

Urology

Evaluation of storage symptoms improvement and factors affecting, after relief of obstruction in patients with benign prostatic enlargement --Manuscript Draft--

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Eric A. Klein, MD

Editor-in-Chief

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Eric A. Klein, MD

Re Evaluation of storage symptoms improvement and factors affecting, after relief of obstruction in patients with benign prostatic enlargement

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content of the manuscript to be submitted to the Urology Gold Journal. We look forward to having a favorable response from you.

Yours Sincerely,

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Response to Reviewers

Reviewer #2

Minor revisions:

- The manuscript should be revised for some vocabulary, grammar & punctuation faults.

The manuscript was revised for these faults.

In Abstract: In 'METHODS' section, the authors said the patients with persistence of storage symptoms were significantly older 70.43 ± 8.32 vs 70.43 ± 8.32 p value = 0.022. I think it is 70.43 ± 8.32 vs 67.04 ± 7.49 respectively

This fault was corrected.

Major Revisions:

Were the patients operated by the same surgeon? I think it is important to alleviate the influence surgeon factor

The patients were operated by 2 expert endourological surgeons, the 1st and last authors.

- Was there any difference between responders and non-responders in the volume of resected tissues or residual adenoma?

This is a very good idea that is worth investigation, our rationale was the removal of the obstructing adenoma and sparing the **verumontanum**.

Why did the authors use MCC of 250 cc as a cut-off point. You should do a ROC curve to get the cut-off point that affect response.

We revised the med line during our study design and we set the 250 ccs cut-off point for MCC and later we did a ROC curve and we added that curve to tables.

Reviewer #3

Clear rationale and what is new to be added to the literature not elucidated clearly in the introduction.

We did a prospective study to evaluate the factors affecting improvement of storage symptoms in developing countries and low socio economic levels and correlate with compare our results with the literature

- What is known from the literature about the subject and where is the debate so the present study will resolve these issues.

Thanks for this important question. The prognostic factors of storage symptoms improvement such as aging, detrusor overactivity, maximum cystometric capacity, prostate size and etc. all under investigation in the literature and these parameters are worth studying for the quality-of-life improvement after exposure to the procedure of TURP. Our work was trial to share with literature our data with our patients aiming to reach or come near to that hope of giving our patient the best choice of intervention.

- Revise the abstract regarding the presence of citations and the use of abbreviations

The abstract was revised

- Most of references are too old.

We revised the all the references

- Revise the citation of ref# 8, 9.

We revised the citations of both references.

- Revise the ethical approvals and consents for participation.

These were revised.

CONFLICT OF INTEREST

Manuscript #:URL-D-22-00376

Title: "Evaluation of storage symptoms improvement and factors affecting, after relief of obstruction in patients with benign prostatic enlargement"

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Remaining Authors: Amr Eldakhakhny, M.D.; Hisham Alazaby, M.D.; Mostafa Khalil, M.D.; Khaled Elgamal, M.D.; Mohamed Alhefnawy, M.D.

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Examples of Conflict of Interest:

- (a) Source of Funding
- (b) Paid consultant to Sponsor
- (c) Study Investigator Funded by Sponsor
- (d) Employee of Sponsor
- (e) Board Membership with Sponsor
- (f) Stock Holder for Mentioned Product/Company
- (g) Patent Inventor for Mentioned Product
- (h) Any Financial Relationship to Competitors of Mentioned Product
- (i) Other (please specify)

- 1)_____ Tarek Gharib no conflict
- 2)_____ Amr Eldakhakhny_____ no conflict
- 3)___ Hisham Alazaby___ no conflict
- 4)___ Mostafa Khalil no conflict
- 5)___ Khaled Elgamal no conflict
- 6) Mohamed Alhefnawy no conflict

I accept the responsibility for the completion of this document and attest to its validity on behalf of the co-authors.

(Type name above) (Date)

)_____ Tarek Gharib 11/06/2022

ORIGINAL ARTICLE

Title: Evaluation of storage symptoms improvement and factors affecting, after relief of obstruction in patients with benign prostatic enlargement

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Key words: storage symptoms, TURP, detrusor overactivity, benign prostatic enlargement

Running title: persistent storage symptoms

Ethics approval and consent to participate:

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee in Benha faculty of medicine,

Informed consent was obtained from all individual participants included in the study

Consent for publication:

Not applicable.

Availability of data and material:

Authors can confirm that all relevant data are included in the article and/or its supplementary information files.

Competing Interest:

The authors declare that they have no competing interest.

Funding: None.

Author contribution

| | Name | Contribution | Institution |
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| | | Data analysis Manuscript writing/editing | Benha Faculty of medicine, Benha university |
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Evaluation of storage symptoms improvement and factors affecting, after relief of obstruction in patients with benign prostatic enlargement

Abstract

Objectives: To evaluate the improvement of storage symptoms in accordance with voiding symptoms and **assess** the prognostic factors that influence the relief of **storage** symptoms after transurethral resection of the prostate (TURP).

Methods: Between August 2017 to November 2019, 75 patients indicated for TURP were included in the study, we assessed the improvement of storage symptoms and factors that may influence storage symptoms persistence after TURP such **as Age**, Overactive bladder symptoms (OABS) score (Blaivas 2007) and Urodynamic parameters such as maximum flow rate (Q MAX), maximum cystometric capacity (MCC), bladder contractility index (BCI), phasic and terminal detrusor overactivity (DO). Assessment of patients was done before and six months after TURP by international prostate symptom score (IPSS), quality of life score (QLSS), OABSS (Blaivas score 2007), and urodynamic studies.

Results: Mean age of the patients was 67.88 ± 7.82 years. The patients with persistence of storage symptoms were significantly older 70.43 ± 8.32 vs 67.04 ± 7.49 respectively p -value = 0.022, also IPSS score was significantly higher in patients with resolution of symptoms (26.83 ± 3.91 vs 24.35 ± 3.68 $p=0.017$). Terminal D.O and Q max were significantly higher in patients with persistence of storage symptoms (26.3% and 8.1 vs 8.9% and 6 respectively). MCC was significantly higher in **a patient** with resolution vs persistence of storage symptoms (345.18 ± 90.89 ml vs 242.16 ± 72.73) respectively $p=0.001$

There was no significant difference between both groups regarding duration of symptoms, prostate size, prostatic specific antigen (PSA), QOL score, OABS score, and maximum detrusor pressure

Conclusion: more elderly patients with MCC less than 250 ccs and terminal DO were associated with worse outcomes and persistence of storage symptoms post TURP.

Key words:

storage symptoms,
TURP,
detrusor overactivity,
benign prostatic enlargement

Abbreviations:

TURP: trans urethral resection of the prostate

OAB: Overactive bladder

MCC: maximum cystometric capacity

BCI: bladder contractility index

DO: detrusor overactivity

IPSS: international prostate symptom score

PSA: prostatic specific antigen

QOL: quality of life

BPE: Benign prostatic enlargement

BOOI: bladder outlet obstruction index

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Conclusion: more elderly patients with MCC less than 250 ccs and terminal DO were associated with worse outcomes and persistence of storage symptoms post TURP.

Introduction

Benign prostatic enlargement (BPE) appears to be the most common cause of disturbances in storage and voiding symptoms in elderly patients above 50 years producing a high economic cost for this problem. (1,2)

The percentage of storage symptoms in male patients with BPE is about 50 % and these storage symptoms are assumed to be caused by the disease itself, undiscovered neuropathic disorder, detrusor dysfunction with increased age, or a combination of all these factors. (3,4)

Urodynamic studies (UDS) seem to be crucial in patients with storage symptoms to assess the presence of detrusor overactivity (DO) whether terminal or phasic, bladder outlet obstruction (BOO), and detrusor contractility. UDS also assesses the treatment decision. (5)

Transurethral resection of the prostate ameliorates these voiding and storage symptoms, although a high percentage of patients (20- 40%) suffer from non-relief of storage symptoms such as nocturia, urgency, and frequency after relief of obstruction. (6,7)

In some studies that were done before, there were about 60% recurrence of storage symptoms after TURP, and extreme age was claimed as the main cause (8)

In this study, we evaluated the improvement of storage symptoms in accordance with voiding symptoms and assessed the prognostic factors that influence the relief of storage symptoms after transurethral resection of the prostate in our country (TURP).

Patients and Methods

This is a prospective study that was conducted on patients with BPE, and storage symptoms indicated for TURP, from August 2017 to November 2019 in our urology department, Benha university hospitals.

In this period 124 patients with BPE less than 80 gm and storage symptoms were presented to the urology outpatient clinic. All patients were subjected to medical history, International Prostatic Symptom Score (IPSS), quality of life score, overactive bladder symptoms score (Blaivas score2007) and voiding diary, body mass index (BMI), digital prostate examination, and special tests such as prostatic specific antigen (PSA), urine analysis, complete blood count, kidney function tests. Renal and pelvic ultrasound was done to detect the prostate size and post-void residual urine. 35 patients had no indication for TURP and were excluded from the study.

89 patients were having different indications for TURP (recurrent hematuria (n3), refractory retention (n14), uremic manifestation (n16), severe obstructive symptoms with failed medical treatment (n45), and recurrent urinary tract infection(n11).

We excluded 14 patients from the study as they were having one or more of the following, (neurological disease, prostate cancer, previous prostate surgery, urethral stricture, stone bladder, bladder cancer, acute and chronic prostatitis) and so 75 patients were enrolled in the study (fig 1), underwent complete Urodynamic study including uroflowmetry and pressure-flow cystometry preoperatively and 6 months postoperatively using Laborie Dorado™ KT urodynamic device to assess bladder capacity, accommodation, sensation, and bladder contractility. Other urodynamic parameters also recorded as maximum cystometric capacity (MCC), volume at first sensation-normal desire and strong desire, compliance, maximum detrusor pressure, bladder outlet obstruction index (BOOI), Q max, phasic and terminal detrusor overactivity (DO), bladder contractility index (BCI)

These 75 patients underwent TURP and complete the 6 months follow-up period for assessment of subsidence of storage and voiding prostatic symptoms

The study was conducted according to the ethical principle stated in the declaration of entity 2013 and the requirement of the faculty of medicine at Benha University. Informed consent was taken from all patients participating in this study. Benefits from this study were discussed with patients in detail.

The clinical data were recorded, tabulated, and analyzed using the program SPSS version 16 to obtain *descriptive statistics in the form of mean and standard deviation ($\pm SD$)* for quantitative data and frequency and distribution for qualitative data. Analytical statistics comparing the different groups, the significance of difference was tested using one of the following tests T induction tests (T value) and inter-group comparison of categorical data was performed by using the chi-square test (X^2 -value) and Fisher exact test (FET). A *P* value <0.05 was considered statistically significant.

Results

This study included 75 patients with the **patient** characteristics displayed in table 1, the mean age was 67.88 ± 7.82 years old, ranging from 50 to 88 years. Hypertension and Diabetes were diagnosed in 36% and 32% of cases respectively, mean Duration of urinary symptoms was 17.32 ± 12.55 months, mean prostatic volume was 58.68 ± 10.01 gram, and mean total PSA was 3.15 ± 0.95 ng/dl.

Table (2) showed the overall differences in the data pre-and post-TURP in all patients with significant differences regarding the IPSS, QLSS, OABSS, Q MAX, PVRU, MCC, BCI, and BOOI.

Table (3) showed the comparison between patients with resolution of storage symptoms (56) and patients without (19) after TURP. Patients with **the** persistence of storage symptoms were significantly older than those with resolution 70.43 ± 8.32 vs 67.04 ± 7.49 respectively P-value of 0.022. Mean prostatic volume was higher among patients with persistence of storage symptoms but without a significant difference of 61.49 ± 9.05 vs 57.76 ± 10.17 respectively P-value of 0.14.

Regarding symptomatology, preoperative IPSS in patients with resolution of storage symptoms was significantly higher than those with persistence 26.83 ± 3.91 vs 24.35 ± 3.68 respectively P-value 0.017, but QLSS and OABSS do not reach to significant value.

Regarding urodynamic parameters preoperative MCC was significantly lower in patients with persistence of storage symptoms than those with **a resolution** of symptoms 242.16 ± 72.73 vs 345.18 ± 90.89 respectively P-value < 0.001 , also BCI was significantly higher in patients with persistence of storage symptoms 114.14 ± 13.69 vs 99.78 ± 15.79 respectively P-value < 0.001 . Terminal DO was significantly more in patients with persistent storage symptoms (26,3 % vs 8,9%) P-value of 0.01.

Other parameters **such** as BOOI, PVRU, and P det max **do** not reach to significant value.

Discussion

One of the important goals of **the** TURP procedure is the resolution of both voiding and storage symptoms but persistence or recurrence of storage symptoms affects the quality of life of those elderly patients.

Thomas et al (5) in their **long-term follow-up** study observed that there was a 60% recurrence of storage symptoms after TURP and claimed that aging may be the cause.

About half of patients with bladder outlet obstruction (BOO) are complaining also of associated storage symptoms that persist after TURP in 20 - 30 % of these cases (9).

In this study we assessed the outcome of **the** TURP procedure regarding **the** resolution of storage symptoms after relief of obstruction., there **were** 32% of patients suffering from BOO associated with DO with significantly higher Q max that may be attributed to more powerful detrusor muscle.

These findings were in accordance with Antunes et al (9) who performed their study on 46 patients to assess the resolution of DO after TURP and found higher Q max in **the** DO group, although these results disagreed with Choi et al (10) who declared higher Q max in storage symptoms negative group.

Many clinical trials showed that the persistence of storage symptoms occurred much more in elderly patients. One of these was Gormley et al (6) who declared that patients older than 80 years were more susceptible **to** the persistence of storage symptoms after TURP, also Losco et al (11) investigated 100 patients after TURP and found that the persistence of symptoms occurred much more with older patients.

Knutson et al (12) found that increasing age was an isolated risk factor for the coexistence of DO with BPE. Our study results were in accordance with all the above-mentioned results, as increasing age was a significant prognostic factor for the persistence of storage symptoms after TURP.

Antunes et al (9) and Choi et al (10) also reported comparable results regarding the same age issue.

In our study, we found that there was no significant difference in detrusor contractility between the 2 studied groups, and this finding complies with the results of Choi et al (10) who declared less correlation between weak detrusor contractility and persistence of storage symptoms post TURP, also Antunes et al (9) found that the degree of bladder contraction did not affect the outcome of storage symptoms relief **postoperatively**.

However, many studies disagree with ours like Han et al (13) who reported better improvement of storage symptoms and BOO after TURP in patients with good detrusor contraction. Also, Thomas et al (14) in a study with minimum 10 years follow-up period of patients post TURP, found that postoperative weak detrusor muscle contractility was associated with persistence and non-relief of lifelong storage symptoms.

Also, Seki et al (15) studied the prognostic factors of storage symptoms improvement after TURP and concluded that patients with weak bladder contraction had a lower opportunity of improvement of storage symptoms after surgical correction of obstruction.

In our study we found that terminal DO was a significant prognostic factor for the persistence of storage symptoms after TURP, 26.3% vs 8.9 % p-value =0.01, this finding was not in accordance with Tanaka et al (16) who stated that improvement of storage symptoms was independent of presence or absence of DO but affected by the status of bladder contractility, but Zhao et al (17) in his retrospective study agreed with our results as he stated that presence of DO was accompanied by bad prognosis.

Antunes et al (9) showed that not only the presence of DO but also the amplitude of detrusor contraction during DO and the repetition of DO during filling were significant prognostic factors for the persistence of storage symptoms post-operatively. Kageyama (18) reported also similar results to Antunes et al that multiple and frequent DO was associated with worse outcomes.

One of the significant prognostic factors of our study was MCC above 250 ccs as 57.9% of patients with persistent symptoms had MCC less than 250 ccs, and this result agreed with Antunes et al (9) and Choi et al (10) as they found

that MCC less than 250 was associated with persistence of storage symptoms.

The limitation of this study was decreased number of patients and relatively short **follow-up** period as we need to compare these results with another study with a larger scale of patients to **assess** the results of the current study.

Conclusion

The **persistence** of storage symptoms after TURP is an important issue with economic cost and should be evaluated effectively before the procedure. According to our results more elderly patients with MCC, less than 250 ccs, and terminal DO were associated with worse outcomes and persistence of storage symptoms **post-TURP**.

Abbreviations:

TURP: transurethral resection of the prostate

OAB: Overactive bladder

MCC: maximum cystometric capacity

BCI: bladder contractility index

DO: detrusor overactivity

IPSS: international prostate symptom score

PSA: prostatic specific antigen

QOL: quality of life

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prostatectomy for benign prostatic hypertrophy? *Neurourol Urodyn* 2000;
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The clinical data were recorded, tabulated, and analyzed using the program SPSS version 16 to obtain *descriptive statistics in the form of mean and standard deviation ($\pm SD$)* for quantitative data and frequency and distribution for qualitative data. Analytical statistics comparing the different groups, the significance of difference was tested using one of the following tests T induction tests (T value) and inter-group comparison of categorical data was performed by using the chi-square test (X^2 -value) and Fisher exact test (FET). A *P* value <0.05 was considered statistically significant.

Results

This study included 75 patients with the patient characteristics displayed in table 1, the mean age was 67.88 ± 7.82 years old, ranging from 50 to 88 years. Hypertension and Diabetes were diagnosed in 36% and 32% of cases respectively, mean Duration of urinary symptoms was 17.32 ± 12.55 months, mean prostatic volume was 58.68 ± 10.01 gram, and mean total PSA was 3.15 ± 0.95 ng/dl.

Table (2) showed the overall differences in the data pre-and post-TURP in all patients with significant differences regarding the IPSS, QLSS, OABSS, Q MAX, PVRU, MCC, BCI, and BOOI.

Table (3) showed the comparison between patients with resolution of storage symptoms (56) and patients without (19) after TURP. Patients with the persistence of storage symptoms were significantly older than those with resolution 70.43 ± 8.32 vs 67.04 ± 7.49 respectively P-value of 0.022. Mean prostatic volume was higher among patients with persistence of storage symptoms but without a significant difference of 61.49 ± 9.05 vs 57.76 ± 10.17 respectively P-value of 0.14.

Regarding symptomatology, preoperative IPSS in patients with resolution of storage symptoms was significantly higher than those with persistence 26.83 ± 3.91 vs 24.35 ± 3.68 respectively P-value 0.017, but QLSS and OABSS do not reach to significant value.

Regarding urodynamic parameters preoperative MCC was significantly lower in patients with persistence of storage symptoms than those with a resolution of symptoms 242.16 ± 72.73 vs 345.18 ± 90.89 respectively P-value < 0.001 , also BCI was significantly higher in patients with persistence of storage symptoms 114.14 ± 13.69 vs 99.78 ± 15.79 respectively P-value < 0.001 . Terminal DO was significantly more in patients with persistent storage symptoms (26,3 % vs 8,9%) P-value of 0.01.

Other parameters such as BOOI, PVRU, and P det max do not reach to significant value.

Discussion

One of the important goals of the TURP procedure is the resolution of both voiding and storage symptoms but persistence or recurrence of storage symptoms affects the quality of life of those elderly patients.

Thomas et al (5) in their long-term follow-up study observed that there was a 60% recurrence of storage symptoms after TURP and claimed that aging may be the cause.

About half of patients with bladder outlet obstruction (BOO) are complaining also of associated storage symptoms that persist after TURP in 20 - 30 % of these cases (9).

In this study we assessed the outcome of the TURP procedure regarding the resolution of storage symptoms after relief of obstruction., there were 32% of patients suffering from BOO associated with DO with significantly higher Q max that may be attributed to more powerful detrusor muscle.

These findings were in accordance with Antunes et al (9) who performed their study on 46 patients to assess the resolution of DO after TURP and found higher Q max in the DO group, although these results disagreed with Choi et al (10) who declared higher Q max in storage symptoms negative group.

Many clinical trials showed that the persistence of storage symptoms occurred much more in elderly patients. One of these was Gormley et al (6) who declared that patients older than 80 years were more susceptible to the persistence of storage symptoms after TURP, also Losco et al (11) investigated 100 patients after TURP and found that the persistence of symptoms occurred much more with older patients.

Knutson et al (12) found that increasing age was an isolated risk factor for the coexistence of DO with BPE. Our study results were in accordance with all the above-mentioned results, as increasing age was a significant prognostic factor for the persistence of storage symptoms after TURP.

Antunes et al (9) and Choi et al (10) also reported comparable results regarding the same age issue.

In our study, we found that there was no significant difference in detrusor contractility between the 2 studied groups, and this finding complies with the results of Choi et al (10) who declared less correlation between weak detrusor contractility and persistence of storage symptoms post TURP, also Antunes et al (9) found that the degree of bladder contraction did not affect the outcome of storage symptoms relief postoperatively.

However, many studies disagree with ours like Han et al (13) who reported better improvement of storage symptoms and BOO after TURP in patients with good detrusor contraction. Also, Thomas et al (14) in a study with minimum 10 years follow-up period of patients post TURP, found that postoperative weak detrusor muscle contractility was associated with persistence and non-relief of lifelong storage symptoms.

Also, Seki et al (15) studied the prognostic factors of storage symptoms improvement after TURP and concluded that patients with weak bladder contraction had a lower opportunity of improvement of storage symptoms after surgical correction of obstruction.

In our study we found that terminal DO was a significant prognostic factor for the persistence of storage symptoms after TURP, 26.3% vs 8.9 % p-value =0.01, this finding was not in accordance with Tanaka et al (16) who stated that improvement of storage symptoms was independent of presence or absence of DO but affected by the status of bladder contractility, but Zhao et al (17) in his retrospective study agreed with our results as he stated that presence of DO was accompanied by bad prognosis.

Antunes et al (9) showed that not only the presence of DO but also the amplitude of detrusor contraction during DO and the repetition of DO during filling were significant prognostic factors for the persistence of storage symptoms post-operatively. Kageyama (18) reported also similar results to Antunes et al that multiple and frequent DO was associated with worse outcomes.

One of the significant prognostic factors of our study was MCC above 250 ccs as 57.9% of patients with persistent symptoms had MCC less than 250 ccs, and this result agreed with Antunes et al (9) and Choi et al (10) as they found

that MCC less than 250 was associated with persistence of storage symptoms.

The limitation of this study was decreased number of patients and relatively short follow-up period as we need to compare these results with another study with a larger scale of patients to assess the results of the current study.

Conclusion

The persistence of storage symptoms after TURP is an important issue with economic cost and should be evaluated effectively before the procedure. According to our results more elderly patients with MCC, less than 250 ccs, and terminal DO were associated with worse outcomes and persistence of storage symptoms post-TURP.

Abbreviations:

TURP: transurethral resection of the prostate

OAB: Overactive bladder

MCC: maximum cystometric capacity

BCI: bladder contractility index

DO: detrusor overactivity

IPSS: international prostate symptom score

PSA: prostatic specific antigen

QOL: quality of life

BPE: Benign prostatic enlargement

BOOI: bladder outlet obstruction index

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Legends of tables and figure

Table (1) Demographic characteristics of the studied groups.

Table (2) Difference between preoperative and postoperative data in all patients after TURP

Table (3) Comparison between patients with persistent and resolute storage symptoms after TURP

figure (1) Flow chart of the study

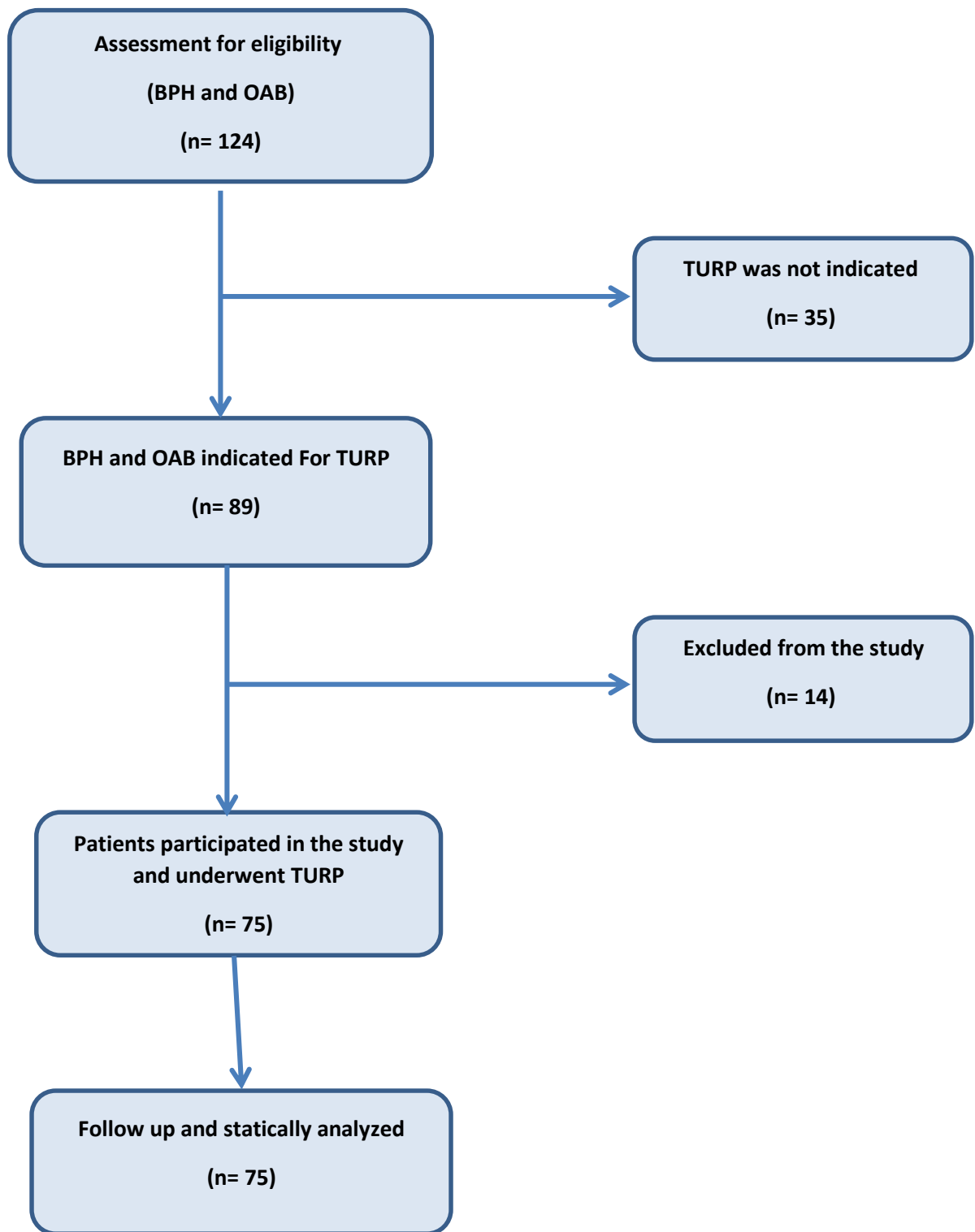


figure (1) Flow chart of the study

(1) DEMOGRAPHIC CHARACTERISTICS OF THE STUDIED GROUP

| | | The studied group (75) |
|----------------------|-----------------------|-------------------------------|
| Age | mean \pm SD (range) | 67.88 \pm 7.82 (50-88) |
| BMI | mean \pm SD (range) | 26.37 \pm 3.14 (20-35) |
| Smoking | n (%) | 25 (33.3) |
| Duration | mean \pm SD (range) | 17.32 \pm 12.55 (1-60) |
| DM | n (%) | 24(32.0) |
| HTN | n (%) | 27 (36.0) |
| Prostate size | mean \pm SD (range) | 58.68 \pm 10.01 (36-80) |
| PSA total | mean \pm SD (range) | 3.15 \pm 0.95 (1-5) |
| IPSS | mean \pm SD | 26.22 \pm 3.99 |
| QLSS | mean \pm SD | 4.46 \pm 0.60 |
| OABSS | mean \pm SD | 18.97 \pm 4.87 |
| Q MAX | mean \pm SD | 6.53 \pm 1.86 |
| PVRU | mean \pm SD | 111.63 \pm 48.57 |
| MCC | mean \pm SD | 319.77 \pm 97.33 |
| P det max | mean \pm SD | 71.6 \pm 12.17 |

2) Difference between preoperative and postoperative data in all patients after TURP

| | Pre (75) Mean \pm SD | Post (75) Mean \pm SD | P value |
|---------------------------------------|-----------------------------------|-----------------------------------|----------------|
| IPSS | 26.22 \pm 3.99 | 7.89 \pm 2.69 | <0.001** |
| QLSS | 4.46 \pm 0.60 | 1.67 \pm 0.83 | <0.001** |
| OABSS | 18.97 \pm 4.87 | 9.14 \pm 3.18 | <0.001** |
| Q MAX | 6.53 \pm 1.86 | 15.99 \pm 2.76 | <0.001** |
| PVRU | 111.63 \pm 48.57 | 18.53 \pm 12.26 | <0.001** |
| MCC | 319.77 \pm 97.33 | 361.4 \pm 98.51 | <0.001** |
| P det max | 71.6 \pm 12.17 | 61.64 \pm 12.38 | <0.001** |
| BOOI | 58.67 \pm 11.97 | 30.21 \pm 14.43 | <0.001** |
| BCI | 103.32 \pm 16.47 | 141.48 \pm 18.25 | <0.001** |
| | Pre (75) No (%) | Post (75) No(%) | P value |
| PVRU \leq 100 >100 | 43 (57.3) 32 (42.7) | 75 (100) 0(0.0) | <0.001** |
| MCC \leq 250 >250 | 18 (24) 57 (76%) | 11 (14.7) 64 (85.3) | 0.029* |
| BOOI \leq 40 >40 | 3 (4) 72 (96) | 60 (80.0) 15 (20.0) | <0.001** |
| BCI <100 100-150 >150 | 27 (36.1) 47 (62.6) 1 (1.3) | 2 (2.7) 52 (69.3) 21 (28) | <0.001** |

(3) Comparison between patients with persistent and resolute storage symptoms after TURP

| | Persistence (19) Mean \pm SD | Resolution (56) Mean \pm SD | P value |
|-----------------------------|--|---|----------------|
| Age | 70.43 \pm 8.32 | 67.04 \pm 7.49 | 0.022* |
| Duration of symptoms | 20.86 \pm 13.07 | 16.16 \pm 12.21 | 0.19 |
| Prostate size | 61.49 \pm 9.05 | 57.76 \pm 10.17 | 0.14 |
| PSA | 3.36 \pm 0.93 | 3.08 \pm 0.95 | 0.27 |
| Amplitude | 56.9 \pm 17.53 | 50.75 \pm 22.06 | 0.22 |
| IPSS | 24.35 \pm 3.68 | 26.83 \pm 3.91 | 0.017* |
| QLSS | 4.41 \pm 0.64 | 4.48 \pm 0.58 | 0.68 |
| OABSS | 19.27 \pm 5.69 | 18.87 \pm 4.6 | 0.78 |
| Q MAX | 8.11 \pm 1.24 | 6.01 \pm 1.74 | <0.001** |
| PVRU | 106.08 \pm 39.39 | 113.45 \pm 51.24 | 0.52 |
| MCC | 242.16 \pm 72.73 | 345.18 \pm 90.89 | <0.001** |
| MCC pre | | | |
| \leq250 | 11(57.9) | 8(14.3) | <0.001** |
| >250 | 8(42.1) | 48(85.7) | |
| P det max | 71.84 \pm 9.61 | 71.52 \pm 12.93 | 0.91 |
| BOOI | 55.59 \pm 9.71 | 59.67 \pm 12.49 | 0.15 |
| BCI | 114.14 \pm 13.69 | 99.78 \pm 15.79 | <0.001** |
| ----pre | | | |
| Phasic | 5(26.3) | 6(10.7) | 0.13 |
| Not | 14(73.7) | 50(89.3) | |
| ---pre | | | |
| Terminal | 5(26.3) | 5(8.9) | 0.01* |
| Not | 14(73.7) | 51(91.1) | |



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