was shocked, with a blood-pressure of 90/60, and a jugular venous pressure raised to the angles of the jaws. She was given 10 mg. of morphine and 1 mg. of "digoxin" intravenously, and 10 mg. of metaraminol intramuscularly. It was decided that she had probably had an extension of the original infarct, and that her condition was so serious that immediate treatment with anticoagulant drugs was indicated. To this end the polythene cannula, with the attachments described above, was introduced into the median basilic vein in the right antecubital fossa and 10,000 units of heparin given four-hourly. This treatment, and frequent intramuscular injections of metaraminol, succeeded in maintaining her systolic blood-pressure above 100 mm., and the maintenance of digitalization by mouth successfully controlled the congestive cardiac failure. However, her general condition remained poor. She was cold and clammy, with a tinge of cyanosis, and eight days after the commencement of intravenous heparin she again collapsed, the blood-pressure being 70/? and showing no response to intramuscular metaraminol.

At this stage a noradrenaline drip (1 mg. noradrenaline in 500 ml. of 5% dextrose) was started, the Gordh adapter being removed from the polythene adapter, to which the drip connexion was then attached. By this means the systolic blood-pressure was maintained at a level of 110-130 mm., and administration of heparin was continued via the tubing of the drip set. It was necessary to continue the noradrenaline drip for three days before the patient's blood-pressure could be maintained on intramuscular metaraminol again. At this stage, 11 days after the insertion of the polythene cannula, there were marked signs of a local phlebitis along the course of the cannula, and it was removed. Since it was felt necessary to continue with the intravenous heparin, the polythene cannula was reinserted through the cut-down over the long saphenous vein at the right ankle, and by this means heparinization continued for a further 12 days.

The patient's general condition improved, and three days after the insertion of the polythene cannula at the ankle it was possible to maintain her blood-pressure without further assistance from pressor drugs. The good progress was maintained, and when the cannula had been in place for 12 days and phlebitis again developed it was decided that intravenous heparin could be discontinued. Her further course was uneventful, and cautious mobilization was begun. As soon as this was advanced enough she was submitted to a barium-meal examination to determine the cause of the haematemeses. This examination revealed no abnormality in the stomach or duodenum, and it was concluded that the haematemeses had resulted from an acute gastric erosion probably related to her habit of taking aspirin. Long-term treatment with anticoagulants was begun, using phenindione, and she was discharged from hospital on May 11, 1960.

Discussion

The possibility of using a polythene cannula as a means of introducing heparin intravenously at frequent intervals for a period of 23 days altogether was established in this case. The useful life of one cannula, as determined by the onset of thrombophlebitis, appeared to be approximately 11-12 days. Once *in situ*, it served as a useful channel for the administration of continuous pressor drugs when the patient collapsed. In shock, the setting up of a transfusion is frequently difficult and may require the use of a cut-down, so that the presence of an intravenous cannula is an obvious advantage. Furthermore, the size 2 polythene cannula is large enough for the transfusion of blood, so that if this patient had in fact had a further haematemeses it would have been possible to transfuse her through the same route. The disadvantage of size 2 cannula is that the

only needle large enough to serve as a means of introducing it is the French needle, which presupposes the presence of fairly large veins, unless a cut-down is to be resorted to. The use of size 1 polythene cannula, in combination with a size 14 aspirating needle as a means of introduction, makes the use of a polythene cannula a little more difficult than a routine push-in transfusion, and this size of cannula is quite large enough to take clear transfusion fluids, such as a noradrenaline drip.

Summary

A case of acute myocardial infarction complicated by haematemeses is described.

Treatment was by intravenous heparin introduced through a polythene cannula.

It was found that the useful life of one cannula was 11-12 days.

In addition to serving as the route of administration of four-hourly heparin, the cannula was used to administer pressor drugs continuously when the patient collapsed.

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REFERENCES

- Bauer, G., Boström, H., Jorpes, E., and Kallner, S. (1950). *Acta med. scand.*, **136**, 188.
McCluskie, J. A. W., and Seaton, D. A. (1959). *Scot. med. J.*, **4**, 305.
Tulloch, J. A., and Gilchrist, A. R. (1950). *Brit. med. J.*, **2**, 965.
Wynn, A., Goodwin, J. F., and Birkbeck, A. (1952). *Ibid.*, **1**, 893.

INVESTIGATION INTO METHODS OF COLLECTION OF URINE FOR CULTURE FROM MEN AND WOMEN

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The main purpose of this investigation was to see if it was possible to collect a satisfactory mid-stream specimen of urine from women. The collection of specimens of urine from men is also considered for comparison.

It is generally agreed that mid-stream specimens from men are satisfactory for culture, but in women it is said that the only satisfactory specimen is one taken by catheter.

I am sure that few would undertake catheterization of the male without a very good reason. On the other hand, catheterization of the female is done at the least provocation, and, what is more, the job is often left to the most junior nurse. I think that this difference is mainly due to the difficulty of it in the male and the ease of it in the female. Urologists have for some time stressed the danger of infection from catheterization in the male, but there has not been the same feeling about the female.

Although I have not kept a record of the cases, and therefore have no figures, I have noticed that some women, sent to my clinic with a chronic urinary

infection, date the start of their trouble from a previous catheterization, often for gynaecological reasons. It was this fact that prompted me to start this investigation.

Method of Collection

There has been no selection of cases, except that all specimens of urine have been collected in the out-patient department during a busy urological out-patient clinic.

1. Mid-stream urines were collected from men, without preliminary cleaning of the glans penis, by getting them to pass the first portion of their urine into an unsterile container and the next portion into a sterile container, with the usual precautions about touching the inside of the latter.

2. Mid-stream urines collected from women were immediately followed by the taking of a catheter specimen. The mid-stream urines were collected after a nurse had given the vulva a good wash with soap and water, but without antiseptics, by getting the women to pass the first portion into an unsterile container and the next portion into a sterile container. This was immediately followed by the collection of a catheter specimen of urine.

3. Catheter specimens of urine were collected from men mostly at cystoscopy.

4. Catheter specimens of urine collected from women included the catheter specimens taken immediately after a mid-stream urine, a few other catheter specimens, and those taken at the time of cystoscopy.

Method of Analysis

During January to March, 1960, 423 specimens of urine were collected in the urological out-patient clinic; 81 have been excluded from the analysis. Of these, 69 showed active infection; they had more than five white cells per high-power field in the centrifuged deposit and a growth on culture. It is not possible to say whether these specimens were contaminated in addition to the presence of active infection, therefore they are excluded from the analysis. Twelve mid-stream urines were taken from women without a following catheter specimen. They are also excluded, as there was no catheter specimen with which to compare the mid-stream urine. This leaves 342 specimens for consideration.

For the purpose of analysis these 342 specimens have been classified as satisfactory or unsatisfactory.

Satisfactory.—Those with no growth or only scanty growth—that is, less than 15 colonies on a plate—have been considered satisfactory. This means that such scanty growth can only be a contaminant and that therefore there is no active infection or significant bacilluria.

Unsatisfactory.—I believe that a chronic bacilluria with fewer than five white cells per high-power field in the centrifuged deposit can cause recurrent active urinary infection and may be the only evidence found between acute attacks. This is not uncommon in patients who have had a lot of treatment. I agree that all such positive urine cultures are suspect of contamination and should be repeated. Therefore with more than a scanty growth (15 colonies), I feel one cannot be certain that it is only contamination. The growth may indicate a significant bacilluria despite the absence of pyuria—that is, more than five white cells per field. These specimens are accordingly classed as unsatisfactory. It must be remembered that all specimens with more than five white cells per field and a growth on culture

have already been excluded from the series as evidence of active infection of the urinary tract.

A note was also made of the time at which the specimen was collected and the time at which it was cultured. It is therefore possible to compare specimens cultured the same day with those cultured the following day, with regard to the relative numbers of satisfactory and unsatisfactory specimens, and so form some idea of the effect on the result of delay in setting up the culture.

Analysis

Of the 114 mid-stream urines from men (Table I), 84 (74%) were satisfactory (no growth in 82 and only scanty growth in 2) and 30 were unsatisfactory (more than 15 colonies on culture, but not more than 5 white cells per field).

Of the 67 mid-stream urines taken from women and immediately followed by the taking of a catheter specimen (Table I), 40 (60%) were satisfactory (no growth

TABLE I.—Analysis of Specimens

	No. of Specimens Analysed	Satisfactory Specimens	Unsatisfactory Specimens
Male mid-streams	114	84 (74%)	30
Female "	67	40 (60%)	27
" less 13 (see text)	54	39 (72%)	15
Male catheter	44	41 (93%)	3
Female "	117	99 (85%)	18

Specimens collected, 423; 81 were excluded, leaving 342 for analysis.

in 22 and only scanty growth in 18) and 27 were unsatisfactory (more than 15 colonies on culture, but not more than 5 white cells per field). This means that it is possible to say almost certainly that any growth is contamination. Of these 67 specimens, 13 had growth in both catheter and mid-stream urine and should therefore be excluded, as one cannot be sure that some of them are not significant bacillurias (see above). This would leave 54 mid-stream urines for analysis. In all of these 54 pairs the catheter specimen of urine was sterile, therefore any growth in the mid-stream specimen must be a contaminant. Of these 54 mid-stream urines from women (Table I), 39 (72%) were satisfactory (no growth in 22 and only scanty growth in 17) and 15 were unsatisfactory.

For comparison, the catheter specimens taken from men and women were analysed. Of 44 catheter specimens from men (Table I), 41 (93%) were satisfactory (no growth in 39 and only scanty growth in 2) and 3 were unsatisfactory (more than scanty growth). Of 117 catheter specimens from women (Table I), 99 (85%) were satisfactory (no growth in 96 and only scanty growth in 3) and 18 were unsatisfactory.

Effect of Delay

In considering the effect of delay I have compared specimens cultured the day they were taken with those cultured next day.

In men, out of 48 mid-stream samples cultured the same day (Table II), 41 (85%) were satisfactory (no growth), whereas of 66 cultured the following day, only 43 (65%) were satisfactory (no growth in 41 and only scanty growth in 2). With women the position is even worse, for of 50 mid-stream urines cultured the same day (Table II), 36 (72%) were satisfactory (no growth in 19 and only scanty growth in 17); but of 17 mid-stream specimens cultured the following day, only 4 (24%) were satisfactory (no growth in 2 and only scanty

TABLE II.—Effect of Delay in Culture

		No. Specimens Analysed	Satisfactory Specimens	Unsatisfactory Specimens
Male mid-streams	{ Same day ..	48	41 (85%)	7
	{ Next " ..	66	43 (65%)	23
Female "	{ Same day ..	50	36 (72%)	14
	{ Next " ..	17	4 (24%)	13
" less 13 (see text)	{ Same day ..	45	36 (80%)	9
	{ Next " ..	9	3 (33%)	6
Male catheter	{ Same day ..	11	11 (100%)	0
	{ Next " ..	33	30 (91%)	3
Female "	{ Same day ..	73	65 (88%)	8
	{ Next " ..	44	34 (77%)	10

growth in 2). If we exclude the 13 instances in which both catheter and mid-stream urines were infected, we are left with 45 cultured the same day, of which 36 (80%) were satisfactory, and 9 cultured the following day, of which 3 (33%) were satisfactory.

With catheter specimens of urine the effect of delay is not quite so disastrous. All 11 male catheter specimens cultured the same day were satisfactory (no growth in 10 and only scanty growth in 1), and of 33 cultured on the next day 30 (91%) were satisfactory (no growth in 29 and only scanty growth in 1). With regard to 73 female catheter specimens cultured the same day, 65 (88%) were satisfactory (no growth in 64 and only scanty growth in 1), and of 44 cultured the following day, 34 (77%) were satisfactory (no growth in 32 and only scanty growth in 2).

Discussion

A similar investigation was carried out by Boshell and Sanford (1958). However, they took only an occasional catheter specimen to compare with their series of mid-stream urines collected from women. They claimed that the specimens were very comparable in the two techniques. They also stressed the danger of introducing infection by catheterization.

Riley (1958) carried out a similar investigation. He compared a mid-stream urine with a catheter specimen taken later the same day, but not at the same time. He also claims that there was good correlation in the results of the two specimens, but many of his cases were already infected and therefore he had to rely on bacterial counts. However, he formed the opinion that a mid-stream specimen of urine taken from the female could give a satisfactory result and might therefore obviate the necessity for a catheter specimen with its attendant danger of introducing infection.

Wood, Pinkerton, and Calman (1960) also carried out an investigation very comparable to the present one in that they had excluded cases of clinical urinary infection. They found that of 40 mid-stream specimens collected, a positive culture was obtained in 6 when the catheter specimen was sterile. In the remaining 34 the mid-stream urine was comparable to the catheter specimen. They used ante-partum and puerperal cases and stated that they considered that they had made a case for the use of mid-stream rather than catheter specimens in women. They also stressed the danger that catheterization might introduce infection.

The results of the present investigation are very similar. The finding that 72% of the mid-stream urines collected from women were satisfactory compares very favourably with the results from men, in which 74% of the mid-stream urines were satisfactory. In other words, one could say that there was no significant bacilluria or active infection of the urinary tract. If

there was any doubt about the presence of significant bacilluria, one would have to repeat the mid-stream urine or have a catheter specimen; but this would hardly be necessary if an obvious active infection was present with more than five white cells per field. Even if one only avoided having to catheterize 50% of the cases, I still feel that this would be well worth while, but I think that in actual practice, bearing in mind the results of this investigation, it would be possible to avoid catheterization in probably about 75% of women.

There is nothing significant about the results of the catheter specimens, which simply bear out the well-known fact that catheter specimens are better than mid-stream.

With these results in mind, it would seem possible to obtain a reasonable number of satisfactory mid-stream urines from women. If this is the case, and I think it is, I would like to make a very strong plea for the abandonment of the routine catheter specimen in women and substitute a routine mid-stream urine. I am sure that the danger of introducing infection is no less in women than in men and may even be greater.

These results also clearly show the importance of culturing the urine as soon as possible, and certainly not later than the same day. This is especially important in mid-stream urines from women, where there is a striking difference between the percentage of satisfactory specimens cultured the same day and those cultured the next day—80% as compared with 33%. I know that this figure of 33% is based on the analysis of only nine specimens, but I am sure that this is a true indication.

Summary

A plea is made for the abandonment of routine catheterization to obtain specimens of urine for culture from women, and a case is presented to show that satisfactory mid-stream urines can be obtained without too much trouble. It is claimed that the 74% satisfactory mid-stream specimens taken from men and the 72% from women justify this claim and that these figures compare very favourably with the respective figures for catheter specimens—93% in men and 85% in women. The investigation also demonstrates the disadvantages of delay in initiating the culture, especially in mid-stream urines from women. It is hoped to minimize this with refrigeration, and a further series will be carried out with this end in view, for it may not always be possible to get the urine cultured on the day the specimen is taken.

My thanks are due to Sister Goatcher, sister-in-charge of out-patients, Hove General Hospital, and to Dr. I. W. Haydu, bacteriologist, Royal Sussex County Hospital, and to their staffs for all the work they put in to enable this investigation to be carried out.

REFERENCES

- Boshell, B. R., and Sanford, J. P. (1958). *Ann. intern. Med.*, **48**, 1040.
 Riley, H. D. (1958). *J. Lab. clin. Med.*, **52**, 840.
 Wood, E. C., Pinkerton, J. H. M., and Calman, R. M. (1960). *Brit. med. J.*, **1**, 961.

The *Annual Report 1959* of the Tanganyika Health Services records a notable increase in demand for hospital services. Compared with 1958, diseases diagnosed in in-patients rose by 3,485, an increase of 1.6%, while diagnoses in out-patients rose by 127,513, an increase of 8% on the 1958 figures, giving an overall increase in hospital usage of 7.4%.