- We have now defined the severity categories for the 24 hour pad test as Mild (9-50g), Moderate (50-100g) and Severe (>100g).

References
[1] Scan J Urol Nephr 1988; 114 (suppl):5-19
[2] Br J Obstet Gynaecol 1986; 93 364-366
[3] Urology 1988; 32(1):78-80
[4] Neurourol Urodynam 1999; 18: 369-370
[6] Br J Obstet Gynaecol 1996; 103: 162-167
[7] BMJ 1996. 312 ;1654

82

Author(s): J.J.M. Pel and R. van Mastrigt

Institution, city, country: Dept. of Urology-Urodynamics, Erasmus University, Rotterdam, The Netherlands

Title (type in CAPITAL LETTERS, leave one blank line before the text):

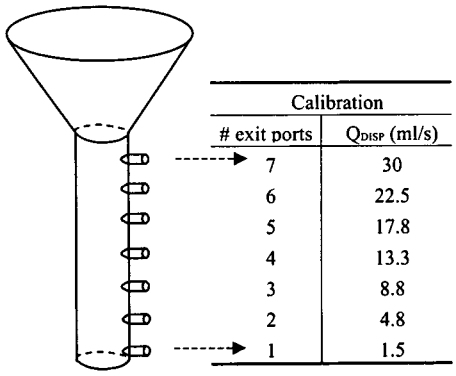
A DISPOSABLE FLOW METER

AIMS OF STUDY

To investigate the urinary stream of a patient, a number of different flow meters have been developed [1]. Due to the costs involved, most devices are only used in the clinic. Recently, the stream cup was introduced as a low cost and easy access device [2]. It consists of a plastic cup with an exit port and evaluates if the maximum flow rate exceeds 12 ml/s or not. In the present study, we developed an inexpensive disposable flow meter to grade the maximum flow rate in a large number of classes. We compared this disposable with a conventional flow meter (Dantec®).

METHODS

The disposable flow meter (patent pending) consists of a small funnel connected to a test tube. 7 exit ports, each 10 mm apart, were made in the tube, see fig. 1 for a schematic drawing. A stream of fluid directed at the funnel exits through a number of exit ports: the higher the flow rate, the more ports are active. In a first test, we calculated the average flow rate value of the uncertainty interval associated with each exit port, see the calibration table. At flow rates higher than 30 ml/s, all seven ports are active. In a second test, 7 healthy volunteers (2 females and 5 males) privately voided several times in a conventional flow meter, to measure the maximum flow rate, Q_{MAX}, and in the disposable flow meter. The disposable was placed in a measuring cup to measure the voided volume and all volunteers counted the number of exit ports active during voiding. Using this number, the average flow rate, Q_{DISP}, was selected from the table. This value was compared to Q_{MAX} using a difference plot [3].



Calibration	
# exit ports	Q_{DISP} (ml/s)
7	30
6	22.5
5	17.8
4	13.3
3	8.8
2	4.8
1	1.5

Fig. 1 Schematic drawing of the disposable flow meter. To compare flow rates measured with the disposable and with a conventional flow meter, we associated the exit ports with the flow rate values, Q_{DISP}, shown in the calibration table.

RESULTS

For each volunteer, we pair-wise selected Q_{MAX} (conventional flow meter) and Q_{DISP} (disposable flow meter) values with comparable voided volumes (± 35 ml) [4]. We plotted the difference of both values measured in separate voidings versus the mean, see fig. 2. This figure demonstrates the borders of agreement (open circles; $0 \leq Q \leq 30$) between both measurement devices ($Q_{MAX} - Q_{DISP} = 0.4 \pm 2.6$ ml/s; mean ± SD). The mean value does not significantly differ from zero, indicating that the disposable flow meter is not biased. The measurement range of our prototype was limited to 30 ml/s (see vertical dotted line). The four outliers (closed circles; $Q > 30$ ml/s) fall outside this range.

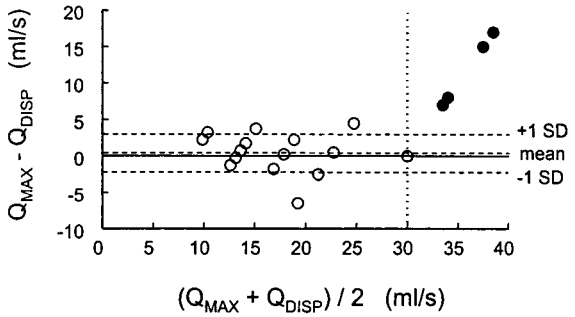


Fig. 2 Difference of the maximum flow rate, Q_{MAX}, (conventional flow meter) and the flow rate related to the number of active exit ports, Q_{DISP}, (disposable flow meter; see also fig. 1) measured in 7 healthy female and male volunteers.

CONCLUSIONS

The self-made disposable flow meter used in the present study is an inexpensive device (estimated costs between $10 and $30) and can be used repeatedly by the same individual to measure maximum flow rates and associated voided volumes at any location. Based on the average difference between the Q_{DISP} values (see calibration table), the accuracy of this disposable is excepted to be between 2 and 3 ml/s. The standard deviation of 2.6 ml/s calculated from the borders of agreement confirms this accuracy, despite the fact that two separate voidings were compared in each volunteer. Different models of the disposable with different accuracy and measurement range can easily be made by adapting the number, the diameter and the distance of the exit ports. In the present model, the maximum flow rate is determined by observing the number of active exit ports. Registration could be automated by fixing indication paper to the ports. The low cost and simplicity of this device, in relation to its accuracy and measurement range might significantly reduce the threshold for uroflowmetry under many conditions.

REFERENCES

[1] Urology **22**: 556-564, 1983
[2] Urology **52**: 1118-1121, 1998
[3] Lancet **1/8476**: 307-310, 1986
[4] Neurourol.Urodynam. **13**: 386-387, 1994

ACKNOWLEDGEMENT

This research is supported by the Technology Foundation STW, applied science division of NWO and the technology programme of the Ministry of Economic Affairs.

83

Category No. (Please choose one): Abstract No.

Author(s): **Werner Schäfer, Limin Liao, Ernst van Waalwijk van Doorn, Dirk de Ridder, Ciaran Reddy, and Claire Fowler, Deborah Lightner, Inge de Lepeleire and Marina de Smet, David Sciberras, Cynthia Bonfiglio and Mark A Bach**

Institution, city, country: **Aachen, D; Beijing, CH; Maastricht, NL; Leuven, B; London, UK; Rochester, MN,USA; Brussels, B; Rahway, NJ, USA**

Title (type in CAPITAL LETTERS, leave one blank line before the text):

NORMAL URODYNAMIC DATA: MEASUREMENTS IN ASYMPTOMATIC YOUNG MALES

Aims of Study: Urodynamic signal quality control, data analysis as well as clinical interpretation all require some knowledge of "normal" data. However, for obvious reasons good urodynamic data from "normals" are very rare and much of what we think is "normal or pathological" relies almost exclusively