VOLUME AND SPECIFIC GRAVITY IN TWENTY-FOUR HOUR URINE COLLECTIONS

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SUMMARY: Volume and specific gravity of twenty-four hour urine from young men give a good guide as to the accuracy of the collection. This relationship holds for patients with renal calculi and also for those with blood urea levels above 40 mg per 100 ml. The method correlated well with that based on creatinine and calcium contents of consecutive specimens, and is much simpler.

A simple method of detecting inaccurate twenty-four hour urine collections by comparing volume with specific gravity (SG), thereby saving laboratory time and reducing clinical confusion, is described.

We obtained 200 twenty-four urine specimens from 64 ambulant men aged eighteen to forty-two years whose body surface area ranged from 1.57 to 2.22 m²; their daily diet contained 1 g of calcium but was otherwise unrestricted. 44 had past or present renal calculi and in 7 the blood urea level exceeded 40 mg per 100 ml. The ward staff and patients were carefully instructed and at least two consecutive collections were made on each patient on each occasion, some being studied more than once. These specimens satisfied our criterion of accuracy of collection, namely that the lowest daily value for creatinine and calcium content in each patient should not differ from the highest by more than 25 per cent. A further 29 specimens from 9 other patients showed a wide daily variation in these values and we assumed that most of them were inaccurate collections. SG was measured at a urine temperature of 19-21° C with a standard hydrometer.

Figure 1 shows the relationship of volume to SG for the 200 accurate collections. The blood urea level did not influence the results, and body surface area had only a small effect. We use this area of scatter as the normal range for younger men, and we reject a twenty-four urine specimen if the plot falls outside this area.

Figure 2 shows the results of 17 collections obtained from one of the patients who was studied five times, twice while he felt well, twice while he had renal colic and once when he had infectious mononucleosis. The relation of volume to SG is close, despite variation in food intake, and the findings were similar in three other patients who contributed 14, 7 and 6 specimens respectively. If an individual's specimens fail to show this feature they are suspect, and this is a further check on accuracy when multiple collections are made.

To assess the usefulness of these procedures we first charted the results of the 29 collections which we assumed to be inaccurate; the plot fell outside the normal range in 11, more than a third. Secondly, we plotted the results of 97 collections taken from

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Fig. 1. Relationship of volume to SG for 200 accurate collections.

17 young Gurkha men, each of whom contributed between 5 and 7 samples. There was a clear separation into two main groups. In each of 9 men all the results, or all except one, lay within the normal range, and volume was closely related to SG, whereas in 6 other subjects a half or more of the plots were outside the normal range and there was no clear relation between volume and SG; the remaining specimens gave equivocal results. We concluded that in the first group collection was fairly accurate, in the second, it was seriously inaccurate and in the remainder it was suspect.

Our findings suggest that this test detects a useful proportion of serious errors in the collection of twenty-four urine specimens, particularly when a series of samples is obtained. For other groups of patients, for example children and the aged, the normal range may be different.

*Volume and Specific Gravity in Twenty-four Hour
Urine Collections*

Fig. 2. Results of 17 collections obtained from one patient.

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