

# ASPECTS OF TRANSURETHRAL RESECTION OF PROSTATE FOR OBSTRUCTING PROSTATIC ADENOMA

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## SYNOPSIS

Transurethral resection of prostate has been established as the operation of choice for patient with bladder outlet obstruction, commonly due to obstructing prostatic adenoma. The purpose of this paper is to analyse some of the aspects of this operation, especially the complications and to identify the causes so that the results can be improved.

168 personal cases done between January 1977 and May 1979 at the University Department of Surgery were analysed. There were two postoperative deaths, a mortality of 1.2%. Serious complications included 1 water intoxication, and 1 recto-prostatic fistula.

On the whole, the results were satisfying. However, clots retention (6%), secondary haemorrhage (7%), postoperative retention of urine (4.8%), strictures formation (4.8%) and Temporary partial incontinence of urine (5.4%) were other complications. One special problem was that of postoperative urinary tract infections present in 26% of patients.

The possible causes of the complications were analysed and management discussed with recommendations made to improve results.

## INTRODUCTION

Transurethral resection of prostate has been established as the operation of choice for obstructing prostatic adenoma in most developed countries and also recently in Singapore and Malaysia. (Yong 1973, Wong 1973, Beng 1977). Apart from low mortality and morbidity and shorter hospital stay, its main advantage is lack of postoperative pain which all patients appreciate. The purpose of this paper is to analyse some of the aspects of this operation, especially the complications and to identify the causes so that the results can be improved.

## MATERIAL STUDIED

At the University Department of Surgery, Singapore General Hospital, 341 patients had prostatectomy done between January 1977 and May 1979. 319 or 92.5% had transurethral surgery. No patient who presented with acute retention of urine was denied the operation because of his poor general condition. 168 patients done personally were available for analysis.

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**RESULTS AND DISCUSSION**

Age Incidence: (Figure 1)

The majority of patients were in the 7th decade of life. Only 3 were below the age of 50 years, the youngest being 47 and the oldest was 89 years. With longer life expectancy and a shift of the population of Singapore to the older age group, more cases will be seen.

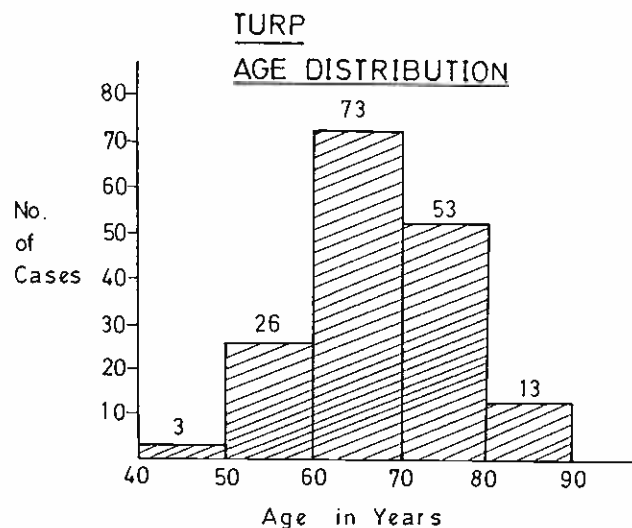


Figure 1. Showing the age distribution of patients.

Ethnic Groups: (Table 1)

Comparing the incidence with the general population of male above the age of 50 years in Singapore, in June 1978, there appears to be a lower incidence of the disease among the Malays.

**ETHNIC GROUPS**

**TABLE I**

ETHNIC GROUPS	NO. OF CASES	%	*GENERAL POPULATION %
CHINESE	138	82.1	70.1
MALAY	9	5.4	13.2
INDIANS	21	12.5	14.1
OTHERS	0	0	2.6

\*Population estimation of Male over 50 years old at the end of June 1978 in Singapore.

Clinical Presentation: (Table II)

132 patients (78.6%) presented as emergency with acute retention of urine. Of these only 63 (47.7%) gave a history of associated 'prostatism.' 2 patients (1.2%) had acute on chronic retention with evidence of renal impairment due to the bladder outflow obstruction. There has been a gradual increase of elective prostatectomy from 18% in 1977 to 35% in 1979.

11 patients (6.5%) had gross haematuria, out of which 6

had urolithiasis. (4 bladder stones and 2 ureteric stones.) 4 patients had painless gross haematuria with minimal obstructive symptoms and 2 of these patients had large prostate, one 72 grams and the other 84 grams. This illustrates the fact that the degree of bladder outflow obstruction is not related to the size of the prostatic adenoma.

4 patients (2.4%) had transurethral surgery 1½ to 3 years previously and their symptoms recurred requiring further resection.

**CLINICAL PRESENTATION**

**TABLE II**

ACUTE RETENTION	132	78.6%
ELECTIVE	36	21.4%
TOTAL	168	100%

Clinical grade of patients: (Table III)

Using the criteria by Singh et al (1973), only 37.5% of the patients were in clinical grade 1, 70 years old and below, with no associated medical diseases. 47.6% were in clinical grade II, age between 71 and 80 years old, or younger patients with associated hypertension, diabetes mellitus, chronic lung diseases, ischaemic heart disease, previous myocardial infarct or cerebrovascular accident more than 6 months before. 14.9% were in clinical grade III, those who were over the age of 80 years and those who had recent myocardial infarct, cerebrovascular accident and severe chronic lung diseases. There were 4 patients who had their operation done within 3 weeks to 3 months post myocardial infarct.

**CLINICAL GRADE OF PATIENTS**

**TABLE III**

NO. OF PATIENTS	GRADE I	GRADE II	GRADE III
168	63	80	25
100%	37.5%	47.6%	14.9%

GRADE I : 70 yrs. old and below, no associated medical diseases.

GRADE II : Age between 71 and 80, or younger patients with associated hypertension, diabetes, chronic lung disease, ischaemic heart; disease, previous myocardial infarct or cerebrovascular accidents.

GRADE III : Age over 80 and those with recent (within 6 months) myocardial infarct, cerebrovascular accidents and severe chronic lung disease.

**Anaesthesia used:**

Regional anaesthesia was used in 84% of cases. Though caudal anaesthesia could be used there was a high failure rate (39% in 1977) and low spinal anaesthesia is now the preferred method. The advantage of regional over general anaesthesia is that postoperative chest complications is less in these old and often medically unfit patients.

**Resection Time:**

130 patients (77.4%) had their glands resected within 60 minutes, 36 patients (21.4%) within 61 to 90 minutes. No resection went beyond 90 minutes which was considered the limit to avoid the danger of water intoxication.

**Weight of prostatic tissue removed: (Figure 2)**

46 patients (27.4%) had less than 10 grams of prostatic tissue removed. 82 patients (48.8%) had glands between 10 to 29 grams, while 18 cases (10.8%) had 40 or more grams, the largest being 84 grams. With better experience, larger and larger glands can be resected with safety, up to the limit of 50 to 60 grams. There are few very large glands in our local population, and during this period of study, only 4 open prostatectomies were done and they were for large prostates associated with multiple or large vesical stones.

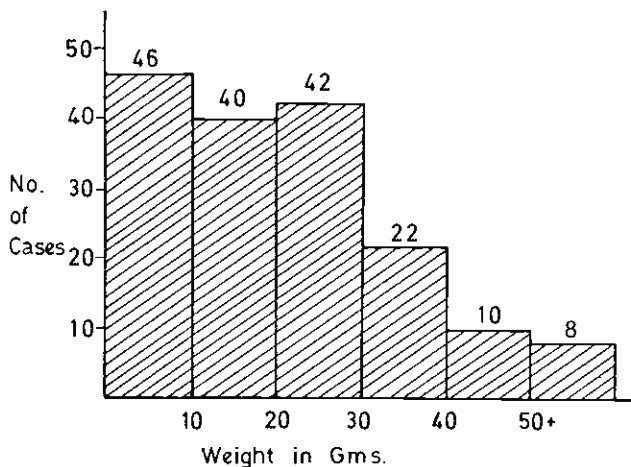
**WEIGHT OF PROSTATIC TISSUE REMOVED**

Figure 2. Showing the weight of prostatic tissue removed.

**Irrigating fluid used:**

Sterile water was used for irrigation during resection. The amount of water used depended of the size of the gland and the duration of resection, the average being 10 to 20 litres. Haemoglobin content of the irrigating fluid was estimated to calculate the approximate blood lost.

**Estimated blood lost and blood requirement: (Table IV)**

130 patients (77.4%) lost less than 500 ml of blood while only 7 patients (4.2%) lost more than a litre during the period of resection. The amount of blood lost depended on the size of the glands. In general, glands less than 20 grams in size usually do not need blood transfusion, while those above 40 grams will require blood transfusion. In this series, 94 patients (56%) did not have blood transfusion, compared to only 4% of 100 cases of open prostatectomies analysed at our department recently (Beng 1977).

**TURP BLOOD REPLACEMENT IN RELATION TO SIZE OF GLANDS**  
**TABLE IV**

SIZE IN GRAMS	NO. OF CASES REQUIRING BLOOD	PERCENTAGE
<10	4/46	8.7
10 — 19	8/36	27.5
20 — 29	24/42	57.1
30 — 39	17/22	77.3
40 — 49	10/10	100
50+	8/8	100
TOTAL	74/168	44

**Associated bladder calculi:**

There appeared to be a high incidence of associated bladder stones, being present in 18 patients (10.7%), 15 were removed at the time of transurethral surgery, 7 were 'scooped' out with the resectoscope, while 8 required additional procedure of litholapaxy. Due to technical difficulty 2 patients had their stones removed at a later stage. 1 patient, to his relief passed out the stone in the postoperative period.

**Associated prostatitis on histology:**

37 patients (22%) had evidence of acute or chronic prostatitis on histology. This group of patients were associated with higher complication rate especially with postoperative urinary tract infections and temporary incontinence of urine.

**Recovery period: (Table V)**

122 patients (72.6%) were discharged within a week. Many of the patients who stayed for more than 2 weeks were due to social reasons.

**RECOVERY PERIOD AFTER TURP**  
**TABLE V**

NO. OF DAYS	NO. OF CASES	%
Up to 5	72	42.9
6 to 7	50	29.7
8 to 14	29	17.3
15 to 21	11	6.5
More than 21	4	2.4
Death	2	1.2
TOTAL	168	100

Complications: (Table VI)

**COMPLICATION OF TRANSURETHRAL SURGERY FOR OBSTRUCTING PROSTATIC ADENOMA (168 PATIENTS)**

**TABLE VI**

MORTALITY	2	1.2%
MORBIDITY		
Chest infection (Bronchopneumonia)	1	0.6%
Congestive Heart Failure	1	0.6%
Bladder Perforation	1	0.6%
Prostato-rectal fistula	1	0.6%
Water Intoxication	1)	
Hyponatremia	3)	2.4%
Post Op. Clot Retention	10	6.0%
Secondary Haemorrhage	12	7.0%
Post Op. Retention	8	4.8%
Strictures	8	4.8%
Temporary Incontinence	9	5.4%
Infections		
U.T.I.	41)	
Septicaemia	1)	26.0%
Epididymoorchitis	2)	

Mortality — There were 2 deaths, a mortality of 1.2%. The first was an 84 year old patient who had previous history of myocardial infarction and congestive cardiac failure. He was admitted with acute retention of urine. Transurethral resection of his obstructing prostate was done removing 25 grams of tissue. Postoperatively, he had episodes of dyspnoea and was treated for heart failure. He appeared to improve and after removal of the urinary catheter, he was able to pass urine, but he died suddenly on the 4th postoperative day, from a fresh myocardial infarction. The second patient was 87 years old, partially deaf and blind, but still ambulant with aid. He was admitted to the medical ward with cor-pulmonale from chronic emphysematous lungs. He developed acute retention there while undergoing treatment. Transurethral resection removing 26 grams prostate was done. Resection was incomplete because the caudal anaesthesia was not working well. Postoperatively, he developed clots retention, and evacuation of clots and completion of resection removing a further 6 grams was done under general anaesthesia. The bleeding was controlled, but unfortunately, patient vomited and aspirated in the recovery ward.

Intra operative complication — There was no major perforation of prostatic capsule requiring suprapubic drainage. However, there was one accidental perforation of the vault of the bladder on introduction of the resectoscope, requiring a laparotomy to repair the perforation.

General Postoperative complications — In spite of the many patients with poor general conditions, chest infection post operatively had not been a problem. This was mainly due to lack of a painful abdominal incision and the use of regional anaesthesia. There was only 1 case of

bronchopneumonia in a bed ridden, senile demented patient. There was one other diabetic, hypertensive patients with ischaemic heart disease who developed congestive cardiac failure postoperatively.

Specific complications:

Prostato-rectal fistula — There was 1 patient who developed a prostato-rectal fistula. He was 73 years of age and had pin and plate done for trochanteric fracture of the femur. He developed acute retention of urine. Transurethral resection of his bladder neck was done but he still could not empty his bladder. Subsequently, transurethral resection of his prostate removing 9 grams was done. He was able to pass urine after that but developed the fistula 3 weeks later. This was probably due to break down of a diathermised portion of the prostatic capsule and poor wound healing as his nutritional state was very poor, his serum albumin being only 2 grams. Only supra-pubic cystostomy was done to divert the urine. His orthopaedic wound also broke down exposing the pin and plate, and he eventually died in the orthopaedic ward.

Water intoxication and hyponatremia — There was one severe case of water intoxication. This was an 82 year old, diabetic, hypertensive and obese patient who presented with acute retention of urine. Transurethral resection removing 72 grams of prostate was completed in 90 minutes. Postoperatively, he was disorientated, cyanosed and developed Cheyne — Stokes respiration. He was intubated and given assisted respiration. As the bladder irrigation was heavily blood stained, he was re-cystoscoped but no clots were found. There was generalised oozing and his blood samples were haemolysed. His serum sodium dropped to 125 mEq/L. He was given hypertonic saline and frusemide, he eventually recovered and was discharged home on the 14th postoperative day. There were 3 cases of hyponatremia, giving rise to mild symptoms of water intoxication. There was postoperative confusion and rigor. Their blood samples were haemolysed and the serum sodium were 110 to 126 mEq/L. The weight of the glands removed were, 20, 38 and 40 grams and the resection time were 60 to 70 minutes. They were given hypertonic saline and diuretics with rapid improvement.

The problem of water intoxication is the limiting factor to the size of the gland which can be resected with safety. Its occurrence is related more to the resection time than to the actual size of the gland. Thus as experience is gained, larger and larger gland can be resected within the period of time which generally should not be more than 90 minutes, preferably within 60 minutes.

Pre-operatively, hyponatremia should be corrected and the serum sodium should be at least 130 mEq/L. During the operation, the use of hypertonic dextrose saline solution (5% dextrose in 0.9% saline) may help to counter act the effect of absorption of hypotonic water. Frusemide, a diuretic, is given routinely to patients requiring more than 45 minutes of resection time. With these measures the problem should be kept to a minimum.

Postoperative clots retention — Excessive post-operative bleeding occurred in 6 patients (3.6%) leading to clot retention requiring evacuation of clots and haemostasis in the operating theatre. 4 other cases were

of lesser degree requiring only bladder washout in the ward to overcome the problem. The main cause of bleeding was due to minor capsular perforations especially in small glands, leading to venous bleeding in 3 patients. Bleeding from mucosal edge on the anterior aspect of the prostatic cavity which was difficult to reach with the resectoscope, occurred in 2 other cases. One patient was restless postoperatively due to opium withdrawal, leading to increase venous congestion and bleeding. As experience was gained, the problem of immediate postoperative bleeding had decreased.

Secondary haemorrhage — 12 patients (7%) had secondary haemorrhage requiring readmission between 7th to 20th postoperative day. 10 of the 12 cases had positive urine cultures. 2 cases had remnant prostatic adenoma (2 grams and 8 grams) which became infected and bled. 4 cases were severe requiring evacuation of clots and haemostasis or resection of remnant lobe in the operating theatre. 4 cases were moderate requiring only bladder washout and irrigation in the ward, while 4 other cases were mild requiring only observation and liberal fluid intake. All recovered well except one who developed bladder neck contracture on follow up.

Postoperative urinary retention — As a routine, the urethral catheter was removed on the 4th postoperative day. 8 cases (4.8%) developed difficulty in passing urine again and required further period of indwelling catheter usually for another 4 days. After this period if patient was still unable to pass urine, recystourethroscopy was done, as was the case in 5 patients. Two were found to have remnant apical lobes still causing obstruction and these were resected, one 8 grams and the other 2 grams. No mechanical obstruction was found in the other 3 patients and they improved with further period of catheterization and cholinergic drug. Presumably, these patients had poor detrusor muscle tone.

Strictures and bladder neck contractures — There were 8 patients (4.8%), 2 with meatal strictures, 1 with urethral stricture and 5 with bladder neck contractures. These developed from 7 weeks to 3 months post-operatively. The meatal and urethral strictures usually responded to 2 or 3 dilations with bougies. Bladder neck resection was done for bladder neck contractures. It is interesting to note that out of the 5 bladder neck contractures, 4 had their initial resection done for glands which were less than 10 grams. These were probably cases of bladder neck obstruction due to incoordination of detrusor contraction and bladder neck opening (as described by Turner-Warwick 1979) and the initial resection of the bladder neck was inadequate.

Incontinence of urine — There was no permanent incontinence of urine, however, 9 patients (5.4%) had temporary partial incontinence lasting for 3 weeks to 3 months.

Postoperative incontinence of urine is due to destruction of the intrinsic urethral mechanism of the distal urethral sphincter at the prostatic down to the membranous urethra. (Turner-Warwick R 1979). In the present series, it is noted that the incontinence was associated with urinary tract infections (8 cases) especially in the presence of prostatitis (5 cases). It is understandable that in the presence of infection there was inflammation and poor healing of the urethra thus causing impaired control of urine. The only patient who

had no evidence of urinary infection or prostatitis regained control of his urine rapidly within 3 weeks.

Thus to reduce this morbidity one has to control the urinary infection apart from avoiding the destruction of the urethra distal to the verumontanum.

Postoperative infections — One patient had septicaemia. He was a 63 year old, diabetic, who had transurethral resection of his prostate done removing 46 grams, 8 weeks after an attack of acute myocardial infarction. He developed a fever and lowish BP 80/60. Urine and blood culture grew Klebsiella organisms. He responded to treatment with Gentamycin.

2 patients (1.2%) had epididymo-orchitis. Both recovered with appropriate antibiotics. 41 other patients (24.4%) had urinary tract infections as evidence by postoperative fever, undue frequency and dysuria, and significant positive urine cultures.

Postoperative urinary tract infections not only give rise to possible septicaemia, epididymo-orchitis, fever, frequency and dysuria, but also is the main cause of secondary haemorrhage and poor control of micturition. Attention is therefore focus of the cause and the nature of the organisms which were responsible.

37 (22%) of our patients had evidence of acute or chronic prostatitis. Whether it is the cause or the effect of the patient's symptoms is debatable. A proportion (9/37 or 24.3%) of these patients had no acute retention of urine and therefore had not been catheterised. One would therefore think that prostatitis is the precipitating cause of the patient's symptoms rather than the effect. Considering that 22% of our patients had prostatitis, it is not surprising to find that 26% of our patients had post-operative urinary tract infection.

Types of organisms: (Table VII)

The commonest organism cultured pre-operatively was *Pseudomonas pyocyaneus* in 31% of patients with positive cultures. Next was *Klebsiella* organism with 20%, *Acinetobacter* 15.6% and *E. Coli* in 13.3%. Postoperatively the commonest organism cultured was *Klebsiella* in 35% followed by *Pseudomonas* in 32.5% and *Acinetobacter* in 13.8%. Surprisingly, *E. Coli* infection had not been a problem being present only in 1 patient. This may be due to the fact that, nitrofurantoin was used routinely prophylactically on patients with indwelling catheter, and *E. Coli* was sensitive to the drug.

Sensitivities of organisms: (Table VIII)

For postoperative infections, the most practical chemotherapeutic agents to use would appear to be Nalidixic Acid, Nitrofurantoin and Bactrium. Gentamycin should be reserved for those with severe infections due to *Klebsiella* or *pseudomonas*. Ampicilline appeared to be ineffective and should be used less frequently.

Apart from using the right chemotherapeutic agents, care must be exercised in the use of the indwelling 3-way Foley's catheter which is connected to a closed drainage system. As a routine, continuous bladder irrigation with normal saline is maintained up to the third postoperative day and the catheter removed on the 4th postoperative day. It is felt that maintenance of the continuous irrigation of bladder even though bleeding has ceased help to cut down the infection rate.

**ORGANISMS CAUSING URINARY TRACT INFECTIONS NO. OF POSITIVE CULTURES POST TURP  
TABLE VII**

PRE-OPERATIVELY			POST-OPERATIVELY		
ORGANISMS	NO.	%	ORGANISMS	NO.	%
PSEUDOMONAS	14	31	KLEBSIELLA	28	35
KLEBSIELLA	9	20	PSEUDOMONAS	26	32.5
ACINETOBACTER	7	15.6	ACINETOBACTER	11	13.8
E. COLI	6	13.3	CITROBACTER	8	10
PROTEUS	4	9.0	ACROMOBACTER	3	3.8
STREPTOCOCCUS	3	6.7	ENTEROBACTER	2	2.5
STAPHALOCOCUS	1	2.2	E. COLI	1	1.2
CITROBACTER	1	2.2	PROTEUS	1	1.2
TOTAL	45	100	TOTAL	80	100

**SENSITIVITY OF ORGANISMS: NUMBER OF CULTURES SENSITIVE TO THE VARIOUS CHEMOTHERAPEUTICS  
TABLE VIII**

ORGANISM NO	CHEMO-THERAPEUTICS										
	PSEUDO MONAS	KLEB STELLA	ACINETO BACTER	CITRO BACTER	E. COLI	PROTEUS	ACHROMO BACTER	STREPT.	ENTERO BACTER	STAPH	
NITROFURANTOIN	—	16	2	8	7	2	—	3	1	1	
AMPICILLINE	—	—	4	—	3	1	3	2	—	—	
NALIDIXIC ACID	2	25	18	2	7	4	2	—	2	—	
BACTRIUM	7	10	7	6	4	1	2	1	1	1	
GENTAMYCIN	32	22	7	3	2	1	2	—	1	—	
CARBENICILLINE	16	—	—	—	—	—	—	—	—	—	
AMIKACIN	9	5	1	—	—	—	—	—	—	—	
STREPTOMYCIN	3	—	—	—	—	—	—	—	—	—	

**CONCLUSIONS**

168 patients with obstructing prostatic adenoma was operated on transurethrally. 78.6% presented with acute retention of urine. 22% of patients had evidence of prostatitis and this was associated with higher morbidity. Regional anaesthesia was used in 84% and no blood transfusion was required in 56% of patients. The resection time was less than 60 minutes in 77.4% of patients and 72.6% were discharged home within a week.

Transurethral resection of prostate is now the operation of choice for bladder outflow obstruction due to

obstructing prostatic adenoma. More than 90% of our patients can be operated on transurethrally with a mortality of 1.2%. Complications included 1 perforation of bladder, 1 prostatico-rectal fistula, 1 water intoxication and 3 hyponatremia. Postoperative bleeding, postoperative retention, strictures formation and temporary partial urinary incontinence were other complications. The complication rate should decrease as experience in this operative technique is gained. One special problem is that of infections and with better understanding of the cause and the nature of the infecting organisms, it is hoped that we would be able to control and reduce the incidence.

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