

Importance of tongue diagnosis in chronic kidney disease

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Chronic kidney disease (CKD) is described as a sustained reduction in glomerular filtration rate or evidence of structural or functional kidney abnormalities. CKD symptoms include fatigue, persistent itching, peripheral numbness, sleep disturbances, muscle twitches and cramps, swelling of feet and ankles, nausea, and vomiting. [1] CKD are structural and functional renal deficiencies that have become a serious public health care problem, affecting 8–16 % of the world population. [2] Also responsible for high morbidity and mortality, and represent a heavy financial burden to the public national health systems in developing as well as developed countries. [3] Tongue diagnosis is an important diagnostic tool in traditional Chinese medicine (TCM). However, tongue diagnosis is often biased by subjective judgments and environmental factors. [4]

In TCM, tongue diagnosis is an important and unique diagnostic tool. The tongue can reflect the qi-blood, yin-yang status of the internal organs. Through inspection of the appearance of the tongue, such as tongue color, teeth mark, fur color, and thickness, determine the TCM syndrome, which further guides the treatment. [5] Syndrome differentiation is an important concept in TCM practice and it includes a comprehensive analysis of a patient's clinical information from four diagnostic procedures inspection, auscultation, questioning, and pulse analysis. [6] The tongue coating is defined by the presence of a yellowish-white coating on the tongue dorsum, with or without the presence of slightly elongated filiform papillae, which could not be scraped off by a blunt instrument. [7]

Renal disease can give rise to a wide spectrum of oral manifestations in the hard and soft tissues. Renal disease

may lead to the development of pale oral mucosa, dry mouth, poor oral hygiene, and uremic stomatitis, and may cause changes in the salivary composition. These complications can lead to excessive bleeding and anemia. Patients also suffer from the odorous breath (uremic breath) and sensations of metallic taste in the mouth. Gingival inflammation has been reported to be due to plaque accumulation and poor oral hygiene. [8] In addition, CKD positively correlates with periodontal disease viability due to systemic inflammatory burden and low immunity, with a greater predisposition or worsening of the periodontal condition. Furthermore, periodontal disease may be one of the aggravating factors of progression or mortality in CKD patients. The presence of periodontal disease simultaneously worsens the prognosis due to the increased systemic inflammatory load and bacterial translocation. [9]

The immunosuppressed state of CKD patients provides an increased risk of developing oral lesions (OL) a discomfort that affects between 50 and 95.6 % of dialysis and transplant patients among the different types of OLs, the saburral tongue or tongue coating (TC) is a frequent finding. [10] TC is not a disease in itself, but it can contribute to the development of pathologic processes. [11] While TC is present in up to 28 % of the general population in CKD patients, TC has been found in 37 % of dialysis and 42.4 % of kidney transplanted patients. [12] TC is the result of overgrowth and swelling of the fingerlike projections (papillae) on the surface of the tongue. [13] The appearance of a white coating is caused by food debris, microorganisms, and desquamative epithelial cells getting lodged between the enlarged and sometimes inflamed papillae. Papillae hypertrophy is usually the result of poor oral hygiene. While the white appearance of the TC is similar to that of pseudomembranous candidiasis. [14]

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Although TC has been traditionally linked to bacteria, it can also provide adequate environmental conditions for the growth of yeasts, particularly of the *Candida* species. The presence of microorganisms in TC does not necessarily represent a health problem, but the colonization of the tongue by opportunist microorganisms such as *Candida* is a prerequisite for infections. The immunosuppressed state of CKD patients could favor colonization by yeasts and, as a result, the development of oral candidiasis. [15] Moreover, TC may become a gateway for invasive fungal infections. Due to the high rates of mortality and graft loss in immunosuppressed transplant patients with invasive fungal infections, procedures for the early diagnosis and treatment of oral lesions are recommended to increase the likelihood of survival. [16]

Oral and cutaneous hyperpigmentation in renal patients is due to the inability of the kidney to excrete excess beta melanocyte-stimulating hormone, accumulation of hormone results in stimulation of melanocytes at the basal layer of oral epithelium. An oral infection could affect the microvasculature of the heart and kidney resulting in systemic inflammation in CKD patients. [17] Based on the TCM theory, the tongue is subdivided into five areas that correspond to different internal organs the normal tongue should have a light red body with a thin white coating. The abnormal changes in the color, shape, fissures, red dots, ecchymosis, and moisture in the tongue coating and body color can reflect diseases of internal organs. For example, a tongue with teeth marks on the sides can be a sign of *qi* deficiency. A tongue with dark purple color and ecchymosis is often caused by blood stasis. A tongue with pale color can be a sign of blood deficiency.



Figure 1: Tongue coating in chronic kidney disease

Tongue inspection and diagnosis with a computerized automatic tongue diagnosis system can provide objective and quantitative observations. TCM physicians can capture the quantitative features to improve the reliability and

consistency of tongue diagnosis. Patients with CKD have thicker tongue fur, paler tongue, more ecchymosis, teeth marks, and red dots. In the TCM theory, thick tongue fur represents phlegm-dampness, pale tongue corresponds to blood deficiency, ecchymosis mirrors blood stasis, teeth marks represent *qi* deficiency, and red dot correlates to heat therefore, blood deficiency and stasis with *qi* deficiency or blood heat syndrome may be common in patients with CKD. Increased ecchymosis and increased pallor of the tongue among CKD patients could indicate anemia and ischemic vascular diseases. [18]

CONCLUSION

Tongue diagnosis provides a valuable tool to evaluate the status of CKD patients helping clinical doctors to identify potential health problems and implement proper management of the condition and reduce complications.

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