

**Case Report****Displaced Extension Type of Type-1 Salter Harris Epiphyseal Injury of Distal Femur Managed Conservatively**Dr. Shiva prakash SU<sup>1</sup>, Dr. Maruthi CV\*<sup>1</sup>, Dr. Venugopal N<sup>2</sup>, Dr. Irfan Ali<sup>3</sup>, Dr. Nanjundappa HC<sup>4</sup>, Dr. SiddalingaSwamy MK<sup>4</sup><sup>1</sup>Assistant Professor, Dept. of Orthopaedics, MVJ Medical College & Research Hospital, Hoskote, Bangalore, India<sup>2</sup>Associate Professor, Dept. of Orthopaedics, MVJ Medical College & Research Hospital, Hoskote, Bangalore, India<sup>3</sup>Post graduate student, Dept. of Orthopaedics, MVJ Medical College & Research Hospital, Hoskote, Bangalore, India<sup>4</sup>Professor, Dept. of Orthopaedics, MVJ Medical College & Research Hospital, Hoskote, Bangalore, India**\*Corresponding author**

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**Abstract:** Displaced Type -1 Salter Harris injury is very rarely seen in the clinical practice. And the treatment for it is closed reduction and internal fixation with K- wires. Here we are presenting a case of displaced extension type of Type-1 Salter Harris epiphyseal injury of distal femur treated with closed reduction and immobilization with above knee cast for six weeks and its follow up. A ten years boy came to the casualty with the history of two wheeler hit on his thigh and diagnosed to have displaced extension type of Type-1 Salter Harris epiphyseal injury of distal femur, and was treated conservatively by closed reduction and immobilization with above knee cast by keeping knee in 30 degrees of flexion was done, as at this position was stable even under anaesthesia hence not done internal fixation and given less flexed position than given in the literature. Check X ray was done day 1, 2 weeks and 6weeks. There is no redisplacement of the injury and physiotherapy was started, by three months follow-up patient gained full range of movement and returned to his daily activities. In conclusion, displaced extension type of Type-1 Salter Harris epiphyseal injury of distal femur is very rare injuries. It can be treated by closed reduction and immobilization with above knee cast for six weeks in 30 degrees of flexion, if the injury is stable under anaesthesia. Our method avoids the complications of internal fixation.

**Keywords:** Conservative, Distal femur, Epiphysis, Extension type, Type-1 Salter Harris

**INTRODUCTION**

Distal femur epiphyseal injuries constitute 5-6% of the total physeal injuries. Displaced Type -1 Salter Harris injury is very rarely seen in the clinical practice. And the treatment for it is closed reduction and internal fixation with K- wires. Here we are presenting a case of displaced extension type of Type-1 Salter Harris epiphyseal injury of distal femur treated with closed reduction and immobilization with above knee cast for six weeks and its follow up.

**CASE REPORT**

A ten year boy came to the casualty with the history of two wheeler hit on his thigh while playing in the road, complaints of pain swelling and deformity in the left knee joint. Examination of the child revealed vitals were stable, and the knee examination show tenderness and swelling with flexion deformity of the joint with easily palpable popliteal pulsations. Distal neurovascular examination was normal. Radiographic examinations show type-1 Salter Harris distal epiphyseal injury of extension type (Fig. 1). Patient was admitted and closed reduction and immobilization with above knee cast by keeping knee in 30 degrees of flexion was done, as at this position was stable even

under anaesthesia hence not done internal fixation and given less flexed position than given in the literature. Check x ray was done day 1, 2 weeks and 6weeks (Fig. 2). There is no redisplacement of the injury and physiotherapy was started, by three months follow-up patient gained full range of movement and returned to his daily activities.

**DISCUSSION**

The distal femoral physis grows at a rate of 8 to 10 mm per year and contributes approximately 40% of growth of the lower extremity. It closes at around 13 years in girls and 15 years in boys [1]. Distal femoral physeal injuries account for 6% to 9% of all physeal injuries and far less than 1% of all fractures in children [2]. A Salter-Harris type I injury is rare and accounts for 7.7% of all physeal injuries of the distal femur. It is most often seen in two age groups, newborns and adolescents. In a newborn, these birth fractures are more often associated with breech presentation and are frequently undisplaced and therefore unrecognized at initial evaluation until fracture callus is seen 2 to 3 weeks later. In the age group from 3 to 10 years, the fractures are more often due to severe trauma, especially falls from a significant height or being struck

by an automobile, and only a few fractures result from sports activities. In the adolescent age group the majority of fractures result from sports injuries, with a smaller percentage being caused by automobile accidents in which the patient was a pedestrian. Overall, pedestrian–motor vehicle accidents account for approximately 45% to 50% of fractures, sports injuries for 25%, and falls for approximately 20% of injuries [3].

A hyperextension-type injury results in anterior displacement of the distal femoral epiphysis by the hyperextension force and by the pull of contraction of the quadriceps muscle. The periosteum on the posterior aspect is torn, and the fibers of the gastrocnemius muscle are stretched or partially torn. The triangular metaphyseal fragment and the intact periosteal hinge are anterior in location. The distal end of the femoral shaft is driven posteriorly into the soft tissues of the popliteal fossa, where it may injure the popliteal vessels as well as the common peroneal or posterior tibial nerves. Hyperextension of the knee without direct trauma may result in physeal fracture when the energy is significant. Grogan and Bobechko reported on a triple long-jumper who sustained a Salter-Harris type II fracture of the distal femoral epiphysis while landing [4].

There is usually a history of significant trauma. More energy is required to produce a distal femoral physeal fracture in patients younger than 11 years (juveniles) than in adolescents. Most often, it involves being struck by a motor vehicle or falling from a significant height. In an adolescent, sports injuries, especially football, account for a large proportion of injuries. The direction of the direct trauma is important to identify because many injuries may appear undisplaced radiographically at initial evaluation but may have been displaced at the time of injury, thereby predisposing to soft tissue, vascular, or neurologic injury.

On physical examination, the patient is in acute distress secondary to pain in the knee region and is unable to walk. With a displaced fracture the knee is swollen and tense, although a patient with a nondisplaced separation will have less pain and may be able to ambulate. The knee is often in a flexed position because of hamstring muscle spasm, and deformity of the knee may be present with extension of the distal extent of the femur or valgus deformity. The skin should be inspected for open skin lesions. Ecchymotic areas will provide information on the deforming forces, such as a valgus stress with ecchymosis on the medial aspect of the knee from displacement of the medial distal femoral metaphysis at the time of injury. Swelling in the popliteal space may alert the surgeon to a vascular injury or disruption.

A careful neurovascular examination should be performed in all patients with a distal femoral fracture

or physeal injury. The soft tissue envelope should be palpated to evaluate for compartment syndrome at the time of initial evaluation and during the first 48 hours after injury.

The goal of treatment of a distal femoral physeal injury is to gain an anatomic reduction with stable fixation, especially in an older child (>10 years). In a younger child, acceptable alignment includes up to 20 degrees of angulation in the sagittal plane [5], less than 5 degrees of varus or valgus angulation, and no rotational deformity.

A Salter-Harris type I injury in a newborn can be treated by immobilization without attempts at reduction because significant remodelling potential exists [3]. Immobilization in a newborn is difficult but often requires only a bulky soft dressing. An older child with complete physeal separation will need closed reduction performed under general anaesthesia. Reduction of a hyperextension injury in which the distal fragment is displaced anteriorly and flexed relative to the tibia is similar to that described for distal femoral metaphyseal fractures. Immobilization is accomplished with a hip spica or long-leg cast with the knee flexed, usually to 60 degrees, followed by gradual extension of the knee over the ensuing 3 to 4 weeks. However, Aitken and Magill pointed out that the distal femoral physeal separation occurs distal to the medial head of the gastrocnemius, with the distal fragment displaced posteriorly, and therefore reduction of these fractures should occur with the knee in extension. Likewise, the knee should be immobilized in extension to allow “the taut medial head of the gastrocnemius to act as a posterior splint and prevent posterior displacement”[6].

In an older child or a patient with an unstable physeal separation, smooth pin fixation may be necessary to provide stable fixation. We prefer to place smooth wires or pins in crossed fashion; they are removed at 4 weeks, and the limb is then recasted for an additional 2 weeks in a long-leg cast. To prevent knee contractures, aggressive therapy is then started to regain range of motion of the knee. We prefer a long-leg cast in most children except an obese child, in whom control of the knee in a long-leg cast is difficult, or if there is any concern about compliance with non–weight-bearing status.

Loss of knee motion occurs in approximately 27% of distal femoral physeal injuries [3].

It may be due to excessive duration of immobilization with intra-articular adhesions, capsular contraction, or hamstring or quadriceps contraction. Contractures are best prevented by restricting the duration of external immobilization, removing crossed Kirschner wires as soon as possible, and performing anatomic reduction of intra-articular fractures. Aggressive active and active assisted range-of-motion

exercises should be started as soon as 4 to 6 weeks from the time of fracture. A removable posterior splint can be worn at 4 weeks so that the patient can begin range-of-motion exercises twice per day as the fracture heals.

Once fracture healing occurs, knee ligament integrity should be re-evaluated and appropriate treatment instituted if necessary.

Loss of reduction occurs because of suboptimal stabilization of the unstable fracture, usually a result of inadequate external immobilization. Aitken and Magill reported nine fractures treated by closed reduction and cast immobilization, with only two patients maintaining anatomic reduction [6].

They attributed this outcome to not maintaining knee flexion when immobilizing the anteriorly displaced fractures and inadequate knee extension when immobilizing the posteriorly displaced fractures. Others have reported loss of reduction in 40% of fractures after the initial reduction and cast immobilization [7].

With the greater use of internal fixation devices and strict adherence to correct leg immobilization techniques, loss of reduction has become less prevalent in more recent studies [3].

Our method of closed reduction and immobilization with above knee cast for six weeks in 30 degrees of flexion, if the injury is stable under anaesthesia and avoids the complications of internal fixation.

## CONCLUSION

Displaced extension type of Type-1 Salter Harris epiphyseal injury of distal femur is very rare injuries. It can be treated by closed reduction and immobilization with above knee cast for six weeks in 30 degrees of flexion, if the injury is stable under anaesthesia. Our method avoids the complications of internal fixation.

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