

Investing the Combination of Age-related and the Symptoms, Treatments of Knee

Junxi Wang^{1,a,*}

¹*Dulwich International High School, Suzhou, 215021, China*

a. gwmsxb@outlook.com

**corresponding author*

Abstract: This study focuses on the symptoms and treatment of knees in different age groups. As knee joints face different problems at different ages, such as children prone to injury and congenital diseases, adolescent sports injuries and adolescent growth imbalance, adults often have chronic strain and acute trauma, and the elderly suffer from osteoarthritis and rheumatoid arthritis, this study is conducted. The paper comprehensively explores the knee related problems in children, adolescents, adulthood, and old age, covering physiological characteristics, common symptoms, diagnostic methods, and treatment methods. During research, literature review, clinical case data analysis, expert consultation and experience exchange were used. The common symptoms of knees in all age groups, such as growth pain in children, the corresponding diagnosis methods according to the characteristics of different age groups, and the precise treatment measures, including physics, medicine, surgery and rehabilitation training, which are of great significance to improve the quality of life of patients and reduce the social medical burden.

Keywords: knee symptoms, different age groups, diagnostic methods, treatment measures, clinical research

1. Introduction

As one of the largest and most complex joints in the human body, the knee joint plays a vital role in daily activities. For example, walking, running, jumping and other movements all depend on the normal function of the knee joint [1]. However, the knee joint faces various challenges and problems at different ages.

In childhood (0-12 years old), the knee joint is in a critical period of growth and development, and the bone, cartilage, ligaments, and other tissues continue to mature and improve. However, children at this stage are active and active, and they are prone to knee joint injuries due to accidental falls and collisions. At the same time, some congenital knee diseases may also be found in this period, such as congenital dislocation of the patella. These problems not only affect the child's current mobility but may also have a long-term impact on the subsequent development of the knee joint.

In the adolescent period (13-18 years old), with the rapid growth of the body and the significant increase in the demand for exercise, especially the frequency and intensity of physical activity participation increase, the pressure on the knee joint also rises sharply. This makes teenagers become a high incidence of knee joint sports injury group, meniscus injury, ligament strain and other

conditions are common. In addition, uneven growth and development may also lead to knee pain and other symptoms, which bring a lot of inconvenience to teenagers' life and study.

In adulthood (19-59 years old), people are faced with the dual pressure of work and life. Poor postures, such as standing, walking, and sitting for a long time, and overwork, can easily lead to chronic knee strain. For example, patellofemoral joint pain syndrome is more common in the adult population, and its symptoms are often recurrent, which seriously affects the quality of life of patients. At the same time, acute trauma such as traffic accidents and sports accidents will also cause serious injuries to the knee joint, which requires timely and effective treatment and rehabilitation.

In old age (60 years older), degenerative changes in the knee joint have become a major problem. With age, bone loss, cartilage wear, narrow joint space, and high incidence of osteoarthritis and other diseases. These diseases not only lead to pain, swelling and stiffness of the knee joint, but also limit the joint movement, seriously affecting the daily self-care ability and physical and mental health of the elderly, and bring heavy burden to the family and society.

As a result, Intensive study of knee joints at different ages has important practical significance and clinical value. From a clinical point of view, the accurate identification of the symptoms and characteristics of the knee joint at different ages is helpful for doctors to make accurate diagnosis and avoid misdiagnosis and missed diagnosis [2]. For example, knee pain in childhood may be growth pain or a manifestation of other serious diseases, and only the reasons behind the symptoms can be developed. There are still some controversies and shortcomings about the treatment methods and drug choices in different age groups [3]. Through this study, we can provide clinicians with a more comprehensive and scientific basis, optimize the treatment strategies, improve the treatment effect, and reduce the patient's pain and recovery time.

From the perspective of patients, understanding the problems of knee joints of different ages and the corresponding treatment methods can enhance patients' self-health care awareness and cognition of the disease. Patients can better cooperate with doctors according to their own age and symptoms, actively participate in the rehabilitation process, and improve the quality of life. Especially for elderly patients, effective treatment and rehabilitation can help them maintain certain mobility and improve their happiness in their later life [4].

Moreover, from a societal perspective, knee disease is one of the crucial factors leading to the loss of labor force and the consumption of medical resources. Through this study, it is expected to reduce the incidence and disability of knee disease, reduce the burden of medical care, and improve the overall health level and productivity of society.

This study focuses on "symptoms and treatment of knees at different ages (drugs / methods)" and aims to systematically explore the differences and associations in physiological characteristics, common symptoms, diagnostic methods, and therapeutic drugs and methods in childhood, adolescence, adulthood, and old age.

2. Common symptoms of the knee at different ages

2.1. Knee symptoms in childhood

In childhood, knee symptoms include growth pain and those related to congenital knee diseases. Growth pain is one of the most common symptoms of the knee in childhood. Usually occurs in the evening or night, pain is bilateral knee, may also involve the calf muscles. The pain is mild to moderate, intermittent, and resolves spontaneously after a few minutes to several hours. The main reason is that children's bones grow rapidly, while the surrounding nerves, tendons and muscles grow slowly, resulting in muscle traction and pain. This pain does not affect children's daily activities, and usually has no obvious symptoms during daytime play, and only occurs during rest or nighttime sleep [5].

Some children may have congenital patellar dislocation, knee varus (O leg), or knee valgus (X leg) and other diseases. In children with congenital patellar dislocation, the patella may not be in the normal position, and there may be sound, lag, or even pain, which can affect the flexion and extension function of the knee joint. Children with knee varus or knee valgus, with obvious abnormal appearance of the knee joint and changed posture when walking, may lead to uneven stress of the knee joint, causing pain and joint wear. In addition, some children may suffer from knee dysplasia, such as femoral condylar dysplasia, which may lead to knee instability, easy to sprain, swelling, pain and other symptoms [6].

2.2. Knee symptoms in adolescence

Adolescence is a stage when the knee is highly susceptible to both sports injuries due to increased physical activity and symptoms related to unbalanced growth and development.

Sports injury-related symptoms: teenagers are active, participate in sports activities frequently, sports injury is more common. When meniscus injury, the knee joint may appear pain, the pain position is mostly in the joint space, especially in the flexion and extension of the knee joint or torsion when the pain intensifies, sometimes can be accompanied by ringing and interlocking phenomenon, that is, the knee joint suddenly stuck and cannot move, and can be unlocked after a little activity[7]. Ligament strain, such as anterior cruciate ligament or collateral ligament injury, can cause severe pain in the knee, then swelling and congestion, and decrease in joint stability. Patients feel knee weakness and shaking when walking or exercising and are unable to walk with weight in severe cases.

Symptoms of unbalanced growth and development: In the stage of rapid growth and development in teenagers, the bone growth rate is faster than the growth of muscles and tendons may lead to muscle tension around the knee joint or inflammation of tendon attachment points, causing knee pain. This pain is mostly dull pain, which is aggravated after a long time of standing, walking or exercise, and can be relieved after rest. In addition, some teenagers may have tibia tubercle epiphysis, manifested as pain and swelling in the tibia tuberosity (below the knee). The pain is obvious when pressing, especially in running, jumping and other exercises, which is caused by the patellar ligament pulling the tibia nodocle epiphysis.

2.3. Knee symptoms in adulthood

In adulthood, the knee is frequently afflicted by a combination of chronic strain resulting from daily work and lifestyle habits and acute trauma incidents, giving rise to a diverse range of symptoms.

Patellofemoral joint pain syndrome: This is one of the most common symptoms of chronic knee strain in adulthood. Patients often feel pain in the front of the knee, especially up and down stairs, squatting or long knee flexion pain aggravation, can be reduced after rest. The degree of pain is moderate and can be accompanied by knee joint weakness. The main reasons are the cartilage wear of the patellofemoral joint surface and the abnormal movement trajectory of the patella, leading to the uneven pressure distribution of the patellofemoral joint, causing pain.

Synovitis: due to long-term strain, cold or mild trauma and other factors, the knee synovium is stimulated, produce inflammatory reaction. Patients' knee joints will appear swelling and pain, and the degree of swelling can vary according to the severity of the disease. In mild cases, only mild swelling of the knee joint, and in severe cases, obvious joint effusion can appear, leading to knee swelling such as "bread". The pain is mostly swelling pain, and the pain is aggravated during activities, and slightly relieved after rest. At the same time, patients may feel knee fever and limited flexion and extension movement [8-9].

Symptoms after acute trauma: adult work, exercise and other reasons, the knee may suffer acute trauma, such as fracture, dislocation and so on. When fracture, the knee joint will have severe pain,

swelling and deformity of the injured site, limited limb movement, and no weight bearing. During dislocation, the appearance of the knee joint is obviously abnormal, and the pain is severe. Patients can often feel the sense of dislocation of the joint. The joint movement is seriously limited, which may be accompanied by vascular and nerve damage, numbness, coolness, and pale of the lower limbs. In addition, acute ligament injury is also more common, with symptoms like adolescence, but due to the poor joint stability in adults, the recovery time after injury may be longer, and more likely to leave sequelae such as joint instability [10].

2.4. Knee symptoms in old age

In old age, the knee joint undergoes significant degenerative changes, leading to a variety of characteristic symptoms that severely impact the quality of life of the elderly.

Osteoarthritis symptoms: This is the most representative symptom of the knee in older age. Early on, patients may only develop knee pain after long walking or walking up and down stairs, which can be relieved after rest. As the disease progresses, the pain gradually increases, even at rest, and nocturnal pain may affect sleep. The knee joint will appear swelling, mostly caused by joint effusion, the degree of swelling can vary depending on the condition [11-12]. Joint movement is obviously limited, flexion and extension are difficult, especially in the morning joint stiffness, slightly relieved after the activity, but the activity time is slightly longer, and pain aggravation will appear. Patients may also feel the friction or sound of the knee joint, which is caused by worn articular cartilage, bone hyperplasia and other reasons [13].

Symptoms of rheumatoid arthritis in old age: In addition to osteoarthritis, some elderly people may suffer from rheumatoid arthritis. The knee symptoms are symmetrical joint pain, swelling, the pain is mostly persistent, the degree is heavier, often accompanied by morning stiffness, morning stiffness time is longer, can be up to several hours or even the entire day. Joint swelling is mostly caused by joint effusion and synovial hyperplasia caused by synovial inflammation, which can involve multiple knees and lead to joint deformity, such as knee flexion contracture, valgus, or varus deformity, which seriously affects the patient's ability to walk and take care of themselves. In addition, patients may also appear systemic symptoms, such as fever, fatigue, waste, etc. [14].

3. The diagnostic method of knee symptoms at different ages

Knee problems are prevalent among people of all ages, yet the diagnostic methods vary significantly based on age. A precise diagnosis is the cornerstone for effective treatment. This article will first overview the general diagnostic steps and then spotlight the differences in diagnosing knee symptoms across various age groups.

3.1. General Diagnostic Procedures

Medical History Taking: The first step in diagnosing knee issues is a detailed medical history inquiry. This includes understanding when the symptoms begin, whether they are sudden or gradual. For example, a sudden onset might indicate an acute injury like a ligament sprain during physical activity [15]. The frequency of symptoms, their intensity, and what makes them better or worse are also crucial. Additionally, any past knee injuries, family history of joint problems, and the patient's overall health status are noted.

The next step is physical examination, which includes visual inspection, palpation, joint mobility assessment.

Visual Inspection: Doctors carefully look at the knee for swelling, redness, or deformities. Swelling could be a sign of inflammation or fluid accumulation in the joint. Deformities like knee varus(bow-legged) or valgus(knock-kneed) can point to long-term structural problems.

Palpation: By gently touching the knee, doctors can identify tender areas. Tenderness can indicate where the problem lies, such as around the patella(kneecap), ligaments, or meniscus. They also check for lumps or changes in temperature, which might suggest inflammation or a mass.

Joint Mobility Assessment: Measuring the range of motion of the knee is essential. This involves testing how far the knee can bend(flex)and straighten(extend), as well as any rotational movement. Limited mobility can be due to pain, swelling, or mechanical issues like a torn meniscus.

The last step is imaging examinations, which includes X-rays, MRI, ultrasound.

X-rays: X-rays are often the first imaging choice. They can show the bones of the knee, helping to detect fractures, dislocations, or signs of osteoarthritis like bone spurs and joint space narrowing. However, X-rays are not effective for visualizing soft tissues such as ligaments and cartilage.

MRI (Magnetic Resonance Imaging): MRI is excellent for imaging soft tissues. It can clearly show meniscus tears, ligament ruptures, and cartilage damage. But it is more expensive and requires the patient to lie still for a long time.

Ultrasound: Ultrasound is a non-invasive option that can be used to examine soft tissues, detect fluid in the joint, and assess tendons. It is real-time, allowing doctors to observe the movement of structures within the knee.

3.2. Diagnostic Differences by Age

In children, the focus is on recent trauma, changes in activity levels, and growth-related pain. Growth pain is common, typically occurring at night with no history of injury. However, congenital knee problems also need to be ruled out. Visual inspection may reveal congenital deformities. Special tests for ligament and meniscus integrity are done with caution as children may not cooperate fully due to fear. X-rays are the primary imaging tool for detecting bone problems. Ultrasound is useful for soft tissue issues, and MRI is usually reserved for complex cases where other tests are inconclusive.

Given their active lifestyle, sports-related injuries are common. The doctor needs to know about the nature of sports activities, the mechanism of injury, and the relationship between symptoms and exercise. Swelling and bruising from sports injuries are often visible. Special tests for ligament stability are more dependable as adolescents can cooperate better. X-rays rule out fractures, and MRI is the main method for diagnosing soft tissue injuries like meniscus and ligament damage[16].

Occupation and lifestyle play a significant role. Long-term standing, heavy lifting, or repetitive knee movements in jobs can lead to knee problems. A history of previous knee injuries is also important. Visual inspection may show signs of wear and tear, such as mild swelling or muscle atrophy. Palpation helps identify tender areas related to different knee structures. X-rays are used to assess bone conditions, especially for signs of osteoarthritis. MRI is crucial for diagnosing soft tissue injuries.

Elderly patients often have multiple comorbidities like diabetes, rheumatoid arthritis, and gout that can affect knee symptoms. The doctor needs to consider their overall health and medications. Visual inspection may reveal significant deformities due to osteoarthritis. Special tests for joint effusion and patellofemoral joint problems are useful. X-rays are crucial for diagnosing osteoarthritis, showing characteristic changes. MRI supplements the diagnosis for soft tissue issues, and ultrasound can be an alternative for patients who cannot tolerate MRI.

4. Treatment of knee symptoms at different ages

4.1. Treatment of knee symptoms in childhood

For knee symptoms in childhood, treatment strategies focus on relieving pain caused by growth and effectively managing congenital knee conditions to ensure the normal development of the knee joint.

Treatment of growth pain: Growth pain usually requires special medication, and conservative measures are taken to relieve pain. Parents can help relax the muscles through hot compress when the child has pain attacks, such as using a warm towel around the knee joint, 15-20 minutes each time, several times a day. Soft massage can also effectively reduce the discomfort, from the thigh to the calf along the muscles to gently knead. Encourage children to moderate activities during the day to avoid excessive fatigue, but avoid strenuous exercise before sleeping at night, ensure adequate sleep, conducive to the body recovery. At the same time, children give supplements rich in calcium, vitamin D food, such as milk, soy products, fish, and shrimp, to promote healthy growth of bones.

Treatment of congenital knee diseases: for congenital patellar dislocation, mild manual reduction can be tried first and then wear a brace to help the patella maintain in a normal position and promote joint development. The fixation time is usually a few months, during which regular review is required to observe the effect of reduction [17]. Severe dislocation or manual reduction failure may require surgical treatment, and the timing of surgery is chosen at the mature stage of the child's bone development to reduce the risk of recurrence. Knee varus or knee valgus, if the deformity is light, can be corrected by orthopedic insoles or braces, the correction process should last for a long time, parents should supervise the children to insist on wearing, and adjust the braces regularly. If the deformity seriously affects walking or skeletal development abnormalities, surgical correction should also be considered, and the surgical plan depends on the individual situation .

4.2. Treatment methods for knee symptoms in adolescence

During adolescence, the treatment of knee symptoms centers around promoting the repair of sports injuries and alleviating the discomfort brought about by unbalanced growth and development to restore knee function and support continued physical activities.

Sports injury treatment: meniscus injury if the degree is mild, acute phase using RICE principle (rest, ice, pressure dressing, raise the limb) reduce swelling pain, after wearing knee braces limit activities, promote the meniscus repair, and with physical therapy, such as ultrasound, ultra short wave, etc., accelerate the local blood circulation, help repair tissue, rehabilitation cycle usually takes months. If the meniscus tear is severe and conservative treatment is ineffective, arthroscopic surgery is required with microscopic meniscus repair or suture. Ligament strain also follows the RICE principle. For mild strain, rehabilitation training after 4-6 weeks to restore joint function; severe ligament rupture, such as anterior cruciate ligament rupture, requires surgical reconstruction, and postoperative rehabilitation training, including muscle strength training, joint mobility training, etc. The whole rehabilitation process requires the guidance of a professional rehabilitation therapist for six months to one year [18].

Treatment of uneven growth and development: for the knee pain caused by uneven growth and development, we should first adjust the amount of exercise, avoid excessive exercise to aggravate the pain, and rest appropriately. Hot compress, massage and other physical therapy can be used to relieve muscle tension, hot compress for about 20 minutes each time, 3-4 times a week, moderate massage strength, to relax the muscles for the purpose. When the pain is more severe, short-term oral NSAID anti-inflammatory drugs, such as ibuprofen, can reduce inflammatory pain, but pay attention to the dosage and course of treatment to avoid adverse reactions. At the same time, strengthen muscle strength training, especially the quadriceps muscle, such as straight leg elevation exercises, to enhance the stability of the knee joint.

4.3. Treatment methods for knee symptoms in adulthood

In adulthood, the treatment approach for knee symptoms is mainly divided into two aspects: one is to relieve the pain and improve the function of the knee joint caused by chronic strain through

conservative treatment and rehabilitation training; the other is to take timely and appropriate measures to deal with the damage caused by acute trauma to promote the recovery of the knee joint.

Treatment of chronic strain: for patellofemoral joint pain syndrome, conservative treatment is adopted at the beginning, such as lifestyle adjustment, avoid long knee flexion, climbing stairs and other movements aggravating the pain, and reduce the load of knee joint. Wear a special patellofemoral joint support to correct the patella movement trajectory and reduce the joint pressure. At the same time, rehabilitation training, including quadriceps and hamstring strength training, such as squatting against the wall, 30 seconds each time, several times a day, to gradually enhance muscle strength and improve joint stability. It can also be combined with physical therapy, such as hot compress and medium frequency electric therapy, to relieve pain and promote local blood circulation, 2-3 times a week for several weeks. If the effect of conservative treatment is not good, arthroscopic cleaning can be considered to remove the inflammatory synovial membrane in the joint and worn cartilage debris to relieve the symptoms[19].

Treatment of acute trauma: fracture patients should be reduced and fixed according to the fracture type and site. For mild fracture, manual reduction and plaster fixation can be used. The fixation time is 6-8 weeks, during which the X-ray should be reviewed regularly to observe the fracture healing. For severe fractures, such as comminuted fractures, surgical open reduction and internal fixation, early postoperative rehabilitation training to prevent muscle atrophy and joint stiffness and gradually transition from passive active joints to active movement. The rehabilitation cycle is 3-6 months. Patients with dislocation should be reduced by manipulation as soon as possible and then fixed with plaster or brace for 3-4 weeks, and the adjacent joints should be mobilized to prevent complications.

4.4. Treatment methods for knee symptoms in old age

In old age, the treatment of knee symptoms focuses on alleviating the pain and functional impairment caused by osteoarthritis and rheumatoid arthritis through a combination of drug therapy, physical therapy, and surgical intervention when necessary, aiming to improve the quality of life of the elderly.

Treatment of osteoarthritis: early osteoarthritis, conservative treatment. In terms of drugs, non-steroidal anti-inflammatory drugs are preferred, such as etorcoxi, to relieve pain and reduce inflammation, but adverse reactions should be paid attention to gastrointestinal tract, and gastric mucosal protective agents can be taken at the same time. Intra injection of sodium vitonate into the joint cavity, lubricate the joint, reduce friction, once a week, 3-5 consecutive times for a course of treatment, can effectively improve the joint function. Physical therapy, such as hot compress, infrared irradiation, and hydrotherapy, can promote blood circulation and relieve pain, 2-3 times a week. Assistive devices such as crutches, wheelchairs, according to the condition to reduce the burden of the knee joint[20]. As the disease progresses with the disease, when conservative treatment is ineffective, artificial knee replacement can be considered to completely solve the problems of joint pain and limited movement, and postoperative rehabilitation training to restore joint movement and walking ability.

Treatment of rheumatoid arthritis: drug therapy is the key, often using antirheumatic drugs, such as methotrexate, combined with nonsteroidal anti-inflammatory drugs, to control the progression of the disease and reduce joint inflammation and pain. Biological agents, such as tumor necrosis factor antagonists, have good efficacy for patients with severe disease and poor treatment effect with traditional drugs, but the price is high, and it needs to be considered comprehensively. Physical therapy is equally important to relieve pain and improve joint function, similarly as in children and adolescence. When joint deformities seriously affect the quality of life, surgical correction, such as knee replacement or synovectomy, can also be considered, and rehabilitation care can be strengthened after surgery.

5. Conclusion

Focusing on the symptoms and treatment of the knees at different ages, this study systematically explored the issues related to the knees in childhood, adolescence, adulthood, and old age. In terms of physiological characteristics, there are significant differences among different ages. Childhood is in the critical period of growth and development, rapid bone growth and frequent movement in adolescence, the risk of strain and trauma in adulthood, and degenerative changes in old age. The corresponding common symptoms are also different. Children are mostly growth pain and congenital diseases, teenagers with sports injury and uneven growth and development, chronic strain and acute trauma are common in adults, and the elderly are deeply troubled by osteoarthritis and rheumatoid arthritis. The diagnostic methods have different emphasis according to the age characteristics, from the medical history, physique, and imaging in childhood, to the fine screening of a variety of complications in old age. In terms of treatment, precise measures are taken according to different ages, covering physics, medicine, surgery, and rehabilitation training. In short, an accurate grasp of the characteristics of knee joints of different ages and the implementation of targeted diagnosis and treatment strategies are of great significance to improve the quality of life of patients and reduce the social medical burden.

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