Evaluating Urological Residents on Interpretation of Uroflowmetry Graphs

KHAN M.S., MANNAN A., TASNEEM R.A.
Correspondence: Muhammad Safdar Khan, Department of Urology & Renal Transplantation, SIMS / Services Hospital, Lahore. **Email**: saldera@hotmail.com.

Abstract: Object of this study was to assess whether patients should be given only the uroflowmetry graph and report (computer report) or final diagnosis and opinion. 17 urological residents (clinical experience > 3 y and urology experience > 6 months) were assessed by flowmetry reports and graphs of five patients. Subjects were kept blind that report and graph was of same patient. Of the 85 results correct diagnosis was made in 40% and 34% based on report and graph respectively. Qmax was considered in 98.8% of results. Other parameters were less frequently considered. On cross tabulation of report and graph the correct diagnosis was 27%. It can be concluded that interpretation of the uroflowmetry is not easy. Majority of the clinicians have difficulty in interpreting it. It is recommended that final diagnosis be given with the uroflowmetry graph.

Key words: uroflowmetry, Qmax, Urological residents.

Uroflowmetry is a non invasive, rapid, easy and accurate tool for the screening of LUTS (lower urinary tract symptoms) patients[1,2]. More over uroflowmetry has gained wide spread recommendation because symptomatology[3] and residual[4] urine are not reliable criteria for the assessment of bladder outlet obstruction (BOO). During uroflowmetry evaluation the variables which are considered depend on the preference of the clinician but the important one are; maximum flow rate (Q_{max}), average flow rate (Q_{ave}), waiting time, flow time and voided volume[1]. In addition to these we have been studying voiding time, time to maximum flow and other parameters to assess different aspects of the BOO.

Among all the parameters of uroflowmetry, Qmax is the most important single parameter.[5,6] Urinary flow rate is dependent on the volume voided[7] and clinical studies require volume voided to be greater than 125 to 150 ml[8].

When a patient is referred for flowmetry, we have a routine of sending the flowmetry traces and computer report to the referring clinician*. This study was carried out to find out whether sending the results of uroflowmetry tracings and computer evaluation report is sufficient or we need to give our opinion as most of the clinicians are not familiar with the uroflowmetry results.

Material and Methods

Seventeen Urology residents were assessed for interpretation of uroflowmetry traces and reports (they were having clinical experience more than three years and urology experience six months to four years). Flowmetry record of five patients (five traces and five reports) were shown to each of the resident. Residents were kept blind of the fact that the report and trace were of same patient. Traces of patient I and II, shown to the residents are given in figure I and II.

In the report following parameters were present; Waiting time, maximum flow rate, average flow rate, time to maximum flow, time between 5% & 95%, flow time, decent time, voiding time, volume to max flow and voiding volume.

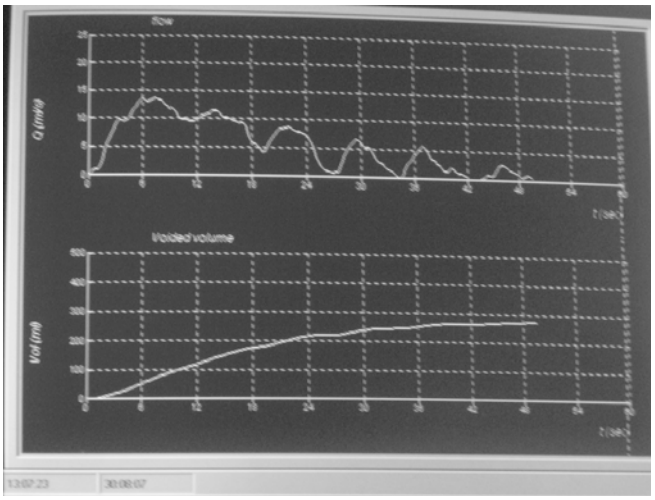

Fig. 1: *Flowmetry of patient I who has voided normal amount (300 ml).*

Residents were evaluated for;

A) Correct diagnosis (obstructed, equivocal, normal) from report or graph.
B) Time taken to make the diagnosis.
C) For gross mistake which was defined as making a diagnosis which can not be made from uroflowmetry.
D) Preference (report or graph).
E) Advanced knowledge of differentiating for artifacts and their manual correction.

There are a number of uroflowmetry parameters which can be helpful in the diagnosis of bladder outlet obstruction. Residents were assessed that for the diagnosis, which of the parameters they were considering. They were also assessed for the correct diagnosis from the flowmetry traces and report.

For each parameter's consideration its percentage was calculated. Similarly the percentage for the correct diagnosis on the basis of report and graph was calculated.

A correlation between the results of graph and its significance was calculated by SPSS 12. Clinicians knowledge was also assessed by the cross tabulation of the results of graph and report, if they were able to make the correct diagnosis.

Results

There were total of 85 results of uroflowmetry. Mean time in reading a report was 25.22 s (± 27.46 s.d.). Most of the clinicians deduced their diagnosis from the Qmax. Parameters considered by various residents for diagnosing the condition are summarized in table 1.

Table 1: *Parameters considered in the diagnosis by various residents.*

Parmeters	Considered	Not considered
Waiting time	5.9%	94.1%
Qmax	98.8%	1.2%
Qave	17.6%	82.4%
Time to maximum flow	0%	100%
Time between 5% and 95%	0%	100%
Flow time	17.6%	82.4%
Descent time	0%	100%
Voiding time	5.9%	94.1%
Volume to maximum flow	0%	100%
Voided Volume	12.9%	87.1%

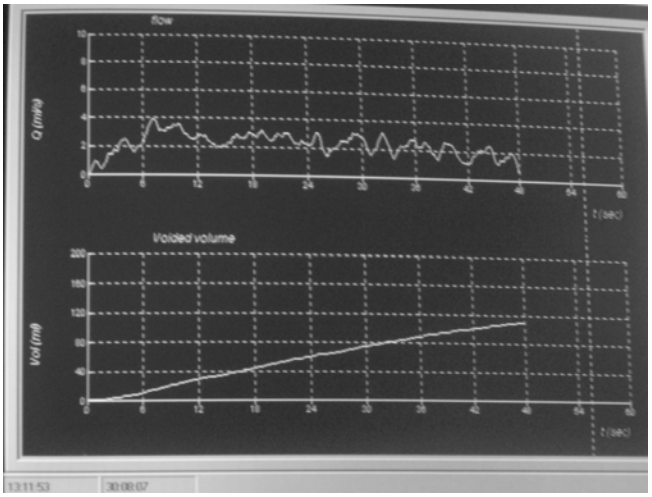

Fig. 2: *Flowmetry of patient II who has voided small amount (<120 ml).*

None of the residents had advance knowledge of artifacts. On cross tabulation between the report and graph, it was correct in 27%. The individual results of the residents with correlation between graph and report and its significance level are given in table 2.

The diagnosis was correct in 40% and 34.1% according to report and graph respectively. In 10.6% of the results, there was a gross mistake in the diagnosis e.g. neurogenic bladder or high pressure which was committed by 3 (17.6%) residents. Regarding the preference of the clinicians in report and graph; 76.5% preferred report, 11.8% graph and for 11.8% both graph and report were equally helpful.

Table 2: *Correlation between results of report and graph with significance level.*

ReSident	Correct diagnosis according to report	Correct diagnosis according to graph	Correlation between Report and graph	P value less than
1.	60%	40%	-.167	.789
2.	40%	20%	.612	.272
3.	40%	40%	1.00	0.01
4.	40%	40%	1.00	0.01
5.	60%	20%	.408	.495
6.	60%	60%	1.00	0.01
7.	49%	0%	a*	a*
8.	20%	40%	1.00	0.01
9.	80%	20%	1.00	0.01
10.	60%	40%	.667	.219
11.	40%	60%	.167	.789
12.	40%	20%	.612	.272
13.	40%	20%	.612	.272
14.	40%	40%	1.00	0.01
15.	40%	40%	1.00	0.01
16.	60%	60%	1.00	0.01
17.	40%	20%	.612	.272

a* could not be correlated as one of the parameters was fixed; but as the diagnosis was incorrect in 100% of cases of graph, there was no correlation.

Discussion

Most of the residents have relied on Qmax in the results and have ignored all other parameters. Although Qmax is the single most important parameter[7] but it can best be interpreted according to the uroflowmetry traces, voided volume and age of the patients[5].

Voiding time is an important parameter because it is of short duration among the young individuals in relation to the voided volume[9].

Prolonged voiding time and voided volume are both important parameters. We know that flow rate is dependent on the voided volume, therefore the first parameter which needs to be considered should be the voided volume. In the uroflowmetry graphs, there are two graphs and one graph shows the voided volume. Voided volume and voiding time was considered in very few results and this could be responsible for low percentage of correct diagnosis. Some of subjects based their results on the flow time and Qave and did not considered Qmax. Probably they were not knowing these two parameters can be affected by the voluntary sphincter activity[10].

Voiding time and flow time are also important because the difference between these two gives an objective evidence of intermittency.

Waiting time is an important parameter and normally it is less than 10 sec[2] and from prolonged waiting time hesitancy can be concluded. In the present study this parameter was considered by very few, this could be due to their in experience in interpreting such reports.

The maximum marks obtained by some one were 80%, but then interpretation of the graph did not confirm this. The cross tabulation of graph and report shows that only 27% were able to make the correct diagnosis which means that among the remaining the diagnosis was based on a guess work. In addition to this it is seen that only eight (48%) of the residents have shown a significant relation between their diagnosis based on graph and computer report.

Majority of the residents have preferred the computer report for the calculation. We have always been taking help of this but it is important to know that sometime the manual correction is necessary.

Some of the residents have made the diagnosis of neurogenic bladder and high pressure, from results of uroflowmetry. This confirms that these three residents were not clear between uroflowmetry and pressure flow studies[6]. We never expected from the residents for their knowledge of manual correction of artifacts[7], but a clinician should be able to interpret the artifacts.

This study has proved that majority of the clinicians are not familiar with urodynamics and it is not sufficient just to send the computer tracings. Clinician familiar with these techniques should give his opinion regarding the diagnosis.

References

1. Porru D, Bartoletti R, Austoni E, Carrinod M, Gianneo E, Melloni D. Relationship of flow rate with symptoms, quality of life and other clinical parameters in patients with LUTS suggestive of BPH *Eur. urol*. 2001, 40: 23-27.
2. Belal M, Abrams P. Noninvasive methods of diagnosing bladder outlet obstruction in men. Part 2: Noninvasive urodynamics and combination of measures. *J Urol.* 2006; 176 (1): 29-35.
3. Steele GS, Sullivan MP, Sleep DJ, Yalla SV Combination of symptom score, flow rate and prostate volume for predicting bladder outflow obstruction in men with lower urinary tract symptoms *J Urol*. 2000; 164 (2): 344-8.
4. Wu Z, Wu K, Wang B. Clinical significance of residual urine volume in bladder outlet obstruction with benign prostatic hyperplasia *Zhonghua Wai Ke Za Zhi* 1997; 35 (6): 374-6.
5. Kajbafzadeh AM, Yazdi CA, Rouhi O, Tajik P Mohseni P Uroflowmetry nomogram in Iranian children aged 7 to 14 years *BMC Urol.* 2005; 5: 3.
6. D Porru, R M Scarpa, D Prezioso, A Bertaccini and C A Rizzi. Home and office uroflowmetry for evaluation of LUTS from benign prostatic enlargement *Prostate Cancer and Prostatic Diseases* 2005; 8: 45–49.
7. Chung JY, Lee SE. Uroflowmetry in the normal males: Relationship between volume voided and flow rate. *Korean J Urol*. 1984; 25 (5): 679-84.
8. Dicuio M, Creti s, Di Campli A, Dipietro R et al. Usefulness of a prevoiding transabdominal sonographic bladder scan for uroflometry in patients involved in clinical studies of benign prostatic hyperplasia. *J Ultrasound Med*. 2003; 22 (8): 773-6.
9. Suebnukanwattana T; Lohsiriwat S; Chaikomin R; Tantiwongse A; Soontrapa S. Uroflowmetry in normal Thai subjects. *J Med Assoc Thai.* 2003; 86 (4): 353-60.
10. Emil A Tanagho: Urodynamic Studies; *Smith's General Urology. 15th edn:* Mcgraw-Hill, New York 1998: 518-20.