AN EVALUATION OF THE BOLEN BLOOD PATTERN TEST FOR DETECTING CANCER*

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THE need for a simple laboratory procedure to detect the presence of cancer, especially in its early stages, by routine examination of all patients, has been outstanding in the minds of cancer specialists and public health authorities for years. Bolen[1,2] has advocated the gross and microscopic (low power) morphology of dried drops of blood as sufficiently diagnostic to fill this need in many instances. Bolen employs the technic of Goldberger[3] as a rapid bedside test for measuring the blood sedimentation rate. Ciron,[4] in 515 cases in Guatemala, closely approximated Bolen's 90 per cent accuracy. Bolen also differentiates "beginning malignancy" from "late malignancy" by this blood pattern test. Our purpose here is an attempt to evaluate this test fairly and to duplicate the results of Bolen in a study of 100 cancer and non-cancer patients.

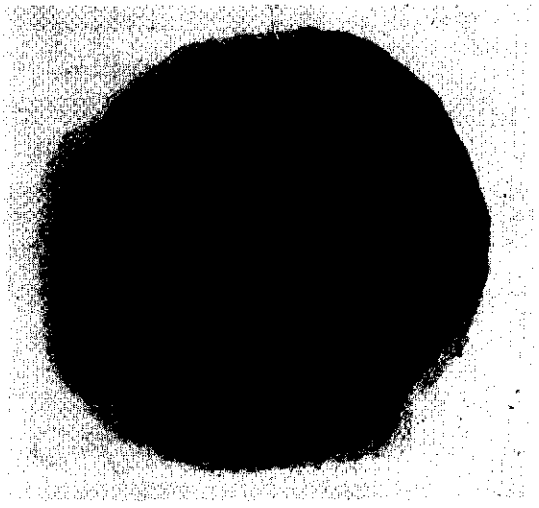

FIG. 1. Normal dried drop of blood, low power magnification. Note the compact design and a dark agglutinated nucleus, without dried lakes of plasma. × 45.

METHODS

The technic outlined by Bolen of very lightly touching the under surface of a clean glass slide three or more times to a small drop of blood was employed throughout. Each was thoroughly allowed to dry horizontally with the glass slide righted. A blood pattern with compact design and a dark agglutinated nucleus, without dried lakes of plasma, as interpreted both macroscopically and microscopically was considered "normal." (Figs. 1 and 2.) The "early carcinoma pattern" was interpreted as lacking a central nucleus but accumulating peripheral dried lakes of plasma without red cells so that the central area was darker than the periphery. (Figs. 3 and 4.) This is the pattern of "peripheral breakdown" referred to by Bolen as characteristic of early malignancy. "The dotted curtain" or ground glass appearance of the dried blood broken down into heterogenous dots was required for a slide to be interpreted as demonstrating the "advanced carcinoma pattern." In this pattern the fibrin was broken up, there were lakes of dried plasma without red cells throughout and microscopically "three-cornered, tri-asteroid spicules" as described by Bolen were scattered throughout the dried drop of blood. (Figs. 5 and 6.)

Sedimentation rates were recorded on a few representative patients.

RESULTS

In forty-three clinically proved cancer cases thirty-five or 81.4 per cent revealed positive slides according to the Bolen technic. (Table 1.) However, only two of these were cases of early malignancy and yet fourteen of the thirty-five slides indicated "early malignancy" and only twenty-one indicated "advanced malignancy," a percentage of 51.2 per cent correct for the diagnosis according to which Bolen interprets

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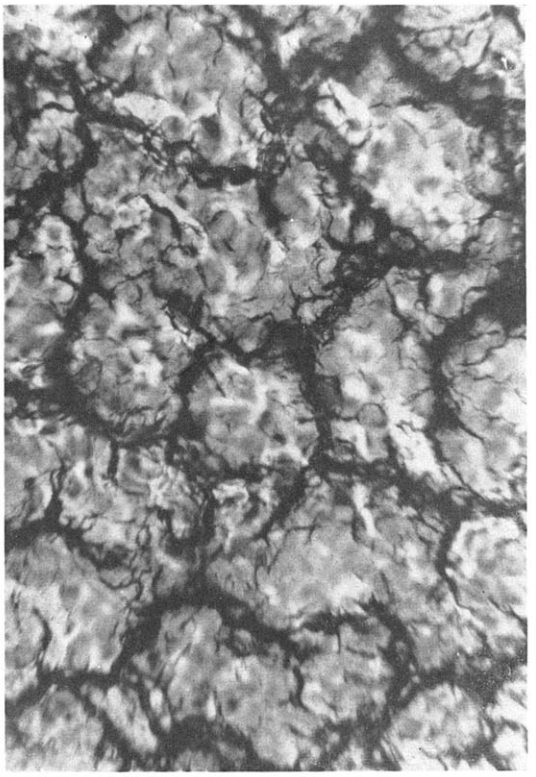

FIG. 2. Normal dried drop of blood, high power magnification. × 450.

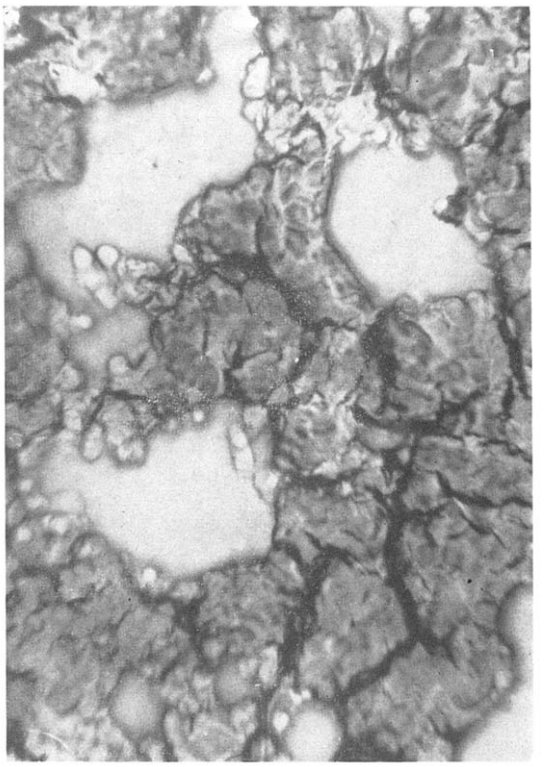

FIG. 4. "Early malignancy" pattern of dried drop of blood, high power magnification. × 450.

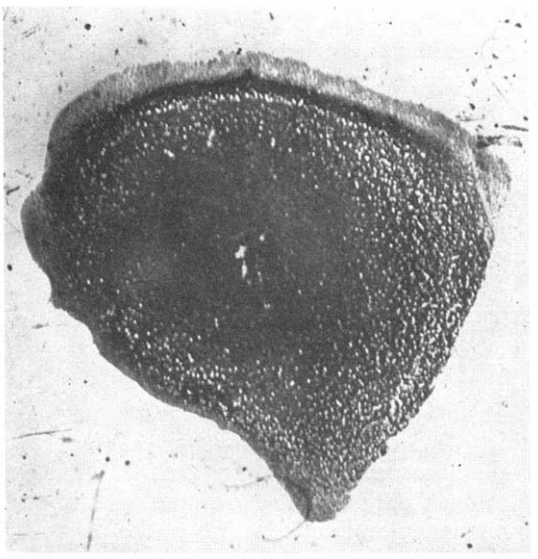

FIG. 3. "Early malignancy" pattern of dried drop of blood, low power magnification. Note the lack of a central nucleus, but accumulating peripheral dried lakes of plasma without red cells so that the central area is darker than the periphery. This is the pattern of "peripheral breakdown" referred to by Bolen as characteristic of early malignancy. × 45.

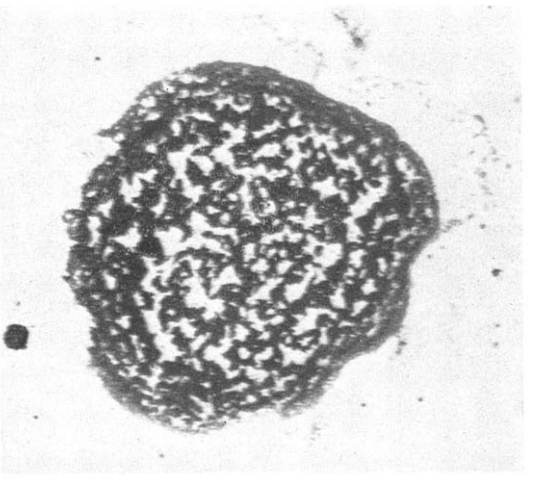

FIG. 5. "Advanced malignancy" pattern of dried drop of blood, low power magnification. Note "the dotted curtain" or ground glass appearance of the dried blood broken into heterogeneous dots. The fibrin is broken up and there are lakes of dried plasma without red cells throughout. × 45.

"early" and "late" malignancy. The early breast tumor (intraductal papillary carcinoma) did not give a positive blood pattern, and the other "early" tumor was that of melanoma, a condition well known to frequently recur fatally even though an "early" malignant tumor is apparently totally excised.

In fifty-two non-cancer cases (all of which were followed eight to twelve months to be certain that no malignancy developed in those demonstrating positive slides), twenty-nine or 55.8 per cent revealed positive slides. (Table II.) Of these, nineteen or 36.5 per cent demonstrated the "early malignancy" pattern and ten or 19.3 per cent demonstrated the "advanced malignancy" pattern. Only twenty-three or 44.2 per cent of these non-cancer patients had negative slides.

In five apparently clinically cured cancer cases (Table III), three by surgical extirpation and two by irradiation, only one or 20 per cent gave a positive slide (this case, having had a malignant thyroid adenoma removed three years before, showed an "advanced malignancy" pattern). The other four, or 80 per cent showed negative slides. Table III roughly parallels a similar one presented by Bolen.

Of the nine representative patients in which the sedimentation rates were measured (Table IV), eight that demonstrated either "early" or "advanced" malignancy had elevated sedimentation rates. The only one with a normal sedimentation rate recorded had a negative blood pattern. One patient having a negative blood pattern (a proved advanced carcinoma of the prostate) had an elevated sedimentation rate.

COMMENTS

The results of this clinical evaluation indicate that although the Bolen blood pattern may be positive in 80 per cent or more of clinically malignant cases it is not by any means specific enough for a routine test for malignancy, nor is it apparently sensitive enough to detect the early malignancies, as it has not been shown to be positive when the sedimentation rate is not elevated. Bolen presented thirty cases of gastrointestinal malignancy with sedimentation rates recorded, all of them definitely elevated according to his own criterion except one which was between his range of "borderline" and "elevated" for the female. Nowhere could we find evidence reported that the blood pattern

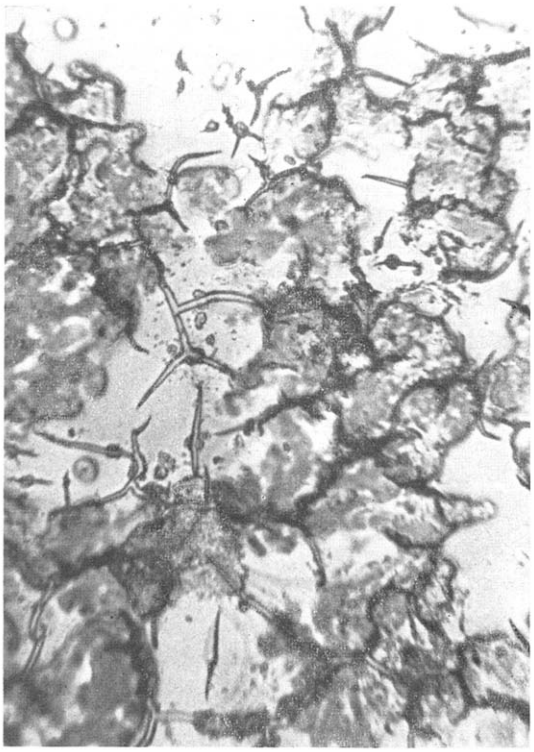

FIG. 6. "Advanced malignancy" pattern of dried drop of blood, high power magnification. Note the "three cornered tri-asteroid spicules" as described by Bolen scattered throughout the dried drop of blood. × 450.

test becomes positive routinely before the sedimentation rate is elevated. Bolen records the well known fact that "early cancer produces little alteration in the velocity" of blood sedimentation. (It is, of course, possible that the sedimentation rate may be retarded by cachexia in terminal malignancy, but there is seldom any doubt of the diagnosis then. However, this may explain why some of the nearly terminal malignancies did not give a positive blood pattern.)

SUMMARY

Results are presented of gross and microscopic blood pattern studies made in 100 cancer and non-cancer patients.

The blood patterns are divided into three categories; (1) negative, (2) positive for "early malignancy," and (3) positive for "advanced" malignancy, as defined by Bolen.

Specificity of "early" and "advanced" malignancy according to the blood patterns on the slides could not be accurately correlated

TABLE I

PROVED CANCER CASES (43)

Site	No. of Cases and Clinical Stage		Positive Pattern		Negative Pattern	Per cent Positive	Clinical Stage Correlation	
	Early	Advanced	Early	Advanced			Per cent Early Correct	Per cent Advanced Correct
Tongue	..	1	1	..	..	100	...	0
Larynx	..	2	..	2	..	100	...	100
Esophagus	..	2	2	..	..	100	...	0
Stomach	..	5	1	1	3	40	...	20
Pancreas	..	4	1	2	1	75	...	50
Colon	..	5	1	3	1	80	...	60
Rectum	..	3	2	1	..	100	...	33
Lung	..	4	1	3	..	100	...	75
Breast	1	2	..	2	1	67	0	100
Cervix	..	1	..	1	..	100	...	100
Prostate	..	2	1	..	1	50	...	0
Kidney	..	2	1	1	..	100	...	50
Bladder	..	2	..	2	..	100	...	100
Generalized carcinomatosis	..	3	1	2	..	100	...	67
Melanoma	1	..	1	..	..	100	100	...
Neurofibroma	..	1	..	..	1	0	...	0
Giant follicular hyperplasia	..	2	1	1	..	100	...	50
Totals	2	41	14	21	7	81.4	50	51.2

TABLE II

NON-CANCER CASES (52)

Disease	No. of Cases	Positive Pattern		Negative Pattern	Per cent		
		Early	Advanced		Positive	Early	Advanced
Gastric ulcer	6	2	1	3	50	33.3	16.7
Duodenal ulcer	2	..	..	2	0	.....	.....
Benign obstruction jaundice	3	1	2	..	100	33.3	66.7
Cholecystitis and cholelithiasis	2	1	..	1	50	50	.....
Empyema of gallbladder	2	1	1	..	100	50	50
Cirrhosis of liver	1	..	..	1	0	.....	.....
Thyroid nodular goiter	3	1	1	1	66.7	33.3	33.3
Toxic goiter	1	..	..	1	0	.....	.....
Chronic cystic mastitis	2	2	..	..	0	.....	.....
Uterine fibroids	5	1	1	3	40	20	20
Chronic prostatitis	1	1	..	..	100	100	.....
Chronic cervicitis	1	..	..	1	0	.....	.....
Ovarian cystadenomas	1	..	1	..	100	.....	100
Pregnancy 1st trimester	1	..	..	1	0	.....	.....
Terminal pregnancy	5	5	..	..	100	100	.....
Postpartum pregnancy 4 days	1	..	..	1	0	.....	.....
Pneumonia	1	1	..	..	100	100	.....
Thromboangiitis obliterans	1	1	..	..	100	100	.....
Hemangioma, thigh	1	1	..	..	100	100	.....
Hematoma, thigh	2	..	2	..	100	.....	100
Rheumatoid arthritis	2	..	..	2	0	.....	.....
Diabetes and arteriosclerosis	2	1	1	..	100	50	50
Thrombophlebitis	1	..	..	1	0	.....	.....
Osteoporosis	1	..	..	1	0	.....	.....
Ruptured nucleus pulposus	1	..	..	1	0	.....	.....
Inguinal hernia	1	..	..	1	0	.....	.....
Neuroses	1	..	..	1	0	.....	.....
Normal student nurse (control)	1	..	..	1	0	.....	.....
Totals	52	19	10	23	55.8	36.5	19.3

TABLE III
CLINICALLY APPARENTLY CURED CARCINOMA CASES (5)

Side	No. of Cases	Treatment		Positive Pattern		Negative Pattern	Per cent	
		Surgery	Irradiation	Early	Advanced		Positive	Negative
Lip	1	..	1	..	..	1	...	100
Thyroid	1	1	..	..	1	..	100	...
Cervix	1	..	1	..	..	1	...	...
Colon	2	2	..	..	..	2	...	100
Totals	5	3	2	0	1	4	20	80

TABLE IV
BLOOD SEDIMENTATION RATES (9 CASES)

Disease	No. of Cases	Negative Pattern	Positive Pattern		Sedimentation Rates	
			Early	Advanced	Elevated	Normal
Sigmoid carcinoma	1	..	..	1	1	..
Prostate carcinoma	2	1	1	..	2	..
Ovarian cystadenoma	1	..	..	1	1	..
Lip carcinoma (postirradiation)	1	1	..	..	..	1
Empyema gallbladder	2	..	1	1	2	..
Giant follicular hyperplasia	2	..	1	1	2	..
Totals	9	2	3	4	8	1

with the pathologically proved carcinoma cases although 81.4 per cent of the proved cases gave a positive pattern.

A positive "malignancy" blood pattern was given in 55.8 per cent of the non-cancer cases, 19.3 per cent of these indicating "advanced malignancy." A follow-up of eight to twelve months revealed no development of malignancy in this group.

The Bolen blood pattern test cannot be verified as a good laboratory procedure for detecting early cancer from this study. However, it may be useful as a simple, modified sedimentation rate technic in following the course of carcinoma patients treated by total extirpation or irradiation as an adjunct in evaluating "clinical cures."

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