

Purple-bluish tongue is associated with platelet counts, and the recurrence of epithelial ovarian cancer

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Abstract

OBJECTIVE: To evaluate the relationship between purple-bluish tongue and platelet counts, and further to examine their associations with the recurrence of epithelial ovarian cancer.

METHODS: A total of 82 epithelial ovarian cancer patients were enrolled in this study. Cluster analysis was used for grouping patients' P_{RGB} (Red-R; Green-G; Blue-B; Average percentage of RGB, P_{RGB}) values. Receiver operating characteristic (ROC) curve was performed for detecting the diagnostic standard of purple-bluish tongue. χ^2 test was used to assess the relationship between purple-bluish

tongue and platelet counts, and the recurrence of epithelial ovarian cancer. The perioperative (preoperative) platelet level was examined with tongue image and disease recurrence.

RESULTS: Tongue images were classified into two groups basing on P_{RGB} values of images by cluster analysis. The numbers of cases in cluster "1" (normal color tongue) was 16 and cluster "2" (purple-bluish tongue) was 66. Two groups of P_{RGB} values, classified by cluster analysis, were significantly correlated with vision-based tongue color recognition (Kappa = 0.852, $P < 0.001$). ROC curve showed that the ratio of P_B to P_R had the highest diagnostic value. The sensitivity and the specificity of the ratio of P_B to P_R were 95.3% and 88.9% respectively and the optimal cut-off point was 0.71. Purple-bluish tongue was significantly correlated with increased platelet counts ($P < 0.001$). Both the increased platelet counts ($P = 0.01$) and purple-bluish tongue were associated with recurrence of epithelial ovarian cancer ($P < 0.001$).

CONCLUSION: The ratio of P_B to P_R greater than 0.71 could serve as an indicator for purple-bluish tongue diagnosing used in symptom pattern identification in Traditional Chinese Medicine. Purple-bluish tongue, associated with increased platelet counts, was also closely correlated with the recurrence of epithelial ovarian cancer.

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Key words: Ovarian epithelial cancer; Tongue inspection; Cluster analysis; Recurrence; Platelet count

INTRODUCTION

Ovarian cancer is the fifth-leading cause of cancer death among women accounting for nearly 3% of all new cancer patients in the United States.¹ Epithelial ovarian cancer (EOC), encompassing 90% of all ovarian malignant tumors, is an aggressive malignancy and one of the most lethal malignant gynecological tumors.^{2,3} Patients with EOC usually present with advanced stage disease due to the deep location of the ovary, as well as the lack of typical early symptoms and effective diagnostic methods clinically.⁴ Although serum CA125 is commonly used as a tumor marker for ovarian cancer clinically, its sensitivity and specificity is insufficient.⁵ So, while a high remission rate of EOC might be reached after surgical treatment and chemotherapy, the propensity for the common recurrence and early peritoneal dissemination of EOC ultimately result in high mortality.⁶ Therefore, exploring the clinical prognostic factor for EOC is of great significant. For thousands of years, tongue diagnosis has been one of the four facets in the diagnostic method of symptom pattern identification used in Traditional Chinese Medicine (TCM). A tongue image can reflect the physical condition.⁷ Purple-bluish tongue is largely reflecting the status of physical hypercoagulation. Clinical experience shows that the recurrent EOC patients usually have purple-bluish tongues. Platelets play an important role in hypercoagulation phenomenon. Whether the purple-bluish tongue was related with the high platelet level is unclear (Figure 1). Thus, in this study, we investigated the relationship between tongue color and increased platelet counts in EOC patients and explored the possibility of purple-bluish tongue in predicting the relapse of EOC.

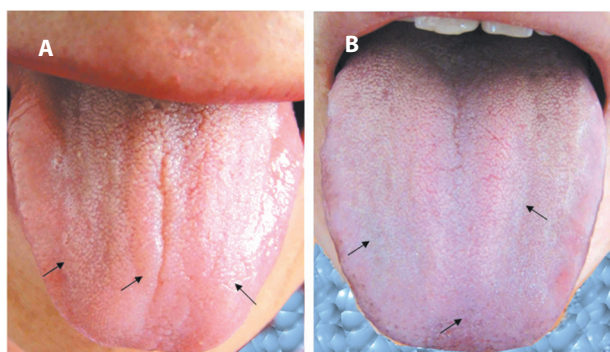


Figure 1 Purple-bluish tongue versus normal color tongue
A is the representative picture for patient with epithelial ovarian cancer who has normal color tongue. The average percentage of RGB values: $P_R = 43.14$, $P_B = 27.39$, $P_G = 29.47$. The ratio of P_B to P_R is 0.64; B is standing for patient with epithelial ovarian cancer whose tongue is purple-blue. Three points were chosen at the purple-bluish part by operators randomly. The average percentage of RGB values: $P_R = 34.07$, $P_B = 35.37$, $P_G = 30.56$. The ratio of P_B to P_R is 1.04.

MATERIALS AND METHODS

Patients

The data of 82 EOC patients with their tongue photos

in Tianjin Medical University Cancer Institute and Hospital from June 1999 to December 2011 were analyzed. All these tongue photos were taken at the time after surgeries or peri-recurrence. Among the total patients, 26 EOC patients underwent surgeries on other hospitals, whose perioperative platelet data were not found. The study was approved by the Hospital Ethics Committee. Pathological test was performed to confirm EOC and all patients were re-examined by ultrasound, pelvic CT and tumor markers detection periodically after surgery or systemic therapy (usually performed at three months, six months, and then once a year after surgery). All patients received primary surgical staging according to the International Federation of Gynecologists and Obstetricians (FIGO, 1989) guidelines. The tongue photos were taken in the same background by the camera (SONY DSC-H7). Patients were informed that the detail information of their faces was not been collected on photos. Informed consents were obtained from all participants involved in this study.

The categorical variables of EOC patients including age, histological type, stage, platinum combined with paclitaxel and postoperative residual disease were retrospectively abstracted from medical records under the institutional review board-approved protocol. Platelet counts were measured at perioperation (preoperative). Peripheral blood was obtained from the cubital vein of the patients.

Computerized analysis versus visual recognition method for tongue color

Vision-based tongue color recognition is widely used in symptom pattern identification in TCM practice.⁸ In this study, tongue colors were grouped into normal (not purple-blue) and purple-blue by three experienced doctors that ruled out the subjective factors basically. "2" was used to represent purple-bluish tongue and "1" was used to stand for normal color tongue. Cluster analysis operated by SPSS turned visual recognition into computerized identification. Three primary colors of light, R (red), G (green) and B (blue), were used to produce the color image. We used Adobe Photoshop CS5 to analyze three points on patients' tongues (for purple-bluish tongue, three points were chosen at the purple-bluish part by operators randomly; for normal color tongue, three points were chosen at random) and collected the data of the RGB values. 82 patients' tongues were analyzed by Photoshop CS5. The average percentage of R, G and B values (P_{RGB}) were classified into two groups *via* cluster analysis. We assessed the relationship between the two cluster analytic groups and the groups classified *via* vision-based recognition, and tried to find out a computerized standard for visual-based recognition and process the tongue colors identification. Purple-bluish versus normal color tongue was shown in Figure 2.

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