

## ORIGINAL ARTICLE

### EFFECTIVENESS OF EXTERNAL BLADDER STIMULATION FOR COLLECTION OF URINE SAMPLE IN NEONATES

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#### Abstract

**Aim:** To assess the efficacy of external bladder stimulation technique as a time saving non-invasive approach for clean catch urine sample collection compared to sterile bag collection method in neonates.

**Methods:** This was a non-blinded randomized control trial in neonates, admitted in neonatal intensive care unit (NICU) or post natal wards requiring urine analysis for various indications. One hundred twenty neonates were block randomized into two groups. For the collection of urine sample, study group was subjected to external bladder stimulation, while adhesive sterile perineal bag was used for control group.

**Results:** The new technique was successful in 53/60 (88.3%) neonates. Median time for sample collection was 55 seconds and Inter Quartile Range (IQR) of 40 seconds. Mean time for sample collection was 61.76 + 43.62 sec. In control group, success rate was seen in 52/60 (86.67%) patients. Median time for urine collection by bag was 70 min and IQR of 25 min and mean time of 68.7 + 20.45 min. Difference of median time taken for urine collection among study and control group (55 seconds versus 70 minutes respectively) was statistically significant ( $p < 0.001$ ).

**Conclusion:** External bladder stimulation is an effective, fast, non-invasive and safe method of urine sample collection in neonates which avoids long waiting time required by bag collection.

**Keywords:** Bag specimen collection, external bladder stimulation, mid-stream urine collection, neonate, urine specimen collection.

#### Introduction

We need urine sample of a neonate for evaluation of many disorders on day-to-day basis. Various invasive and non-invasive techniques are being used for collection of urine sample. These techniques have their own merits and demerits. Though invasive procedures like supra-pubic aspiration (SPA) or bladder catheterization (CATH) are prompt in procuring the urine sample with minimal or no contamination, they are painful, may cause complications and apprehension to parents and attending doctors. (1-4) Urine collection in a sterile bag is non-invasive, safe, simple and well accepted by the parents but is time consuming, may require several attempts and culture may show high false positivity rate. (5-7) A health technology assessment suggested that clean voided midstream urine samples had similar accuracy as SPA samples when cultured with the advantage of being a non-invasive collection method. (8) But procuring spontaneous mid-stream sample from a neonate by wait and watch technique can lead to long waiting time and can't be used in an urgent situation. It was also thought as messy, impractical, distressing and too much troublesome. (9)

There are techniques reported in literature which can be used to stimulate voiding in patients with multiple sclerosis with neurogenic bladder. (10, 11) Fernández et al recently attempted one such technique

called as bladder stimulation and lumbar massage in babies who were up to 30 days old and found it to be very effective for obtaining clean catch urine sample with success rate of 86.3%. (12) We performed a randomized control trial to assess the efficacy of this technique in our setup and compared it with perineal bag collection of urine sample in terms of success rate and time taken. We also hypothesized that babies who are adequately hydrated on breast feeding or two hourly nasogastric (NG) feeding need not be additionally fed before the maneuver.

#### Methods & Materials

The present study was a parallel, single centre, non-blinded, randomized controlled trial. Data collection was done over seven month period after approval from Institutional Ethics Committee. Informed oral consent was taken from parents before enrolling the neonates. Random allocation sequence was generated by principal investigator using a computer software program in block size of ten. Using this table, participants who fell in group one were assigned to study group and those who fell into group two were assigned to control group. Participants were enrolled and assigned to respective groups by co-investigator. Allocation was concealed by using serially numbered, opaque and sealed envelopes. Purposive sampling method was done to enroll the neonates during the study period. Neonates requiring urine sample for various diagnostic indications whose parents consented to participate in the study were included in the study. Very low birth weight babies (< 1500 grams), hemodynamically unstable neonates (neonates on respiratory support and/or vasopressor support) and neonates with surgical condition like necrotizing enterocolitis that prohibited the maneuver were excluded from the study.

Primary outcome measured was success rate for collecting urine sample by bladder stimulation technique as well as bag collection method. In study group, success was defined as ability to collect the urine sample within five minutes of starting the maneuver while in control group success was defined as ability to collect the urine sample in first attempt after applying the sterile bag. Secondary outcomes measured were – 1) comparison of the time taken by two methods, 2) correlation between time intervals from last feed with time taken by the maneuver to start micturition ( in study group) by subgroup analysis.

Three members of neonatal intensive care unit (NICU) team (two doctors and one staff nurse) were trained to perform the maneuver and time recording by watching a video demonstration followed by hands on practice before starting the study. In study group, bladder stimulation technique was performed as described by Fernández et al. (12) After cleaning and drying the perineal area, one trained staff posted in NICU held the baby gently under the armpits with legs dangling (Fig 1a). Another member of the team performed the maneuver of external bladder stimulation by gentle finger tapping over supra pubic

**Fig 1a: Holding the baby under the armpit, Fig 1b: Gentle tapping over suprapubic area, Fig 1c: Circular massage over lumbar paravertebral area**



area (Fig 1b) for 30 seconds at the rate of 100 taps per minute followed by circular massage over lumbar paravertebral area (Fig 1c) for 30 seconds. This cycle of 60 seconds was repeated till baby started micturating and mid-stream clean catch urine sample was collected in a sterile container. Time taken from start of maneuver to start of micturition was noted. It was planned to abort the procedure if neonate failed to pass urine by the end of fifth cycle. Time of last feeding was noted from monitoring charts of the babies.

In control group, sterile adhesive bag was applied over perineum after cleaning and drying the area and time was recorded. Subsequently, baby was observed for passing urine in the bag either by mother (mothers are allowed to enter in our NICU for feeding and Kangaroo Mother Care) or staff nurse who had a continuous watch on the baby and the time was recorded again. In case of spillage, another bag was applied for collection of next voided sample.

**Statistical analysis:** Data was analyzed using Statistical Package for Social Sciences (SPSS; version 19, IBM Corp, NY, USA). Comparability of baseline data in two groups was assessed. Time taken by both the methods to collect urine sample was documented in terms of median and Inter Quartile Range (IQR). Difference in time taken for urine sample collection between two groups was analyzed by Mann Whitney U Test. Correlation between time gap from last feed and time taken by external bladder stimulation technique to void urine was analyzed by Pearson’s correlation coefficient test. We assumed significance at 5% level ( $p < 0.05$ ).

**Results**

During the study period, 138 neonates were found eligible for the study. Fifteen neonates were excluded

as per exclusion criteria and in three patients we could not get parental consent. Remaining 120 neonates were randomized and assigned to study and control groups (60 in each group). After randomization, study and control group were found to be comparable for various demographic parameters like weight, age in days and gender (Table 1). As primary outcome, bladder stimulation technique was successful in 53/60 (88.3%) participants within 5 minutes. Median time for urine sample collection was 55 seconds and IQR of 40 seconds (25th percentile: 35 sec, 75th percentile: 75 sec with minimum of eight sec and maximum of 230 sec). Mean time for sample collection was  $61.76 \pm 43.62$  sec. No major side effect was noted except consolable cry in all babies. In control group, success rate was seen in 52/60 (86.67%) patients with spillage from first bag application in eight babies. Median time for urine collection was 70 minutes and IQR of 25 minutes (25th percentile: 55 minutes, 75th percentile: 80 minutes with minimum of 30 minutes and maximum of 115 minutes). Mean time for sample collection with bag was  $68.7 \pm 20.45$  min. Time taken by two methods were found to be statistically significant ( $p < 0.001$ ) in favor of bladder stimulation technique. In study group, subgroup analysis was done on 36 neonates who were on exclusive breast feeding or two hourly nasogastric feeding. We did not find any correlation between the time gap from last feeding with time taken by maneuver to start micturition ( $r$  value -0.10,  $p$  value 0.57).

**Discussion**

Urinary bladder is controlled by spinal cord reflex with its nerve root level at S2-S4. This spinal cord reflex is under the influence of cortical feedback

**Table 1. Comparability of baseline characters in two randomization groups**

	<b>Study group (N=60)</b>	<b>Control group (N=60)</b>	<b>P value</b>
Weight in grams (mean $\pm$ SD)	2430 $\pm$ 496.18	2170 $\pm$ 698.36	0.09
Age in days (mean $\pm$ SD)	4.87 $\pm$ 3.15	8.19 $\pm$ 5.37	0.10
Male (%)	60%	64%	0.68

which matures with increasing age. First conscious awareness of bladder function occurs between one to two years of age. Voluntary control over the periurethral striated muscle sphincter occurs only by the age of 3 years. (13) Amarenco et al demonstrated a suprapubic bulbocavernosus reflex (SBR), in which tapping the suprapubic area gives a strong stimulus to make bulbocavernosus muscle contract reflexively. This reflex has been used in the management of neurogenic bladder to initiate bladder contraction. (14) External bladder stimulation technique demonstrated by Fernandez et al (12) is based on these physiological bases of reflex stimulation of bladder in early days of life which we also tried to replicate in our setup. Our result confirms that "external bladder stimulation" technique is an effective, non-invasive, fast and safe method of clean catch urine sample collection in neonates. It also supports that the new technique saves lot of time when compared with bag collection method. Time taken by the maneuver for voiding urine in our study replicates the results showed by Fernandez et al (success rate 86%, median 45 seconds with IQR of 30 seconds) and Altuntas et al (success rate 78% with median time of urine collection 60 seconds). (12,15) Although the babies in their trial were fed 15-20 minutes before maneuver to ensure hydration, we postulated and confirmed that if baby is getting on demand breast feeding or two hourly NG feeding, there is no need to additionally feed them before starting the maneuver.

We used external bladder stimulation to get clean catch urine sample of neonates as the NICE (National Institute for Health and Care Excellence) clinical guidelines also recommend that clean catch urine (CCU) sample collection as an ideal method for infants and children presenting with symptoms and signs suggestive of urinary tract infection (UTI). (4) A systematic review referred by this guideline compared the diagnostic accuracy of a CCU sample with SPA urine sample as the reference standard and showed good agreement between two methods. (8)

As we did not compare the contamination rate of two methods, we accept it as a limitation of our study and it can be the area of interest for future research.

### Conclusion

The present study concludes that the technique of external bladder stimulation and lumbar massage is an effective, fast, safe and non-invasive method of clean catch urine sample collection in neonates.

### Contributor Statement

AK conceptualized the study, drafted the initial manuscript, did literature search, revised the manuscript and approved the final manuscript before submission. DM did data collection, literature search, reviewed the manuscript and approved the final manuscript before submission.

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**Conflict of Interest :** None

### References :

1. Barkemeyer, BM. Suprapubic aspiration of urine in very low birth weight infants. *Pediatrics*. 1993;92:457-9.
2. Ross JH. Urinary tract infections: 2000 update. *Am Fam Physician*. 2000;62:1777- 80.
3. Pollack CV, Pollack ES, Andrew ME. Suprapubic bladder aspiration versus urethral catheterization in ill infants: success, efficiency and complication rates. *Ann Emerg Med*. 1994;23:225-30.
4. National Institute for Health and Clinical Excellence. Urinary tract infection in children: Diagnosis, treatment and long term management. Clinical Guideline no 54, 2007. Available from: <http://www.nice.org.uk/CG54>. Accessed March 2012.
5. Al-Orifi F, McGillivray D, Tange S, Kramer MS. Urine culture from bag specimens in young children: are the risks too high? *J Pediatr*. 2000;137:221-6.
6. Alam MT, Coulter JB, Pacheco J, Correia JB, Ribeiro MG, Coelho MF, et al. Comparison of urine contamination rates using three different methods of collection: clean-catch, cotton wool pad and urine bag. *Ann Trop Paediatr*. 2005;25:29-34.
7. Karacan C, Erkek N, Senel S, Akin Gunduz S, Catli G, Tavil B. Evaluation of urine collection methods for the diagnosis of urinary tract infection in children. *Med Princ Pract*. 2010;19:188-91.
8. Whiting P, Westwood M, Bojke L, Palmer S, Richardson G, Cooper J et al. Clinical effectiveness and cost-effectiveness of tests for the diagnosis and evaluation of urinary tract infection in children: a systematic review and economic model. *Health Technol Assess*. 2006;10:1-154.
9. Liaw LCT, Nayar DM, Pedler SJ, Coulthard MG. Home collection of urine for culture from infants by three methods: survey of parents' preferences and bacterial contamination rates. *BMJ*. 2000;320:1312-3.
10. Prasad RS, Smith SJ, Wright H. Lower abdominal pressure versus external bladder stimulation to aid bladder emptying in multiple sclerosis: a randomized controlled study. *Clin Rehabil*. 2003;17:42-7.
11. Dasgupta P, Haslam C, Goodwin R, Fowler CJ. The 'Queen Square bladder stimulator': a device for assisting emptying of the neurogenic bladder. *Br J Urol*. 1997;80:234-7.
12. Herreros Fernández ML, González Merino N, Tagarro García A, Pérez Seoane B, de la Serna Martínez M, Contreras Abad MT, et al. A New Technique for Fast and Safe Collection of Urine in Newborns. *Arch Dis Child*. 2013;98:27-9.
13. Sillen U. Bladder function in infants. *Scand J Urol Nephrol Suppl* 2004;215: 69 - 74.
14. Amarenco G, Bayle B, Ismael SS, Kerdraon J. Bulbocavernosus muscle responses after suprapubic stimulation: analysis and measurement of suprapubic bulbocavernosus reflex latency. *Neurourol Urodyn*. 2002;21:210-3.
15. Altuntas N, Tayfur AC, Kocak M, Razi HC, Akkurt S. Midstream clean-catch urine collection in newborns: a randomized controlled study. *Eur J Pediatr*. 2015; 174:577-82.

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