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THE CIRCADIAN VARIATION OF POST-VOID RESIDUALS IN A POPULATION OF INSTITUTIONALIZED OLDER PEOPLEHypothesis / aims of study

Post-void residual (PVR) is defined as the volume of urine left in the bladder at the end of micturition. PVR is an important parameter in the evaluation of lower urinary tract dysfunction and is related with bladder outlet obstruction and detrusor underactivity. Until now, there are no clear cut-off values of the normal range of PVR (1). Several studies reported that a PVR > 100 ml was rather frequent (27-35%) in the population of nursing home residents, although the clinical impact of PVR in this population remains unclear. The intra-individual variation of PVR in older persons is high and appears to depend in part on the time of the day while it can also be attributed to the difference in the prevoid volume (2,3). The aim of this study is to investigate PVR and its circadian variation more thoroughly by taking into account 24h measurements and prevoid volume in a population of institutionalized older people.

Study design, materials and methods

A multicentre prospective study was conducted between April 2014 and February 2015 in 5 nursing homes amongst 73 older cognitive intact residents. A frequency-volume chart with post-void residuals (FV_{PVR}) was kept for 24 hours including voided volume (VV) (ml), incontinence (g) and post-void residual (PVR) (ml; BladderScan® BVI 9400). The residual fraction (RF) was calculated using the formula: (maximum PVR x 100) / prevoid volume. To explore the intra-individual variability of PVR (diurnal vs nocturnal and first morning void), only data of nocturic residents were selected to ensure having at least one morning void and one or more nocturnal voids.

ResultsResident characteristics and symptoms

The median age of the 73 studied residents was 84 [IQR: 68-97] years and 69% were women. Analysis of the FV_{PVR} showed that 59% was continent and 41% suffered from incontinence. More particularly, 22% had nocturnal and diurnal incontinence, 18% pure diurnal and 1% pure nocturnal incontinence. Median incontinence volume in the incontinent residents was 72g [IQR: 12-412g]. Nocturia was seen in 60 of the 73 residents (82%) and 31 residents (43%) gets up twice or more at night for voiding.

PVR and circadian variation

The prevalence of PVR in the residents, depending on the definition of PVR, was 79% (PVR>50ml), 53% (PVR>100ml), 29% (PVR>150ml) and 15% (PVR>200ml). The median maximum PVR over 24 hours is 106 ml [IQR: 56-161 ml]. No difference was detected between maximum diurnal and nocturnal PVR, 59 ml [IQR:34-123 ml] and 67 ml [IQR: 36-119 ml], respectively. However when investigating the RF, a significant difference between diurnal and nocturnal voiding was observed in all residents, 43 % [IQR: 20-60 %] and 24 % [IQR: 11-48 %] respectively. Figure 1 shows the RF of the diurnal, nocturnal and first morning void of 60 residents with nocturia. Diurnal RF of these nocturic residents was significantly higher than their nocturnal and first morning RF while the RF of the first morning void and nocturnal void(s) were not significantly different.

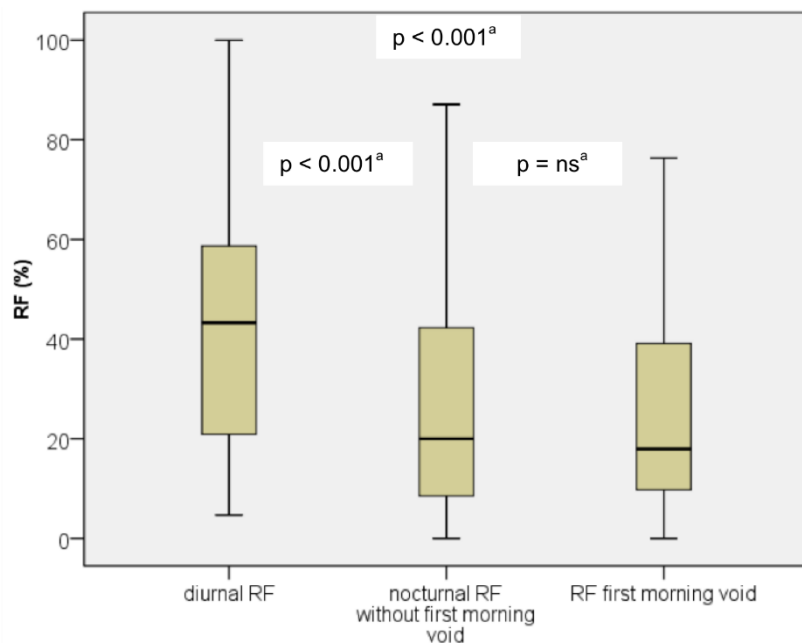


Figure 1: Intra-individual variability of the residual fraction (RF) in 60 patients with nocturia.

^aP-values are from Mann-Whitney U-test for skewed data.

Interpretation of results

In this study, we measured the FV_{PVR} of 73 cognitive intact institutionalized older people. Only 41% of residents had UI, but nocturia was present in 82%. We aimed for a more in-depth investigation of the PVR and its circadian variation in cognitive intact institutionalized older people by taking into account for the first time the PVR and prevoid volume for each void during 24h. The prevalence of institutionalized people with different levels of PVR differed from previous published data possibly depending on the method and/or population. The application of RF to this unique 24h data set takes into account the effect of the prevoid volume on PVR and showed a difference between diurnal and nocturnal RF. The diurnal RF was higher than the nocturnal RF suggesting that nursing home residents empty their bladder more effectively during night than during daytime. Furthermore, the morning RF can function as an indicator for the nocturnal RF in patients with nocturia.

Concluding message

This study investigates the PVR and its circadian variation in cognitive intact institutionalized older people in a more in-depth manner measuring PVR for the first time after each void during 24 consecutive hours and by correcting for the prevoid volume. Prospective studies in other populations and in patients with LUTS are needed to confirm whether these findings can be generally applicable and to further investigate the clinical significance of PVR and its circadian variations.

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Disclosures

Funding: Research grants from coloplast, hollister, wellspect, Bard **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Ethics Committee Ghent University Hospital Ingang 75 (De Pintepark II) - 2de verdieping De Pintelaan 185, 9000 Gent Fax: 09 332 49 62 Mail : Ethisch.Comite@UGent.be **Helsinki:** Yes **Informed Consent:** Yes