

A method for urine collection in infants

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Abstract

A simple, inexpensive, non-invasive method for urine collection was used in 28 consecutive infants for periods of 48 hours (n=10) and 72 hours (n=18). The incidence of urine collector detachment was low on the first and second days (<4%) and increased significantly on the third day (28%). Volume of urine leaked was <4% of the total volume collected daily. This method is applicable to both sexes and is reliable for up to 48 hours.

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Prolonged urine collections for metabolic studies are notoriously difficult. In infants, particularly girls, various techniques have been described, all of which have some drawbacks.¹⁻⁴ To our knowledge, the reliability

of these urine collection systems has not been assessed. We describe our modification of a technique that has been used previously.^{5,6} The reliability of this method was assessed from its use in a sequential series of infants.

Methods

Urine was collected continuously for two days in 28 consecutive surgical newborn infants (13 boys, 15 girls) receiving standard postoperative care. Mean (SD) gestational age was 35.3 (0.7) weeks (range 29-42), weight 2900 (100) g (range 1000-5000), and postnatal age 24.6 (6.2) days (range 1-137). In 18 of these infants (seven boys, 11 girls) the collection was prolonged for three days continuously.

CONSTRUCTION OF THE URINE COLLECTOR

The fifth finger was cut obliquely from a starch free size 7 surgical glove, leaving at the base of the finger a large flange which was tailored for each infant (figure A). Girls require a wider flange. A length of oxygen bubble tubing (Universal Hospital Supplies, London) was cut with a wide opening at one end and a narrow opening at the other. A hole was made at the tip of the finger from the glove, stretched around the wide end of the oxygen tubing, and secured to it with waterproof adhesive tape. The distal narrow end of the oxygen tubing was fitted into a vented bottle.

FITTING THE URINE COLLECTOR

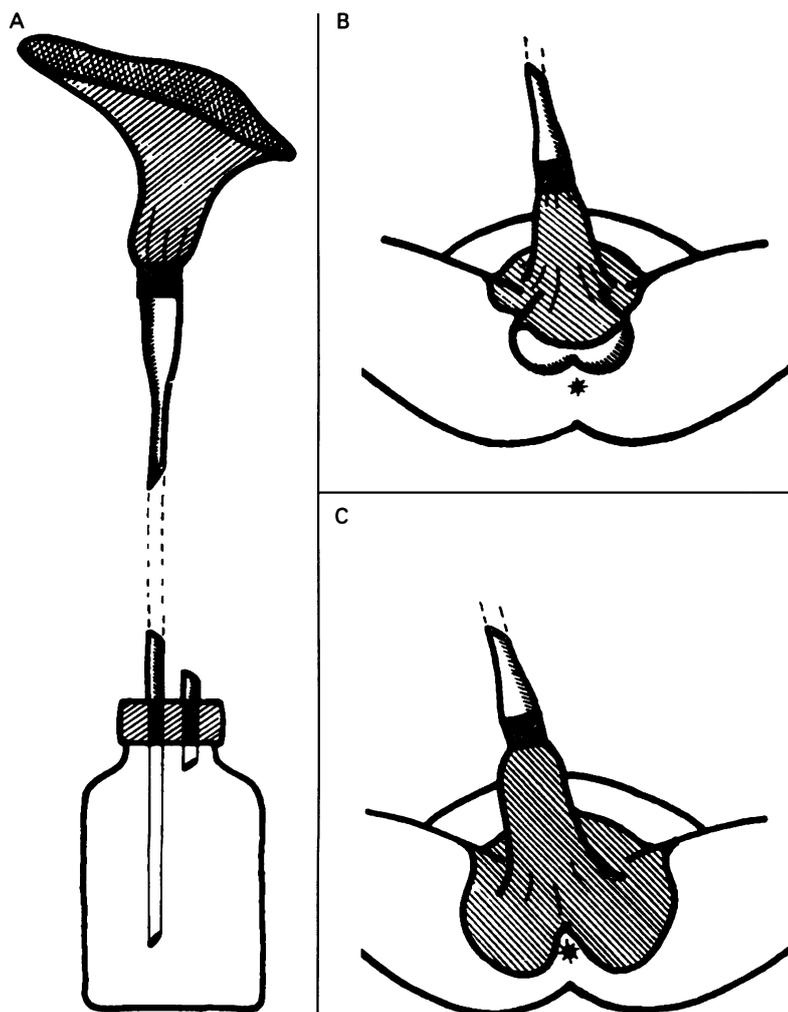
The infant was placed supine with legs held flexed and abducted by an assistant. An hypoallergenic medical adhesive (Hollister, Chicago) was sprayed onto the infant's perineum and left to dry for one minute. In boys, the urine collector was applied to the perineum, first fixing the narrow side of the flange to the anterior portion of the scrotum and then fixing the rest of the flange to the skin surrounding the base of the penis (figure B). In girls, the urine collector was applied to the perineum, first fixing the narrow side of the flange to the skin between the posterior fourchette and anus and then fixing the wide portions of the flange to the lateral sides of both labia majora and anteriorly onto the mons pubis (figure C). Care was taken to ensure that it was applied firmly and without wrinkles. Surplus adhesive was removed with cotton wool. The oxygen tubing was taped to the infant's leg to prevent traction on the urine collector. The drainage tubing always drained downwards creating a siphoning action which prevented a build up of pressure in the system. The collecting bottle was placed in an insulated container filled with ice. Every four hours, the

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(A) The apparatus. The fifth finger of a surgical glove with a large flange at the base is attached to oxygen bubble tubing, the distal end of the oxygen tube is connected to a vented bottle. (B) The urine collector applied to the perineum of a male infant. (C) The urine collector applied to the perineum of a female infant.

Details of urine collections

| | Sex | Length of urine collection (hours) | | |
|--|-----|------------------------------------|------------|--------------|
| | | 24 | 48 | 72 |
| No of collections | M | 13 | 13 | 7 |
| | F | 15 | 14 | 11 |
| No (%) of failed collections | M | 0 | 0 | 3(42.9) |
| | F | 0 | 1(7.1) | 2(18.2) |
| Mean (SEM) urine collected (ml/kg/day) | M | 73.3 (7.5) | 88.9 (8.8) | 112.1 (16.0) |
| | F | 63.8 (5.3)* | 80.9 (5.2) | 89.4 (6.1) |
| Mean (SEM) urine leaked (ml/kg/day) | M | 0 | 0.4 (0.4) | 0 |
| | F | 2.8 (2.8) | 0.7 (0.6) | 0 |
| Mean (SEM) % leak (per patient/day) | M | 0 | 0.6 (0.6) | 0 |
| | F | 3.8 (3.8) | 0.9 (0.9) | 0 |

* $p=0.01$ v day 2.

urine collected was decanted and stored at -4°C .

ASSESSMENT OF URINE COLLECTION

The infant was placed on a disposable nappy. Urinary leak was calculated by weighing the nappy every two hours with a scale accurate to ± 1 g. Failure of the urine collection was defined as detachment of the urine collector from the perineum, and subsequent unmeasurable urinary leak. Once failure had occurred the urine collection was discontinued and excluded from subsequent calculations for that day.

STATISTICS

Data are expressed as mean (SEM). Unpaired t test and Yates's corrected χ^2 test were used to compare groups. Results demonstrating probability levels ≤ 0.05 were considered significant.

Results

There was no significant difference between sexes for weight, gestational age, postnatal age, volume of urine collected, volume of urine leaked, percentage of daily urinary leakage, and urine collection failure rate (table). The volume of urine collected was smaller on day 1 than on day 2. This difference which approached significance in boys ($p=0.07$) and was significant in girls ($p=0.01$) may reflect the decreased urine output frequently observed in the immediate postoperative period.

Urine collection failure rate was zero during the first day and 3.6% during the second day. The failure rate increased significantly to

27.8% during the third day ($p=0.05$ day 2 v day 3). No significant correlations were found between the predictor variables, weight, gestational age and postnatal age, and the dependent variables, collection failure and urinary leakage. We did not observe any complications related to the system.

Discussion

The drawbacks of previously described methods for urine collection are complexity of the apparatus,² non-suitability for girls,⁴ significant interference with the comfort and nursing care of the infant,^{1,3} and contamination of urine with stool.^{1,3}

The method described is safe, inexpensive, relatively simple, prevents mixture of urine and stool, is well tolerated by the infant, and does not interfere with routine nursing care. The urine collector is not available commercially and must be constructed and fitted with great care. The method is reliable for up to 48 hours, and close monitoring is necessary if urine collection is to be extended beyond this. In the event of collector detachment, a new collector should be applied instead of attempting to reinforce the attachment of the old one.

It has been suggested that metabolic studies requiring urine collection should be limited to boys because of the difficulty of performing accurate urine collection in girls.⁴ In our experience the anatomy of the female infant perineum does not preclude secure fixation of the urine collector around the vulva and our results demonstrate that the method is reliable for both sexes.

This method is suitable for very small neonates as well as for older infants. It is also theoretically applicable to incontinent, unconscious, or uncooperative children.

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