Diagnosis of gonorrhoea in women

A national survey

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SUMMARY In a retrospective study of 2581 microbiologically confirmed female cases of gonorrhoea seen in STD clinics in England and Wales 96% of infections were detected by the first set of Gram-stained smears and cultures. A comparison of the outcome of the two tests between clinics according to their size and location showed considerable variation. The reasons for these disparities are analysed and physicians advised to re-examine their present methods in the light of these findings and newer techniques.

Introduction

A number of papers on microbiological aspects of the diagnosis of gonorrhoea in women have appeared over the last few years.¹⁻⁶ In general, they have reported the sensitivity of smears and cultures and compared results from different sampling sites. All, however, have come from individual clinics, and their findings are described in such disparate ways as to be largely incomparable.

A study of epidemiological treatment given to female contacts of gonorrhoea was recently conducted in sexually transmitted disease (STD) clinics throughout England and Wales.⁷ In the process a large nationwide sample of confirmed cases of gonorrhoea in women was obtained. From this I have examined smear and culture results from the more representative clinics and made comparisons between clinics, according to their size and location.

Methods

A retrospective sample of female cases of gonorrhoea treated in STD clinics in England and Wales during 1978 was drawn in two stages. Sixty clinics were selected at the first stage, and cases seen within the selected clinics were sampled at the second. Full details of the study design are available elsewhere.⁸ For every female case diagnosed or treated as gonorrhoea the information recorded included the results of cervical, urethral, and rectal smears and cultures for each visit

up to and including that on which treatment was given; any evidence of a history of exposure to gonorrhoea; and whether treatment was given epidemiologically (to a contact before or without confirmation of the diagnosis). The study was designed to provide a 15% sample of female cases seen in the year. One of the sample clinics closed during 1978 and one consultant in charge of two clinics refused to take part in the survey. The findings described below have been weighted to adjust for cases seen in these three clinics.

A sample of 2903 female cases diagnosed or treated as gonorrhoea was obtained. Thirty-five cases were treated on clinical grounds alone and have been excluded from analysis. In 2420 cases the diagnosis was confirmed by microscopy or culture before treatment. A further 448 cases were treated epidemiologically, of which 161 were subsequently culture-positive, thus giving a total of 2581 confirmed cases. In the remaining 287 cases treated epidemiologically, no proof of the diagnosis was ever obtained. It seemed certain that some proportion of this group were in fact true cases of gonorrhoea since by definition all patients given epidemiological treatment must have provided some history of exposure to the disease. Thus, to have excluded all such cases from analysis would have favourably biased the findings relating to the sensitivity of tests. Equally, their inclusion in toto would have unfavourably biased the results. To obtain an estimate of the number infected, therefore, the results of smears and cultures in the microbiologically confirmed cases were examined. A comparison between self-referred patients and those who attended as contacts showed, as expected, that in the latter group a higher proportion of confirmed cases were detected by the first set of tests, the reason being that the number of confirmed cases fell short of the true

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number, since some were treated epidemiologically but never confirmed. From this comparison it was estimated that 18% (52) of the 287 unconfirmed epidemiologically treated cases would have been shown to be true cases of gonorrhoea had a full series of tests been carried out before treatment. The results reported below, which were obtained from the 2581 microbiologically confirmed cases, have therefore been adjusted so that they relate to the estimated number of actual cases in the sample, 2633.

Results

In a very high proportion (96%) of cases the diagnosis was made on the results of tests carried out at the patient's first visit to the clinic (table I). This figure did not differ between cases seen in Greater London clinics and those seen in clinics outside London. While smear results are available immediately in most (95%) clinics in England and Wales,⁹ culture results obviously are not. This means that if smears examined at, say, the patient's initial visit to the clinic are negative, but the diagnosis is subsequently established by culture, she has to return to the clinic for a second time before receiving treatment. Thus, the diagnosis was made and treatment given to the patient on her first visit in only 71% of cases. Significantly fewer cases were treated on the patient's initial visit to clinics in London (63%) than to clinics in the rest of England and Wales (75%) ($p<0.05$). No differences were found between small clinics outside London (in which 1000 or fewer cases were seen annually) and larger clinics (in which more than 1000 cases were seen annually) in relation either to the number of sets of tests or the number of clinic visits needed before treatment could be given.

At the patient's first clinic attendance microscopy and culture were performed on samples taken from the cervix in almost all (99%) cases. Urethral tests, both

TABLE I Female patients in whom diagnosis of gonorrhoea established by first set of microbiological tests/clinic visit

	Clinics outside London		London clinics		All clinics	
	%	SE	%	SE	%	SE
First set of tests	95.9	0.5	96.6	0.9	96.1	0.4
First clinic visit	74.7	2.1	62.9	4.9	71.0	2.2

SE = standard error

smear and culture, were also carried out in over 90% of cases. Rectal tests were performed less commonly; a smear was examined in only 12% of cases and a culture performed in 32%. The diagnosis was made so frequently on one set of tests that further diagnostic tests were carried out on subsequent visits in very few cases. A detailed analysis of their results will not, therefore, be presented.

The results of tests performed on the patient's initial visit are shown in table II. Overall, 64% of cervical smears but only 40% of urethral smears were positive. Cultures of specimens from these sites could be used to establish or confirm the diagnosis of gonorrhoea more often, in about three-quarters of cases. Rectal tests yielded positive results infrequently.

Depending on the location or size of the clinic striking differences were found in the proportions of tests with a positive outcome. Both cervical and urethral smears were positive significantly less often in London clinics (53% and 34% respectively) than in clinics elsewhere (69% and 43% respectively) ($p<0.05$). There were no differences in culture results between these two groups of clinics. When small and large clinics in the rest of England and Wales were compared, however, cervical and urethral cultures were positive more often in large clinics (78% and 71% respectively) than in the small clinics (65% and 58% respectively) ($p<0.05$).

TABLE II Results of first set of microbiological tests in female patients with gonorrhoea

Positive result by:	Clinics outside London									
	1-1000 Cases/year				All clinics		London clinics		All clinics	
	%	SE	%	SE	%	SE	%	SE	%	SE
Gram-stained smear										
Cervical	71.2	5.1	68.0	2.7	68.6	2.3	53.4	6.0	63.8	2.7
Urethral	43.8	6.1	43.2	3.5	43.3	3.0	33.8	3.6	40.2	2.4
Rectal	*	*	18.1	3.6	19.0	4.2	15.7	2.7	16.8	2.1
Culture										
Cervical	64.7	6.0	77.9	2.5	75.6	2.4	77.4	2.5	76.1	1.9
Urethral	57.5	6.1	70.9	2.6	68.4	2.4	69.4	2.1	68.7	1.8
Rectal	*	*	35.0	0.9	33.8	2.8	33.3	4.8	33.6	2.6

*Too few cases for analysis
SE = standard error

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None of these tests can be regarded as infallible: false-positive and false-negative smear results can occur, as can false-negative cultures. To examine the agreement between smear and culture results, therefore, each type of test was in turn taken as the "correct" standard against which to compare the outcome of the other. Table III shows that in all clinics just over three-quarters of positive smears taken from the cervix or urethra at the patient's first visit were followed by a positive culture taken from the same site. There was less consistency between the results of rectal tests: only 70% of positive smears were accompanied by a positive culture. These figures are very similar for clinics in London and outside. A comparison between small and large clinics in the rest of the country showed, however, that the results of cervical tests gave only 62% agreement in the former group but 81% agreement in the latter ($p < 0.05$).

When a positive culture was taken as giving the correct result, the proportion preceded by a positive smear was found to be two-thirds for samples from the cervix but only one-half for urethral specimens and one-third for rectal samples. This method of examining the relationship between smear and culture results also showed that their agreement appeared to be poorer in London clinics than in clinics elsewhere. Only 59% of positive cervical cultures and 41% of positive urethral cultures were preceded by positive smears taken from the same site in London clinics compared with 69% and 53% respectively in the rest of the country. These differences, however, reached statistical significance only at the 10% level. No differences related to the size of clinic were found for those situated outside London.

Discussion

The survey showed that in STD clinics throughout England and Wales 96% of gonococcal infections were detected by the first set of tests. This figure

confirms several recent reports from individual clinics in London. For example, Thin and Shaw⁶ found that 95% of cases seen at St Bartholomew's Hospital in 1976-7 were diagnosed on the results of the first set of tests, while a similar study at St Thomas's Hospital produced a figure of 98%.⁵

On the other hand, microscopy gave positive results at the patient's initial visit in only 71% of cases overall. In this respect the variation between London clinics and those in the rest of England and Wales was an unexpected finding. Essentially, the results presented above appear to show that in confirmed female cases of gonorrhoea smears taken at the patient's first visit were more often negative in London clinics. There are several possible explanations for this difference. For instance, the false-positive rate could be higher in clinics outside London. If this were true, however, one would expect the proportion of positive smears followed by positive cultures to be lower in these clinics, but no such difference was observed. Equally, the false-negative rate could be higher in London clinics if, perhaps, pressure of work led to slides being read with less care. Other work has certainly shown that the sensitivity of the cervical smear can reach 70% (Lossick, personal communication) compared with the figure of 53% observed in London clinics. It is to be expected that a few cases will escape diagnosis in all clinics. A third explanation for the differences described above, however, is that cases remained undetected more often in clinics outside London. In this case, the denominator used in calculating the proportion of smears giving positive results would be too low and thus the proportion itself would be increased.

Other authors^{2,5} have already emphasised the importance of immediate diagnosis, so that treatment may be started. Any addition to the time interval between infection and treatment can only serve to increase both the risk of spread of the disease and the probability of complications. Steps should therefore

TABLE III *Agreement between results of microscopy and culture at first clinic visit by female patients with gonorrhoea*

	<i>Clinics outside London</i>									
	<i>1-1000 Cases/year</i>		<i>>1000 Cases/year</i>		<i>All clinics</i>		<i>London clinics</i>		<i>All clinics</i>	
	%	SE	%	SE	%	SE	%	SE	%	SE
Proportion of positive smears followed by positive culture										
Cervix	61.9	6.9	80.6	2.7	77.0	2.9	78.6	2.0	77.4	2.2
Urethra	72.0	6.2	80.5	3.3	79.0	2.9	83.7	1.7	80.2	2.2
Rectum	*	*	72.7	3.8	68.4	4.7	71.5	9.9	70.2	6.2
Proportion of positive cultures preceded by positive smear										
Cervix	69.7	6.5	69.4	3.0	69.5	2.7	59.0	4.7	66.4	2.4
Urethra	54.7	7.6	52.1	4.9	52.5	4.3	41.5	4.5	48.9	3.2
Rectum	*	*	35.0	3.9	35.0	3.9	32.8	2.7	33.6	2.1

*Too few cases for analysis
SE = standard error

be taken to ensure that the maximum number of cases possible are detected by microscopy on the patients' first clinic visit. Well-trained microscopists and good microscopes are fundamental to an efficient clinic service. If the pressure of work in a clinic is such that slides cannot be read with due care, then the usefulness of urethral and rectal smears should perhaps be reassessed. In this sample less than 3% of cases were detected by urethral smears alone and only 0.2% by rectal smears. If they were no longer taken extra time could be devoted to the more productive cervical smear. In addition, discrepancies between smears and cultures should be continuously reviewed. This can be done by retaining smears until the culture reports are available and re-examining the slides if there is any difference. The establishment of some form of quality control service should also be considered. To monitor and maintain standards in reading slides transparencies could be sent out to clinics by, say, the Public Health Laboratory Service. Such a service is available to venereologists in other countries and is provided to other specialties in this country.

This study showed that cultures taken in the small clinics outside London had lower sensitivity than those taken in the larger clinics. Furthermore, positive cervical smears were followed by a positive culture taken from the same site in less than 80% of cases seen in all clinics. Other work has shown that this figure should exceed 90%.^{5,11} Whether these differences are due to poor culture techniques or to inadequate laboratory services remains unclear. A survey of clinic facilities carried out in 1976 showed that culture plates had to be transported to an outside laboratory from 94% of clinics in England and Wales.⁹ Transport media were used in only 24% of London clinics but in 41% of large clinics and 62% of small clinics elsewhere (unpublished data). Comparisons of transport media with direct plating and transportation have produced conflicting results; one study showed that the use of Stuart's transport medium led to the loss of 44% of cases,¹² while another found that the same medium gave superior results to the transportation of inoculated plates.¹³ The loss of cases during transportation is, however, obviously possible. A poor culture

yield can result from many other factors: the use of a non-selective medium; failure to pre-warm the plates; insufficient inoculum or a poor plating technique; too long a delay before the plates are placed in carbon dioxide; or the use of candle-extinction jars rather than a carbon dioxide incubator. Physicians should, therefore, re-examine their current methods and consider whether they are still appropriate in the light of newer techniques.

Efforts to control the spread of gonorrhoea by contact tracing or increased public awareness of the services available will be of little avail if infected patients are sent away from the clinic untreated.

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