

SUCCESS RATE OF A NOVEL NEW NON-INVASIVE STIMULATION TECHNIQUE FOR OBTAINING MIDSTREAM URINE IN NEONATES

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ABSTARCT

Background: Sterile urine samples are required in neonates to exclude urinary tract infections. Urine collection especially in neonates is a challenge. Recommended method for accurate diagnosis is midstream clean catch sample of urine. In cases of dysfunction of bladder, few stimulation techniques are described in literature to facilitate bladder emptying. We used a technique described first by Herreros Fernandez who used the concept of stimulation for collection of midstream urine in neonates and children lacking sphincter control. This study was done to determine the success rate of anew non-invasive technique for obtaining midstream urine samples in neonates.

Methods: An interventional study was conducted at PAF Hospital Mushaf Sargodha over a period of 6months from 1st June 2024 to 30th November 2024 on 126 neonates of age less than 15 days. Bladder and lumbar stimulation technique was done by trained personnel to collect midstream urine. Success rate was main variable, which was measured as collection of midstream samples of urine within five minutes. Complications were measured as excessive crying and local redness due to massage.

Results: In 85% of babies' sample of mid-stream urine was successfully collected. Urine collection mean time was 1.73 minutes with 1.15 minutes median time and standard deviation of ± 1.25 minutes. There were no unwanted complications except controllable cry.

Conclusion: Bladder and lumbar stimulation are a safe, feasible and quick noninvasive method of urine collection in neonates with minimal discomfort and maximum success rate.

Keywords: Neonate, Lumbosacral massage, Bladder stimulation, Midstream urine, complications, Noninvasive

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INTRODUCTION

In neonates' collection of urine is a difficult challenge.^{1,4} Sterile urine samples are required in neonates to exclude urinary tract infections.^{3,9} The

American Academy of Pediatrics (AAP) recommends standard method for diagnosis of UTI is midstream clean catch urine (CCU).^{10,11} Clean catch urine collection is a non-invasive way for collection of urine in infants.^{1,3} It is also the most popular cost-effective non-invasive method around the globe.^{2,8} However, in children with lack of sphincter control, collection of clean catch midstream urine is quite time consuming and difficult.^{2,3}

Wide range of non-invasive and invasive methods have been described and tested for urine collection.^{3,5} The commonest non-invasive method being used is a sterile bag, which causes patient discomfort, time wastage and contamination of samples.¹³ Bladder needle aspiration

and catheterization are invasive methods being used for collection of urine.^{6,14,15} Micturition reflex is impulses travelling from urinary bladder to the spinal cord sacral portion and back to the bladder from sacral portion of spinal cord. Higher brain center has no influence in incontinent children. Action potential is initiated by stretch receptors in bladder for micturition reflex.¹³ Bladder stimulation is used in many clinical scenarios to obtain urination. In literature few stimulation maneuvers are described to facilitate emptying in bladder in cases of dysfunction of bladder.¹⁶ We used a technique described first by Herreros Fernandez.¹⁷ who used his concept of stimulation for mid-stream urine collection in neonates. The rationale of this study was to have evidence of safe and less time-consuming method for midstream urine collection in neonates.

Hypothesis of this study is that this noninvasive method would be helpful for clean catch collection of midstream urine in neonates. The objective of our study was to determine the success and safety of this maneuver for urine collection in neonates.

METHOD

This interventional study was done at PAF Hospital Musaf Sargodha in Neonatal Intensive Care Unit (NICU) over a period of 6 months from 1st June to 30th November 2024. Sample size was 126 neonates and was calculated by using WHO sample calculator with confidence level (95%), alpha error (5%), anticipated population with successful collection of urine sample (91%). Non probability sample technique was used for enrollment in study. Inclusion criteria were term babies of age less than 15 days either on breast feeding, or on top feeding, stable babies with septicemia, term/ low birth weight babies with neonatal jaundice. Consent was taken verbally from parents after explaining the procedure. Exclusion criteria were babies who were on ventilators/CPAP, very sick babies, dehydrated babies, preterm babies, syndromic babies, babies with poor feeding, very low birth weight, extreme low birth weight babies, drug administration prior to urine collection. Congenital anomalies, congenital heart diseases, congenital urogenital abnormalities and any other medical illness that forbids manipulation.

To ensure adequate hydration baby was breast fed or formula fed according to his or her weight and day of life by NICU trained nurse 25 minutes before initiation of maneuver. Formula fed babies were given 10ml per kg at 1st day of life. Prior feed was incremented by 10ml per day for every successive day during the first week. While 25ml/kg was fed from second week onwards before the onset of stimulation. Before performing the method, non-pharmacological analgesia, such as 2%

sucrose syrup or non-nutritive sucking were administered to baby to prevent or lessen crying. Three trained persons were required to carry out the procedure. One person held the neonate, other performed the procedure and the 3rd one notes the time. Neonates' genitalia were cleaned properly with soap and Luke warm water 25 minutes after feeding, followed by drying with sterile gauze. Neonate was held under her/his armpits with their legs dangling and for collection of urine a sterile urine collector was placed nearby. Bladder stimulation was done in suprapubic region by gently tapping at the rate of hundred blows or taps per minute for 30 seconds (Figure A), followed by 3 seconds massage in lower lumbar area in the paravertebral zone with gentle movements in circular motion (Figure B). These stimulation maneuvers were repeated still start of micturition and collection of urine midstream sample in a sterile urine collector (Figure C). Study approval was taken from ethical committee of PAF Hospital Mushaf Sargodha.





Figure: New Non-invasive technique of bladder stimulation for collection of midstream urine in neonates.

Suprapubic area tapping

Lower Lumbar area stimulation

Collection of Midstream urine in a sterile urine container a) Female b) Male

Operational definitions

Success: Urine collection in five minutes after start of stimulation (Figure C)

Sample Collection Time: Time taken from start of the tapping or stimulation to start of collection of urine sample
SPSS 20 was used for data analysis. Frequency and percentages were assessed for age, gender, success and failure rates.

RESULTS

Out of 126 neonates, 70 (55.6%) were males and 56 (44.4%) were females. 15 (11.9%) were at 1st day of life, 95 (75.4%) were between 2-7 days of life and 16

(12.8%) were above 7 days of life with mean age of 3.8 days of life and SD of ± 3.4 . Overall success rate of procedure was 85%. Success rate of procedure was 48/56 (85.7%) in females and 59/70 (84.3%) in males (Table I) there was no statistically significant difference I outcome of procedure regarding gender (p value >1). Success rate was 80% at 1st day of life and 62.5% in more than 7 days of life (Table I). Mean time for sample collection was 1.73 minutes (104 seconds), median time of 1.15 minutes with SD of ± 1.25 minutes. Regarding complications only controllable cry was seen in 11 (8.7%) of neonates. No other complication was observed.

TABLE I: Association of Age with Outcome

Age in Days	Success (n 107)	Failure (n 19)
1 (n 15)	12 (80%)	3 (20%)
2-7 (n95)	85 (89.5%)	10 (10.5%)
>7 (n16)	10 (62.5%)	6 (37.5%)

TABLE II: Association of Gender with Outcome

Gender	Success (n 107)	Failure (n 19)
Male (n 70)	59 (84.3%)	11 (15.7%)
Female (n 56)	48 (85.7%)	8 (14.3%)

DISCUSSION

Urine collection in infants and neonates remains very challenging.^{2,8} Urinary cauterization and suprapubic aspiration are invasive methods and are quite painful and needs expertise.^{1,3,5,18} Spontaneous collection of urine is time consuming and tiring. Common noninvasive method in practice use of urinary sterile bags, which is an easier and economical with 63% specificity¹⁹, but associated with quite high almost 40% to 62.8% of contamination.²⁰ So, method involving suprapubic tap and limbo sacral massage for midstream urine collection is worthwhile in children who are incontinent yet.²¹ This maneuver has higher success rate and less than 1 minute of mean time for passing urine. Success rate of 86% was in study done by Herreros Fernandez abd 57 seconds mean time for urine sample collection.^{1,8,20} Our study shows almost similar results as above-mentioned study in respect to success rate i.e. 85% but sample collection mean time in our study was almost double i.e. 1.73 minutes (104 seconds vs 57 seconds).²¹ A case control study by Altun Tus N et al applying same methodology of bladder massage in case group and wait and watch technique was observed for control group. Quite high success rate was observed in the experimental case group (78%) for urine collection while it was 33% ($p < 0.001$) in control group. The urine collection median time was 60 seconds in the experimental group (20) and 300 seconds in the control

group ($p < 0.0001$). Antoine Tran applied bladder massage stimulation maneuver too for collection of urine and showed 52 seconds (10.0; 110.0) of median time and 55.6% (21) of success percentage. He also conducted that the success rate decreased with weight, from 85.7% (less than 4Kg) to 28.6% (more than 10kg) ($p = 0.0004$) and with advancing age from 88.9% (newborn) to 28.6% (more than 1 year) ($p = 0.0001$). Another study by Pratap G et al showed success percentage of 72% with sample collection mean time of 57 seconds (23), success rate in our study was greater than this i.e. 85% while sample collection was longer in our study (104 seconds vs 57 seconds). Lack of control group was main limitation of our study and neonates till 15 days of life being the same population made it non evidence for generalization of results for age more than 15 days of life.

CONCLUSION

Bladder and lumbar stimulation are a safe, feasible and quick noninvasive method of urine sample collection in neonates with minimal discomfort and maximum success rate.

SUGGESTION

Technique of bladder and par vertebral massage is safe, easy, effective and time sparing method for clean catch mid-stream urine collection without unwanted effects. Bag collection associated time wastage and discomfort and invasive methods related side effects could be avoided. This bladder stimulation method can be used as a preferable primary mode for urine collection in neonatal care units. But study with controlled group and on large sample is recommended.

ETHICAL APPROVAL

Ethical approval was granted by the Hospital Ethical Committee, PAF Hospital Mushaf vide reference No MSF(H)/308/3/1/Trg dated: May 2024

CONFLICT OF INTEREST:

Authors declare no conflict of interest.

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AUTHOR'S CONTRIBUTIONS

AY: Data collection and manuscript writing

HBS: Data collection & analysis

FN, MN: Data collection and critical Review

MS: Interpretation of data

MI: Statistical analysis, and critical Review

ALL AUTHORS: Approval of the final version of the manuscript to be published

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