Explore the diagnosis and treatment of avascular necrosis of the femoral head

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Abstract: Avascular necrosis of the femoral head (ANFH) is a common bone disease in clinic, and its diagnosis and treatment have been paid much attention. In diagnosis, in recent years, the progress of medical imaging technology has significantly improved the early detection of ANFH. In terms of treatment, it is increasingly important to make an individualized treatment plan. Surgical intervention, such as hip replacement, is suitable for cases with serious disease progression. In the future, the diagnosis and treatment of ANFH will be more refined and individualized, combining biomarkers, imaging technology and individual characteristics to provide more effective treatment and better disease management. In addition, interdisciplinary cooperation and future research will continue to promote the development of this field and provide better diagnosis and treatment options for patients with ANFH. The purpose of this study is to explore the diagnosis and treatment of ANFH, so as to provide the latest insights about this disease.

1. Introduction

Avascular necrosis of the femoral head (ANFH) is a disease, which usually occurs near the hip joint and involves the interruption of blood supply to the femoral head, leading to the death and collapse of bone tissue. This disease may be caused by many factors, such as fracture, alcoholism, chronic use of steroid drugs, uneven intra-articular pressure, or primary blood vessel supply problems.

ANFH is a clinical challenge, because it usually appears in the young and active stage of patients, which has obvious negative impact on their quality of life and function [1]. Early diagnosis and treatment are very important to prevent or delay the progress of the disease. With the continuous progress of medical science, we have a deeper understanding of the diagnosis and treatment of ANFH, providing more opportunities to improve the quality of life of patients.

The purpose of this paper is to discuss the diagnosis and treatment of ANFH, including imaging examination, clinical symptoms, disease stages, treatment options and the latest research progress. We will focus on the importance of early intervention and the advantages and disadvantages of different treatment methods to help clinicians and patients better understand and cope with this challenging disease. Through in-depth study on the diagnosis and treatment of ANFH, we hope to provide more effective medical care for patients, relieve their pain, improve their quality of life, and finally restore their mobility.

2. Definition and etiology of ANFH

ANFH is a clinicopathological disease, which usually refers to the pathological changes of bone tissue in femoral head, which leads to cell necrosis and bone tissue collapse [2]. This disease, also known as "avascular necrosis of femoral head" or "necrosis of hip joint", is a common disease of bone condyle, especially in middle-aged and elderly people.

The causes of ANFH are various and usually include the following factors:

Insufficient blood supply: one of the most common causes is the obstruction of blood supply to the femoral head. This may be caused by impaired arterial blood supply, thrombosis or other blood circulation problems. Insufficient blood supply will lead to insufficient oxygen and nutrition for bone cells of femoral head, which will eventually lead to cell death.

Bone injury: Fracture, joint dislocation or other bone trauma may interfere with the blood supply

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to the femoral head and increase the risk of necrosis.

Alcoholism and smoking: Long-term heavy alcoholism and smoking will affect vascular health and increase the risk of ANFH.

Steroid use: Long-term or high-dose steroid use will damage bones and blood vessels, which may lead to ANFH.

Other potential factors: Other factors, such as obesity, hypertension, diabetes and other chronic diseases, may also increase the risk of ANFH.

The main symptoms of ANFH are pain, limited joint movement and discomfort. Early lesions may not be easy to detect, but if not treated in time, the condition may gradually deteriorate, eventually leading to serious damage to the hip joint, and even need hip replacement surgery to correct it.

3. Symptoms and diagnosis of ANFH

3.1. Symptoms of ANFH

The symptoms of ANFH usually appear gradually and will get worse with the progress of the disease. These symptoms may vary, depending on the severity of the disease, but the following are some common symptoms:

Hip pain: The most prominent symptom of ANFH is hip pain, which is usually gradual. Pain can radiate to the thigh in different parts, such as the front of the hip, the inside of the hip joint or the knee, showing dull or dull pain.

Pain aggravation: The pain may be aggravated during exercise or load bearing, causing the patient to feel uncomfortable when walking, standing or exercising.

Difficulty in walking: With the aggravation of pain, ANFH patients may find it more difficult to walk and lose their normal gait.

Stiffness of joint: Patients may feel stiffness of hip joint in the morning or after sitting and lying for a long time, and this stiffness will usually be relieved within a period of time.

Muscle weakness: Due to joint pain and functional impairment, the surrounding muscles may atrophy, leading to muscle weakness.

Limited range of motion: Patients may find that the range of motion of the hip joint is limited, for example, the hip cannot be flexed or rotated.

Pain radiation: Pain may radiate to the area around hip, including thigh, waist and knee, which may lead to misunderstanding of the cause of symptoms.

3.2. Diagnosis of ANFH

(1) Clinical examination

ANFH is characterized by insufficient blood supply to femoral head bone tissue, which leads to bone cell death and joint function damage [3-4]. This disease usually causes pain, muscle weakness and joint stiffness, and even leads to arthritis in severe cases. Early examination of ANFH is very important for timely intervention and treatment, so the study of clinical examination in this field is very important.

In the clinical examination of ANFH, the first task is to understand the patient's medical history and symptoms. Patients may report symptoms such as hip pain, fatigue, joint stiffness and motor dysfunction [5]. By asking the patient's medical history in detail and observing the duration and degree of symptoms, the doctor can preliminarily judge whether there is the possibility of ANFH.

(2) Imaging examination

X-ray is one of the most commonly used imaging examination methods of ANFH. Through X-rays, doctors can observe the shape and density changes of femoral head. The early X-rays of ANFH may not show abnormalities, but with the progress of the disease, the bones may show characteristic changes such as necrotic areas, bone collapse, bone deformity and narrowing of joint space [6]. Although X-ray is an economical and easy-to-obtain examination method, its sensitivity in early diagnosis is limited.

Magnetic resonance imaging (MRI): MRI is a non-invasive high-resolution imaging examination, which is very valuable for the early diagnosis of ANFH and the monitoring of disease progress. MRI can provide detailed cross-sectional images, showing the blood supply and tissue changes of femoral head. It can detect pathological changes such as necrosis area of femoral head, soft tissue injury and joint cavity effusion. MRI is highly sensitive in the early stage of finding diseases.

CT scan can provide more details about bone structure, especially for the location and evaluation of necrotic areas and bone collapse. Although CT scanning is not usually used as the primary screening tool for ANFH, it can provide additional information in complex cases to help doctors make accurate diagnosis and treatment plans.

Nuclear medical examination, such as single photon emission computed tomography (SPECT) or positron emission tomography (PET), can be used to evaluate the blood supply of femoral head. These tests are usually used for early diagnosis and monitoring of diseases, especially for those cases that cannot be diagnosed clearly [7-8].

Generally speaking, the imaging examination of ANFH plays a vital role in diagnosis, disease progress monitoring and treatment planning. Different examination methods can complement each other to help doctors understand the patient's condition more comprehensively, so as to provide the most suitable treatment plan. It is very important to diagnose the early stage of ANFH, because early intervention can relieve pain, delay the progress of the disease and improve the chances of successful treatment.

(3) Bone scan

Bone scanning is a nuclear medical imaging technique, which can be used to evaluate the degree and location of ANFH. This test uses radioactive tracers, which are enriched in bone tissue in the body, especially in damaged bone areas. Bone scanning can help doctors diagnose ANFH before or early symptoms appear, which is very important for taking early treatment measures. Bone scanning can determine the exact location of ANFH and help doctors know which parts are affected. Bone scanning can be used to monitor the progress of the disease and help doctors understand the evolution of the disease so as to adjust the treatment plan. According to the results of bone scanning, doctors can make more accurate treatment plans, including drug therapy, physical therapy or surgery.

Scanning is a powerful tool for early diagnosis, lesion localization, disease monitoring and treatment planning, which is helpful to provide better medical care and improve the quality of life of patients [9]. Therefore, bone scanning is a very valuable diagnostic tool when ANFH is suspected.

(4) Blood examination

C- reactive protein (CRP) and white blood cell count: These indicators are usually used to evaluate the level of inflammation. ANFH may lead to inflammatory reaction in the early stage of the disease, so CRP level may increase. The white blood cell count may also increase, reflecting the inflammatory state. These indicators can help doctors diagnose and monitor the severity of ANFH.

Platelet count: Platelets play a key role in the formation of blood clots. For ANFH patients, especially in severe cases, the risk of blood clot formation may increase. Therefore, detecting platelet count can help doctors evaluate patients' coagulation function and make appropriate treatment plans.

Blood biochemical indicators: Biochemical indicators in blood, such as blood sugar, liver enzymes (ALT, AST) and muscle enzymes (CPK), can provide information about systemic diseases, and these indicators also play an important role in the management of ANFH. Hyperglycemia and abnormal enzyme levels may be related to bone health problems.

Thyroid function examination: Thyroid dysfunction may affect bone health, so it is important for ANFH patients to examine thyroid function to rule out potential thyroid problems.

Blood lipid examination: high cholesterol and hyperlipidemia may be related to bone health problems. By checking cholesterol, triglycerides and other lipid parameters in the blood, doctors can assess the cardiovascular health of patients, because cardiovascular problems may lead to ANFH.

In the process of treating and managing ANFH, the results of blood tests can help doctors make personalized treatment plans, monitor the progress of the disease and provide comprehensive health assessment. Patients should receive regular blood tests to ensure timely intervention and management of the disease, so as to minimize the progress of bone necrosis and the risk of complications.

It should be emphasized that blood tests are usually not used to directly diagnose ANFH, but as an auxiliary tool to evaluate patients' overall health and possible complications. The diagnosis of ANFH usually needs to be combined with imaging examination, such as X-ray, MRI and clinical symptoms.

(5) Joint puncture

Joint puncture can be used to determine the diagnosis of ANFH. By analyzing fluid samples in joints, doctors can detect inflammatory markers, cell count, protein level and bacterial infection. This helps to exclude other joint diseases, such as infectious arthritis, to ensure the correct diagnosis. ANFH is usually accompanied by intra-articular inflammation, which can lead to pain and other symptoms. By analyzing the joint fluid, doctors can evaluate the degree of inflammation and guide the treatment strategy. Joint puncture can also be used to monitor the effectiveness of treatment to ensure that inflammation is gradually reduced during treatment. In some cases, joint puncture can also be used for treatment. Doctors can inject drugs directly into the affected joints through joint puncture to relieve pain, reduce inflammation and improve joint function. This treatment method is usually called joint effusion aspiration and injection treatment.

In a word, joint puncture plays an important role in the diagnosis, treatment and management of ANFH. It can provide key information about disease state, inflammation level and treatment effect, and help doctors provide better medical care for patients. However, this process should be carried out under the supervision of a professional medical team to ensure the safety and comfort of patients.

4. Treatment of ANFH

4.1. Medication

Non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen and phenacetin, can be used to relieve the pain and inflammatory symptoms of patients with ANFH. They can help patients cope with pain better, but they will not cure the disease itself. Some drugs, such as etopin and alendronate, can be used to maintain the stability of bones and prevent the progress of bone necrosis. They work by promoting bone regeneration and reducing bone absorption. In addition to NSAIDs, doctors can also prescribe drugs, such as opioids or other pain management drugs, to help patients better deal with the pain caused by ANFH.

It should be noted that drug therapy is usually combined with other treatment methods (such as physical therapy, weight loss, surgical intervention, etc.) to achieve better therapeutic effects. Patients should be treated under the guidance of professional doctors and strictly follow the doctor's advice. In addition, each patient's situation is unique, and the treatment plan should be based on the specific situation.

4.2. Surgical treatment

Fracture reduction This operation improves the shape and function of the hip joint by repositioning the bone and fixing it. However, it is usually used for early illness and may not be effective enough for serious cases. Artificial joint replacement, which is a common surgical method, includes total or partial hip replacement to restore function and relieve pain. This is very effective for the advanced cases of ANFH, but the life of joint prosthesis and possible complications need to be considered. Gene therapy and stem cell therapy, which are relatively new treatments, are aimed at treating ANFH by promoting the growth and repair of new bone cells. Although in the research stage, it shows potential.

Artificial joint replacement can usually relieve pain and improve function quickly, but the

operation risk is high and it takes a long time to recover after operation [10]. Gene therapy and stem cell therapy have low surgical risk, but the curative effect may take a long time to appear, and more research is needed to verify its long-term effect.

When deciding the surgical treatment of ANFH, doctors should choose the appropriate treatment method according to the specific conditions of patients, including the severity of illness, age, health status and other factors. In addition, postoperative rehabilitation is also very important, patients need to actively participate in physical therapy and follow the doctor's advice in order to obtain the best treatment effect. In a word, ANFH surgery is an important treatment, which can relieve pain, improve function and help patients return to normal life.

4.3. Lifestyle management

ANFH can cause pain, stiffness and limited function of hip joint, and in severe cases, surgery may be needed. But in many cases, lifestyle management can help alleviate symptoms, delay the progress of the disease, and even reduce the need for surgery.

ANFH is related to weight. Overweight will increase the burden on the femoral head and accelerate the progress of the disease. Maintaining an appropriate weight can reduce the burden on joints and reduce the risk of pain and further damage. Diet is essential for maintaining bone health. Take enough vitamin D and calcium to promote bone growth and repair. In addition, eating foods rich in antioxidants can help reduce inflammation. High impact or excessive exercise may increase the burden on the hip joint and aggravate the pain. At the doctor's suggestion, choosing suitable low-impact exercise, such as swimming or yoga, can help maintain muscle strength and joint flexibility, and at the same time relieve pain. Tobacco and excessive alcohol intake are both related to bone health problems. Smoking can damage blood vessels and reduce blood flow, while alcohol may have harmful effects on bones. Quitting smoking and limiting alcohol intake can improve bone health. Physical therapy and rehabilitation exercises can help improve muscle strength and joint flexibility, relieve pain and improve hip function.

Lifestyle management of ANFH is very important for alleviating symptoms, delaying disease progression and reducing the need for surgical intervention. Patients should actively adopt healthy lifestyle habits and make personalized management plans under the guidance of doctors to improve the quality of life and maintain bone health.

ANFH is a serious joint disease, and the treatment varies according to the specific conditions of patients. Early diagnosis and treatment is very important, because it can relieve symptoms, improve the quality of life and avoid further hip pain and dysfunction. Patients should choose the most appropriate treatment method under the guidance of professional doctors to achieve the best treatment results.

5. Future research and development direction

ANFH is a disease, which usually occurs when the blood supply to the femoral head (the upper part of the thigh bone) is interrupted or reduced, resulting in the gradual death of bone tissue. This problem seriously affects the quality of life of patients, and if it is not intervened in time, it may lead to serious degenerative diseases of hip joint. Although some progress has been made, there are still some challenges in the diagnosis and treatment of ANFH.

Understanding the genetic basis of ANFH is very important for the development of diagnosis and treatment. Future research can focus on finding genetic variation related to the disease to help identify high-risk individuals and improve individualized treatment methods. It is very important to find biomarkers that can be targeted for diagnosis and monitoring for early detection of ANFH and tracking the changes of the disease. This will be helpful for early intervention and treatment and reduce the risk of joint degeneration.

Although surgical intervention is necessary in some cases, future research can explore non-surgical treatment methods, such as drug therapy, physical therapy and stem cell therapy, to alleviate patients' pain and improve their function. Considering that each patient's condition may be different, the future treatment should be more individualized. This includes making a treatment plan

according to the patient's age, gender, genetic background and severity of the disease.

6. Conclusions

ANFH is a complex and challenging disease, which needs multidisciplinary efforts to improve the diagnosis and treatment. Generally speaking, the field of diagnosis and treatment of ANFH is still developing, which requires interdisciplinary cooperation and continuous research efforts. Future research and clinical practice are expected to provide more innovative methods to improve patients' quality of life and alleviate their pain.

References

[1] Ng, V. Y., Granger, J. F., & Ellis, T. J. (2010). Calcium phosphate cement to prevent collapse in avascular necrosis of the femoral head. Medical Hypotheses, 74(4), 725-726.

[2] Bin, Shi, and, Gang, Li, & and, et al. (2010). Effect of antler extract on corticosteroid-induced avascular necrosis of the femoral head in rats - sciencedirect. Journal of Ethnopharmacology, 127(1), 124-129.

[3] Xu, M., & Peng, D. (2011). Mesenchymal stem cells cultured on tantalum used in early-stage avascular necrosis of the femoral head. Medical Hypotheses, 76(2), 199-200.

[4] Jankovits, D. A., Liska, W. D., & Kalis, R. H. (2012). Treatment of avascular necrosis of the femoral head in small dogs with micro total hip replacement. Veterinary Surgery, 41(1), 143-147.

[5] Wen, Q., Zhou, C., Luo, W., Zhou, M., & Ma, L. (2014). Pro-osteogenic effects of fibrin glue in treatment of avascular necrosis of the femoral head in vivo by hepatocyte growth factor-transgenic mesenchymal stem cells. Journal of Translational Medicine, 12(1), 114-114.

[6] Gagala, J., Tarczyńska, M., & Gawda, K. (2013). Response to comment on gagala et al.: clinical and radiological outcomes of treatment of avascular necrosis of the femoral head using autologous osteochondral transfer (mosaicplasty). Preliminary report. International Orthopaedics(8), 37.

[7] Ghosh, J., Manjunatha, Y. C., Thulkar, S., & Bakhshi, S. (2010). Avascular necrosis of femoral head in childhood acute myeloid leukemia: complication of chemotherapy without steroids. Pediatric Blood & Cancer, 51(2), 308-309.

[8] Zugravu, A. G., & Lupescu, V. (2013). Sat0362evaluation of diagnostic criteria in avascular necrosis of femoral head. Annals of the Rheumatic Diseases, 72(3), 706.

[9] Yu, X., Jiang, W., Pan, Q., Wu, T., & Yan Zhang. (2013). Umbrella-shaped, memory alloy femoral head support device for treatment of avascular osteonecrosis of the femoral head. International Orthopaedics, 37(7), 1225-1232.

[10] Horiuchi, H., Saito, N., Kobayashi, S., Ota, H., Taketomi, T., & Takaoka, K. (2010). Avascular necrosis of the femoral head in a patient with fabry's disease: identification of ceramide trihexoside in the bone by delayed-extraction matrix-assisted laser desorption ionization-time-of-flight mass spectrometry. Arthritis & Rheumatology, 46(7), 1922-1925.