

## ANALYSIS OF VOIDING PATTERN FROM 530 NORMAL AND ABNORMAL NEWBORNS

### Hypothesis / aims of study

How to diagnose the bladder dysfunction in newborns is challenging, not only due to the practical difficulty in manipulation of the newborns, but also the value of voiding pattern in newborns is still unclear. Furthermore, the fact that the value of voiding pattern for children and adults is impossible to use in newborns has made it difficult to diagnose abnormal voiding pattern in newborns. Voiding function in infants has recently attracted the attention of many pediatric physicians. In this study, we observed the voiding pattern in term and preterm newborns with or without different abnormality by using 4, 8 and 12 hours observation.

### Study design, materials and methods

A total of 530 term and preterm newborns (aged 1 to 28 days) normal or abnormal including preterm, periventricular-intraventricular haemorrhage (PIVH), hyperbilirubinemia, hypoxic ischemic encephalopathy (HIE), periventricular white matter injury (PWMI) and low birth weight were included in this study. The voided volume (VV), post void residual (PVR) volume, state of consciousness at voiding, voiding frequency (VF) and voiding time as well as the quantity of intake milk and liquid, the intake time were recorded. The liquid intake was given according to standard protocol. We totally observed 4944 times to study the difference of voiding pattern in different lengths of observation.

### Results

1. Comparing term with preterm newborns, VV and consciousness voiding rate was significant higher [(19.8±10.9) ml vs (11.1±7.5) ml and (43.5±26.8) % vs (24.7±19.1) %, (P<0.05), respectively], whereas PRV volume and VF were significant lower [(1.55±1.01) ml vs (1.82±0.88) ml, (P<0.05) and (7.2±1.9) times vs (9.6±2.5) times per 12 hours, (P<0.05), respectively];
2. By using 4h, 8h and 12h observation, it was indicated that there were no differences in the three groups on VV, PVR volume (p>0.05). But there was significant difference in VF in 12h-observation compared with 4h and 8h-observation (p<0.05);
3. There were significant differences between the newborns with and those without PIVH of the PVR volume and the proportion of conscious voiding (p<0.05), the two groups with PIVH and without PIVH have no significant differences of VF, VV and the proportion of interrupt voiding (p>0.05); the VF and PVR volume of severe hyperbilirubinemia (SHB) is higher than normal bilirubin (NB), however the VV of SHB is lower than that of NB and mild to moderate hyperbilirubinemia (MHB) (p<0.05); the VV and rate of consciousness at voiding was significant lower in newborns with HIE compared with the control group, whereas PVR volume and VF were significant higher (p<0.05); the voiding times of infants with PWMI were significantly less than normal infants and the percentage of conscious voiding of infants with PWMI was significantly reduced than normal infants (p<0.05), but the VV and PVR volume of infants with PWMI were significantly more than normal infant (p<0.05); the VV and empty percentage of bladder in group of low birth weight is lower than those in group of normal birth weight;
4. With the increase of humidity of incubator, the weight of dry pads gradually increased, the higher of the humidity, the more weight to gain (p<0.05); the increases of diaper under various humidity were significant. With the increase of humidity of incubator, when it is ≥70%, there was a statistically significant in weight increase of wet diapers (p<0.05).

### Interpretation of results

Characteristics of the free voiding patterns were very similar in preterm and full term infants with different stage of development. Neonate voiding pattern was immature, showing peri-voiding and incomplete emptying of the bladder. Furthermore, frequent interrupted voiding in preterm neonates suggests detrusor-sphincter dyscoordination. It seems that simple 12-hour period monitoring on awake voiding disclose a connection between the newborn bladder and the central nervous system (CNS), indicating engagement in the reflex pathways and its ramifications rather than a voluntary, controlled act.

### Concluding message

There was great difference of voiding pattern in newborns with different degree of mature. Compared with preterm and low weight newborns, the voiding pattern of fullterm and normal weight newborns was more mature. PIVH, SHB, SIE and PWMI can affect the voiding pattern of newborns, which indicated that senior nervous centre of micturition involved in the voiding. 4h-observation could estimate VV, PVR volume of newborns in the same age old in 12 hours. It is important for getting more accuracy data of observation to pay an attention of humidity and air temperature of incubator during the collection of voiding pattern parameters.

### Disclosures

**Funding:** NONE **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Ethics Committee of The First Affiliated Hospital of Zhengzhou University **Helsinki:** Yes **Informed Consent:** Yes