SINOPULMONARY INFECTION

An infection of the paranasal sinuses and/or the lungs, associated with several conditions of impaired fertility.

診断

Relating Diagnoses:

Obstructive azoospermia

About Sinopulmonary infection

Sinopulmonary infection is an infection involving the paranasal sinuses and the airways of the lungs. It may involve inflammation of various parts of the respiratory system.

- Sinusitis (Pic. 1), or rhinosinusitis, is the inflammation of the mucous membranes of nose and paranasal sinuses. It represents a very common upper airway infection. It is mostly caused by viral infection, but may become complicated by subsequent bacterial infection.
- An inflammation of the airways in the lungs is called bronchitis, which can be divided into acute and chronic depending on the duration. Acute bronchitis (with duration up to three months) is also one of the most common diseases. Again, the most frequent cause is a viral infection.
- Inflammation of the alveoli (small air sacs of the lung) is called pneumonia, which can be also caused both by viruses or bacteria.

Sinopulmonary infections are among the most common diseases worldwide. However, frequent and recurrent sinopulmonary infections may be associated with some conditions of impaired fertility. These conditions include mainly Young’s syndrome, cystic fibrosis (CF) and ciliary dyskinesia, also known as immotile cilia syndrome. In the cases of Young’s syndrome and cystic fibrosis, the infertility is due to obstructive azoospermia in most patients.

Young’s syndrome

Young’s syndrome, also called azoospermia sinopulmonary infections syndrome, is a condition characterised by recurrent sinus infections, dilated bronchi in the lungs (bronchiectasis) and male infertility. Infertility in affected males occurs due to obstructive azoospermia. Sperm cells are produced normally in affected males, but do not reach the seminal fluid due to a physical obstruction of the genital tract, mostly the vas deferens (Pic. 2). Sperm cells (Pic. 3) are found in the epididymis (the tubules leading out of the testis) in a viscous, lipid-rich fluid. As the symptoms of Young’s syndrome are similar to those of cystic fibrosis and immotile cilia syndrome, the diagnosis of the syndrome includes ruling these conditions out.

Cystic fibrosis

CF is a systemic illness that affects multiple organ systems, including lungs, endocrine and epithelial tissues, gastrointestinal system, pancreas, and reproductive tract. It is caused by the presence of mutations in the gene for the cystic fibrosis transmembrane conductance regulator (CFTR) protein. CFTR is involved in production of sweat, digestive fluids, and mucus. When CFTR is not functional, secretions which are usually thin instead become thick. Due to abnormally thick mucus, cystic fibrosis patients suffer from frequent sinopulmonary infections, which are potentially life-threatening. Infertility affects both men and women. Almost 97% of male CF patients are infertile, but not sterile and can have children with assisted reproductive techniques (ART). This infertility is mainly secondary to an obstructive azoospermia (Pic. 4), caused in most cases by congenital absence of the vas deferens. Around 20% of women with CF have fertility difficulties due to thickened cervical mucus or malnutrition.

Primary ciliary dyskinesia
Primary ciliary dyskinesia (PCD) is a hereditary disease characterized by motile ciliary dysfunction that causes defects in the action of cilia lining the respiratory tract (lower and upper, sinuses, Eustachian tube, middle ear), fallopian tube, and flagella of sperm cells.

PCD comprises chronic upper and lower respiratory tract disease, infertility or ectopic pregnancy, and situs anomalies (abnormally located organs), and these may be associated with congenital heart abnormalities.

As a consequence of abnormal sperm structure, some, but not all, male patients with PCD have fertility problems. Sperm flagellum is a type of cilia. Therefore, abnormal ciliary structure may lead to the reduction or loss of the ability of the flagellum to swing, causing ultimately male infertility. Females may also suffer from reduced fertility due to impaired function of the Fallopian tubes, which are also lined by ciliated cells.

The treatment of sinopulmonary infections depends on the type of infection. Upper airway infections are mostly viral and should not be treated with antibiotics. Non-steroidal anti-inflammatory drugs can be used to help with fever. More severe bacterial infections, such as bacterial pneumonia, are treated with antibiotics based on the knowledge of the pathogen.

Associated diseases

- Young’s syndrome
- cystic fibrosis
- primary ciliary dyskinesia
- obstructive azoosperma

Complications

Infertility

Although sinopulmonary infections alone do not cause impaired fertility, some conditions typically associated with frequent sinopulmonary infections, mainly cystic fibrosis, Young’s syndrome and primary ciliary dyskinesia may lead to infertility in affected individuals.

Chronic lung disease

Longstanding pulmonary infections can lead to bronchiectasis, pathological dilation of the airways of the lung. These can easily get infected with bacteria, as the clearance ability of the affected airways is reduced. The bacteria tend to proliferate in the bronchial secretion, causing chronic lung inflammation, further damaging the airways and the lung tissue. The presence of bronchiectasis is also one of typical symptoms of Young’s syndrome.

Nasal polyps

Recurrent or long-lasting, chronic rhinosinusitis can cause the mucosa of the nasal cavity or the paranasal sinuses to proliferate and form mushroom-like protrusions, called polyps. These can further worsen the sinus infections and can cause muffled speech.

Risk factors

- viral respiratory infection
- weakened immune system
- allergy
- irritants in the air
- swimming
- genetic factors

Impact on fertility

Impaired fertility is commonly seen in patients with recurrent sinopulmonary infections due to disorders of the respiratory tract function. These include:

Young’s syndrome

Spermatogenesis is normal in men with Young’s syndrome. However, infertility is common due to obstructive azoosperma. There is a physical obstruction in the vas deferens, preventing the sperm from leaving the
epididymis, where they are found in viscous, lipid-rich fluid. The obstruction is sometimes regarded to be due to thickened secretions of the vas deferens.

**Cystic fibrosis**

Almost 97% of male CF patients are infertile, having significant anatomical abnormalities of the reproductive tract, in most cases a congenital bilateral absence of the vas deferens. Most CF women have a normal reproductive tract and may be able to conceive spontaneously, but multifactorial fertility problems can affect them also: the main cause could be the difficult transport of sperm through the female reproductive tract, secondary to thick secretions, but also lung function and nutritional status at the time of conception significantly influence their fertility.

**Primary ciliary dyskinesia**

Abnormal ciliary structure may lead to fertility problems in males with primary ciliary dyskinesia. The flagella of the sperm are also affected and may be unable to swing properly. Having immotile sperm is common among affected males, and spontaneous pregnancy is rarely achieved unless through artificial insemination, including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). Females with PCD may experience an increased rate of ectopic pregnancy and decreased fertilization ability, because of impaired ciliary function in the oviduct.

**Prevention**

The best method of prevention of sinopulmonary infections is avoiding contact with affected individuals and taking measures to reduce the spread of the infection. This involves covering the nose and mouth while infected, washing hands regularly or wearing a face mask. Irritants in the air and swimming, due to irritative properties of chlorine in the water, may also predispose the airways for an infection, so avoiding them may lower the risk of becoming affected. In cases of genetically determined disorders of the respiratory tract leading to frequent sinopulmonary infections, prevention is usually not possible.

**Symptoms**

The symptoms of sinopulmonary infection depend on the type of infection. In uncomplicated upper respiratory tract infections (e.g., rhinosinusitis), typical symptoms include cough, sore throat, runny nose, nasal congestion, headache, low-grade fever, facial pressure and sneezing. The cough and nasal discharge may persist for 14 days or more. A change in color and consistency of the nasal discharge to thick, greenish or yellow indicates a bacterial infection.

In bronchitis, cough is the predominant symptom. Depending on the duration, the bronchitis can be acute (usually around three weeks) or chronic (three months or more). In chronic bronchitis, sputum (phlegm) is usually coughed up.

Pneumonia usually manifests with productive cough, fever, chills, shortness of breath, increased respiratory rate and chest pain.

**Therapies**

**Self therapy**

While the condition must be managed by methods of conventional medicine, some self-help steps may be used to relieve the symptoms of the disease.

Sinusitis symptoms can be relieved by several methods. Getting lots of rest helps the organism regenerate and deal with the infection. Drinking enough fluids will help dilute the secretions of nasal mucosa and relieve the congestion of the nasal cavity. Applying wet, warm towels on the face can ease
the pain caused by congested sinuses. A nasal wash, a method of rinsing the nasal cavity with water or irrigation solution, helps to clear the nasal cavity and eases the drainage of sinuses.

Symptoms associated with bronchial infections, such as shortness of breath, coughing and wheezing, can be eased by many similar steps. They are not, however, going to reduce the duration of the disease. As in sinusitis, getting enough sleep and drinking lots of fluids are helpful in fighting the infection. Herbal remedies may be helpful, such as ginger root, which eases coughing out the mucus (phlegm). A traditional combination used for bronchitis is lemon and honey added to tea, which soothes the irritated airway surfaces, has antibacterial properties and eases expectoration. Throat lozenges may also help to reduce the irritation, specifically of the upper airways.

**Conventional medicine**

The treatment of sinopulmonary infections depends on the localization of the inflammation. Upper airway infections are, in the vast majority, caused by common respiratory viruses, and therefore they resolve spontaneously and do not require any (or only symptomatic) treatment. Bacterial infections that develop in the setting of viral infection or that affect the lower airways may be treated with antibiotics. Surgery is used rarely and only in severe cases that do not respond to the pharmacotherapy.

**Pharmacotherapy**

The vast majority of these community-acquired infections is initially caused by viruses, self-limited in their clinical evolution, and have no need of antibiotic treatment. A small percentage is complicated by secondary bacterial infection for which antibiotics could be useful. But the effect of antibiotic treatment, when pneumonia is not suspected, is at best moderate, indicating that a large amount of antibiotic prescriptions are in fact inappropriate and confer no benefit for the patient.

In cases of sinusitis, decongestants may be useful to reduce the nasal congestion, and non-steroidal anti-inflammatory drugs, such as ibuprofen, may be taken to reduce fever. However, in cases of uncomplicated viral infections, antibiotic treatment is not useful, and should be reserved for cases of subsequent bacterial infection.

The treatment of pneumonia depends on the causative pathogen. In bacterial pneumonia, antibiotic therapy significantly improves the outcome. Antibiotic choice depends initially on the characteristics of the person affected, such as age, underlying health, and the location the infection was acquired. The duration of treatment has traditionally been seven to ten days, but increasing evidence suggests that shorter courses (3-5 days) may be effective for certain types of pneumonia and may reduce the risk of antibiotic resistance. The addition of corticosteroids to standard antibiotic treatment appears to improve outcomes. In patients with severe shortness of breath, oxygen therapy may be necessary.

**Surgical therapy**

Surgery is used only in cases of localized, recurrent suppurative infections of the lungs that do not respond to conservative treatment. It can be used in the case of bronchiectasis, where the distended airways tend to retain mucus and are a source of bacterial growth. If the bronchiectasis are localised, the tissue segment can be surgically removed. Similarly, a lung abscess filled with pus may require surgical incision and drainage, to prevent further spread of the infection and possible rupture of the pus-filled cavity.

**Assisted reproduction**

If conservative medical treatments fail to achieve a pregnancy, the physician may suggest the patient to use the methods of assisted reproduction. The vast majority of patients with sinopulmonary infection do not suffer from infertility, but patients with recurrent infections due to cystic fibrosis, Young’s syndrome or primary ciliary dyskinesia have frequently associated fertility issues, in males due to obstructive azoospermia, immotile sperm, or less frequently other causes.

Intracytoplasmic sperm injection (ICSI) is beneficial in the case of male factor infertility where sperm counts are very low or failed fertilization occurred with previous IVF attempt(s). The ICSI procedure involves a single sperm carefully injected into the center of an egg using a microneedle. With ICSI, only
Two techniques that enable to some extent the selection of physiologically normal spermatozoa have recently been developed. One of these is termed intracytoplasmic morphology-selected sperm injection (IMSI). Here, spermatozoa are selected for ICSI and analysed digitally prior to the microinjection procedure in order to deselect morphologically abnormal spermatozoa. With this technique, abnormalities not visible in standard ICSI procedures have been observed. IMSI increases the pregnancy rate during ICSI cycles, and some data suggests that the level of pregnancy termination is also decreased. A second technique recently introduced to assisted reproduction is that of sperm selection with hyaluronic acid (HA), e.g. physiological ICSI (PICSI). In this technique, mature sperm with HA receptors are distinguished from immature and abnormal sperm as these do not express such receptors.

Men who ejaculate no sperm, because of blocked tubes in their testes, or because of a genetic condition that prevents their sperm being released, require some form of surgical sperm retrieval to enable ICSI to take place. Epididymal sperm obtained by microsurgical aspiration (MESA) or percutaneous sperm aspiration (PESA) and testicular sperm obtained by surgical excision (TESE) or percutaneous aspiration (TESA) are used in ICSI treatment. Alternatively, the retrieved sperm can be cryopreserved (stored using special freezing methods) for use in future sperm injection attempts.

If all efforts to extract vital sperm cells fails, then donated ones may be recommended.

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**Diagnoses**

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Absence of sperm in the ejaculate despite normal spermatogenesis, caused by an obstruction of the genital tract.
Learn more at: [www.fertilitypedia.org/therapy/diag/obstructive-azoospermia](http://www.fertilitypedia.org/therapy/diag/obstructive-azoospermia)

**Therapies**

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Process by which a woman donates eggs for purposes of assisted reproduction or biomedical research.
Learn more at: [www.fertilitypedia.org/edu/therapies/egg-donation](http://www.fertilitypedia.org/edu/therapies/egg-donation)

**ICSI**
A micromanipulative fertilization technique in which a single sperm is injected directly into an egg.
Learn more at: [www.fertilitypedia.org/edu/therapies/icsi](http://www.fertilitypedia.org/edu/therapies/icsi)

**Sperm donation**
The procedure in which a man (sperm donor) provides his sperm for fertility treatment.
Learn more at: [www.fertilitypedia.org/edu/therapies/sperm-donation](http://www.fertilitypedia.org/edu/therapies/sperm-donation)

**Standard IVF**
A process in which an egg is fertilised by sperm outside the body: in vitro. Own or donated gametes may be used.
Learn more at: [www.fertilitypedia.org/edu/therapies/standard-ivf](http://www.fertilitypedia.org/edu/therapies/standard-ivf)
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