INTRODUCTION
Transurethral resection of prostate (TURP) is the most common surgical treatment for benign hyperplasia of prostate. Its efficacy, cost effectiveness, minimum morbidity and mortality is known since decades.1 Ideally this procedure is meant for treating moderate size prostate (60 grams + 10).2 Patients with huge prostate i.e. weighing more than 120 grams, treatment algorithm is not definite. Urologists used to manage such cases according to their own criteria, based on their skills, experience, availability of treatment modalities, treatment related morbidity, patient choice and affordability.

ABSTRACT
Objective: To evaluate the safety and efficacy of elective hemi-resection of prostate in patients with huge gland, weighing more than 120 grams.
Study Design: Multicentric, analytical comparative study.
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Methodology: All benign cases were included in this study and divided into two groups. In group A, patients having huge prostate (> 120 grams) were placed and hemi TURP was performed. In group B, patients having 60 to 100 grams prostate were placed and conventional Blandy's TURP was performed. Results of both groups were compared in terms of duration of surgery, amount of tissue resected, operative bleeding, postoperative complications, duration of postoperative catheterization, re-admission and re-operations. Effectiveness of procedure was assessed by a simple questionnaire filled by the patients at first month, first year and second year. Patients satisfaction in terms of their ability to void, control urination, frequency, urgency, urge incontinence, haematuria, recurrent UTI, re-admission and re-operations were also assessed. Fisher exact test was applied to compare the safety and efficacy of variables.
Results: In group A and B, average age range was 72 and 69 years, average weight of prostate was 148 and 70 grams, average duration of surgery was 102 and 50 minutes respectively. Average weight of resected tissue was 84 and 54 grams and haemoglobin loss was two grams and one gram respectively. Total hospital stay was 5 and 4 days. Total duration of indwelling Foley's catheter (postoperative) was 5 days and 2 days. Patient satisfaction in term of urine flow, urinary control, improvement in frequency and nocturia were comparable in both groups. UTI and re-admission was more in hemi-resection group. At the end of 2 years follow-up, there is no statistical difference between the safety and efficacy of two methods of treatment.
Conclusion: In selected population, elective hemi TURP for huge obstructed prostate is a safe treatment. It's safety and short term efficacy is comparable with the results of conventional TURP.

INTRODUCTION
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Practicing TURP in huge glands may result in increased treatment related morbidity and mortality.3 In such patients the resection time is prolonged, amount of irrigant fluid absorption is more, there are higher chances of operative and postoperative bleeding and electrolyte imbalance.4 Commonly, such cases are managed by transvesical or retropubic open prostapectomy.5 The symptomatic improvement after open surgery is generally comparative with TURP but large abdominal scar, drain tubes, prolonged indwelling and suprapubic catheters, higher incidence of impotence, ejaculatory disorders and poor urine control are the limitations for open approach. In patients with giant size prostate, instead of open procedures, elective hemi TURP can be an effective treatment like conventional endoscopic resection for moderate size gland. In contrast to conventional TURP, where complete resection of adenoma is the target, hemi-resection means complete resection of the median and one lateral lobe. The other lateral lobe remains untouched. This

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modification in resection, cuts down the operative duration, lessens bleeding and fluid absorption and decreases overall morbidity and mortality rates. Relatively large volume of prostatic tissue is taken out, therefore, the symptomatic relief to the patient is comparable with other methods.

In this study, we present our experience of managing huge prostate of 120 grams or more by elective hemi TURP. Since, more than thirty percent of the tissue is left unresected, question might be raised regarding the effectiveness of hemi-resection. To answer this, we compared the surgical results of hemi-resection with conventional TURP, performed at the same hospitals. We also discuss the role of the volume of prostate in the pathophysiology of bladder outlet obstruction (BOO) and the importance of the amount of resected tissue for symptomatic relief, in cases of conventional and hemi-resection.

**METHODOLOGY**

It is an analytical, comparative study of elective hemi-resection of prostate in benign disease. Study was conducted at two teaching hospitals, Abbasi Shaheed Hospital and Dr. Ziauddin Hospital, Karachi, from August 2006 to July 2009. Purposive sampling was performed. Initially 100 cases were included and divided into two equal groups. The hemi-resection patients were placed in group A and the conventional TURP patients were in group B. We compared the surgical results of hemi-resection with conventional TURP, performed at the same hospitals. We also discuss the role of the volume of prostate in the pathophysiology of bladder outlet obstruction (BOO) and the importance of the amount of resected tissue for symptomatic relief, in cases of conventional and hemi-resection.

All patients of group A had elective resection of median and one lateral lobe of prostate. Complete resection of all lobes was performed in group B patients. Duration of surgery starting from the introduction of cystoscope to the placement of three way Foley's catheter was recorded. Weight of resected tissue was assessed by counting the prostatic chips (1.5 cm long, thick chip by 27 Fr. Cutting loop was considered as one gram). The weight mentioned in biopsy reports is dry weight, that does not truly represent the precise amount of the resected tissue. Blood haemoglobin, and serum sodium was repeated on first postoperative day. Pre-operative and postoperative haemoglobin difference was used to assess the blood loss during surgery. Relatively clear urine after 12 hours of irrigation free phase was considered as proper time to remove Foley's catheter. When the patient was stable, out of bed, taking orally and catheter free, he was discharged from the hospital. Total hospital stay and total duration of catheterization was also noted.

Outcome variables for procedure effectiveness included duration of postoperative indwelling catheterization, postoperative hospital stay, catheter free state, able to void with satisfaction, residual moderate to severe frequency, urgency, urge incontinence and nocturia. Effectiveness of the surgery was considered positive if the patients achieved at least 6 out of 8 variables of efficacy. Excessive haematuria, failure to void after catheter removal, total incontinence, re-admission and re-operation were our procedure safety variables. Safety of our hypothesis was considered positive if
more than 90% of the patients of group A did not have any of safety variables in the specific follow-up period. Subjective complications and symptomatic relief in both groups were estimated by simple questionnaire filled after first month, first year and at the end of second year. On the basis of the level of patients satisfaction, their symptoms severity were divided into mild, moderate and severe. Mild means it does not bother patients daily activity. Moderate explains some limitation in daily activity but patients was able to continue his routine work with satisfaction. Severe explains dissatisfied, unhappy and compromised routine activities. It includes unable to offer his prayers, unable to have social or official visits. Final outcome was measured at the end of second year.

Data was analyzed via Statistical Package for Social Sciences (SPSS) version 13. Mean and standard deviations (SD) was calculated for all quantitative variables, while frequencies and percentages were calculated for all qualitative variables as mentioned in Table I. Fisher’s exact test was applied to compare the qualitative variables as mentioned above. P-value < 0.05 was taken as significant.

**RESULTS**

Initially 100 cases were included in this study with 50 patients in each group. Four patients from group A and 2 from group B were excluded because of malignancy reported in tissue histopathology. Another 3 and 2 patients from respected group were excluded due to positive urine culture. Their final reports came after surgery. Three more hemi TURP cases were excluded due to low resected volume. Six patients from group B who were lost to follow-up were also excluded from the study.

In group A, the mean age (range) was 72 (65 - 80) years. Fourteen patients (34%) suffered from different illnesses including high blood pressure (22%), diabetes (17%) and ischaemic heart disease (15%). Average weight of the prostate was 148 (120 - 190) grams. Duration of surgery was 102 (86 - 115) minutes. Average weight of resected tissue was 84 (71 - 105) grams. Haemoglobin drop was 2 (1.5 - 3) grams. Total hospital stay was 5 (4 - 8) days. Total duration of indwelling catheter (postoperative) was 5 (4 - 6) days. In group B patients, the mean age (range) was 69 (60 - 84) years. Comorbid conditions and their percentages were almost similar to that of group A patients. The prostate weight was 70 (60 - 100) grams. Surgery duration was 50 (40 - 70) minutes. Average weight of resected tissue was 54 (36 - 60) grams, and average blood loss was 1 (0.8 - 1.6) grams. Total hospital stay was 4 (3 - 5) days and postoperative duration of catheterization was 2 (2 - 3) days (Table I).

There was no perioperative deaths and prolonged postoperative excessive bleeding in either group. The surgical outcome of hemi-resection group and its comparison with conventional TURP group are mentioned in Table II. All patients of either group were catheter free and able to pass urine after removal of Foley’s catheter. Procedure, efficacy and safety variables are years follow-up of both group, their efficacy and safety variables were proportional to each other and there is no significant numerical difference. There were 4 patients (10%) from group A and 2 patients (5%) from group B had mild to moderate degree of irritative symptoms in the initial few weeks. After one year, there is no statistical difference between the two groups. Immediate postoperative haematuria was relatively more common in group A patients. In 3 patients (7.5%)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hemi TURP (n=40)</th>
<th>Conventional TURP (n=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of the patient</td>
<td>65 - 80 (72 ± 02)</td>
<td>60 - 84 (69 ± 02)</td>
</tr>
<tr>
<td>Comorbid conditions</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>Prostate weight (grams)</td>
<td>120 - 190 (148 ± 5)</td>
<td>60 - 100 (70 ± 03)</td>
</tr>
<tr>
<td>Duration of surgery (minutes)</td>
<td>86 - 115 (102 ± 10)</td>
<td>40 - 70 (50 ± 05)</td>
</tr>
<tr>
<td>Amount of tissue resected (grams)</td>
<td>70 - 124 (84 ± 03)</td>
<td>27 - 68 (54 ± 03)</td>
</tr>
<tr>
<td>Haemoglobin loss. (grams)</td>
<td>1.5 - 3.5 (02 ± 0.3)</td>
<td>0.8 - 2.6 (01 ± 0.3)</td>
</tr>
<tr>
<td>Postoperative catheter duration (days)</td>
<td>04 - 06 (05 ± 01)</td>
<td>02 - 03 (02 ± 01)</td>
</tr>
<tr>
<td>Postoperative hospital stay (days)</td>
<td>04 - 08 (05 ± 01)</td>
<td>02 - 03 (03 ± 01)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th>Hemi TURP (group A)</th>
<th>Conventional TURP (group B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st month</td>
<td>1 year</td>
<td>2 years</td>
</tr>
<tr>
<td>Catheter free</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Void with satisfaction</td>
<td>80%</td>
<td>95%</td>
</tr>
<tr>
<td>Frequency</td>
<td>++ 10%</td>
<td>+ 10%</td>
</tr>
<tr>
<td>Urgency</td>
<td>++ 15%</td>
<td>+ 10%</td>
</tr>
<tr>
<td>Urge Incontinence</td>
<td>+ 10%</td>
<td>Nil</td>
</tr>
<tr>
<td>Nocturia</td>
<td>+ 20%</td>
<td>+ 05%</td>
</tr>
<tr>
<td>UTI</td>
<td>10%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Total incontinence</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Haematuria</td>
<td>+ 7.5%</td>
<td>+ 10%</td>
</tr>
<tr>
<td>Re-admission</td>
<td>12.5%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Re-operation</td>
<td>Nil</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

Mild = +, Moderate = ++, Severe = +++
from hemi-resection group and one patient (2.5%) from group B patients had haematuria and clot retention in immediate postoperative period. None of these patients required blood transfusion or second look cystoscopy. In early postoperative time, UTI was more in group A patients. In hemi-resection group, 7.5% patients developed urinary infection as compared to only 2.5% in the conventional group. Within 2 years, one patient of each group had re-operation because of bothersome nocturia and obstructive symptoms.

**DISCUSSION**

In last three decades, several minimally invasive and non-invasive treatment modalities emerged for the treatment of obstructive and irritative symptoms associated with benign hyperplasia of prostate. Their benefits are in comparison with the TURP and minimal side effects challenge the gold standard position of transurethral resection of prostate.7 Including conventional TURP, all modalities have some limitations, and treatment is advised on individual basis. Extreme weight of the prostate is an important limiting factor for choosing treatment modalities. TURP and all new modalities like transurethral microwave thermotherapy (TUMT), laser ablation of prostate, electrovapourisation of prostate, high frequency ultrasound (HIFU) can manage moderate size gland (70 grams + 10) with great success and patient satisfaction. But, the question of what one must do with a huge gland (more than 120 grams) arises. Either the old open surgical procedures like transvesical or retropubic prostatectomy can be performed or the patient’s life can be exposed to extra risk by attempting conventional TURP.

The treatment options for huge glands are very limited, specially an effective method with minimal complications is rare. Both Blandy’s and McCarthy TURP are initially applicable for mild to moderate size obstructing adenoma. With improvement in instruments and surgical skills, urologists are usually able to manage up to 100 grams of prostate with good level of safety and patient’s satisfaction. However, while resecting large gland, operating time is in direct proportion to operative bleeding and postoperative fluid and electrolytes disturbance.5,9 A modification in the resection zone during TURP may solve this problem. In conventional TURP according to Blandy technique the resection area is well defined and to achieve satisfactory results one has to resect all tissue within the surgical capsule from Verumontanum to bladder neck.10 In hemi TURP, in order to reduce long duration of surgery and excessive resection related complications, one complete lateral lobe and median lobe if present were resected. The remaining lateral lobe was kept un-touched, to prevent it from bleeding and hanging on the urethra and causing obstruction.

To understand how hemi-resection works, it is important to review some important facts from the history. Just two decades back all patients with retention of urine or with severe LUTS were treated surgically. Then era of medical treatment were commenced. With the help of alpha 5 reductase inhibitors and alpha one adrenoceptor blockers, majority of patients who needed surgery, got symptomatic improvement.11 These medical treatments cleared many important facts regarding the pathophysiology of bladder outlet obstruction and lower urinary tract symptoms secondary to enlargement of prostate. Now, it is clear that volume of the prostate is not the only factor responsible for all clinical sequels. Presence of surgical capsule,12 angle of urethra to bladder neck and configuration of the lobes of prostate,13 specially presence of median lobe and lateral kissing lobes relation are more important than the overall weight of the prostate. Just to re-emphasize the fact that it is not very rare in our clinical practice that at many times aging males have maximum lower urinary tract obstructed symptoms with mildly enlarged gland and minimum or no obstructed symptoms with moderate to severely enlarged prostate.14

Still, if the patient’s condition and overall fitness allows, complete resection is ideal. Decision of performing hemi-resection is a compromise. A concession in the technique and relative amount of tissue resected, but no compromise in the surgical outcome and benefits. In literature, there is a debate with regards to how much adenoma one should resect,15 and how much prostatic tissue can be safely left in cases of TURP.16 Amusingly, the surgical outcome in terms of symptom improvement and patient satisfaction has minimal correlation with the amount of tissue resected. According to these workers it is enough to resect just 30% of the total weight of the prostate in order to get satisfactory results in term of urinary flow rate.17 Alberto A, from Brazil made three groups of patient and electively resected 25%, 50% and 75% of the obstructing tissue during TURP in the respected groups. The patients satisfaction and IPSS symptoms score improvement was not very different in these three groups.17 What we actually did in hemi-resection was, removing large volume of adenoma, changing the gland configuration by removing lateral

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**Table III: Comparison of efficacy and safety between groups.**

<table>
<thead>
<tr>
<th></th>
<th>Hemi TURP (A)</th>
<th>Conventional TURP (B)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficacy of Hemi TURP v/c conventional TURP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st month</td>
<td>36</td>
<td>38</td>
<td>0.6752</td>
</tr>
<tr>
<td>1st year</td>
<td>38</td>
<td>38</td>
<td>1.000</td>
</tr>
<tr>
<td>2nd year</td>
<td>39</td>
<td>39</td>
<td>1.000</td>
</tr>
<tr>
<td>Safety of Hemi TURP v/c conventional TURP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st month</td>
<td>39</td>
<td>40</td>
<td>1.000</td>
</tr>
<tr>
<td>1st year</td>
<td>39</td>
<td>39</td>
<td>1.000</td>
</tr>
<tr>
<td>2nd year</td>
<td>40</td>
<td>40</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Fisher’s exact test
lobe, removing the most obstructed portion of the gland that is median lobe and neutralizing the pressure effect of capsule. All these measures give maximum benefit to the patients, resulting in significant improvement in symptoms.

Literature back-up for elective hemi-resection in giant prostate is insufficient. There are a few studies where workers randomly perform hemi-resection, and conventional resection in single group of patients in which complete resection looked possible. Both treatment modalities were compared. Our study is different. There was no random sampling in this study. Here we performed hemi-resection in group A patients where complete resection is not a safe option because of huge size of adenoma. While, in group B we performed complete resection as prostate size and patient condition allowed us to proceed. In order to check the operative problems and to assess the surgical results we compared the outcomes of the two groups. The duration of surgery and the amount of tissue resected in hemic group is significantly high. Extra bleeding and haemoglobin fall is obvious because with prolonged surgery and large raw area, there are high chances of oozing. This large raw area not only gives problems in term of bleeding but also there were more chances of infection and irritative symptoms after surgery. To avoid this issue in elective hemic-resection, it is compulsory not to touch one of the residual lateral lobe. Leaving one lateral lobe untouched is as important as a good, clean and regular resection of median and one lateral lobe. Resecting few chips from the dependent portion or base of the lateral lobe that is supposed to be un-touched, has a negative impact on the symptomatic improvement. Because by nibbling the base, the residual lobe becomes unstable, the remaining adenoma hangs down on the prostatic urethra that may leads to significant obstructed symptoms or even retention.

In conventional resection group, the duration of surgery, operative bleeding, indwelling catheter duration and postoperative improvement in symptoms were satisfactory. Surgical duration, amount of tissue resected and blood loss in hemic-resection group were significantly more. Consider what would happen if conventional TURP is attempted in group A patients. Where even with hemic-resection, the duration of surgery is 30% more, volume of prostatic tissue resected is almost 30% more. Also the blood loss is almost double in group A patients as compared to group B patients. What would happen if complete resection is attempted in 140 grams prostate. The tissue resected may be 100 grams or more, duration of surgery may be more than 2 hours and the haemoglobin drops 3 grams or more. All these above factors impact badly on the overall clinical condition of the patients and labelled this modality as unsafe and less effective for huge glands.

Because of a relatively less practicing method of treating huge gland, the efficacy of hemic-resection may be questionable. One of the object of making this study, comparative, is to highlight its efficacy. By comparing group A results with the time tested and most effective treatment method i.e. TURP of group B patients, we may be able to draw conclusions regarding the effectiveness of hemic-resections. Early symptomatic improvement and patients satisfaction in terms of ability to void, controlled voiding, significant improvement in obstructive and irritative symptoms were similar in both groups. Literature back-up of long-term results of hemic-resection in huge glands are limited. In 3 years follow-up re-admission because of recurrent UTI is more from hemic-resection group. All of our hemic-resection group patients had prolonged catheterization before surgery. The drawback of catheter is recurrent infection. It is a known fact that the outcome of TURP in patients who were never catheterized before is better than the results of patients who were already catheterized before surgery.\textsuperscript{18} Literature on long-term results of hemic-resection in giant prostate is not available. Aagaard presented his minimal TURP results with 10 years follow-up in BJU. Modified minimal resection outcome is satisfactory in terms of re-admission, re-operation and treatment related stricture formations.\textsuperscript{19}

**CONCLUSION**

TURP is a time tested and safe treatment for moderately enlarged prostate. For huge glands, the treatment algorithm is not very clear. Elective hemic-resection of prostate is a much better choice as compared to open prostatectomy, and safer choice when compared with conventional TURP in huge glands of more than 120 grams. Hemi TURP demands much more controlled and precise resection. In experienced hands though the duration of surgery, operative bleeding and catheter duration is more in hemic-resection, but the surgical outcome in terms of ability to void with good satisfactory stream, improvement in frequency, nocturia and most importantly continence is comparable with conventional TURP.

**REFERENCES**


