

Original Research Article

Mid-stream clean catch urine collection in newborns: a non-invasive and safe technique

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ABSTRACT

Background: The aim of this study is to determine the success rate and safety of a non-invasive technique to obtain clean-catch midstream urine samples in newborns.

Methods: Prospective bedside clinical study. After obtaining written informed consent, 120 consecutive newborns admitted in NICU with no dehydration, poor feeding, need for immediate urine sample by invasive method for whom urine collection was advised for various reasons who met the inclusion criteria were included in the study with consent being taken from the parents. After adequate milk intake supra pubic and lumbar para vertebral areas were stimulated in repeated cycles of 30 s until micturition began.

Results: Success rate in obtaining a midstream urine sample within 5 min. The success rate was 90%. The mean time taken to collect urine was 64.24s, for males it was 62.55s and for females 65.93s.

Conclusions: The technique has been demonstrated to be safe, quick and effective. The discomfort and time consumption usually associated with bag collection methods as well as invasive techniques can be avoided.

Keywords: Clean-catch, Midstream, Newborns, Urine

INTRODUCTION

Urinary tract infection is one of the most common bacterial infections and its occurrence in childhood may carry special significance. Making the diagnosis is difficult particularly in young children and infants. Seeking laboratory confirmation of the diagnosis requires the initial step of collecting an uncontaminated urine sample and this is a challenge in infants and children who are not toilet-trained.¹ Failure to diagnose urinary tract infection or delaying the antibiotic treatment of a urine infection can have the effect of producing an acute clinical deterioration and in addition it may result in long-term renal damage.² A wide range of clinical interventions for urine collection is described in the

literature, including non-invasive and invasive methods. A variety of non-invasive methods are used in primary care, predominantly clean catch, urine collection pads or urine collection bags. The most common non-invasive technique is urine collection using sterile bags, which is associated with significant patient discomfort and contamination of samples. Obtaining a clean-catch urine sample is the recommended method for urine collection in children who are able to co-operate.³ However, in infants and children lacking sphincter control, urine catch is more difficult and time-consuming and invasive methods (catheterisation and needle aspiration of urine from the bladder) are sometimes needed. While being advocated in the literature as the 'reference standard' to collect urine, supra pubic aspiration is invasive and

unpleasant for the child and is dependent upon skilled practitioners to perform.^{4,5} Vesical stimulation techniques are applied in certain medical situations to obtain micturition. At present there are no standardized manoeuvres to stimulate urination in neonates. Authors used these stimulation techniques to obtain clean catch mid-stream urine in newborn with the objective to determine the success and safety of this technique.

METHODS

This was a prospective bedside clinical study conducted at Cheluvamba Hospital attached to Mysore Medical College and Research Institute, Mysore.

The study was carried out over two months, February and March of the year 2015 after obtaining institutional ethical committee clearance.

Inclusion criteria

- 120 newborns delivered in the same hospital and being admitted in the NICU attached to the pediatric block, who needed urine analysis according to the attending physician were included into this study.

Exclusion criteria

- Neonates with poor feeding, dehydration were excluded from the study.

Total of three people were needed for this procedure, two (trained nurses and/or physicians) to perform, and a third to measure the time taken. This technique involved a combination of fluid intake and non-invasive bladder stimulation manoeuvres. The first step was either breast-feeding or providing formula intake appropriate to the age and weight of the newborn. In babies fed expressed breast feeding or infant formula, 15ml/kg was provided on the second day of life, increasing by 15ml/kg every day. This was administered prior to the onset of stimulation. Half an hour after feeding, the infant's genitals were cleaned thoroughly as per aseptic techniques. A sterile collector was placed near the baby in order to avoid losing urine samples. Before performing the technique, authors administered non-pharmacological analgesia, such as non-nutritive sucking or 2% sucrose syrup, to prevent/lessen crying. The second step was to hold the baby under their armpits with their legs dangling. One person then started bladder stimulation which consisted of a gentle tapping in the supra pubic area at a frequency of 100 taps or blows per minute for 30s. The third step was stimulation of the lumbar para vertebral zone in the lower back with a light circular massage for 30s. Both these stimulation manoeuvres were repeated until micturition started and a midstream urine sample can be caught in a sterile collector. Success is defined as the collection of a sample within 5min of starting the stimulation manoeuvres. The main variable was the success rate in obtaining a midstream urine

sample within 5min. Secondary variables were the time taken to obtain the sample, age and sex. The sample collection time was defined as the time from the beginning of the stimulation procedure (i.e. the tapping) to the beginning of sample collection.

Statistical analysis

The percentage of newborns where urine was obtained (success) was analysed, so also the time to obtain the sample from the onset of bladder stimulation, age and sex. Chi square test was applied to find out the success. Independent sample t test was applied to find out the mean time taken for the total sample, including male and female newborn. Descriptive statistics with the mean, standard deviation and standard error were analysed. All statistical analyses were performed with SPSS software (V.20.0). Authors assumed significance at the 5% level ($p < 0.05$).

RESULTS

Of the 120 samples selected, 54 were cases of neonatal hyper bilirubinemia, 30 of late onset sepsis, 24 of low birth weight and 12 of early onset sepsis. 59 newborns were males and 61 were females. The mean age of males was 5.08 days whereas for females it was 4.90 days.

Table 1: Frequency and percent success rate of urine collection.

Results	Frequency	Percent
Success	108	90.0
Failure	12	10.0
Total	120	100
Test statistics	Chi-square=76.80; $p=0.05$	

The success rate was 90% (108 of 120) which was found to be statistically significant.

Table 2: Mean time taken to collect urine.

Gender	Number	Mean	Standard deviation	t value; p value
M	53	62.55	39.792	$t=0.436$; $p=0.664$
F	55	65.93	40.788	

The mean time taken to collect urine was 64.24sec, whereas for males it was 62.55sec and for females 65.93sec, which were statistically the same.

DISCUSSION

This technique to obtain a midstream clean catch urine sample in newborns, has a high success rate and a mean time for passing urine of approximate 1min. Midstream urine collection is the preferred method for adults and older children and is suitable for diagnosing UTI.⁶ The collection of spontaneous urine is also useful in infants with suspected UTI, but is a time-consuming and

unpredictable task that requires prolonged attention and patience, and so is not widely performed. Invasive methods for obtaining clean urine (supra pubic aspiration and bladder catheterisation) are aggressive and have a high failure rate in newborns due to their anatomical characteristics and irregular voiding pattern. The urine collection bags and urine collection pads have high contamination rate and not suitable for culture.⁷

This procedure is based on manoeuvres described for patients with bladder dysfunction to stimulate bladder emptying through reflex contraction of the detrusor muscle.⁸ The detrusor muscle is innervated by the parasympathetic pelvic nerves (S2-S4). The spinal micturition reflex is a simple arc reflex. Distended bladder walls stimulate efferent fibers going to the medulla, the arc reflex is produced in S2-S4, and afferent fibers stimulate the detrusor muscle which contracts to pass urine. This reflex is voluntarily inhibited and controlled in continent individuals by the cortex, but not in newborns. In neonates, it can be triggered. The advantages of midstream urine collection, its difficulty in collecting in newborns and the success of the stimulation technique described in newborns made us to evaluate the usefulness of this technique. This stimulation technique is published and practiced in few centre's abroad. Authors have demonstrated that this technique is effective in obtaining a urine sample in a majority of newborns is easy, safe, fast and effective. Bag changes, long waiting times and invasive techniques were avoided. Several factors may have influenced the efficiency of present technique: trained staff performed the procedure and a standardised fluid intake.^{9,10}

This novel study has no complications. It is also a non-invasive study as authors are only stimulating the bladder. Other invasive and aggressive methods carrying some risk (supra pubic aspiration or bladder catheterisations) were also avoided.

CONCLUSION

A new method to obtain midstream urine in newborns is described. It consists of feeding, bladder stimulation and paravertebral lumbar massage. The technique has been demonstrated to be easy, safe, quick and effective with good success rate. The discomfort and time consumption usually associated with bag collection methods as well as invasive techniques can be avoided.

What is already known: The bladder stimulation manoeuvre applied in certain medical conditions is known but its feasibility for urine collection in newborn has not been studied adequately.

What this study adds: The technique has been demonstrated to be easy, safe, quick and effective with good success rate.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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