Therapeutic Archive (Terapevticheskii Arhiv)
Haematology Questions

Examination of blood according to Bolen's method in ambulatory practice.

Sergel O.S. et al 1976

In a situation of time constraints in population dispensary it would be extremely useful to employ a technically simple laboratory test that could point to a hidden pathology. This was the reason for testing out Bolen's "blood drop" investigation during dispensary of the staff members of the Institute of surgery and donors.

The dried blood drop test was suggested by Bolen, an American scientist. He investigated 800 people and obtained 100% negative results in 500 healthy individuals and patients with various benign processes. Amongst patients with proven cancerous process the test was positive in 96.5% cases. There is scarce literature regarding this question. Investigation results in healthy people are included in only 3 other works. For example, in some data, Bolen's reaction was negative in 100% of healthy individuals (Sergel O.S. et al., Haider A.A. et al), in others – in 93% cases (Stiller-Winkler and Kuchinski). Different authors produce close data regarding positive test results during cancer of various localization – from 83.7 to 100% (Sergel et al., Wtiller-Winkler and Kuchinski; Tonnesu et al). Test results are non-specific or negative in 100% of cases with benign tumours (Pinskaya and Sergeeva). Patients with acute infectious diseases and tuberculosis had positive Bolen's test in 0.82% and non-specific in 9.6%. In suppurative torpid and gangrenous processes 47-62% cases have positive test results (Sergel et al; Pinskaya and Sergeeva). Test is positive during pregnancy. Multiple transfusions have been shown to affect test results. Bolen's test has been shown to be completely independent of patients' sex or age characteristics.

Therefore, based on the literature, negative Bolen's test results are generally sufficiently characteristic for healthy and positive – for ill people. The results are particularly pronounced in patients with cancer and suppurative processes.

Only one work showed no value of Bolen's test in differential diagnostic of cancerous and non-cancerous conditions (White et al).

We have investigated 1801 Surgical Institute staff and 61 donors. Amongst staff there were 372 men and 1429 women aged on 21 to 60 years old. Donors were mainly younger, or less often middle-aged. Staff members have had detailed clinical and laboratory investigations with specialist involvement.

The technique and classification of results of the "blood drop" or Bolen's test. Fleshy part of the finger was punctured with a thin needle. Surface of a clean, carefully degreased glass slide is then gently touched to the finger tip (without pressure to avoid lymph contamination). Several drops are applied to the slide in equal distance to produce a thin drop. First 1-2 drops are usually unsuitable for the test due to being too thick. Blood is air dried and investigated using dry microscopy using oculars 7 or 10 and objective lens 10 and 40. Bolen's negative result looks like a complete mass of erythrocytes tangled in a thick fibrin mesh (see pic a attached). Positive result (in sick patients) looks like erythrocytic conglomerates separated by empty spaces – "lagoons" (see pic b attached). Another sign of pathology is an underdeveloped fibrin net. This

two signs are not always equally pronounced and therefore apart from negative and positive, there are weakly positive and non-specific Bolen's results (see pic c).

Out of 1801 institute staff members there were 1658 negative results (92.06%), 11 positives (0.60%), 10 had weak positive (0.56%) and non-specific in 122 (6.77%) (Table 1)

After targeted investigations it turned out that positive test results were in one female staff member with malignant breast tumour, cancer of soft tissues and osteosarcoma, 6 people with chronic pneumonia which was difficult to differentiate from lung cancer; chronic nephritis and pyelonephritis, infectious-allergic syndrome (??), influenza, hypertension, and secondary anaemia on background of cystic ovary disease. 2 women were pregnant (in the second half of it). Weak negative results were shown in 10 staff members with chronic cholecystitis, pyelonephritis, gastric and duodenal ulcerations, polyarthritis, goitre, in 3 women in the second half of pregnancy. Out of 122 staff with non-specific results 6 had uterine fibromas, 1 had hypernephroma, 1 had benign breast tumour, and 2 had radical resection of malignant cancers. 106 people had various chronic and acute infectious-allergic illnesses. 6 women were pregnant. (Table 2)

Therefore, 1658 staff that had no pathology had negative Bolen's test when investigated. All pregnant women had a positive test, especially so in the second half of pregnancy. Positive reaction was registered in patients with malignant tumour and also with chronic or acute inflammatory-allergic process in a variety of viscera or tissues. Non-specific results of Bolen's reactions were shown in staff members with benign tumours, after successful removal of malignant tumour and also in less complicated cases noticed above of gastro-duodenal and cardiovascular pathology, in which by current understanding autoallergic processes play a large role.

Out of 61 donors, there were 2 positive results (Table 1) in 6/40 pregnancy and profound anaemia (53 U), nuclear shift 11% and ESR 18 mm/hour.

There are no explanations of the mechanism of positive Bolen's test in literature. The author himself points at the increased agglutinability of erythrocytes as the cause. There is data showing simultaneous decrease of albumin levels and increased concentrations of alpha 1, 2 and beta 1 and 2 – globulins (Gyrtova B.L. and Axmetov V.Z.). It is known that erythrocytes in a sensitised body carry immunoglobulins on their surface that are actively involved in autoimmune processes. In particular, agglomeration of erythrocytes was shown in children with various autoimmune states: rheumatic disease, erythema, tuberculosis etc. (Burgio and Severti). Erythrocytes are widely used for *in vitro* allergic reactions demonstrations due to their property to accumulate antigens on their surface (Komarov F.I. et al; La Go). In this light, it is possible to explain positive Bolen's test presence in patients with auto-allergenic illnesses in our observations. Current view of pregnancy in an immunological aspect: foetus as a transplant (Allbright) – also agrees with immunological genesis of positive reaction during blood drop test.

Above, in our opinion, allows us to express a hypothesis of autoimmune mechanism of positive reaction during Bolen's blood drop test.

Bolen's test is non-specific but generally characteristic for pathology and negative in 100% healthy individuals. Exceptional simplicity of the test allows us to recommend it for wide use in dispensary practice.

Test result	Staff members	Donors
Negative	92.07	96.72
Non-specific	6.77	1.64
Weakly positive	0.56	-
Positive	0.6	1.64

Table 1. Bolen's test result (in%) in investigated staff members and donors.

Test Result	Chronic and acute infectious-inflammatory conditions with autoimmune component	Tumour			Pregnancy	Total
		Malignant	Benign	After surgical removal		
Non-specific	106	1	7	2	6	122
Weakly positive	7	-	-	-	3	10
Positive	6	3	-	-	2	11

Table 2. Bolen's test results compared to type of disease and pregnancy.