Transurethral Resection of Prostate: The Standard Surgical Intervention for Benign Prostatic Hyperplasia

Baker A. Al-Abbadi MD, Firas A. Al-Hammori MD*, Adnan A. Abo Gamar MD*, Zakia M. Saed SN***

ABSTRACT

Objectives: To report our experience, surgical results and complications of transurethral resection of prostate for benign prostatic hyperplasia.

Methods: This is a retrospective study of 162 patients who underwent transurethral resection of prostate for benign prostatic hyperplasia between January 2007 and January 2008 at Prince Hussein Ben Abdullah Urology Center. The indications, surgical results and the occurrence of various complications were studied from the retrieved clinical records.

Results: Seventy-one patients (43.8%) underwent elective transurethral resection of prostate for significant lower urinary tract symptoms. Fifty patients (30.9%) had resection because of recurrent urine retention that had failed a trial without urinary catheter. The other patients had recurrent urinary tract infection (4.3%), recurrent hematuria of prostatic origin (6.8%), renal impairment (6.2%) or bladder stone (8.0%). Seven patients (4.3%) developed urinary tract infection postoperatively. Secondary hemorrhage within four weeks postoperatively developed in three patients (1.8 %). Six patients developed urge incontinence. Urethral stricture occurred in two patients (1.2%) and one patient developed bladder neck contracture. One patient had bladder perforation. Only one patient (0.6%) suffered from transurethral resection syndrome in this study. Seven patients (4.3%) required blood transfusion during or after surgery. No episodes of immediate postoperative sepsis were encountered. There was no postoperative mortality.

Conclusion: Transurethral resection of prostate is considered safe with low associated morbidity rate. Accordingly, transurethral resection of the prostate remains the 'gold standard' surgical treatment of benign prostatic hyperplasia and its complications.

Key words: Benign prostatic hyperplasia, Complications, Transurethral resection of prostate

JRMS December 2010; 17(4): 28-34

Introduction

Benign prostatic hyperplasia (BPH) is the most common benign neoplasm in males.[1] It often produces chronic and progressive lower urinary symptoms or chronic complications, leading many men to seek treatment. It has a significant impact on the quality of life and sometimes the physical well-being of affected individuals.[2-4] Surgical intervention remains the sole means of curing the resultant obstruction of urinary tract.[5] The absolute indications for surgery include refractory urinary retention, renal impairment, and hematuria due to BPH. Urinary tract infection and bladder stone formation are also good indications for surgical

From the Departments of:
*Urology, Prince Hussein Ben Abdullah Urology Center, King Hussein Medical Center (KHMC), Amman-Jordan
**Nursing, (KHMC)
Correspondence should be addressed to Dr. B. Al-Abbadi, P. O. Box 855044 Amman 11855 Jordan, E-mail:abbadibaker@hotmail.com
Manuscript received October 22, 2008. Accepted July 2, 2009

intervention. Another large group of surgical candidates are those who had unsatisfactory medical management of lower urinary tract symptoms (LUTS).[6,7]

Transurethral resection of the prostate (TURP) is the most common surgical procedure for relieving symptoms of benign prostatic hyperplasia.[8,9] Although special training is required for surgeons performing TURP, morbidities may arise even in experienced hands. With increased experience, improvements in operative techniques, video endoscopy, anesthetic care and intraoperative monitoring of fluid and electrolytes, the rates of intraoperative and postoperative morbidity and mortality have been greatly reduced.[10,11]

Newer interventions for BPH (transurethral microwave thermotherapy (TUMT), transurethral needle ablation, laser prostatectomy) aim to attain the same benefits as TURP with minimal morbidity. These procedures are described as 'minimally invasive procedures.[12-14] Most of these 'minimally invasive procedures' appear to wane in popularity after a short period of interest. Often, reports on such minimally invasive procedures cite transurethral prostatectomy as the gold standard.[15,16]

This paper focuses on our experience of TURP for BPH and associated surgical outcomes.

Methods

A total of 162 patients who underwent TURP for BPH at Prince Hussein Ben Abdullah Urology Center between January 2007 and January 2008 were included in this retrospective study. The inpatient and outpatient records, operative reports, investigations and histology results and discharge summaries were reviewed. The indications, the operative duration, blood loss (need for blood transfusion), resected tissue weight, histology, changes in hemoglobin and serum sodium level, duration of catheterization, and complications were recorded. All patients gave a detailed history and had a physical examination including a digital rectal examination, urine analysis, urine culture, renal function tests, serum PSA levels, and prostatic U/S preoperatively. Only new BPH cases without previous prostate operations were included. Patients who had neurovesical dysfunction, urethral stricture, bladder cancer, prostate cancer diagnosed preoperatively or suspected of having carcinoma of the prostate because of very high PSA levels or suspicious digital rectal examinations were excluded from this study.

The video camera-assisted TURPs were performed by surgeons with varying degree of experience in our center, ranging from a junior urologist under the supervision of a senior specialist to a senior consultant. The procedure was performed under spinal or general anesthesia and all the patients received preoperative antibiotics.

All the procedures were done with a size 24 or 27F continuous–flow conventional monopolar resectoscope (Storz, Germany) and 1.5% glycine for irrigation was administered in all cases. A standard technique was used for TURP. At the end of the procedure, a 24F double-lumen urinary catheter was left indwelling and continuous irrigation was commenced with 0.9% saline to maintain a clear return. Irrigation was discontinued depending on the color of the returning fluid and the catheter was removed 48-72 hours after ensuring clear urine. Patients were usually discharged after they could pass urine.

All patients in the study were followed for at least three months at the out-patient urology clinic to note complications and to assess patient satisfaction.

Results

The mean age of patients undergoing TURP was 67.6 years (range, 55–85 years) (Table I). Symptomatic prostatism (LUTS) was the most common indication for TURP (43.8%). The proportion of patients operated on for recurrent urine retention was 30.9%. In 8.0% of TURP cases, concomitant removal of bladder calculi was done. The majority of them were removed endoscopically using lithoclast and cystolithalopexy. Only two open cystolithotomies were done because of large stones. The other indications for TURP are shown in Table II.

The prostate size estimated by transabdominal ultrasound was 100g or less in all patients. Of these patients, 70 (43.2%) had a prostate larger than 50g. In the retention group, 35 patients had a large prostate and 27 patients had preoperative bacteriuria. Other perioperative data are shown in Table I. Prostatic adenocarcinoma was detected in TURP chippings of four patients. All of them subsequently had either surgical or medical castration or observation in view of their age.

The overall complication rate was 16.0% (Table III). The most common postoperative complication

Table I. Patient characteristics and perioperative data obtained on patients undergoing TURP

Variables	Mean	Range
Age (years)	67.6	55-85
Hemoglobin (g/dl) - Preoperative	12.9	10-17
- Postoperative	12.3	9-17
- Drop	0.60	0 - 6
Serum Na (mEq/L) - Preoperative	139.3	132-146
- Postoperative	137.2	121-145
- Drop	2.1	1-20
PSA (ng/mL)	3.1	1.5- 4.5
Prostate size (g)	46	30-100
Weight of resected tissue (g)	27	10-70
Surgical time (min)	38	20-90
Catheter duration (days)	2.9	2-3
Hospital stay (days)	3.2	2-4
Peak flow (ml/sec) - Preoperative	4.8	0-14
- Postoperative	20.4	11-40

Table II. Indications for transurethral resection of prostate

Indications	Number of patients	%
Symptomatic prostatism	71	43.8
Acute urinary retention	50	30.9
Bladder stone	13	8.0
Recurrent hematuria	11	6.8
Renal function impairment	10	6.2
Recurrent UTI	7	4.3

Table III. Complications of transurethral resection of prostate

Complications	Number of patients	%
UTI	7	4.3
Urge incontinence	6	3.7
Reoperation -evacuation	2	1.2
-redo TURP	3	1.8
Secondary hemorrhage	3	1.8
Urethral stricture	2	1.2
Bladder neck contracture	1	0.6
Bladder perforation	1	0.6
TUR Syndrome	1	0.6
Total	26	16.0

was urinary tract infection (UTI), which occurred in seven patients (4.3%). All of them occurred in patients operated for urinary retention who already had bacteriuria preoperatively. Two patients (1.2%) who developed clot retention due to persistent hematuria immediately in the recovery room were returned to theatre for evacuation and diathermy. Both of them originally had large prostates. Only one patient (0.9%) suffered from TUR syndrome in this study; seventy grams of prostatic tissue was resected over 80 minutes, the intraoperative serum sodium was 121mEq/L. A hypertonic saline solution with a diuretic was given. The patient was kept under monitoring for the next 24 hours. He responded to hypertonic saline infusions and recovered fully with no neurological deficit.

One patient needed a bladder neck incision for bladder neck contracture. Another two had repeated urethrotomies because of urethral stricture.

Seven patients (4.3%) required blood transfusion during or after TURP, each patient received on average of 1.4 units of blood. No patient developed long term urinary incontinence, non TURP related postoperative complications or septicemia. There was no mortality in the 162 patients studied.

Average postoperative hospital stay and average indwelling urethral catheter time were 3.2 and 2.9 days respectively. Regarding postoperative satisfaction, nine patients (5.6%) stated that they were 'unhappy' with the results of their surgery. Three of them underwent re-do TURP for persistent obstructive symptoms. The others were found to have bladder instability.

Discussion

Treatment options for BPH in older men include watchful waiting, medical therapy, TURP, minimally invasive treatments, prostatic stenting, and open prostatectomy.[17,18,19] Patients with complicated BPH certainly require surgical intervention. Although medical therapy is the mainstay treatment for symptomatic control of BPH, patients who respond unsatisfactorily should not be denied the opportunity of effective surgery.[6,20]

Although open prostatectomy has largely been replaced by TURP, it is still practiced in our center for prostates larger than 100g. Nonetheless, some of our urologists safely perform transurethral resection in the form of staged TURP on huge prostates. In the past decade, many minimally invasive procedures have been introduced worldwide in the hope of minimizing some of the problems associated with TURP such as haemostasis and TURP syndrome.[21,22]

In our center, the Greenlight laser prostatectomy (Photoselective Vaporization of the Prostate) was introduced a few months ago. TUMT was introduced in 2001 and is performed only for selected cases. Transurethral needle ablation was tried last year on a few cases and the results were equivalent to TUMT. Other minimally invasive procedures are not available therefore, TURP is the most common surgical intervention routinely practiced in our hospital for BPH.

The age of our patients (range: 55-85 years), resection time, weight of resected tissue, length of hospital stay, and catheter duration are comparable to other series.[23-26] Our results confirmed that TURPs are still being performed on a statistically older male population.

As reported by many authors,[27] symptomatic prostatism is the most common indication for TURP in our study. Most of our patients had received medical therapy for BPH symptoms before they underwent TURP. Of the patients who underwent TURP, the indication was BPH complications in 56.2% (recurrent urine retention, 30.9%; chronic complications, 25.3%). These patients had larger prostates and more tissue was resected compared with patients who had symptomatic prostatism. Most recent series reported similar results and argued that because of the later presentation in the disease process, larger amounts of prostatic tissue would need to be resected in order to achieve symptomatic improvement.[27] The other main two factors in our study influencing the resection time and the amount of tissue resected during TURP were the health of the patient, and the surgeon's preference and experience.

Compared to some series,[25] there were relatively fewer TURPs performed because of LUTS in our study and more patients are presenting for TURP as a result of complications arising from prostatic enlargement. Most likely, this is because of the widespread use of effective pharmacological agents in our country which resulted in a sharp decrease in the number of symptomatic patients treated surgically. Borth *et al.* also reported a significantly higher percentage of patients presenting with acute urinary retention (55%) and upper tract obstructive uropathy (12.5%) in 1998 compared with 1988 (23% and 1.3%, respectively). Also, over the 10-year study period (1990-2000), Wilson *et al.* reported that patients presenting in urinary retention requiring TURP increased from 33% to 58%, an increase of 75.8%, whereas LUTS as an indication for TURP fell from 65% to 42%, a decrease of 35.4%.

TURP has played an important role in prostate cancer detection in the 1970s and 1980s. In more recent years, with the availability of PSA and fine-needle biopsy, the importance of TURP in prostate cancer detection declined with little effect on prostate cancer incidence.[28,29] This is confirmed by our low incidence (2.5%) of TURP detected prostate cancer.

The morbidity associated with TURP is still an important issue. Problems that have not yet been overcome in monopolar TURP include bleeding, TUR syndrome, stricture formation, incontinence, Reoperation, and in rare cases bladder perforation.[15,30,31] Our complications rate of 16.0% is comparable to other series in the recent literature,[32] bearing in mind that surgeons with varying amounts of experience were involved in our study. The main early postoperative complication is still urinary tract infections. Lim *et al.*[25] reported a fall from 25% in the 1970s and 16% in the 1980s to 6% in 1999. All infection cases in our study occurred in patients who already had a urinary catheter preoperatively in which bacteriuria as common. However, our low rate of urinary tract infection (4.3%) probably reflects on the routine use of prophylactic antibiotics before surgery, and most likely because almost all of our patients who underwent elective TURP had preoperative sterile urine cultures.

Seven patients had intraoperative and postoperative hemorrhage requiring blood transfusions. Most of them occurred in patients who had chronic complications and/or a large prostate. The possible causes may be the higher percentage of recurrent hematuria and the significant incidence of preoperative anemia in these patients. Furthermore, it is hypothesized that because of the increasing usage of pharmacological therapy, more patients would present later in the natural history of the disease process for TURP. This would imply that

larger glands would be resected with longer resection times and potentially more complications and transfusion rates.[23,26,27,33] The improvement in the TURP technique, resectoscopes, and electrosurgical equipment has improved endoscopic views, with better-controlled haemostasis. This improvement is reflected in the lower transfusion rate in our study as compared to previous years.[23,25,34] Recently, some reports have shown that preoperative medications for two to three months with five alpha-reductase inhibitors significantly reduce transfusion rate and hemoglobin drop or blood loss in large prostates.[7,22,28,35]

The TUR syndrome is a potential complication of TURP in countries where bipolar saline TURP is not available.[36,37] The incidence of TUR syndrome in our study was 0.6%. The reported rates range from 0.18% to 10.9%.[30,38] Our recommended TURP technique completely removes almost all adenomatous tissue. The risk of TUR syndrome increases with a larger prostate (>45g) or longer resection time (>90 min).[22,26,31] Therefore, limited resection techniques (minimal TURP, channel TURP) have been introduced to reduce the morbidity of transurethral resection, and have gained some popularity.[29,39] Many authors claimed that inexperienced urologists and training residents more frequently induce irrigating fluid absorption and TUR syndrome than experienced urologists, who are capable of resecting more tissue per unit time.[38,40] Today, the introduction of bipolar resection devices for TURP has allowed for coagulation of tissue during resection, using normal saline as the irrigant fluid. This technique has reduced the potential for TUR syndrome and allowed for earlier removal of the urinary catheter and discharge from the hospital, while simultaneously decreasing complications, as indicated by some recent studies.[22,31] Therefore, in this environment, the influence of a surgeon's experience on the results and complications of TURP is questionable. Other authors have claimed that no advantages in terms of intraoperative and postoperative bleeding, resected tissue, catheterization time, hospital stay, operation time, or late complications were observed for bipolar TURP as compared to monopolar TURP.[37]

Strictures of the urethra and bladder neck occur in 1- 10% of patients after transurethral resection. This figure has remained relatively stable over the decades.[25,26] Our complication rate of 1.8 % is similar to other major series. Strictures complicate any procedure which requires urethral instrumentation, and they can therefore be expected to occur with any one of the physical methods of destroying prostatic tissue.[9] In our study, overzealous resection of small prostate glands by less experienced urologists when a transurethral incision of the prostate would suffice are contributing factors. Three of the nine patients who were dissatisfied with transurethral resection of the prostate underwent redo-TURP for incompletely resected prostates. All of them had primarily large prostates and urine retention. Here, we suggest that the level of experience is of great importance, as it indicates that resections performed by experienced urologists should have a lower frequency of re-TURP due to recurrent adenomas or adenomas that were incompletely resected. The other five patients who had diabetes and/or a cerebrovascular accident preoperatively were found to have detrusor instability postoperatively, and arguably the operation was inappropriate for them. Therefore, we suggest that a urodynamic study in the preoperative evaluation of such patients may be needed to rule out the possibility of concomitant bladder dysfunction.

Urinary bladder perforation is one of the complications of the procedure and it occurs in less than 1% of cases in some series.[8] We had one case of bladder perforation from TURP performed by a junior urologist during training. The perforation was recognized during surgery and managed by laparotomy and closure of the perforation.

Lastly, there are multiple studies comparing TURP and other “less invasive” therapeutic options such as microwave therapy, needle ablation, high intensity focused ultrasound, Holmium laser resection of the prostate, and photoselective vaporization of the prostate (PVP) with KTP laser.[41,42,43] These studies reported mainly short-term results and showed that the “less invasive” surgical options offered less morbidity, shorter duration of the procedure and earlier discharge from hospital.[21,22,26,44] However, longer follow up in some studies showed that there is a higher re-operation rate and unplanned secondary catheterization for those who underwent “less invasive” treatments and found no evidence of a difference in outcomes for symptoms using any of the newer technologies for endoscopic ablation of benign enlargement of the prostate over transurethral resection.[10,45,46] Therefore, it is

appropriate to consider these "less invasive" treatments as alternatives to and not a substitute for TURP.

Conclusion

The findings of this study are consistent with worldwide opinion: TURP remains the gold standard of surgical intervention for BPH and must remain the basis for comparison. Conventional monopolar TURP is considered safe with a low associated morbidity rate. The introduction of video camera-assisted TURP and the development of virtual reality training systems for TURP have enhanced training in this procedure; they have also provided more physical comfort for the urologist and improved the technical skills of the operating surgeons. As a result, both complication rates and the hospital stay have been significantly reduced.

However, other technologies are currently emerging as alternatives to TURP. None of them is capable of completely eliminating complications. The current vogue is for laser induced prostatectomy, which gives impressive results. Recently, transurethral resection and vaporization (GreenLight Laser) has been introduced to our center. We will use this technique, review our results, and compare them with our TURP experience before introducing it into routine clinical practice.

References

1. **Fonseca RC, Gomes CM, Meireles EB, *et al.*** Prostate specific antigen levels following transurethral resection of the prostate. *Int Braz J Urol* 2008; 34: 41-48.
2. **Borth CS, Beiko DT, Nickel JC.** Impact of medical therapy on transurethral resection of the prostate: a decade of change. *Urology* 2001; 57:1082–1086.
3. **DE Lima ML, Netto NR.** Urodynamic studies in the surgical treatment of benign prostatic hyperplasia. *Int Braz J Urol* 2003; 29: 418-422.
4. **Roehrborn CG.** Current Medical Therapies for Men with Lower Urinary Tract Symptoms and Benign Prostatic Hyperplasia: Achievements and Limitations. *Rev Urol* 2008; 10(1): 14–25.
5. **Suaid HJ, Goncalves MA, Rodrigues AA, *et al.*** Estimated costs of treatment of benign prostate hyperplasia in Brazil. *Int Braz J Urol* 2003; 29: 234-237.
6. **WH Sun, CW Man, RLC Ngai, *et al.*** Surgical intervention for benign prostatic hyperplasia in Hong Kong. *Hong Kong Med J* 2005; 11: 79-84.
7. **Kashif KM, Foley SJ, Basketter V, *et al.*** Haematuria associated with BPH: Natural history and a new treatment option. *Prostate Cancer and Prostatic Disease* 1998; 1: 154-156.
8. **Popoola AA, Onawola KA, Adesina MD, *et al.*** Intestinal obstruction: a rare complication of channeling Transurethral Resection of the Prostate (TURP): a case report. *J Med Case Reports.* 2008; 2: 30.
9. **Notley RG.** Transurethral resection of the prostate with and without continuous irrigation. *Journal of the Royal Society of Medicine* 1982; 75: 872-874.
10. **Lourenco T, Pickard, Vale L, *et al.*** Alternative approaches to endoscopic ablation for benign enlargement of the prostate: systematic review of randomized controlled trials. *BMJ* 2008; 337(7660): 36–39.
11. **Holman, Wisniewski, Semmens, *et al.*** Mortality and prostate cancer risk in 19 598 men after surgery for benign prostatic hyperplasia. *BJU Int* 2001; 84(1): 37-42.
12. **Choi J, Ikeguchi EF, Te AE, *et al.*** Laser Prostatectomy: Checkup on the Promises. *Rev Urol* 1999; 1(3): 170–176.
13. **Stafinski T, Menon D, Harris K, *et al.*** Photoselective vaporization of the prostate for the treatment of benign prostatic hyperplasia. *Can Urol Assoc J* 2008; 2(2): 124–134.
14. **Rubeinstein JN, Mcvary KT.** Transurethral microwave thermotherapy for benign prostatic hyperplasia. *Int Braz J Urol.* 2003; 29: 251-263.
15. **Crow P, Gilbert HW, Jones DJ, *et al.*** The influence of histological diagnosis on the postoperative complication rate following trans-urethral resection of prostate (TURP). *Ann R Coll Surg Engl* 2002; 84: 418–421.
16. **Roehrborn CG.** Safety and Efficacy of the Potassium-Titanyl-Phosphate Laser and Photoselective Vaporization of the Prostate for Benign Prostatic Hyperplasia. *Rev Urol* 2006; 8(3): 16–23.
17. **Dull P, Reagan RW, Robert R.** Managing Benign Prostatic Hyperplasia. *Journal of the American Academy of Family Physicians* 2002; 5: 244-249.
18. **Bishop MC**. Controversies in Management: Alternatives are still unproved. *BMJ* 1994; 309: 717-718.
19. **Kirby RS**. Controversies in Management: Urologists must grasp the future. *BMJ* 1994; 309: 716-717.
20. **Wasson JH, Reda DJ, Bruskewitz RC, *et al.*** A Comparison of Transurethral Surgery with Watchful Waiting for Moderate Symptoms of Benign Prostatic Hyperplasia. *NEJM* 1995; 332(2): 75-79.
21. **Fowler C, McAllister W, Plail R , *et al.*** Randomized evaluation of alternative

electrosurgical modalities to treat bladder outflow obstruction in men with benign prostatic hyperplasia. *Health Technology Assessment* 2005; 9(4).
22. **Miano R, De Nunzio C, Asimakopoulos AD, *et al.*** Treatment options for benign prostatic hyperplasia in older men. *Med Sci Monit* 2008; 14(7): 94-102.
23. **Wilson JR, Urwin GH, Stower MJ.** The changing practice of transurethral prostatectomy: a comparison of cases performed in 1990 and 2000. *Ann R Coll Surg Engl* 2004; 86: 428–431.
24. **Iwamoto K, Hiraoka Y, Shimizu Yuji.** Transurethral Detachment Prostatectomy Using a Tissue Morcellator for Large Benign Prostatic Hyperplasia. *J Nippon Med Sch* 2008; 75: 77―84.
25. **Lim KB, Wong MYC, Foo KT.** Transurethral Resection of Prostate (TURP) Through the Decades –A Comparison of Results Over the Last Thirty Years in a Single Institution in Asia. *Ann Acad Med Singapore* 2004; 33: 775-799.
26. **Gupta N, Sivaramakrishna, Kumar R, *et al.*** Comparison of standard transurethral resection, transurethral vapour resection and holmium laser enucleation of the prostate for managing benign prostatic hyperplasia of >40 g. *BUJ Int* 2005; 97(1): 85-89.
27. **Liu C, Huang S, Chou Y, *et al.*** Current indications for transurethral resection of prostate and associated complications. *Kaohsiung J Med Sci February* 2003; 19(2): 49-53.
28. **Merrill RM, Feuer EJ, Warren JL, *et al***. Role of Transurethral Resection of the Prostate in Population-based Prostate Cancer Incidence Rates. *Am J Epidemiol* 1999; 150(8): 848-866.
29. **Chang C, Yih Kuo J, Chen K, *et al.*** Transurethral Prostatic Resection for Acute Urinary Retention in Patients with Prostate Cancer. *J Chin Med Assoc* 2006; 69(1): 21-25.
30. **Kluger M, Szekely SM, Singleton RJ, *et al.*** Crisis management during anaesthesia: water intoxication. *Qual Saf Health Care* 2005; 14(23): 1-4.
31. **Yoon C, Kim J, Moon K, *et al.*** Transurethral resection of the prostate with a bipolar tissue management system compared to conventional monopolar resectoscope: One year outcome. *Yonsei Medical Journal* 2006; 47(5): 715-720.
32. **Reich O, Gratzke C, Bachmann A, *et al.*** Morbidity, mortality and early outcome of transurethral resection of the prostate: a prospective multicenter evaluation of 10,654 patients. *J Urol* 2008; 180(1):246-249.
33. **Smyth R, Cheng D, Asokumar B, *et al.*** Coagulopathies in patients after transurethral Resection of the Prostate: Spinal versus General Anesthesia. *Anesth Analg* 1995; 81: 680-685.
34. **Enver MK, Hoh I, Chinegwundoh FI.** The Management of Aspirin in Transurethral Prostatectomy: Current Practice in the UK. *Ann R Coll Surg Engl* 2006; 88(3): 280–283.
35. **Bowden EA, Foley SJ.** Hematuria; a late complication of TURP? *Prostate Cancer and Prostatic Diseases* 2001; 4: 178–179.
36. **Chen S, Lin AT, Chen K, *et al.*** Hemolysis in Transurethral Resection of the Prostate Using Distilled Water as the Irrigant. *J Chin Med Assoc* 2006; 69(6): 270-275.
37. **Scheingraber S, Heitmann L, Weber W, *et al.*** Are There Acid Base Changes during Transurethral Resection of the Prostate (TURP)? *Anesth Analg* 2000; 90: 946-950.
38. **Gravenstein D.** Transurethral Resection of the Prostate (TURP) Syndrome: A Review of the Pathophysiology and Management. *Aneth Analg* 1997; 84: 438-446.
39. **Hakenberg OW, Helke C, Manseck A, *et al.*** Is there a relationship between the amount of tissue removed at transurethral resection of the prostate and clinical improvement in benign prostatic hyperplasia. *Eur Urol* 2001; 39:412–417.
40. **Cury J, Coelho FR, Bruschini H, *et al.*** Is the ability to perform transurethral resection of the prostate influenced by the surgeon's previous experience*? CLINICS* 2008; 63: 315-320.
41. **Sountoulides P, Tsakiris P.** The Evolution of KTP Laser Vaporization of the Prostate. *Yonsei Med J* 2008; 49(2): 189 – 199.
42. **Yokoyama T, Tsugawa M, Nagai A, *et al.*** High-energy Transurethral Microwave Thermotherapy in Patients with Benign Prostatic Hyperplasia: Comparative Study between 30-and 60-minute Single Treatments. *Acta Med Okayama* 2004; 58(3): 151-156.
43. **Bouza C, López T, Magro A, *et al.*** Systematic review and meta-analysis of Transurethral Needle Ablation in symptomatic Benign Prostatic Hyperplasia. *BMC Urol* 2006; 6: 14.
44. **Cowles RS, Kabalin JN, Childs S, *et al.*** A prospective randomized comparison of transurethral resection to visual laser ablation of the prostate for the treatment of benign prostatic hyperplasia. *Urology* 1995; 46(2): 155-160.
45. **Helke C, Manseck A, Hakenberg OW, *et al.*** Is transurethral vaporesection of the prostate better than standard transurethral resection? *Eur Urol* 2001; 39(5):551-557.
46. **Tam PC.** Transurethral resection of the prostate: reaffirming the gold standard. *Hong Kong Med J* 2005; 11(2): 76-78.