of men with severe lower urinary tract symptoms (LUTS) and complications arising from BPH. Resource-poor countries like ours have found it challenging moving from open simple prostatectomies to these less invasive techniques due to financial problems in procuring equipments and sponsorship of urologists to foreign/local training centers. The urologists that attempt to overcome these challenges keep searching for cheaper but effective ways of performing these endoscopic surgeries. For TURP, it is cheaper to start off with monopolar TURP than bipolar TURP. A major challenge in monopolar TURP in resource-poor countries is procuring irrigation fluid for surgery. Several irrigation fluids exist including 1.5% glycine, water, mannitol, sorbitol, 5% dextrose water, etc., We found it was easier to procure 5% dextrose water as it was already in a sterilized form unlike water which is as cheap but has to be sterilized with attendant high risk of intravascular hemolysis. We did not encounter difficulties in the surgeries because of viscosity as reported by some researchers.

In this study, we report the outcome of TURP in our environment using 5% dextrose water.

The mean age of patient was 66.25 yrs which agrees with age incidence of BPH and is comparable to other studies.[13-16]

The high mean IPSS and QOLS score signifies that our patients present for surgery when their LUTS is severe. It could also reflect the tendency to seek medical attention late in our environment.

The mean volume/weight of prostate recruited in this study was 53.2 g (range 13–126 g). It is not significantly different from prostate sizes offered monopolar TURP using variety of irrigant fluids (water, 1.5% glycine, mannitol, etc.).[15,17]

In this study, 35.5% of patients were on catheter prior to TURP reflecting the number of patients who presented in acute, acute on chronic, and chronic urine retention. One advantage of prior catheterization is that it dilates the urethra making it unnecessary to dilate it before introducing the resectoscope. Jeje *et al.* reported similar observation in their study.[18]

Intraoperatively, the mean volume of irrigant used was 45.35 liters (range 20–70 liters), and the mean resected weight of prostate was 30.1 g over mean resection time of 66.08 mins. Mbaeri *et al.* reported resected weight of 33.8 g over a mean resection time of 69.5 mins using 5% dextrose water.[19] While Akpayak *et al.* reported resected weight of 29 g over a mean resection time of 71 mins using same fluid.[20]

Alhassan *et al.*[15] recorded resected weight of 59.8 g over a mean resection time of 64.1 mins using sterile water while Tela *et al.*[21] reported 18.4 g of resected tissue over a mean resection time of 63.8 mins using same water as irrigant. Jeje *et al.*[18] used mean volume of 68.7

liters of water and resected a mean weight of 56.68 g of prostate over mean resection time of 131.3 mins.

Agrawal *et al.*[22] using 1.5% glycine recorded resection weight of 22.4 g and 26.8 g over a resection time of 63.2 mins and 62.6 mins in 2006 and 2016, respectively.

These show that resected weight and resection times do not depend on irrigant fluids but probably on dexterity of the surgeon, size, and vascularity of prostate as there is no consistent pattern noted in these studies.

In this study, no patient needed blood transfusion probably because this was a prospective study and patients were properly selected (those with deranged clotting profiles were excluded, and those on blood thinners waited for 4 weeks after stopping these before surgery). In addition, a single experienced urologist did all surgeries and ensured meticulous coagulation often asking the anesthetist to raise the blood pressure slightly above the immediate preoperative blood pressure with ephedrine to witness the worst possible bleeding. Some studies recorded blood transfusion rates of 2.4% (Akpayak; dextrose),[20] 7.6% (Mocha *et al.*; dextrose),[16] 8% (karadeniz *et al.*; mannitol),[23] 6.5% (Jeje *et al.*; water),[18] 1.9% (Ho HS *et al.*; glycine)[24] while some had similar results with this study (Eziyi; water).[13]

There were neither capsular tear nor bladder perforations in this study. This may also be due to the experience of the surgeon. TURP has a steep learning curve and many of the studies that reported capsular tear attributed it to residents in training[16] or the learning curve associated with TURP. 14.3%; Akpayak dextrose,[20] 4.2%; Kumar glycine).[17] They were independent of irrigation fluid used.

Also no patient had TURP syndrome in this study. This may be because of use of continuous flow resectoscope and the surgeon in addition intermittently empties bladder never allowing distended bladder for a prolonged time. The absence of capsular perforations and mean resection time may be a factor in this study. The prevalence of the TUR syndrome is 0.3%–0.5%, in prospective controlled trials.[7] It has been seen in all irrigation fluids for monopolar TURP in studies.[14] The absence of TURP syndrome has also been reported in some studies using the different types of irrigation fluids [Akpayak; dextrose,[20] Eziyi; water[13]]. Therefore, there is no superior irrigation fluid for monopolar TURP with regard to TURP syndromes. Yousef *et al.*[11] in Egypt in a randomized comparison between glycine and 5% dextrose water recorded TURP syndrome in 14% of patients in glycine arm and none in 5% dextrose arm. Collins *et al.*[10] in another randomized study recorded 2% in glycine arm and none in 5% dextrose arm. Both concluded that glycine portends higher risk of TURP syndrome than 5% dextrose water. However, TURP syndrome was also reported using 5% dextrose water; Chukwujama *et al.*[14].

Few patients, 5 (2.3%) had hematuria with associated clot retention in 3 (1.4%) but none of them required take back to theatre for coagulation as they were transient and successfully managed by bladder irrigation and bladder washout. Kumar *et al.* recorded 12.7% incidence of hematuria and 8.5% incidence of clot retention using glycine.[17]

Five (2.3%) patients developed acute urinary retention on the removal of catheter and were recatheterized immediately. They all voided urine on the removal of catheter. The retention may have been due to residual edema of the prostatic bed or bladder atony. We did not think it was due to residual adenoma as all voided urine after 2 weeks catheterization. This complication was reported in other studies at comparable proportion irrespective of the irrigation fluid used. 2.1% in Kumar (glycine).[17]

In this study, 42 (19.1%) patients developed UTI despite a negative urine culture before surgery. This was quite high. Other studies that used 5% dextrose water reported lower incidence as seen in Akpayak *et al.*; 4.8% (dextrose water).[20] Their results were not significantly different from other studies using other types of irrigant fluids as reported by Ho SSH *et al.*; 3.84% (glycine),[24] Alhassan 7.2% (water).[15] During resection in our series, some of the prostatic adenomas had walled off pockets of pus which oozed out while resecting the adenoma. This may account for high incidence of UTI postoperatively since aseptic catheterization was done post TURP.

Twenty-two (10%) patients developed secondary hemorrhage which was managed conservatively with antibiotics and bladder irrigation without need for blood transfusions.

There was a positive association between UTI and secondary hemorrhage in this study which was statistically significant. Once UTI is documented postoperatively, aggressive antibiotic treatment should be instituted in an attempt to prevent secondary hemorrhage. We noticed a drop in secondary hemorrhage with this regimen.

The voiding outcome evaluated by change in IPSS at 3 months and 6 months and change in bother impact index at 3 months showed significant mean change of 22 at 3 months and 24 at 6 months and 4 for bother impact change. These were comparable to findings in other

studies irrespective irrigation fluid used. IPSS mean change was 22.1 in Jeje *et al.* (water),[18] 19.6 in Ho SS *et al.* at 3 months (glycine),[24] 15.3 in Al-Rawashdah S.F *et al.* (mannitol/sorbitol) at 3 months.[3]

Long-term complications in these patients after a 2 yrs follow-up include temporary incontinence in 14 (6.4%) patients. Some lasted up to 3 months before resolution on pelvic floor exercises. We believe the incontinence is due to overzealous coagulation at the apical end of the prostate. Sometimes these apical ends extend below the verumontanum putting the surgeon in a dilemma while resecting and coagulating in these areas. Incidence in other studies; 6.3% in Kumar *et al.* study (glycine),[17] Mbaeri 6.9% (dextrose),[19] Jeje; 2.4% (water).[18]

Also, nine (4.1%) patients developed partial short-segment urethral stricture at the bulbar area within 3 months to one year postoperatively. Direct visual urethrotomy (DVIU) was successfully used to treat these strictures. All presented with dwindling stream and rising IPSS or outright acute urine retention with subsequent failure of catheterization. Routine urethral dilation with up to size 28/32 metallic bougies and instillation of copious amount of lubricants prior to introduction of resectoscope has drastically reduced urethral strictures in subsequent TURPs. Mbaeri *et al.* recorded a stricture rate of 6.9% (Dextrose),[19] Mocha; 2.4% (Dextrose),[16] Jeje; 0.8% (water).[18] In a meta-analysis by Rassweiler *et al.*,[25] the rate of stricture ranged from 2.2% to 9.8%. They concluded that there were multifactorial causes of urethral strictures, depending on technique, operating room time, technology, and the regimen of antibiotic treatment.

We recorded five (2.3%) patients with incidence of BNS but no repeat TURP for residual adenoma in the 2 yrs follow-up. The BNS patients had bladder neck incision (BNI) with the resolution of their symptoms. The incidence of BNS in another study was 1.6% in Jeje *et al.* (water as irrigant fluid).[18] It ranged from 0.3%-9.2% in a meta-analysis conducted by Rassweiler J *et al.*[25] and 0-21% in another meta-analysis by Ahyai S A *et al*.[26] It was seen more commonly in smaller prostates less than 30 g.[25] It really had nothing to do with irrigant fluid used.

Conclusion

TURP using 5% dextrose water has comparable outcomes to other irrigation fluids for monopolar TURP. It is a good alternative to any other irrigation fluid.

Recommendation

We will advocate the use of 5% dextrose water to urologists in resource-poor countries as an alternative to expensive irrigation fluids.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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