The commonly encountered pediatric orthopedic leg problems include Blount’s disease, Legg-Calvé-Perthes Disease (LCPD), Slipped Capital Femoral Epiphysis (SCFE) and Osgood-Schlatter Disease (OSD). Combinations of genetic and environmental factors often play a role in their occurrence. The diagnosis is usually clinical and the treatment plan is divided into medical and surgical options. Medical therapy constitutes the conservative measures, whereas surgery is more useful in cases of SCFE. In all other cases, surgery is done optionally. All of the disorders carry a good prognosis if the treatment is vigilantly started on a priority basis.

Definition of Blount’s Disease

Blount’s disease is a pediatric orthopedic problem in which the leg is bowed outward or in a varus position. It is due to a dysfunctional growth of the posterior-medial aspect of proximal physis of the tibia resulting in the lower limb deformity. It is a developmental disorder. There are internal rotation and medial angulation of tibial physis and outward
bending of the lower limb. Failure to receive an early treatment may lead to the disease progression.

![Image](MBlount 1 by Kinderradiologie Olgahospital Klinikum Stuttgart License: CC BY-SA 4.0)

The Blount’s disease is **divided into two classes**, the early onset or the infantile and late onset disease. The late Blount’s disease is further divided into juvenile and adolescent. This **division is based on the time of appearance** of the disease symptoms.

- The early form is presented at 1-3 years of age when the child starts to ambulate.
- The juvenile form occurs at 4-10 years of age.
- The adolescent form is presented when the child is above 10 years of age.

**Etiology of Blount’s Disease**

The exact cause of the disease is still unknown, but it occurs **due to the combination of genetic and developmental factors**. Obesity has a direct link, especially in the late-onset form of the disease. It leads to the mechanical load on the proximal region of tibia resulting in the pressure molding; however, a mechanical load cannot be the sole reason as the disease also occurs in normal weight children. In short, the etiology can be described as **multifactorial**. The inheritance pattern has not been clearly established for Blount’s disease.

**Clinical presentation of Blount’s Disease**

A child with Blount’s disease may present with the following features:

- Bowing of lower legs, mostly outwards.
- Length discrepancy in lower limbs.
- Non-tender bony protuberance at the medial aspect of proximal tibia.
- In some patients, deformity at the distal end of the femur is also seen.
- Deformity is usually painless.
Risk Factors and Incidence of Blount’s Disease

- The children with early onset start to walk earlier than their age fellows, although it is a controversial aspect.
- The disease is more often unilateral.
- The children can be obese, although obesity can be a factor in juvenile cases but rarely associated in infantile type.
- There is an increased incidence with a positive family history.

Diagnosis of Blount’s Disease

Blount’s disease is due to a cumulative effect of mechanical forces along with altered bone anatomy. This is still a controversy which factor takes initiative.

There is no specific diagnostic investigation for Blount’s disease. It is based on the history, examination and the radiological tests. X-rays are the routinely used radiological investigations. MRI is mostly done in the cases of infantile Blount’s disease in which the minor changes can also be easily visualized.

Treatment of Blount’s Disease

The treatment options can be divided into the surgical and non-surgical options.

The brace therapy

It should be applied to all cases younger than 3 years of age. The ambulatory bracing is done along with above-knee orthosis to stop the progression of the disease process. It corrects the varus deformity and growth disturbance. The treatment is more useful in the early stages of the disease.

Surgical treatment

It is reserved for stages 3 and 4 of Blount’s disease. The various surgical procedures include osteotomies, fixation methods, and hemiepiphysiodesis.

Prognosis of Blount’s Disease

Prognosis in infantile cases is good and the recurrence rate is very low when treatment is started timely at a young age and at an early stage.

Definition of Legg–Calvé–Perthes Disease (LCPD)

LCPD is an avascular necrosis of the proximal head of the femur. It results due to a lack of blood supply to the region of a femoral head. The disease mostly occurs in children aged 4-10. It can affect one side or both of the legs. The onset is insidious and mostly occurs after an injury. In majority cases, it is unilateral.
A continuous blood supply is necessary for the rapid growth. An absence of blood supply results in the necrosis and breakdown of the bone. The process of bone replacement takes place, but its adequacy is dependent on many factors like the age of a patient and other medical conditions. The disease is five times more common in boys than girls.

Etiology of Legg–Calvé–Perthes Disease (LCPD)

In most of the cases, an exact cause cannot be identified but many risk factors have been studied in association with LCPD.

- Idiopathic
- Trauma
- Sickle cell disease
- Steroids use
- Toxic Synovitis
- Congenital hip dislocation

Epidemiology of Legg–Calvé–Perthes Disease (LCPD)

This is a rare disease condition occurring in approximately 4 out of 100,000 children.

- Age of onset is 4-10 years
- More common in boys than in girls

Clinical Presentation of Legg–Calvé–Perthes Disease (LCPD)

The signs and symptoms of Legg–Calvé–Perthes Disease include:

- Pain in an anterior aspect of the thigh. It can also radiate to the hip, knee and the lateral side of a thigh.
- Children with LCPD have delayed bone age and growth.
- There may be mild shortening of stature.
- Abductor lurch or intermittent limp, especially after exertion.
- There is atrophy of quadriceps muscles and other soft tissues of a thigh.
- The hip can develop adduction contracture.
- The movements get limited, especially abduction and internal rotation.
Diagnosis of Legg–Calvé–Perthes Disease (LCPD)

The diagnostic workup of LCPD includes laboratory tests and radiological investigations.

CBC, DLC, and ESR are the common tests that are done on every patient of LCPD, although they can turn out to be completely normal. The radiological investigations include the X-rays, MRI, and bone scans. X-rays include the anteroposterior and lateral view of the leg. It is also used for the follow-up of the disease. The LCPD is staged depending on the radiological findings.

Management of Legg–Calvé–Perthes Disease (LCPD)

The lack of proper treatment in time may lead to worsening of the disease and higher chances of developing hip arthritis in the adulthood. The disease is managed on medical and surgical grounds.

Medical therapy

The aim of medical therapy is to eliminate hip irritability, maintain a good range of motions, prevent the collapse of femoral epiphysis, and attain a normal femoral head as the healing process is started. This all is done through the following procedures:

- Physical therapy and stretching exercises are recommended.
- Minimize the weight-bearing on the affected side. It can be done with the help of crutches.
- Traction is maintained to keep the femur abducted with internal rotation.
- The leg casts are applied for four to six weeks in order to fix the head within the socket.
- Orthotic devices or bracing is also used.

Surgical treatment

It involves the femoral osteotomy, removal of loose bodies or bone fragments, joint realignment and the joint replacement. The complication of surgery can be the shortening of the leg, bone fractures and the damage to nerves.

Definition of Slipped Capital Femoral Epiphysis (SCFE)

SCFE is a condition where the head of the femur slips backwards off the neck of the femur. This is seen in pre-teens and teens, in the growing age. It is an important hip disorder encountered in the pediatric and adolescent population. The condition is rare, but accurate diagnosis and treatment is crucial. In SCFE, the proximal growth plate of a femur is unstable. The head of the femur slips backward and downward from the neck of bone at the region of the growth plate.
Epidemiology of Slipped Capital Femoral Epiphysis (SCFE)

The disease is regarded as multifactorial, which occurs due to the combination of constitutional and mechanical factors. The incidence rate is 2.5 times higher in boys in comparison to girls. On average, there are about 11 cases out of 100,000 children in the United States. The disease is classified as acute or chronic, depending on the duration. More than 3 weeks is termed as chronic.

Pathophysiology of Slipped Capital Femoral Epiphysis (SCFE)

SCFE falls under the classification of Salter-Harris Type 1 fracture. The epiphyseal plate becomes widened due to excessive hypertrophy in the hypertrophic zone.

Histologically, there is an abnormal maturation of the cartilage, endochondral ossification, and instability of perichondral ring in SCFE. This disrupts the normal architecture of cartilage and produces a weak structure that leads to the disc slip. There can be inflammatory synovitis along with disorganized collagen, consisting of glycoprotein and proteoglycan, within the epiphyseal plate.

Clinical features of Slipped Capital Femoral Epiphysis (SCFE)

Symptoms vary according to the severity. Some striking features are as follows:

- Pain in the groin, hip, knee or thigh for many weeks or months and this pain aggravated by physical exertion. Severe and sudden onset of pain usually after an injury.
- Limping while walking or running. Inability to walk in severe cases.
- Outward turning of affected leg.

Incidence

- The left hip is more commonly affected.
- Most of the children with SCFE are obese as the mechanical factors play a role.
- There may be other associated endocrine disorders like hypothyroidism, hypogonadism, panhypopituitarism and growth hormone disorders.

Discrepancy in length of leg - affected leg appears shorter. Diagnosis of Slipped Capital Femoral Epiphysis (SCFE)

A series of laboratory and imaging tests are done to confirm the diagnosis. The laboratory test involves the hormone levels that can be associated with various endocrinopathies. X-rays, CT, MRI and bone scans are done to view the details of the SCFE. Usually, two views are taken, anteroposterior and lateral in the X-ray films. Klien’s line is drawn to make an early diagnosis. CT, MRI and bone scans are not routinely performed due to higher costs, but they give a better measure of the degree of displacement.

Management of Slipped Capital Femoral Epiphysis (SCFE)

It is divided into medical and surgical treatment options. The definitive treatment is the surgical repair of SCFE.

Medical therapy

Bed rest and physical therapy are an important part of the treatment. Painkillers like acetaminophen and NSAIDS are prescribed to the patient. Antipyretics are also given and antibiotics cover can also be initiated, depending on the situation.

Surgical treatment

It is often compulsory in all cases of SCFE. The disc is fixed with the help of 1 or 2 pins. Screws are also placed in the plane perpendicular to physis. The other side is also fixed to prevent its slippage in the future.

Definition of Osgood-Schlatter Disease (OSD)

OSD is the apophysitis of tibial tubercle; the patellar ligament gets inflamed at the region of a tibial tuberosity. A bump appears below the knee joint which gets exaggerated with activity and relieved with rest. The traction occurs on the patellar tendon due to repetitive contraction of quadriceps.
Epidemiology of Osgood-Schlatter Disease (OSD)

The condition mostly occurs in the pre-adolescent age when the tubercle is skeletally immature and is more susceptible to trauma and strain. The disease mostly occurs from 12–14 years in boys and 10–13 years in girls.

Signs and symptoms of Osgood-Schlatter Disease (OSD)

- Pain below the knee, which gets worse during activities like running, jumping and kneeling. The pain gets reduced upon rest.
- Swelling, redness, and tenderness at the patellar region.
- It can be unilateral or bilateral. Discomfort can continue from weeks to several months.

Risk Factors of Osgood-Schlatter Disease (OSD)

OSD occurs during puberty spurts. The risk factors for the disease are male sex, excessive participation in sports activities, and the age around puberty.

Diagnosis of Osgood-Schlatter Disease (OSD)

The diagnosis is based on the history, physical examination, laboratory and radiological investigations. X-rays, US, CT, MRI and bone scans are done to confirm OSD.

- X-rays show superficial ossicles, irregular ossifications, thickening and calcifications of the tendon, and edematous tissues.
- Ultrasound shows a thickening in the regions of the patellar tendon.
- The bone scan shows an increased uptake at the tibial tuberosity.
- CT and MRI show changes in the region of insertion of patellar tendons.

Treatment of Osgood-Schlatter Disease (OSD)

The treatment of Osgood-Schlatter Disease can be covered under the following headings:

General approach

This involves the symptomatic treatment to give relief to the patient. It includes limitation of the activities, application of ice to the region of inflammation, anti-inflammatory medicines, protective padding and the quadriceps strengthening. Ice is placed for twenty minutes every two to four hours.

Medical Care

Medicines like analgesics, antipyretics, and anti-inflammatories are prescribed to relieve the discomfort. Lidocaine injections are also given in selective cases. The patient is advised to restrict the pain-producing activities, but long-term immobilization is
highly discouraged. The knee is kept immobilized in a knee brace for a maximum of six weeks duration and it should be removed on a daily basis for practicing the stretch exercises.

## Physical therapy

It becomes more important for those who have to take an active part in athletic activities. The aim is to **improve the flexibility and strength of the quadriceps muscles**. There are many exercises that are performed during the course of physical therapy.

## Surgical Care

It is reserved for very limited indications and **not routinely done for OSD**. The ossicle gets resected during surgery. It has its own inherent complications, which include an unsightly scar, poor cosmesis, surgical wound dehiscence, and growth disturbance.

## Prognosis of Osgood-Schlatter Disease (OSD)

Symptoms completely disappear once a child comes out of the adolescent growth spurt, but prominence of a tubercle may persist. Obstinate cases may require medical intervention.

## References

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