URINARY FLOWRATE DETERMINATION FROM VIDEO URODYNAMIC IMAGING

A FEASIBILITY STUDY IN CHILDREN

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Background and aim

Urodynamic study is the gold standard for assessing the bladder function in adults and children. However, young children are generally not able to sit on a uroflowmetry toilet, due to lack of core stability. Absence of the urinary flowrate limits the diagnostic value of the voiding phase.

The aim of this study is to assess the feasibility of urinary flowrate determination based on standard care video urodynamic studies (VUDS) in children.

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Methods

We retrospectively analyzed VUDS's of 3 boys and 2 girls (aged 6-12 years), able to sit on a uroflowmetry toilet. During voiding, X-ray images were taken every second, as by our local standard. The manually segmented area of the bladder was mathematically converted to a volume, and corrected with the known full bladder volume. The resulted 'videoflow' was compared to the flowrate from uroflowmetry.

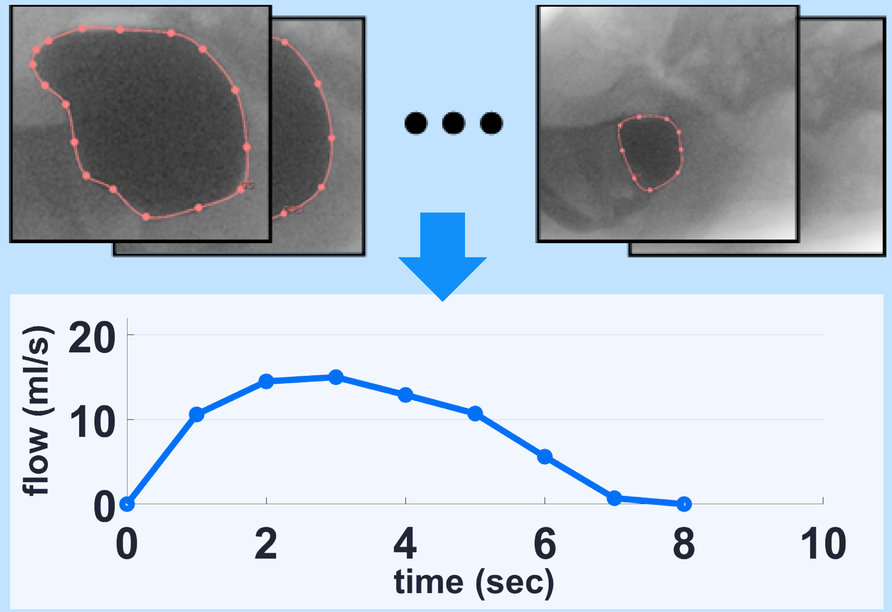

Figure 1: Upper part: manual segmentation of the bladder for all X-ray images taken during voiding in an 8-year-old boy; Lower part: resulting 'videoflow' graph from the algorithm. Voided volume was 74ml.

Results

The 'videoflow' showed a good average cross-correlation with the actual flowrate of 0.92 (0.87-0.95) over a wide range of Q_{max}(9-29ml/s) and voided volume (75-380ml). The $Q_{max}$was on average overestimated with 11%. This overestimation positively correlated with the voided volume (Pearson r=0.99)

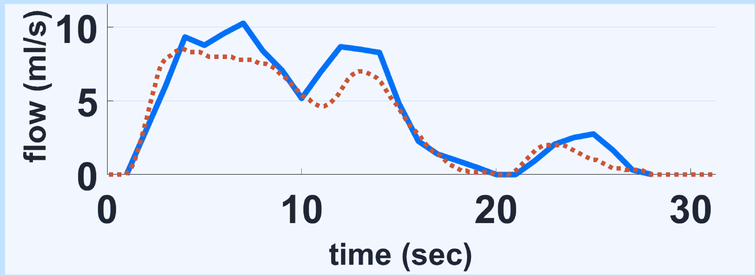

Figure 2: Uroflowmetry graph (orange dotted) compared to the 'videoflow' (blue solid). The graphs have a good crosscorrelation of 0.87 and overestimates the Q_{max} with 13%.

Conclusion

The method presented was found feasible in determining urinary flowrate using VUDS in children.

Outlook

In future research steps, we will include a substatial amount of subjects, to improve the used algorithm. In addition, the segmentation process will be automatized using Machine Learning, so avoiding observer bias.