Complementary Therapies in Medicine (2014) 22, 341—348

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CASE REPORT

Diabetes with pyogenic liver abscess—A perspective on tongue assessment in traditional Chinese medicine

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Available online 2 January 2014

KEYWORDS
Traditional Chinese medicine (TCM);
Tongue examination;
Diabetes mellitus (DM);
Pyogenic liver abscess (PLA)

Summary
Background: This novel study provides a time series analysis of tongue features extracted from a diabetic patient with pyogenic liver abscess (PLA), treated with the integration of western medicine and traditional Chinese medicine (TCM). The features, namely, tongue color, tongue fur thickness and fur color, identified from a series of tongue images taken every two days, exhibit significant transitions matching closely with the progression of disease. These tongue features could serve as effective, non-intrusive indices for different progression stages of diabetes with PLA.
Case presentation: A 76-year-old male diabetic patient was admitted for hyperglycemic hyperosmolar state. Intermittent fever and abdominal discomfort were noted. After performing abdominal computed tomography and laboratory studies, the results indicated pyeogenic liver abscess, *Klebsiella pneumoniae* ssp. *pneumoniae* related. As PLA progressed, the patient suffered spiking fever and right upper abdominal pain. Tongue examination revealed features with red tongue, white-yellow and thick fur. After receiving pigtail catheter drainage, the fever subsided and the pus-like fluid was drained smoothly. During the course of this process, gradually dwindled tongue fur witnessed through periodic tongue examination coincides consistently with laboratory data, namely, body temperature, fasting plasma glucose and plasma glucose level gathered.
Conclusion: This is the first time series analysis of applying tongue examination to the progression of a specific disease. Through a series of tongue images taken periodically, tongue color, tongue fur thickness and fur color are identified to closely linked to the progression of diabetes

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0965-2299/$ — see front matter
http://dx.doi.org/10.1016/j.ctim.2013.12.009

with PLA, as indicated by data gathered through means of plasma glucose and abdominal sonographic follow-ups. Based on this promising finding, our future study will further extend the application of tongue assessment to evaluate the tongue characteristics of diabetic patients.

Introduction

As the world population increases rapidly, diabetes mellitus (DM) has become the major burden of adult public health. According to an epidemiological study of the global prevalence of diabetes,[1] there were 171 million people with diabetes worldwide in 2000. This figure is expected to keep increasing to 366 million by 2030. Among the risk factors relating to pyogenic liver abscess (PLA), e.g., diabetes, malignancy, renal disease and pneumonia, diabetes ranks first as the primary risk factor. PLA is associated with a poor prognosis for diabetic patients than other patients.[2] PLA is a rare, life-threatening disease with an increasing rate of incidence.[3] Previous studies indicated the prevalence of PLA increased among the population in eastern Asia, especially in Taiwan. PLA is regarded as an endemic disease in public health issues in Taiwan.[4] These reports pointed out that diabetes is the main predisposing factor of liver abscess and *Klebsiella pneumonia* the primary pathogen.[4] For patients with *K. pneumonia* liver abscess, an appropriate antimicrobial treatment combined with percutaneous drainage of liver abscesses is approved.[5]

Tongue assessment plays an important role in TCM.[6] The tongue is connected to the internal organs through meridians; thus the conditions of organs, qi, blood, and body fluids as well as the degree and progression of disease are all reflected on the tongue.[7] Organ conditions, properties and variations of pathogens can be revealed through observation of tongue. For example, changes in the tongue proper primarily mirror organ status and the flow of qi and blood; variations in tongue fur can be employed to determine the impact of exogenous pathogenic factors and the flow of stomach qi. Tongue fur color and thickness were found to be associated with effective response in specific disease.[8] Buccal alterations can be easily observed in diabetic patients with an inadequate glycemic control.[9] In clinical practice, practitioners observe tongue characteristics, such as the color and shape, and the amount of saliva before deducing the primary ailment of a patient. However, observation assessment is often biased by subjective judgment, originating from personal knowledge, experience, thinking patterns, assessment skills, and color perception or interpretation. There are no precise or existing quantifiable standards. Different practitioners may pass varying judgments on the same tongue, while a practitioner may even reach different assessments on the identical tongue if examined at different time. Such inconsistency leads many people to be skeptical of TCM, which motivated us to develop the Automatic Tongue Diagnosis System (ATDS).[10] ATDS has demonstrated high degree of assessment agreement far-surpassing human counterparts.[7] It is expected that ATDS can assist TCM practitioners to establish reliable assessments by providing them with standardized automatic procedures as well as objective, reliable and quantified data. The aim of this study is to establish representative indices on different progression stages of diabetic with PLA through periodic observation and analysis of tongue by ATDS.

To the best of our knowledge, there is no references surveyed applying temporal analysis to a series of tongue images to observe transitions in tongue characteristics. The subject, infected with poorly controlled DM, further complicated by PLA, was treated with the integration of western medicine and TCM throughout the progression of the disease without further complication such as endophthalmitis or meningitis.

Case presentation

Hospital stay

This 76-year-old male patient, with the past history of diabetes mellitus and hypertension, was admitted due to shortness of breathing and general weakness persistent for one day. Dyspnea, thirst sensation and poor appetite were also mentioned. Laboratory data showed hyperglycemia (random plasma glucose level: 689 mg/dL) and urine examination indicated no ketone body, ref. Table 1. Arterial blood gas showed hypoxemia but no acidosis. The patient was admitted for further care under the impression of Type 2 DM with hyperglycemic hyperosmolar state.

During hospital stay, the hyperglycemic status was not well-controlled by continuous IV insulin infusion. Intermittent fever and abdominal discomfort were noted. Abdominal computed tomography (CT) was performed, which revealed liver abscess (Fig. 1), and blood culture showed *K. pneumonia*. Ceftriaxone 2 g at bedtime and metronidazole 500 mg every 6 h were administered intravenously. He was diagnosed with pyeogenic liver abscess, *K. pneumoniae* ssp. *pneumoniae* related, accompanied with hyperglycemia. Whole body Ga-67 scan was arranged to rule out endophthalmitis or meningitis, and the result revealed infectious process at segments VI and VII of liver. Standard treatment included percutaneous needle aspiration or pigtail catheter drainage and combination antimicrobial therapy for 2—4 weeks. He later received percutaneous transhepatic needle aspiration and antibiotic therapy. Abdominal ultrasound was scheduled to evaluate the size of liver abscess and needle aspiration was performed in the case of liquefied abscess. On the 9th day, he developed spiking fever up to 39 degrees and persistent abdominal pain, percutaneous transhepatic abscess drainage was subsequently performed and antibiotics changed to cefotaxime 2 mg every 6 h and metronidazole 500 mg every 6 h administered intravenously. His clinical condition improved gradually and fever subsided. After several rounds of abdominal sonographic follow-ups, drainage catheter was removed on the 19th day and antibiotic switched to ceftibuten 200 mg orally every 12 h because the volume of abscess cavity dwindled and total daily drainage from the catheter decreased to less than 5 ml