Fibrosis

Francisco Chen, Joy Li, Hannah Pei, Sally Lin, Tiffany Chen

The condition of fibrosis was already discovered in the 16th century, however it was not identified and was categorized with other more popular diseases such as pneumonia until the last century, it was studied and treatments developed.

Introduction

Fibrosis is a condition wherein the walls of the organs build up excess tissues in addition to scarring. The symptoms of fibrosis vary amongst the broad spectrum of different varieties of fibrosis. Most commonly, patients experience pulmonary fibrosis across the world and it is considered to be the most risky. However, other types of fibrosis like liver fibrosis, cardiac fibrosis, and skin fibrosis shouldn't be underemphasized. Fibrosis is characterized by its chronic inflammation symptom caused by irregular cell signaling (growth factor β1). The excessive accumulation of connective tissue is closely associated with organ malfunctions. When fibrosis is discovered early, it could be reversed; however, when fibrosis progresses to later stages without being addressed, reversal may not be probable.

Fibrosis is a condition where the process of tissue repair and inflammation occur at the same time. Most of the time it is due to the persistent production of growth factors or other proteins that stimulate connective tissues to take the place of normal tissues. Normal process of reparation is having new cells of the same type to replace the injured cells; however, in the case of fibrosis, the repair process becomes pathogenic and uncontrolled, resulting in the growth of permanent scar tissues.

The condition of fibrosis was already discovered in the 16th century, however it was not identified and was categorized with other more popular diseases such as pneumonia (genetic

related fibrosis such as cystic fibrosis was not discovered yet). Fibrosis remained undiscovered as to research and treatments until 1938, when American pathologist Dr. Dorothy Andersen provided the first description of cystic fibrosis in the medical literature, calling it “cystic fibrosis of the pancreas” based on her autopsy findings of children who died of malnutrition. At the same time, other physicians referred to this disease as “mucoviscidosis.”

History

In 1948, Dr. Paul di Sant’Agnese observed infants with cystic fibrosis who were dehydrated, finding that their sweat had a high concentration of salt. Later in the 1980s, the protein and gene that were responsible for this disorder was found. Since then, many new therapies have been introduced, continuing to increase the survival rate.

Today, researchers had deeper studies in fibrosis, finding that some fibrosis like pulmonary fibrosis were caused by infections such as tuberculosis; while some fibrosis such as cystic fibrosis were related to genetic defects.

Cause

Fibrosis is described as a condition when normal and healthy body tissues are replaced by damaged scar tissue, which could interfere with normal organ functions. There are many different types of fibrosis as well as the possible causes for it, and the causes have been categorized into infections and non-infectious factors. One of the main causes of fibrosis is viral infections. Certain viruses create parasites that can lead to fibrosis in the liver or heart, like in Chagas disease. Idiopathic pulmonary fibrosis (IPF), which refers to lung fibrosis that remains to be one of the most fatal fibrosis, has also been proved to be linked to some viral infections. In the

lungs and pleura (the lining around the lungs), fibrosis can often develop from infections, exposure to harmful substances such as asbestos, immune diseases, or post surgery miscare. Sometimes, inflammation in the wound area will heal without scarring, but in other cases, it might develop into fibrosis and the reason has not been fully understood. On the other hand, an clear example of non-infectious factor that leads to fibrosis can be seen in cystic fibrosis, which is a genetic problem that affects the CFTR protein–which regulates salt and water movement in cells–causes thick mucus to build up in mainly the lungs but also some other organs, leading to repeated infections and tissue damage that can eventually result in fibrosis. Furthermore in the kidneys, fibrosis is usually developed after injuries and can have a wide range of roles. It could act as a temporary replacement for damaged tissues, such as helping to rebuild tissue. But if it is developed at an incorrect timing, in some cases, it will block proper healing. While the cause of fibrosis is still being investigated, exposure to infections remains to be one of the biggest causes of it. Overall, fibrosis can both help repair tissue and block healing and contribute to long-term organ damage.

Symptom and Stage

After fibrosis begins, healthy tissue is slowly replaced by stiff scar tissue that cannot carry out its original functions. In the lungs, this scarring causes the walls of the tiny air sacs (alveoli) to thicken, making it harder for oxygen to pass into the blood (Mayo Clinic, 2023). In the liver, repeated damage—often from viruses, alcohol, or fatty liver—triggers cells to lay down collagen, which builds up and disrupts normal blood flow and detoxification (Medical News Today, 2023).

People with lung fibrosis usually first notice that they get unusually short of breath when walking or climbing stairs (Mayo Clinic, 2023). Over months, that breathlessness can appear even when resting. A dry cough that won't go away often develops alongside the breathlessness (Mayo Clinic, 2023). Because breathing takes more effort, fatigue and unintended weight loss are common (Verywell Health, 2023).

Liver fibrosis often starts quietly, with general tiredness or mild nausea as the liver struggles to process nutrients and toxins (Healthline, 2022). As scarring increases, people may notice a loss of appetite and discomfort or swelling in the upper right belly area (Health.com, 2023). In later stages, yellowing of the skin and eyes—called jaundice—can appear when bile flow is blocked by scar tissue (Cleveland Clinic, 2016).

Doctors group lung fibrosis into three simple severity levels based on oxygen needs and scan results:

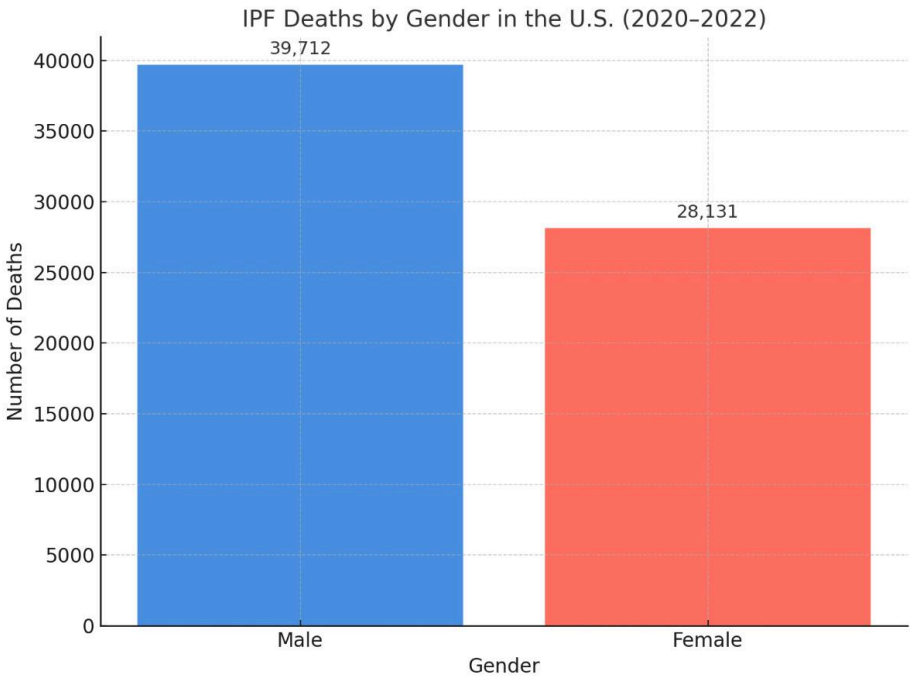
- Mild: Most people keep normal oxygen levels when resting, with only small patches of scarring on CT scans (American Lung Association, 2025).
- Moderate: Oxygen levels dip during activity, and scans show more widespread scarring (KCFPF).
- Severe: Oxygen is needed even at rest, and scarring covers large areas of the lungs (KCFPF).

Liver fibrosis staging relies on scoring from a liver biopsy, in which a small tissue sample is taken and examined under a microscope to assess the extent of scarring. The Metavir scale ranges from F0 (no scarring) to F4 (cirrhosis), while the Ishak scale goes from 0 (no fibrosis) to 6 (definite cirrhosis). Higher numbers mean more scar tissue, which helps doctors decide when to watch for complications like high blood pressure in the liver or liver cancer.

Although scar tissue cannot be erased completely, early treatment can slow or even reverse fibrosis in some cases. For lungs, medications called antifibrotics and breathing exercises help slow damage and improve daily function (Mayo Clinic, 2023). For the liver, treating the underlying cause, such as antiviral drugs for hepatitis, stopping alcohol, or weight loss, can allow the liver to heal and reduce scarring over time (Medical News Today, 2023).

Recognizing the first signs—breathlessness, cough, fatigue, or subtle digestive changes—and understanding these simple staging systems can help people seek help early. Early action offers the best chance to keep organs working and improve quality of life.

Statistic



Note: The data is obtained from *Centers for Diease Control and Prevention*

Global Impacts of Fibrosis

Fibrosis is a serious health condition that damages organs by causing scar tissue to build up, often affecting the lungs. Two common types are idiopathic pulmonary fibrosis (IPF) and cystic fibrosis (CF). As of 2023, IPF affects around 13 to 20 per 100,000 people globally, with about 100,000 cases in the U.S. alone. The 5-year survival rate for IPF is low, between 20% and 40%. Cystic fibrosis affects an estimated 162,000 people worldwide, but over 57,000 remain undiagnosed across 49 countries. These numbers show how fibrosis continues to be a global health issue, especially in places with limited access to diagnosis and treatment.

Conclusion:

The signs and symptoms of fibrosis could be subtle, making it hard for patients to identify the illness hence, it is important to get annual check ups to take precaution.

Reference

https://pathsocjournals.onlinelibrary.wiley.com/doi/full/10.1002/path.2277

https://www.nationaljewish.org/conditions/cf/history

American Lung Association. (2025). Pulmonary fibrosis overview.

https://www.lung.org/lung-health-diseases/lung-disease-lookup/pulmonary-fibrosis/introduction

Cleveland Clinic. (2016). Liver disease: *Signs & symptoms, causes, stages, treatment.*

https://my.clevelandclinic.org/health/diseases/17179-liver-disease

Di Bisceglie, A. M., et al. (2013). Prognostic value of Ishak fibrosis stage: *Findings from the HALT-C trial. Journal of Hepatology, 58(3), 436–442.*

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3814134/

Health.com. (2024). Signs and symptoms of liver disease.

https://www.health.com/liver-disease-symptoms-8399514

Mayo Clinic. (2023). Pulmonary fibrosis: *Diagnosis and treatment.*

https://www.mayoclinic.org/diseases-conditions/pulmonary-fibrosis/diagnosis-treatment/drc-20353695

Mayo Clinic. (2023). Pulmonary fibrosis: *Symptoms and causes.*

https://www.mayoclinic.org/diseases-conditions/pulmonary-fibrosis/symptoms-causes/syc-20353690

Medical News Today. (2023, April 12). Liver fibrosis: *Stages, symptoms, and treatment.*

https://www.medicalnewstoday.com/articles/325073

National Institutes of Health. (2017). Metavir and FIB-4 scores are associated with patient prognosis after curative therapy for hepatocellular carcinoma.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352096/

Verywell Health. (2023). Lung scarring: *What to know.* https://www.verywellhealth.com/lung-scarring-8651272

World Health Organization. (2024). Guidelines for the prevention, diagnosis, care and treatment of cystic fibrosis. Retrieved from https://iris.who.int/handle/10665/59698

- https://www.healthline.com/health/managing-idiopathic-pulmonary-fibrosis/ipf-facts#:~:text=Idiopathic%20pulmonary%20fibrosis%20(IPF)%20is,as%20much%20oxygen%20as%20needed.
- https://www.nhlbi.nih.gov/health/idiopathic-pulmonary-fibrosis
- https://www.sciencedirect.com/science/article/pii/S1569199322000315
- https://www.cdc.gov/mmwr/volumes/74/wr/mm7407a1.htm