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Role of "Facial Diagnosis" Objectification in Tumor Diagnosis and Treatment

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ABSTRACT

As an important part of Traditional Chinese Medicine (TCM) inspection, face diagnosis is significant in judging the rise and fall of viscera and essence and diagnosing and treating diseases. Cancer is a serious disease that endangers human life and health. Face diagnosis can play a great role in diagnosing and treating tumors, but this approach has not achieved the expected effects due to the lack of research. Herein, we summarized the research regarding facial expression, color, shape, and state, demonstrating that facial diagnosis is significant in diagnosing and treating tumors. We also propose that facial diagnosis must be combined with computer technology to realize the objectification of facial diagnosis as soon as possible to play a greater role in diagnosing and treating tumors.

KEYWORDS: Traditional Chinese medicine; Facial diagnosis; Tumor; Objectification

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1. Introduction

Tumors seriously threaten human life and health. They were first recorded in the Yellow Emperor's Classic of Internal Medicine and were called "rock, accumulation, gall tumor, and obstruction" and "the accumulation is caused by the deficiency of positive qi, and then the evil qi is built up". In Chinese medicine, the nature of the tumor is a deficiency condition. At the beginning of the disease, its formation is due to external infection with six evils, poor diet, emotional and mental discomfort, and deficiency of positive qi. The deficiency of positive qi is manifested as qi deficiency, blood deficiency, and yang deficiency. The yang deficiency leads to a deficiency of qi-transformation, water condensation into phlegm, and qi and blood deficiency leads to qi stagnation and blood stasis. Finally, phlegm and stasis intertwine, representing a common cancer symptom ^[1]. Once the accumulation is formed, the positive qi will be even more consumed, and if the positive qi is weakened and the evil qi resides in it, the tumor will be even worse. Therefore, preventing and treating the cause of the disease is crucial. Hence, it is very important to "seek the root of the disease" and increase the awareness of treating it before it occurs ^[2,3]. This also reflects the importance of early detection, diagnosis, and treatment of tumors. However, due to the high examination cost in China and the Chinese people's idea of avoiding medical treatment, patients think their discomfort will pass after a while and rely on their will to overcome the disease. Meanwhile, facial diagnosis instruments can find the facial condition of precancerous lesions and early tumors and accurately diagnose the diseases that appear on the body. Facial diagnosis instruments can also find the sub-healthy state of the human body from facial examination, give the treatment plan to make the human body reach the healthiest state, and, to a certain extent, alleviate the "difficult to see a doctor, expensive to see a doctor" problem. Therefore, improving and promoting the technology of facial diagnosis and treatment for tumor patients is crucial.

1.1 Origin of facial diagnosis

The Chinese medicine culture has a long history. Chinese people have developed a splendid civilization under the protection of its medicine, which has been used for five thousand years. The relationship between Chinese medicine, the nation, and the world is shown in Figure 1. As an essential part of TCM diagnosis, inspection plays an important role in diagnosing diseases. At the same time, face examinations are an important part of inspections, comprising a diagnostic method to check facial expression, color, shape, and posture. The "Spiritual Pivot - Evil Qi Viscera Disease Form" says: "Twelve meridians, three hundred and sixty-five channels, whose blood and qi all go up to the face and take the empty orifices." This passage explains the relationship between the state of the face and qi and blood and that the face can visually reflect these states. The Yellow Emperor's Classic of Internal Medicine says, "Look at the external response to know the internal organs", which means that by observing the state of the face, the internal organs can be inferred. Hence, Chinese medicine believes that the relationship between the facial skin and the state of internal qi and blood is closely related. Observing the color and luster of the face can reflect the strength and weakness of the body's qi and blood, the deficiency of the internal organs, and the depth of the disease. However, the importance of facial diagnosis is being neglected because it is sometimes too subjective, without a very clear refinement and quantification. Thus, facial diagnoses do not play a proper role in diagnosing tumors. For example, in the identification of facial color, there is a difference between normal and sick color. Normal color is normal but is influenced by genetics and living environment. Sometimes the color changes slightly, but it is not sick color, resulting in even the Chinese medicine practitioner might be wrong in judgment, as well as herbalists ^[4-6]. Therefore, we not only aim to demonstrate the importance of facial diagnosis in the diagnosis

and treatment of tumors but also pursue more objectivity and propose its combination with computer technology.

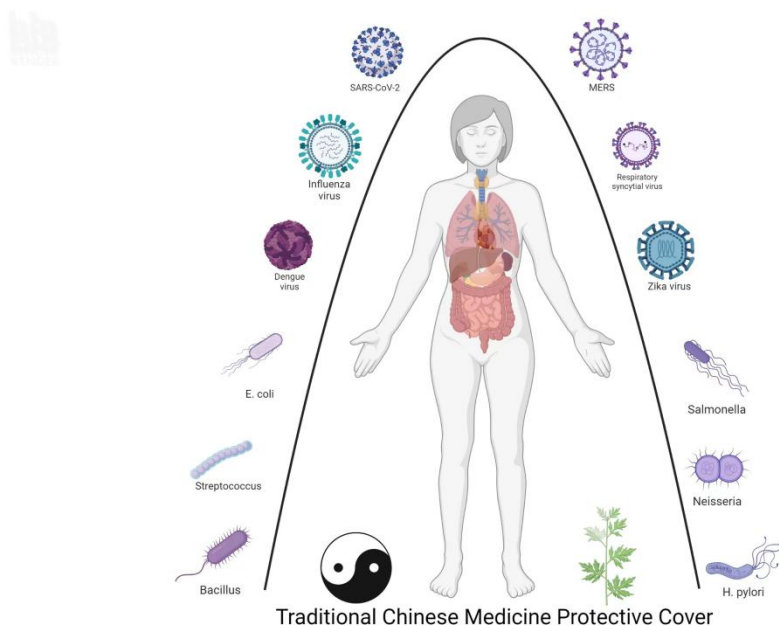


Figure 1. Traditional Chinese medicine protects the human body from diseases.

2 Current status of oncology

In 2020, about 19.29 million cancer cases and 9.95 million deaths were reported worldwide [7]. In 2022, there will be about 4.82 million new cancer cases and 3.21 million cancer deaths in China. The most common cancer is lung cancer [8]. The number of cancer cases and deaths and its crude incidence and mortality rates in China have increased yearly since 2000 [9,10]. The most important factor contributing to this phenomenon is the late detection of tumors, which are almost always at mid to late stages when detected and miss the best treatment period. Therefore, improving early tumor diagnosis and treatment techniques has become a top priority.

3 Application of face-to-face examinations in tumor diagnosis and treatment

3.1 Looking at the spirit of facial diagnosis

The concept of "looking at the gods" was first introduced in the Qing Dynasty in the book "The Heart of Medicine-Four Diagnostic Techniques", but the earliest ancient text that introduced the concept of "gods" was the "Yellow Emperor's Classic of Internal Medicine". The "Spiritual Pivot - Ping Ren Jie Gu" says: "The five organs are stable, the blood vessels are harmonious, and the spirit lives." This passage explains the relationship between the five viscera and the gods. For example, looking at the gods can determine the strength and weaknesses of the essence of the five viscera. Looking at the spirit in facial diagnosis refers to facial expressions, consciousness, qi, and eyes, which can be used to determine the vital energy of the

internal organs [11,12]. The Spiritual Pivot-A Treatise on Dazedness says: "The areoles of the eyes are the eyes, the essence of the bones are the pupils, the essence of the tendons are the black eyes, the essence of the blood are the loops, the essence of the areoles of the qi is the white eyes, and the essence of the muscles are the restraints". Based on this passage, later medical practitioners came up with the "doctrine of the five chakras" and the "doctrine of the eight contours", highlighting the importance of identifying the eyes [13]. The clinical manifestations of Shen can be divided into Shen, Shao Shen, Shen Loss, and Shen Chaos (Table 1). The clinical manifestations of Shen are: the two eyes have Shen, the face is gloriously moist, and the spirit is clear, which are usually seen in normal people, or the disease but the essence has not decayed, and the prognosis is good. The clinical manifestations of Shao Shen are: the two eyes lack Shen, the face is less florid, and the spirit is sluggish, mostly seen in the deficiency caused by tumors. The clinical manifestations of Shen Loss are: the two eyes have Shen, the face is florid, and the spirit is sluggish, mostly seen in tumors. The clinical manifestations of loss of spirit are anxiety, fear, and mania, mainly due to mental confusion [14]. Clinically, it is extremely important to look at the gods, which can reveal the strength and weakness of the essence of the

Classification	Clinical manifestations	Target group
Get a god	Both eyes are clear, the face is gloriously moist, and the mind is clear	Normal people, or sick, but the essence has not yet declined
Lack of God	Lack of energy in the eyes, less florid face, low spirits	Deficiency evidence caused by tumors
Loss of concentration	Both eyes are listless, the face is dull, and the spirit is depressed	Great damage to the essence caused by the middle and late tumor stages
Gods in chaos	Anxiety and fear, mania and restlessness	Caused by delirium

Table 1 Internal organs of cancer patients, as well as cancer obedience and rebellion.

3.2 Facial diagnosis of color

The essence of face-to-face diagnosis is to observe the mental state of the face, its color changes, shape, and movement. A qualified Chinese doctor can infer the state of the internal organs of the human body and whether there is any pathological change from changes in the face, called "governing exterior to infer interior" (Figure 2).

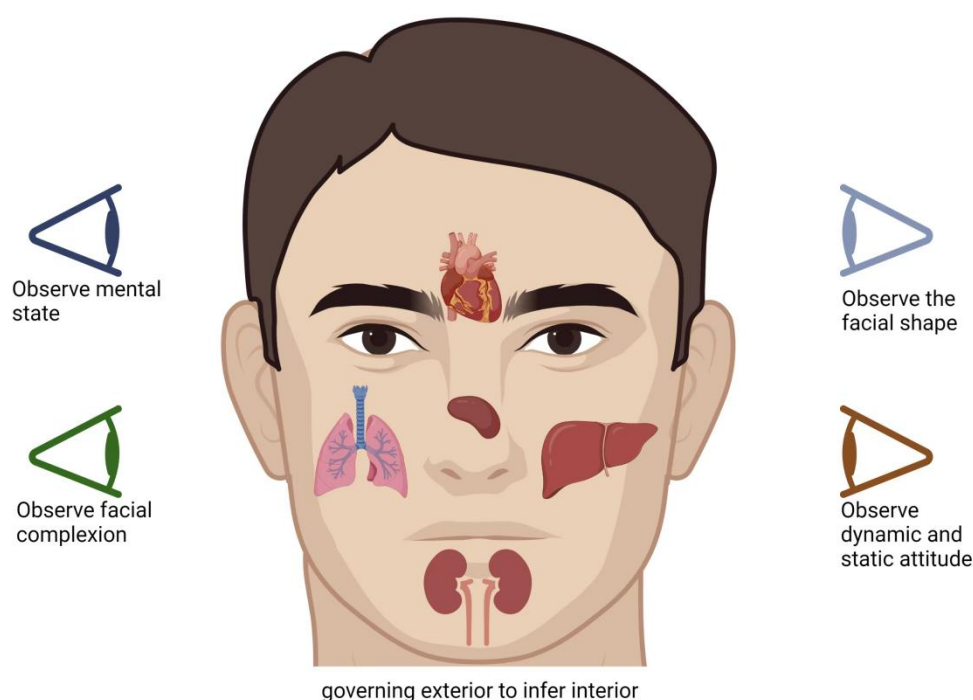


Figure 2. Observe the spirit, color, shape and state of the face to judge visceral

3.2.1 Look at the color of the face

The Yellow Emperor's Classic of Internal Medicine - Spiritual Pivot - Five Colors says: "The five colors are used to order the organs: green for the liver, red for the heart, white for the lungs, yellow for the spleen, and black for the kidneys. The liver is the tendon, the heart is the pulse, the lung is the skin, the spleen is the meat, and the kidney is the bone." The Yellow Emperor's Classic of Internal Medicine laid the foundation for studying facial colors, from which the correspondence between changes in facial colors and the internal organs can be derived. It pointed out that cyan and black dominate pain, yellow and red dominate heat illnesses and white dominates cold illnesses, providing an answer to the pathological significance of facial colors. Wang Hong's "Looking at the Zunjing" also draws on the Yellow Emperor's Classic of Internal Medicine's theory of facial colors and proposes "Looking at the Zunjing - Five Colors Corresponding Outline": "The five colors are shaped on the outside, the five viscera should be on the inside as if the root of the and branches and leaves also ... Therefore, if there is a disease, there must be color, internal and external attack, as the shadow follows the shape, as the drum should rafter." It further illustrates that internal organ pathology will appear in the facial color [15,16]. Yu Chang, a famous doctor in the early Qing Dynasty, says in "The Law of Medical Doctors" that "color is the flag of God." Again, the importance of facial color diagnosis is emphasized. A normal person's face should be rosy and bright, eyes should be bright, the whites of the eyes should be white without blood-yellow staining, and the lips should be red, alive, and clean. The Yellow Emperor's Classic of Internal Medicine - Ling Shu - Five Colors said that "the color is coarse to bright, sunken to death is very, its color upward, the disease is more; its color downward, like clouds through the scattered, the disease party has." The relationship between the color of the face and the degree of disease

indicates that if the patient's face color is slightly brighter, the disease is lighter; if it is darker and darker, the disease is more serious. If the color of the face rises, the disease gets more serious; if the color of the disease falls, like a floating cloud dispersing, the disease will get better. These phenomena are mostly due to blood stasis caused by the poor operation of qi and blood. Therefore, the identification of facial color is mainly an examination of the color and luster of the face [17]. Among them, normal and sick colors can be differentiated. The normal color can also be divided into the main and the guest colors; the main color is the face color born with, and the guest color is the normal color change of the face under different geographical, climate, human, and diet environments. The sick color can be divided into good and bad colors. The good color indicates that the face color is abnormal but still lustrous and bright, and the bad one indicates that the face is withered and dull, and the essence of the internal organs has declined [18]. However, the five organs corresponding to the five colors proposed in Huangdi Nei Jing - Ling Shu - Five Colors, and Su Wen - Lifting Pain Theory says, "Yellow and red is heat, white is cold, and black and blue is pain." Hence, the five-colors theory was proposed (Table 2). Chinese medicine mostly identifies the evidence but not the disease. Thus, the changes in the facial color of tumor patients can also refer to the above five colors as the main disease. For example, liver cancer patients usually have a darker face, and brown pigmentation will appear on the forehead, back of the nose, and both cheeks, which are the reaction areas of the liver, especially around the eyes, which will appear obscure and grayish-black. These patients have the greatest change in facial brightness at the eye socket [19]. According to Chinese medicine, the liver is the master of cyanosis; if it is damaged, the face will show different obscurity degrees. There is also a correlation between the degree of facial obscurity and liver cancer; the more obscure the face is, the more severe the degree of liver cancer [20]. If the two cheekbones or the whole face is flushed or even rouge painted, accompanied by red eyes and lips, it is most likely to be hyperactivity of liver yang during liver cancer [21]. If the face is pale and the mouth and lips are pale, it is likely to be a deficiency of qi and blood in the late stage of cancer. If the patient's face is yellowish-black and obscure, and the mouth and lips are purple and black, it is most likely to be a kidney deficiency and blood stasis in kidney or intestinal cancer.

Color	Certificate Type
Cyan	Blood stasis, pain, qi stagnation, cold evidence, and frightening wind
Red	Heat and Dai Yang evidence
Yellow	Spleen deficiency and dampness evidence
White	Qi deficiency, blood deficiency, Yang deficiency, and cold evidence
Black	Water-drinking, kidney deficiency, blood stasis, pain, and cold

3.2.2 Looking at the color of the lips

Suwen - Six Sections of Tibetan Elephant Theory says: "The spleen and stomach ... have four white lips," indicating that the color of the mouth and lips can reflect the spleen and other visceral functions [22]. Changes in the color of the mouth and lips represent the disease state of the spleen and stomach. White is mostly due to blood deficiency, as the qi and blood cannot go up to the lips; red is due to real heat, which forces the blood upward. Deep red and dry is due to heat that injures the fluid; blue is due to yang deficiency, which leads to blood stasis. Blue lips are due to yin-cold stagnation, leading to blood stasis. Cherry-red lips are mostly due to gas poisoning. In patients with digestive and genital carcinomas, purple spots are occasionally seen along

the inner side of the lower lip, as large as soybeans or as small as mung beans, irregularly shaped as a circle or oval, with varying numbers, or occasionally seen at the lip mucosa, irregularly arranged, with a color ranging from light to dull purple. As the disease progresses, the purple spots gradually become darker. Occasionally, several irregularly rounded purple spots can be seen on the front or the edge of the tongue. In the study of the objectification of mouth and lip colors, mouth and lip images were divided into four groups: crimson, red, purple, and pale; then characterized and classified, providing a new template for the modern discrimination of the mouth and lip [23].

3.3 Visualizing the shape of facial diagnosis

Facial diagnoses using the shape comprise observing the face shape and other features. Facial shape is a collective term for morphological features and is an important part of facial diagnosis in TCM. As early as in the Yellow Emperor's Classic of Internal Medicine, there are records of the facial features of people with five elements. In the "Spiritual Pivot - Yin and Yang Twenty-five People": "Above the Sun on the hand, if the blood is abundant, the mouth is full of beards, and the face is flat with more flesh; if the blood is low, the face is thin and evil-colored". In "Ling Shu - Five Readings and Five Ambassadors": "Therefore, if the lung is sick, the nose will be open with panting" and "if the heart is sick, the tongue will be short, and the cheek will be red". These are the relationship between facial shape and human qi and blood. The Yellow Emperor's Classic of Internal Medicine also has a classification method for yin and yang people. Yin people have a more rounded head and face but a thicker neck, belonging to those with a yang deficiency and a yin bias, whose diseases are mostly caused by yin turning cold and cold damp phlegm. In contrast, yang people have a relatively slender head and face, but a slimmer neck, which belongs to those with a yin deficiency and yang bias, whose diseases are mostly caused by yang-turning heat and cold damp phlegm, causing symptoms such as injury to yin and fluid. Additionally, in the disease state, there are differences in the facial features of patients compared to healthy people. For example, the facial features of liver cancer patients specifically show the features of a wide forehead, wide nose, and narrow jaw; kidney cancer patients have a narrow forehead, narrow nose, and wide jaw. The nasal ratio has been compared for liver tumor patients, kidney tumor patients, and healthy population: liver tumor > healthy population > kidney tumor; as well as the mandibular width ratio: kidney tumor > healthy population > liver tumor [24].

3.4 Facial diagnosis focused on the state

The Yellow Emperor's Classic of Internal Medicine - Ling Shu - The End and the Beginning says: "The Yang Ming end, the mouth and eyes move with joyful fright, delusional speech, and yellow color; its upper and lower meridians are full and do not work, then the end is complete". Thus, the degree of danger of the disease and the facial posture when the body is about to die. Facial diagnosis refers to observing facial movements, abnormal movements, and expressions used to diagnose illnesses [25]. Among them, those with more facial movements, hyperfunction, and restlessness belong to yang, mostly hot, real, and yang tumors; if the facial expressions are indifferent and lazy, they are mostly cold, deficient, and yin tumors.

4 Combination of facial diagnosis and computer technology

4.1 The necessity of facial diagnosis objectification

Facial diagnosis in TCM has a complete theoretical foundation and practical experience combined with clinical tumor diagnosis and treatment. Therefore, facial diagnosis can increase the rate of clinical tumor diagnosis. However, the standard of facial diagnosis in TCM is qualitative, not quantitative, leading to many problems, such as different diagnostic standards and high use threshold, and cannot be promoted on a large scale. Hence, realizing the objectification of facial diagnosis becomes a major key to the progress of facial diagnosis. Thus, the objectivity of facial diagnosis has become a key to its progress, and the need for facial diagnostic instruments has increased.

4.2 Concept of a facial diagnostic instrument

Facial diagnostic instruments are machines that collect and analyze facial images, extract effective information from photos using computer technology, and finally obtain the diseases of the inspected person and TCM classification according to TCM syndrome and corresponding algorithm instructions (Figure 3). It can visually display the patient's facial features and provide a reliable basis for clinical diagnosis. With the development of computer technology and the advancement of image processing technology, facial diagnosis instruments are also gradually receiving attention. The main research directions of facial diagnostic instruments are the acquisition environment, image acquisition and segmentation, image information recognition, and analysis.

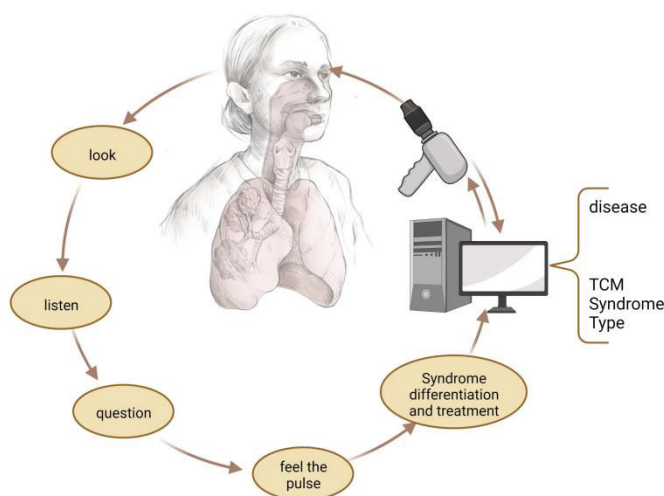


Figure 3. First, input TCM knowledge such as looking, listening, inquiring and feeling the pulse into the face diagnostic instrument through the computer; then, the face diagnostic instrument scans the face to obtain diseases and TCM syndrome types

4.3 Acquisition environment of the facial diagnostic instrument

The more suitable environment is available, the higher the color and brightness reliability of the photos will be, and the more accurate the photos will be, as well as the diagnosis results. Therefore, to ensure the stability of the facial skin color and minimize the influence of the environment and some human factors on the accuracy, the patient is brought to the environment that has been created after the doctor's four

consultations, physical, and chemical examinations, and the corresponding parts are photographed following the doctor's requirements [26]. For example, in advanced liver cancer with deficiency of qi and stagnation of liver qi, forming phlegm and dampness, stagnation of blood and damp heat in the abdomen and forming accumulation, patients usually have a dull yellow face, dull eyes and yellow staining of the face and eyes. A more accurate diagnosis and more suitable treatment will be derived in a consultation room with sufficient light, whereas the diagnosis and treatment will have errors in a dim environment [27,28]. The same is true in the process of lip color photography. By studying various light sources for lip color photography and analyzing the lighting characteristics, researchers have proposed the best light source with appropriate lighting characteristics: a color temperature of approximately 5600 K, Ra = 90 as the light source. Canon PowerShot series S3 IS was selected as the best camera with white balance set in the best mode, resulting in the best environment for taking pictures of tongue diagnosis environment [23]. Under this shooting condition, the facial diagnostic instrument can diagnose the state of the person's lip color: red and bright in a normal person, and if the lip color is white, it might be considered that the advanced tumor patient has a deficiency of qi and blood, yang energy is decayed, and yang energy is unable to promote qi and blood; therefore, qi and blood cannot go up to the head and face, and the patient needs the treatment of tonifying qi and blood and warming yang and dispersing cold. Moreover, suppose the facial diagnostic instrument determines that the patient's lips are too bright red and dry skin appears at the corners of the lips. In that case, this is mostly due to the tumor patient's body being overly hot and burning fluids, resulting in a deficiency of yin and fluids and excessive body fire. Hence, the treatment should clear heat and lower fire, slightly adding drugs to nourish yin and lower the fire [29-31].

4.4 Image acquisition and processing of the facial diagnostic instrument

This step comprehends the acquisition and processing of photos, based on the TCM theory of facial diagnosis for screening and processing, selecting the reflective areas of specific internal organs of the face, detailing and segmenting the specific areas, and making the photos into a format that is more easily recognized by the computer. The division of the facial areas corresponding to the internal organs is described in great detail in the TCM facial diagnosis. The Yellow Emperor's Classic of Internal Medicine should be considered first and foremost among the ancient texts describing facial diagnosis in TCM. The changes in the face vary for different internal organs. The "nine methods of facial diagnosis" in the Huangdi Neijing indicate nine subdivisions: forehead, between the eyebrows, nose, upper lip area under the nose, mouth and lips, yi, under the eyes and cheeks, and cheeks; dividing the reaction areas of different internal organs[32]. Successive generations of physicians have disputed the facial divisions of the Yellow Emperor's Classic of Internal Medicine, but they are generally the same. The center of the eyebrows corresponds to the lungs; the lower pole/shangen corresponds to the heart; below the lower pole corresponds to the liver; the nose corresponds to the spleen; the forehead corresponds to the heart; the upper forehead corresponds to the kidneys; the upper part of the eyebrows corresponds to the lungs; the left cheek corresponds to the liver; the right cheek corresponds to the lungs; under the eyes corresponds to the liver; the two canthi correspond to the liver; the lips correspond to the spleen; the lower jaw corresponds to the kidney [33]. With the theoretical support of the distribution of specific facial organs in the Huangdi Neijing, the facial diagnostic instrument can determine which lesion sites a tumor patient has by simply identifying the regional division in these specific facial locations. For example, abnormal changes in the forehead of a tumor patient can infer its heart pathology, which might appear as bruising on the forehead due to heart yang deficiency or redness on the forehead due to heart fire hyperactivity. Generally, the facial diagnostic instrument performs four main tasks

in this step: facial image acquisition, segmentation, feature extraction, and classification. However, applying color fidelity to the images is crucial to prevent color distortion during the segmentation process. For example, researchers have proposed a dual geographic vector flow (DGF) to detect tongue edges and segment tongue regions in images by refining clinical tongue images through saliency windows, an active contour-based tongue image segmentation method. First, the tongue image is refined by a saliency window, and the active contour is initialized using the prior knowledge of the tongue image. Second, the tongue region is initialized into two parts: binary upper and lower-level set matrices. Finally, the DGF is proposed to detect the tongue edges and segment the tongue region in the image, increasing image stability. Thus, the DGF showed better results with a true positive volume fraction of 98.5% and a false positive volume fraction of 1.51%, demonstrating its extremely high accuracy and effectiveness in automatic tongue image segmentation. This method can also be used for segmenting facial photographs [34,35]. In conclusion, more accurate segmentation of facial regions using facial diagnostic instruments can improve the accuracy of TCM treatment for tumor patients.

4.5 Image information recognition and analysis of the facial diagnostic instrument

Image information recognition and analysis comprises computerized and informative processing of already processed images to recover their parameters [36,37]. Researchers have proposed to build features by splitting four chromaticity bases by luminance distribution on the CIELAB color space and constructing chromaticity bases from the main color of the face using two-level clustering in the following steps. First, four chromaticity bases and their luminance distributions are constructed on their corresponding face color images (i.e., the feature detection and construction phase of face color). Then, the facial skin tones are quantified based on the constructed facial features, and the skin tone distributions are formed on all collected facial images, called the feature representation phase. Further, in the learning phase, a Gaussian kernel (or RBF kernel) support vector machine (SVM) with optimal parameters is used to construct the facial color model. In the final recognition phase, the learned model determines its facial color category for any test facial image. Besides facial color recognition, the facial features built can quantify each patient's color and glossiness. The experimental results achieved the highest face color recognition performance with an overall accuracy of 86.89%, representing a processing method worthy of learning from and studying [5]. Not only in the image information recognition and analysis of the face diagnostic instrument but also in tongue analysis experiments, researchers have employed an SVM training robot and used segmentation and merging, and chromaticity thresholding methods to separate the tongue body and tongue, and trained the SVM diabetes diagnosis model with the extracted tongue image color and texture features as input variables. This approach increased the accuracy of diabetes prediction to 78.77% and the cross-validation accuracy from about 72 to 83.06%, achieving a high correct rate [38,39]. The facial diagnostic instrument can also learn this mode of operation and train its sensitivity to recognize the facial changes of tumor patients by collecting various clinical tumor patients' facial photos to improve the accuracy in treating diseases [40-43].

4.6 Application of the facial diagnosis instrument

Many experts and scholars have applied facial diagnostic instruments and obtained valuable results and experiences. For example, Li Gacai et al. applied the TFDA-1 face diagnostic instrument to compare and analyze the parameters of facial color characteristics of people with different sex and age groups in health status. They collected medically valid data on the facial color of people in health status based on sex and age

to provide an objective basis for diagnosing facial color in TCM [44]. Liu Jintao et al. used a face diagnostic instrument to investigate the relationship between the characteristic information of face diagnosis and pathological biochemical indicators in chronic nephritis patients. The facial diagnostic instrument was performed on chronic renal failure (CRF) patients and revealed differences in facial color parameters in the chronic nephritis group, especially cyanotic, black, and glossy indexes, compared to the normal group [45]. Other studies have used geometric features to quantify the shape of the human tongue and its relationship with the patient's status using computational approaches [46]. For example, 13 geometric features based on measurements, distances, areas, and ratios were extracted from tongue images captured by a specially designed device with color correction. Regarding the five tongue shapes defined in Chinese medicine, the extracted geometric features were valid in tongue shape classification. Also, even if multiple disease categories belong to the same shape, it is still possible to distinguish disease categories by fine classification using a combination of geometric features, with an average accuracy of 76.24% for all shapes [47]. The application of facial diagnosis instrument is similar for different tumor patients, mainly to identify their evidence types and classify the results, which is also more in line with the TCM characteristics of "identifying the evidence but not the disease" based on the evidence types to identify and treat the disease and derive the corresponding treatment method and prescription. The emergence of facial diagnosis instruments might promote this process to a large extent, and cancer patients might receive corresponding TCM treatments, increasing TCM recognition. Overall, the emergence of facial diagnosis instruments is multi-beneficial.

4.7 Shortcomings and reflections of the facial diagnostic instrument

Many experts and scholars are working to promote facial diagnostic devices, achieving good results, such as real increases in the diagnosis rate for treating many diseases. However, some problems remain. For example, the lack of standards and guidelines for diagnosis by facial diagnostic instruments, for tumors or other diseases, can lead to inaccurate data and conclusions after image analyses, leading to incompatible diagnoses. Moreover, the lack of unified guidance can lead to uneven resource allocation for research. For facial diagnostic instruments, related experts have done much research and published many results, but there is much less research in the basic areas of image acquisition and processing, image information recognition and analysis of facial diagnostic instruments. By investing in these areas, the data measured and analyzed by the facial diagnostic instrument will be more refined, and the facial diagnostic instrument will be able to play a greater value in terms of application and prevent the generation of high level[48].

5 Summary

In tumor diagnosis, TCM facial diagnosis can improve the confirmation rate of tumors. However, the lack of objective and quantified diagnostic indexes has led to low awareness of using TCM facial diagnosis to detect and guide the treatment of tumors at early stages. For example, digital imaging needs to overcome the problem of color space rendering of the device. Nevertheless, only adjusting the shooting mode of the facial diagnostic device and improving the shooter's skills cannot completely solve this problem. This problem needs to be supported by more accurate color correction techniques[49]. Therefore, to promote the application of facial diagnostic instruments in oncology diagnosis and treatment at early stages, more accurate data collection, more uniform algorithms for data analysis, and more in-depth learning of TCM facial diagnosis theories are needed. Therefore, there is a long way to go to achieve the objectification of facial diagnosis, and continued efforts are required.

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