the argument in favour of partial gastrectomy, even in the absence of a palpable ulcer, is supported by this example.

The opportunities which these cases provide for the teaching of students and the training of house-physicians seem to be an additional argument in favour of continuing the present practice of admitting the cases to general medical wards.

Avery Jones has emphasized the advantages of the concentration of all gastro-enterological emergencies into special wards as a means of reducing mortality. We are here concerned only with haemorrhage from peptic ulcer, but as our experience has not lent support to a widespread adoption of such a system we have felt obliged to report it.

The value of special gastro-enterological clinics is not in dispute. The work of Avery Jones and others is in itself a demonstration of it. We feel, however, that such clinics should be centres of research over the whole field of gastro-enterology and of the treatment of cases requiring special skill and facilities, and that the concentration of all gastro-enterological emergencies into special wards would be a mistake.

Finally, we believe that the figures presented show that haemorrhage from peptic ulcer is not the highly dangerous condition it is sometimes thought to be. In fact, we would contend that, with a few exceptions, patients under the age of 70 who bleed from a peptic ulcer should recover. Whenever a death occurs in a patient under this age it should stimulate a critical inquiry. If this were done, we think it would be found that the treatment was faulty in one or more respects, as we ourselves have discovered in two out of our four fatalities.

Summary and Conclusions

A series of 170 cases of haemorrhage from peptic ulcer with an overall mortality of 2.4% is reported. Although in the majority radiological evidence of the site and chronicity of the ulcers was lacking, the mortality was found to be low enough to compare favourably with other reported series, even if all our "unproved" cases are assumed to have been acute or duodenal ulcers with their generally accepted high recovery rate.

The patients were treated in a general medical clinic where the bias of interest was not in favour of gastro-enterology.

The treatment given was replacement of fluid loss by mouth (except in the occasional case in which special circumstances compelled the use of the intravenous route), regular fluid or semi-solid feeds at frequent intervals, and blood transfusions as and when required. Ascorbic acid was given as a routine, but magnesium trisilicate powder was given only to relieve pain, which it usually did.

There were only four deaths in the series, and of these two might possibly have been prevented. One was a medical failure, the other a surgical failure. Nevertheless, these results are regarded as a vindication of the general medical ward as a suitable place for the treatment of gastro-duodenal haemorrhage.

There were only two inevitable deaths in 170 cases: it is considered that this fact constitutes an argument against prophylactic operations.

It is suggested that whenever a patient under the age of 70 dies from peptic haemorrhage a critical review of the treatment is indicated.

The treatment demands strict attention to detail and close and continuous observation of the individual patient, but special experience and facilities are not essential.

The indications for blood transfusion used were the hourly pulse rate and a personal assessment of the patient's condition and progress.

Surgical aid was invoked on only two occasions, though it is now realized that in a third case an operation was indicated and might well have saved the patient's life. Of the two patients treated by operation, one recovered and one died.

We gratefully acknowledge the invaluable assistance given by Dr. C. Strang and by a succession of energetic and competent house-physicians in the medical treatment of the patients, and also the work of the late Sister M. Andrews, who was responsible for the nursing throughout the relevant period. We are also indebted to Dr. C. Strang and Dr. D. Maclean for their help in the not inconsiderable labour entailed in the analysis of the case records, and to Dr. W. J. Martin for statistical assistance.

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VALUE OF TUBERCULIN-JELLY TEST

BY

W. POINTON DICK,* M.R.C.S., L.R.C.P.

(From the Tuberculosis Research Unit, Medical Research Council)

The tuberculin-jelly test to determine tuberculin sensitivity has gained considerable support in this country and abroad. It has been used in mass immunization campaigns to select persons suitable for vaccination with B.C.G. Its great advantage over the Mantoux test is that no injection is involved. In addition, its application is so simple that this can be entrusted to a wide range of personnel.

In the past, estimates of the equivalent of the jelly test in terms of old tuberculin injected intradermally have varied from concentrations of 1 in 50,000 to 1 in 100 (Wolff, 1934; Kereszturi, 1941; Holm and Holm, 1943; Grozin, 1943; Paterson, 1944; Climie, 1945). Doubts of the reliability of the test having been expressed, the following investigations were undertaken in order to find a type of jelly and a technique which would give a sufficiently high degree of accuracy and sensitivity in terms of the established Mantoux test. Part of this work was done prior to the Medical Research Council's Tuberculin Survey (now being completed). The technique subsequently used throughout the Survey was based on the findings reported here.

Three tuberculin jellies were compared. Each was made up with a tragacanth base and enough glycerin to bring the total concentration of the latter in the jelly to 40–50%. The first jelly contained 0.2% of purified protein derivative (P.P.D.)†; this concentration was chosen so that the jelly should be approximately equal in tuberculo-protein content to undiluted old tuberculin. The second jelly contained 60% of old tuberculin (O.T.) v/w, and the third 85% of O.T. v/w.

Techniques

Original Technique.—The skin over the interscapular region was cleansed by vigorous rubbing with acetone on cotton-wool and allowed to dry. Tuberculin jelly was then applied from a collapsible tube to the prepared area of skin to form a V with arms about 2 cm. in length and 2–3 mm. in width. This was covered with a strip of adhesive plaster measuring about 2 by 1 in. (5 by 2.5 cm.), and with its long axis parallel to the spine. The examinee

*Seconded from the service of the North-west Metropolitan Regional Hospital Board.

†I am indebted for the supply of this tuberculin to the Veterinary Laboratory, Ministry of Agriculture and Fisheries, Weybridge, Surrey.

was instructed to remove the plaster after 48 hours and the test was read on the following day. This method will be referred to as the original technique.

Modified or Flourpaper Technique.—Deane (1946) modified the original technique by rubbing the skin with sandpaper after the cleansing with acetone and before application of the jelly. It has been found, however, that the grade of sandpaper, "O," recommended is too abrasive and can cause very severe reactions in persons with a high degree of sensitivity to tuberculin and with delicate skins. A type of fine abrasive paper, termed "flourpaper" in the trade, has therefore been substituted in the present work. This was used in 1-in.-wide strips, six gentle strokes being given. A new piece of flourpaper was used for each test.

Comparisons were made between the original and the flourpaper techniques and between the three types of jelly, the more promising being measured against intradermal O.T. Where two jelly tests were compared they were applied one on each side of the spine of each person examined. At the time of the reading of the tests one side would remain covered while the other was read. The tests were read 24 to 48 hours after the removal of the plaster—that is, 72 to 96 hours after the application of the jelly. Erythema was ignored. Four or more vesicles at the site of application of the jelly were read as a positive reaction. Less vesiculation was read as a doubtful reaction and classified as negative.

Evaluation of Flourpaper Technique

Comparisons of Jelly Tests With and Without Flourpaper

A total of 350 school-children aged 11 to 15 and 524 aged 14 to 19 received two tests, using the P.P.D. jelly. In one test the original technique was used, in the other flourpaper was applied as described above. On a further 339 children aged 11 to 15 and 338 aged 13 to 18 similar tests were performed, but using 60% O.T. jelly. The results of these tests are given in Table I. They show the marked increase in the number of positive reactions that were obtained following the use of flourpaper. With the P.P.D. jelly the number of positive reactions after the test with the original technique was in one group only 21% and in another group only 9% of the number obtained with the flourpaper technique. With the O.T. jelly the corresponding figures were 38% and 42%. All four differences were statistically highly significant.

From these results it was evident that preparation of the skin with flourpaper greatly increased the number of positive reactions obtained. It was essential to determine if these were true tuberculin reactions or false positives attributable solely to the abrasion.

TABLE I.—P.P.D. and O.T. Jelly, With and Without Flourpaper

Age in Years	No. Examined	Test A, with Flourpaper		Test B, without Flourpaper		Positives to B as Proportion of Positives to A
		Jelly Used	No. Pos.	Jelly Used	No. Pos.	
11-15	350	P.P.D. 2 mg./g.	62 (18%)	P.P.D. 2 mg./g.	13 (4%)	21%
14-19	524	" "	139 (27%)	" "	13 (2.5%)	9%
11-15	339	O.T. 60%	71 (24%)	O.T. 60%	27 (8%)	38%
13-18	338	O.T. 85%	197 (58%)	O.T. 85%	82 (24%)	42%

Note.—There were no cases giving a positive reaction to Test B but a negative reaction to Test A.

Comparison of Modified Jelly Test With Intradermal Test

Comparisons were now made between the modified jelly test, using flourpaper, and the Mantoux test, to check for the presence of false positive reactions and to assess the value of the flourpaper test in terms of the intradermal. The jelly test and the intradermal test were read by separate observers who had no knowledge of the result of the test they were not recording. The standard for a positive intradermal test was taken as 5 mm. or more of oedema after 72 hours. These results are shown in Tables II and III.

From Table II it would seem that, using flourpaper, the P.P.D. jelly is approximately equivalent, between the ages of 5 and 20, to an intradermal injection of 0.1 ml. of O.T. of strength 1 in 10,000, while the 60% O.T. jelly, using flourpaper, is equivalent to intradermal O.T. of strength 1 in 1,000.

TABLE II.—Comparison Between Flourpaper Technique and Intradermal O.T.

Age in Years	No. Examined	Test A, Mantoux		Test B, Jelly with Flourpaper		Positives to B as Proportion of Positives to A
		Strength of O.T.	No. Pos.	Jelly Used	No. Pos.	
5-7	219	1/1,000	10 (4.5%)	P.P.D. 2 mg./g.	8 (3.5%)	80%
8-10	279	1/1,000	39 (14%)	" "	28 (10%)	72%
11-15	630	1/1,000	96 (15%)	" "	79 (13%)	82%
15-20	143	1/10,000	44 (31%)	" "	43 (30%)	98%
11-15	223	1/1,000	69 (31%)	O.T. 60%	66 (30%)	96%
15-20	124	1/1,000	46 (37%)	O.T. 60%	44 (35%)	96%

The 11 persons (Table III) who gave a positive reaction to the jelly test and a negative reaction to the intradermal test were retested with intradermal O.T. of strength 1 in 100. Nine were positive and two were negative. There were thus two apparently false positives by intradermal standards among a total of 224 positive to the modified jelly test—that is, rather less than 0.9%. It is fair to conclude that the great increase in positive reactions with the flourpaper technique as compared with the original jelly technique was a true increase of specific tuberculin reactions. This increase greatly enhances the value of

TABLE III.—Detailed Results

Age in Years	No. Examined	Tests Used	Jelly Neg., Intradermal Neg.	Jelly Pos., Intradermal Pos.	% with Identical Results	Jelly Neg., Intradermal Pos.	Jelly Pos., Intradermal Neg.	Retest Last Column with O.T. 1/100
5-7	219	{ P.P.D. jelly O.T. 1/1,000 }	209 (95%)	8 (4%)	99%	2 (1%)	—	—
8-10	279	{ P.P.D. jelly O.T. 1/1,000 }	240 (86%)	28 (10%)	96%	11 (4%)	—	—
11-15	630	{ P.P.D. jelly O.T. 1/1,000 }	531 (84%)	76 (12%)	96%	20 (3%)	3 (0.5%)	Pos. 2; neg. 1
15-20	143	{ P.P.D. jelly O.T. 1/10,000 }	94 (66%)	38 (27%)	92%	6 (4%)	5 (3%)	Pos. 5
11-15	223	{ O.T. (60%) jelly O.T. 1/1,000 }	151 (68%)	63 (28%)	96%	6 (2.5%)	3 (1.5%)	Pos. 2; neg. 1
15-20	124	{ O.T. (60%) jelly O.T. 1/1,000 }	78 (63%)	44 (35%)	98%	2 (1.5%)	—	—

the jelly test as a sieve to be used before proceeding to an intradermal test with O.T. of strength 1 in 100. If the original technique were used then a number of persons who would be positive to the flourpaper technique and yet have a relatively high sensitivity would give a negative reaction. On retesting these persons with O.T. 1 in 100 some extremely severe reactions might result.

The next step was to determine whether overuse of the flourpaper would produce any false positive reactions. With this in view, 327 children, aged 11–15, had two tests using flourpaper. In the second test the flourpaper was grossly overused. The results (Table IV) show that there was 99% agreement between the tests. Two persons who gave a negative reaction with the normal technique had a positive reaction to the overuse of the flourpaper. These were retested with intradermal O.T. strength 1 in 1,000. One was positive to this test and one was negative.

TABLE IV.—Overuse of Flourpaper

Age in Years	No. Examined	Negative Both Tests	Positive Both Tests	Pos. Normal Flourpaper; Neg. Overuse Flourpaper	Neg. Normal Flourpaper; Pos. Overuse Flourpaper
11–15	327	264 (81%)	59 (18%)	2 (0.5%)	2 (0.5%)

It should be noted that these tests were carried out by an experienced observer. In the hands of one less experienced there is a definite risk of false positive readings if the flourpaper be overused. For this reason it is essential to apply a control jelly, also using flourpaper, until reactions—e.g., scoring or abrasion, due to over-rubbing—are readily recognized.

Comparison of the Three Jellies Used

Two final comparisons, flourpaper being used, were now made. The P.P.D. jelly was compared with the 60% O.T. jelly, and the 60% O.T. jelly was compared with the 85% O.T. jelly. The results are given in Tables V and VI, and show (1) the marked superiority of the O.T. jelly over the P.P.D. jelly, and (2) that no advantage was gained by increasing the strength of the O.T. jelly from 60% to 85%.

TABLE V.—Comparison Between P.P.D. Jelly and 60% O.T. Jelly

Age in Years	No. Examined	Test A, with Flourpaper		Test B, with Flourpaper		Positives to B as Proportion of Positives to A
		Jelly Used	No. Pos.	Jelly Used	No. Pos.	
11–15	348	O.T. 60%	122 (35%)	P.P.D. 2 mg./g.	76 (22%)	62%

Note.—There were no cases giving a positive reaction to Test B but a negative reaction to Test A.

TABLE VI.—Comparison Between 60% O.T. Jelly and 85% O.T. Jelly

Age in Years	No. Examined	Negative Both Tests	Positive Both Tests	Positive O.T. 60%; Negative O.T. 85%	Negative O.T. 60%; Positive O.T. 85%
11–15	233	191	42	0	0

In the comparative tests between 60% O.T. jelly and 85% O.T. jelly agreement was complete; this also applied to the type and extent of the reactions from the two jellies in each individual tested. It is difficult to account for the superiority of the 60% jelly over the P.P.D. jelly, which was approximately equal in tuberculo-protein content to undiluted O.T. Differences in the physical characteristics of the two tuberculins may be responsible, P.P.D. being less easily absorbed through the skin, par-

ticularly when this is intact. Various substances, including lipoids, which are retained during the preparation of O.T. but excluded from P.P.D., could be expected to assist absorption. It is of interest that confirmation of this difference between the two jellies has been obtained at the Veterinary Laboratory, Ministry of Agriculture and Fisheries, Weybridge, by Paterson (1950—personal communication) working with guinea-pigs. It must be stressed, however, that, when presented intradermally, P.P.D. gives similar results to O.T. of similar tuberculo-protein content.

Conclusions

The flourpaper technique described greatly increases the sensitivity of the tuberculin jelly test and extends its usefulness to include persons up to the age of 20 years. With an experienced observer there is little or no risk of false positive readings with the overuse of the flourpaper, but, until experience has been gained, a control flourpaper-jelly application is essential.

Where it is proposed to use the jelly test as a sieve before proceeding to an intradermal test with O.T. of strength 1 in 100 it is advisable to employ the flourpaper technique. Otherwise some extremely severe reactions to the intradermal test may result.

Using the flourpaper technique and a jelly containing 60% O.T., the proportion of positive reactions obtained will closely approximate, in the age group 5–20, to those obtained using intradermal international standard strength O.T. of dilution 1 in 1,000.

Using the methods and formulae described, O.T. is to be preferred to P.P.D. as the active component of the jelly.

The present method offers an alternative to the Mantoux test when this is contraindicated.

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Addendum

Notes on the Reading of the Test.—This should be done 24 to 48 hours after the removal of the plaster—that is, 72 to 96 hours after application. The longer period will give any pseudo-positive reactions time to fade and any delayed positive time to appear. In reading the test erythema should be ignored. A positive reaction will show vesiculation at the site of application of the jelly. There may be coalescence of the vesicles to form a V-shaped or heart-shaped area of induration. Fewer than four vesicles should be considered to indicate a doubtful positive, and either the test should be repeated or an intradermal test with O.T. 1 in 1,000 performed. Scoring of the skin is an indication of overuse of the flourpaper and can cause confusion in the reading of the test. For this reason it is essential, until the observer has become familiar with these reactions, that a control jelly, with flourpaper, should be applied to the opposite side of the spine.

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In token of their appreciation of gifts from overseas to old and distressed chemists, the Pharmaceutical Society of Great Britain has sent 100 guineas to the Lord Mayor's Thanksgiving Fund.