Utilizing Iris Image Analysis for Screening Lung Diseases: A Retrospective Controlled Study

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This study investigates the correlation between connective tissue density in the iris's lung region and respiratory diseases, assessing the potential use of iris images for screening lung diseases. Iris images from 375 patients collected between 2019 and 2021 were categorized into lung disease and control groups based on medical history. Two iridology experts independently evaluated lacunas, crypts, and pigment spots, showing substantial agreement (kappa values: 0.76 for lacunas, 0.73 for crypts, and 0.74 for pigment spots). The lung disease group (n=60) demonstrated a higher prevalence of lacunae, crypts, and pigment spots in the iris's lung region compared to the control group (n=315). Statistically significant findings were noted for crypts (p=0.004, odds ratio=2.29), with increased significance when considering all indices (p=0.000, odds ratio=3.38). According to the results, individuals with lower tissue density in the iris's lung region appear to be more susceptible to lung diseases. A subsequent investigation is imperative to elucidate these findings further.

keywords : Iris, Connective tissue, Lung disease, Retrospective controlled study

Introduction

Iridology is the study of examining structural and pigment changes in the iris concerning specific iris compartments[1]. As the human body undergoes development, its organs establish genetic and functional interconnections. Iris indices seem to mirror these genetic and constitutional attributes, along with neural reflexes within the body. This correlation is attributed to the influence of genetic factors on iris indices, including iris density, pupil area ratio, and autonomic nerve wreath area ratio[2]. Examining the iris has the potential to unveil insights into an individual's personality[3] as well as provide indications of various systemic conditions such as diabetes[4,5], hearing loss[6], and obesity[7].

In conjunction with traditional East Asian medicine (TEAM), iridology can provide a valuable approach for diagnosing sub-health conditions. The combination of iridology and TEAM knowledge allows for the identification of a subset of patients who are predisposed to specific diseases by identifying their genetic vulnerabilities and categorizing their body constitution. Furthermore, this combined approach facilitates the identification of correlations between patients' symptoms with their genetic and constitutional susceptibilities, which aids in treatment prioritization and patient management. This comprehensive methodology enables the delivery of preventive care, empowering patients to proactively mitigate the onset of major diseases in the future[8]. A notable advantage is the accessibility of iris images, which can be obtained quickly and easily using any camera with adequate lighting. This ease of acquisition allows such information to be utilized even in challenging circumstances, such as during the coronavirus pandemic.

In today's society, environmental factors such as air pollution, fine dust, and smoking contribute to increased susceptibility to lung diseases[9-11]. However, a growing body of evidence suggests that genetic factors also play a significant role in influencing lung disorders, including asthma[12], chronic obstructive pulmonary disease (COPD)[10-13], pulmonary fibrosis[14], and lung cancer[15]. It is believed that a combination of environmental and genetic

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risk factors leads to the development of lung diseases.

The iris, arising from both neuroectoderm and periocular mesenchyme during embryonic development, shares embryological connections with nerves[16]. Moreover, being externally visible, it offers an accessible means to observe areas of tissue weakness characterized by low density. Iridology asserts that specific markers on the iris are indicative of the condition and health of various organs throughout the body. Iris markers provide insight into the phenotype of connective tissue formed during development, offering clues about a person's genotype. Additionally, the accumulation of markers due to aging, stress, tension, and exposure to toxins allows for a rough inference regarding the environmental factors individuals have experienced.

Within the iris, regions associated with the lungs are consistently described, typically positioned at 3 o'clock on the right side and 9 o'clock on the left side. The lung-related areas are mapped in the iris at approximately 8-10 o'clock for the right iris and approximately 2-4 o'clock for the left iris (Fig. 1a). The lung organ itself is mapped at around 9-10 o'clock for the right iris and around 2-3 o'clock for the left iris[1,17].

Despite the acknowledged impact of both environmental and genetic factors on lung health, there remains a dearth of correlation studies in Korea examining iris indices, such as connective tissue density and pigment spots in the lung region, in relation to susceptibility to lung disease. Consequently, we aim to fill this gap by investigating the association between connective tissue density in the lung region of the iris and patients afflicted with lung disorders.

Methods

1. Subjects and data collection

Iris images from 375 patients who visited Korean Medicine clinics and hospitals in Daejeon between 2019 and 2021 were used in this study. The iris images were captured using a CAMSCOPE Pro LED imaging device (Sometech, Seoul, South Korea). All patients consented to using their anonymized medical data for research purposes. The Daejeon University Institutional Review Board (IRB) granted a review exemption due to the study's retrospective nature (IRB no. 1040647-202102-HR-001-01). To compile relevant data, each patient's medical chart was thoroughly examined, with information about their respective disease lists extracted.

2. Patient classification and inclusion criteria

Based on their medical records, the patients were divided into two groups: (1) the lung disease group and (2) the control group. Individuals in the lung disease group were those who sought medical attention at Korean Medicine clinics and hospitals after receiving diagnoses of pulmonary disorders, encompassing conditions such as asthma, chronic obstructive pulmonary disease (COPD), pulmonary emphysema, pulmonary tuberculosis, pneumonia, bronchiectasis, pulmonary fibrosis, and lung cancer, as documented in their medical records. In contrast, individuals assigned to the control group had no prior medical history of pulmonary disorders. The control group was selected from patients aged 20 to 60 who visited Korean Medicine clinics during the same period. Patients with uncertainty regarding the precise nomenclature of their diagnosed pulmonary ailment were excluded from the study.

3. Identifying iris indices

Two Korean Medicine practitioners, who also possess expertise in iridology, conducted independent evaluations of the patients' iris images. Their comprehensive examination focused on identifying distinct features, namely lacunas, crypts, and pigment spots. Lacunas are depressions within the fibrous layer of the iris caused by a defect in fibrous tissue (Fig. 1b). Crypts, on the other hand, appear as deep square or rectangular cavities within the iris fibrous layer, near the collarette (Fig. 1c). Finally, pigment spots are pigmented areas of the iris that have a darker hue than the surrounding regions (Fig. 1d). These distinguishing characteristics served as key indicators during the iridology experts' meticulous analysis of the iris images. Cohen's Kappa coefficient was used to assess the two researchers' inter-rater reliability. Disagreements were resolved through discussion between the two researchers.

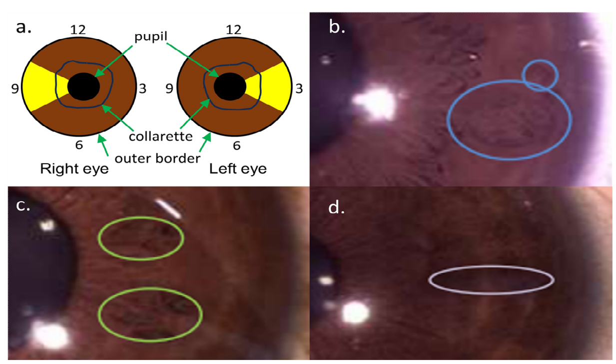

Fig. 1. Iris indices related to the lungs. The iris' lung-related areas (in yellow) (a); lacunas (b); crypts (c); and pigment spots (d).

4. Statistical analysis

Student's t-test and Chi-square tests were used to compare the demographic data of the lung disease group and the control group. The Chi-square test was used to compare the frequency of lacunas, crypts, and pigment spots in the lung disease and control groups. The threshold for statistical significance was set at $p<0.05$. Microsoft Excel 2019 (Microsoft Corporation, WA, USA) was used for all data analyses.

Results

1. Patients' demographics and medical histories

In this study, 60 patients out of a total of 375 were diagnosed with various lung disorders. A total of 24 cases of asthma, one case of COPD, 1 case of pulmonary emphysema, 23 cases of tuberculosis, 6 cases of pneumonia, 3 cases of bronchiectasis, 1 case of pulmonary fibrosis, and 2 cases of lung cancer were included in the study. Furthermore, 2 patients had asthma and pneumonia comorbidities, while 1 patient had bronchiectasis and pneumonia comorbidities. There were 18 (30%) males and 42 (70%) females among the patients with lung disorders.

The control group consisted of the remaining patients (n = 315) who had no diagnosis of lung disorders based on their medical records. The control group patients reported diseases or conditions such as musculoskeletal pain (n = 95), obesity (n = 42), sleep disorder (n = 40), hypertension (n = 23), gastritis (n = 23), herniated intervertebral disc (n = 16), allergic rhinitis (n = 15), trauma (n = 13), type 2 diabetes (n = 11), depression (n = 8), atopic dermitis (n = 7), chronic fatigue syndrome (n = 6), hypothyroidism (n = 5), osteoarthritis (n = 5), urinary tract infection (n = 4), and fatty liver disease (n = 2). The control group included 109 (35%) men and 206 (65%) women. The lung disease group had a mean age of 42.0 ± 15.5, while the control group had a mean age of 46.8 ± 6.0 (Table 1).

2. Inter-rater reliability

Cohen's kappa values calculated between the two researchers revealed significant agreement in their assessments. Specifically, the values were 0.76 for lacunas, 0.73 for crypts, and 0.74 for pigment spots. The results indicate that the two researchers had a substantial degree of agreement in identifying lacunas, crypts, and pigment spots.

3. Frequencies of lacunae, crypts, and pigment spots in the lung disease group and the control group

Table 2 illustrates the frequency of patients in both the lung disease and control groups that exhibit lacunae, crypts, and pigment spots in the iris region corresponding to the lungs. A comparative analysis revealed that patients with lung disease had a higher percentage of lacunae, crypts, and pigment spots than the control group. The most noticeable difference was observed in the case of crypts. It is worth noting that the significance of the difference increased when all indices were considered together. Patients with lung disease had a higher prevalence of one or more indices, such as lacunae, crypts, or pigment spots, when compared to the control group.

Table 1. Demographics and characteristics of the patients

Group	Gender	Age
Lung disease group (n=60)		
asthma (n=24) [a]		
tuberculosis (n=23)		
pneumonia (n=6) [a,b]	18 (30%) male	
bronchiectasis (n=3) [b]	42 (70%)	42.0 ± 15.5
lung cancer (n=2)	female	
chronic obstructive pulmonary disease (n=1)		
pulmonary emphysema (n=1)		
pulmonary fibrosis (n=1)		
Control group (n = 315)		
musculoskeletal pain (n=95)		
obesity (n=42)		
sleep disorder (n=40)		
hypertension (n=23)		
gastritis (n=23)		
herniated intervertebral disc (n=16)		
allergic rhinitis (n=15)	109 (35%) male	
trauma (n=13)	206 (65%)	46.8 ± 6.0
type 2 diabetes (n=11)	female	
depression (n=8)		
atopic dermitis (n=7)		
chronic fatigue syndrome (n=6)		
hypothyroidism (n=5)		
osteoarthritis (n=5)		
urinary tract infection (n=4)		
fatty liver disease (n=2)		
P-value	0.490	0.788

[a]comorbid asthma and pneumonia (n=2); [b]comorbid bronchiectasis and pneumonia (n=1); Data are represented as number (percentage) or mean ± SD.

Table 2. Frequencies of lacunas, crypts, and pigment spots in the lung disease group and the control group

Iris index	Lung disease group (n=60)	Control group (n=315)	P-value	Odds ratio
Lacunae	16 (27 %)	70 (22 %)	0.453	1.27
Crypts	27 (45 %)	83 (26 %)	0.004**	2.29
Pigment spots	7 (12 %)	33 (10 %)	0.784	1.13
All [a]	49 (82 %)	179 (57 %)	0.000***	3.38

Data are represented as number (percentage); P-value for Chi-square test was significant at * $p<.05$, ** $p<.01$, *** $p<.001$; [a]"All" denotes the presence of one or more lacunae, crypts, or pigment spots in the left, right, or both iris regions corresponding to the lung.

Discussion

Iridology and TEAM perceive various parts of the human body as intricately interconnected both structurally and functionally. Pathological conditions are believed to manifest and be projected in different areas of the body including the iris, as a consequence of inherent weaknesses, environmental influences, and metabolic reactions influenced by genetic vulnerabilities. Given that the iris is considered an anatomical extension of the brain, there is continuous bidirectional communication of nerve impulses between the iris and the brain along the neural pathway[1]. This perspective emphasizes the notion that the state of the iris can reflect and be influenced by broader physiological and environmental factors.

The iris contains two types of markers: "constant markers" that remain constant over time and "variable markers" that can be changed throughout a person's lifetime. "Constant markers", or invariant markers, are typically shaped and determined by genetic factors. Lacunas and crypts are examples of constant, invariant markers that represent weak connective tissues in the surface fibers of the iris. Lacunas, depressions within the iris fibrous layer caused by defects in fibrous tissue, are associated with genetic weakness, vulnerability to inflammatory responses, and vulnerability to degeneration of associated organs and tissues in iridology. Crypts, which are deep square or rectangular holes within the iris fibrous layer, may indicate susceptibility to cellular damage in nearby organs and tissues[1,13]. "Variable markers", on the other hand, include reflex markers and pathophysiological markers. Pathophysiological markers in the iris can change in response to physiological and pathological phenomena in the body, whereas reflex markers mirror the central nervous system and autonomic nerve reflexes[18]. In the context of this study, an analysis was conducted comparing lacunas, crypts, and toxic spots in the iris within the area corresponding to the lungs.

Several studies have been conducted to investigate the relationship between iris markers and specific health conditions. For instance, Salles et al.[3] investigated the relationship between diabetes and iris markers, focusing on signs of tissue weakness in regions associated with the pancreas. The study included 97 diabetic patients aged 30 and up who were receiving nursing care. The researchers looked into two specific iris markers: (1) the 'pancreas sign,' which denotes a rupture of the area corresponding to the pancreas at the 7 o'clock position of the right iris, and (2) the 'cross of Andreas,' which involves lacunae near the autonomic nerve wreath (or the collarette) at the 2, 4, 8, and 10 o'clock positions of the iris. The 'cross of Andreas,' initially studied by German iridologists, is indicative of pancreatic endocrine and exocrine dysfunction, often associated with poor eating habits and challenges in altering dietary patterns. The findings of the study revealed a high prevalence of pancreas signs among diabetic patients, reaching 98 percent, while the prevalence based on the 'cross of Andreas' was 89 percent. Additionally, the study identified associations between the 'cross of Andreas' sign and variables such as gender, body mass index (BMI), and family history.

Meanwhile, Lim et al.[7] conducted a study examining the association between iris markers and indicators of obesity. The study focused on the relationship between body impedance and iris markers like the autonomic nerve wreath and pancreas signs. The researchers discovered significant relationships between various iris markers and obesity indicators. The ratio of autonomic nerve wreath length to total iris length, as well as the area within the autonomic nervous wreath, had a significant correlation with BMI. Furthermore, the number of lacunae in the pancreatic region of the iris was found to be significantly related to both BMI and body weight. Furthermore, the study revealed that the pupil area exhibited significant correlations with height, body water, protein, minerals, lean body mass, skeletal mineral mass, and basal metabolic rate.

Bansal et al.[19] conducted a study on the relationship between iris indices and lung diseases. The goal of this study was to create a diagnostic tool for predicting obstructive pulmonary diseases using iris images. The study included spirometry tests on 100 people, as well as the capture of iris images. The investigation specifically focused on the lung areas of the iris, positioned between 2 and 3 o'clock in the left iris and 9 and 10 o'clock in the right iris. Comparing the findings from these iris areas with spirometry data, the study achieved notable accuracies. Specifically, a wavelet-based model demonstrated an accuracy of 89.0 percent, while a Gabor filter-based model achieved an accuracy of 88.0 percent. These results suggest the potential utility of iris images in developing diagnostic tools for predicting obstructive pulmonary diseases, offering valuable insights into the intersection of iridology and respiratory health assessment.

Rehman et al.[20] extracted iris texture (gray-level co-occurrence matrix, GLCM) and statistical features using machine learning techniques, classified the subjects and they could classify obstructive lung diseases with an accuracy of 97.6%. Their extracting regions of interest were iris segments from 2 to 4 o'clock for the left iris and from 8 to 10 o'clock for the right iris. Their work also suggest that it is possible to use iris features for non-invasive early diagnosis of obstructive lung diseases.

The information obtained from the iris not only aids in patient identification, but it can also play an important role in the advancement of both TEAM and public health. Using insights from iridology and TEAM allows for the prediction of vulnerable areas within the body and facilitates tailored management strategies, thereby improving treatment efficacy. Furthermore, in a society dealing with pandemics like the coronavirus, iridology emerges as a valuable tool for public health management. Its ease of use, non-invasiveness, and efficacy make it a useful screening tool for identifying inherent body weaknesses rooted in an individual's constitution and genetic characteristics. Iridology, by providing such insights, can contribute to proactive health management and be useful in public health initiatives during difficult times.

In Sasang medicine, Dr. Lee, Je-ma's conceptualization of the human being includes two fundamental perspectives: an ontological view, which recognizes differences in organ physiology among Taeyangin, Soyangin, Taeeumin, and Soeumin, and an actionist view, which emphasizes the potential to overcome inherent weaknesses through acquired cultivation[21]. These constitutional differences in physiological strengths and weaknesses in organ functions lead to variations in determining health status, diagnosing and prescribing diseases, and predicting prognosis based on one's constitution[22].

In a retrospective chart review conducted by Choi et al.[23], the relationship between constitution and iris index was examined. The authors found that the ratio of the area of the autonomic nerve wreath of the iris was more significant in Taeeumin and Soyangin compared to Soeumin and Taeyangin. Notably, Taeeumin exhibited the highest ratio of the autonomic nerve wreath area. This study contributes to our understanding of how constitutional factors are related to iris indices, shedding light on the intersection of Sasang medicine and iridology.

Park et al.[24] investigated the density of iris connective tissue in patients with Qi-deficiency chronic fatigue. Chronic fatigue patients also had symptoms of Qi deficiency in the lung, such as shortness of breath and increased susceptibility to colds. The density of the connective tissue that makes up the iris was found to be low in such patients with Qi-deficiency chronic fatigue. In Sasang constitutional medicine, Taeeumin's distinctive pathophysiology is regarded as a manifestation of the body's compromised lung function. Individuals with low tissue density in the lung area of the iris are frequently classified as Taeeumin in clinical iridology, and these individuals are identified as being particularly vulnerable to lung diseases. The findings highlight the potential importance of iris indicators in identifying constitutional vulnerabilities and health conditions, emphasizing the importance of further research in this area.

This study's findings suggest that low density of iris connective tissue is associated with susceptibility to various types of lung diseases. However, the logical basis for why the iris region corresponding to the lungs is related to lung disease susceptibility has not been established, which is a limitation of this study. One possible explanation is that type IV collagen is a major component of the lamina densa and lamina fibroreticularis of the iris, as well as the vascular and alveolar basement membranes of the lung[25,26]. Inferring from this, certain congenital weaknesses in human connective tissue may contribute to an increased vulnerability to lung diseases. At the same time, this susceptibility may manifest through a low density of connective tissue in the iris in a specific area.

Embryologically, a deficiency in connective tissue density during the development of bodily tissues signifies weakened structural integrity and susceptibility to functional defects. However, it is important to note that epigenetic vulnerabilities do not invariably result in disease manifestation[27]. In addition, with appropriate lifestyle management, diseases can be prevented and effectively managed.

First, the patient and control groups were differentiated solely based on history-taking, potentially overlooking undiagnosed lung diseases or decreased lung function within the control group. In addition, it was challenging to fully account for variables beyond pulmonary diseases. Moreover, the adequate sample size to validate the hypothesis remains undetermined. While there are suggestive indications of a possible link between low iris connective tissue density in specific regions and susceptibility to specific diseases, it's important to note that definitive research evidence establishing this link is currently lacking. More detailed and comprehensive research studies will be required in the future to establish a concrete and scientifically validated link.

Conclusion

In conclusion, this study suggests a link between low iris connective tissue density and susceptibility to various lung diseases. Pateints in the lung disease group exhibited a higher prevalence of lacunae, crypts, and pigment spots in the lung region of the iris compared to patients in the control group. The Chi-square test was used to determine statistical significance for crypts (p=0.004). Furthermore, when all indices were taken into account collectively, the significance of the difference increased (p=0.000).

The study does, however, acknowledge a limitation in the absence of a well-established logical basis for this relationship. According to the hypothesis, certain congenital weaknesses in human connective tissue may increase vulnerability to lung diseases, with this susceptibility potentially reflected in the iris's low density of connective tissue. While there are some hints, conclusive research evidence supporting this link is currently lacking, emphasizing the need for more extensive studies in the future to establish a scientifically validated link.

This study, being a retrospective case-control analysis based on patient charts, has certain limitations. First, It was challenging to fully account for variables beyond pulmonary diseases. Secondly, the required sample size to validate the hypothesis remains undetermined. Therefore, future research involving larger sample size with enhanced control measures is necessary to validate the findings of this study.

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