Current Management and Rehabilitation in Legg-Calvé-Perthes Disease

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The hip plays a pivotal role in providing mobility for our everyday life activities. Hip disorders in children, such as Legg-Calvé-Perthes Disease (LCPD), can adversely affect a child’s mobility and activity level. LCPD is a hip disorder that involves avascular necrosis of the proximal femoral head. It is a relatively self-limiting disorder, in that some activities may need to be modified to ensure that excessive forces are not placed on the femoral head; however, failure to treat the condition may adversely affect regeneration of the femoral head. Because the etiology of LCPD is not completely understood, the best way to treat the condition is debated. Limitation of high-impact activities and rehabilitation that focuses on restoration of range of motion (ROM) is usually recommended.

Etiology

Deficiency in proteins C and S, interruption of blood flow in the artery of the ligamentum teres femoris, and trauma that results in the loss of intraosseous or extraosseous blood supply have been proposed as etiologic factors. Other factors that may contribute to the development of LCPD include abnormal venous drainage, abnormal growth and development, and coagulation abnormalities. Because the mechanism responsible for development of the condition is not clearly understood, there is no known preventive measure.

LCPD is manifested in four pathological phases: synovitis phase, osteonecrosis phase, fragmentation phase, and revascularization phase. The synovitis phase usually presents decreased movement of the hip. This phase can last from six months to one year. During the osteonecrosis phase, interruption of blood supply to the femoral head occurs, and the bone tissue begins to die. Symptoms become more pronounced in the fragmentation phase. Affected individuals begin to lose more ROM, they begin to have more pain with activities, and they display more prominent gait deviations during this stage, which can last up to one year. During the last stage, new bone formation occurs over a period that lasts from one to three years. Some individuals may not demonstrate radiographic abnormalities initially, but MRI may demonstrate decreased blood supply to the femoral head. Most individuals can be diagnosed by x-ray when the femoral head demonstrates an increase in density.
Signs and Symptoms

The most common signs and symptoms that develop with LCPD include hip, groin, or anterior knee pain, decreased ROM (usually restriction of internal rotation and abduction), gait abnormalities, and muscle atrophy.1-3 It is usually more common in boys than girls and typically occurs in children between the ages of 4 and 8 years of age, but can occur up to 12 years of age.1-5 LCPD is often confused with Slipped Capital Femoral Epiphysis (SCFE), which presents the same signs and symptoms. SCFE typically is seen in the adolescent population (11-15 years of age), the individual is commonly overweight, and pain is often experienced in the thigh or knee, rather than in the hip only.1

Hip pain in young children should be taken seriously. Any child with hip or groin pain, a decrease in hip ROM, or gait abnormalities should be referred for medical evaluation. Depending on the severity of the condition, some individuals with minimal pain and good ROM can continue normal activities.6

Treatment

Treatment for LCPD may vary according to the age of the individual and the extent to which the femoral head is damaged. The age of onset of the disease is usually a prime determinant in the prognosis of the individual, regardless of the treatment (operative or non-operative). Some physicians have noted that children over 8 years of age will usually have a poorer outcome than those who are younger.1,2,5,6 Kruse et al.7 reported two cases that were treated non-operatively, both of which involved patients who were older than 8 years of age. Neither patient had a positive outcome. Containment is the method of treatment for LCPD that maintains the femoral head within the acetabulum, thereby allowing the natural curve of the acetabulum to reshape the femoral head.3 The available evidence suggests that children older than 8 years of age do not benefit from containment treatment.4,6 Children who are less than 6 years of age usually have a better outcome and fewer residual problems, regardless of the chosen method of treatment.5,6 Kamhi and MacEwen8 reported that approximately half of children treated with containment had a good result (48%) and approximately half had a good result without containment (49%). Although age is a strong predictor of the outcome, the extent of the deformity to the femoral head and hip ROM are important factors.

The main goal of LCPD treatment is to maintain (or restore) a spherical femoral head and to prevent loss of hip ROM.1,2,5 A nonsteroidal anti-inflammatory drug and crutches for relief of pain associated with walking, traction, and rehabilitation help improve ROM.1-3,6 Depending on the severity of the condition, other methods of treatment may include containment or surgical intervention. Containment involves the application of a Petrie plaster cast or brace that maintains the hip in a position between 30 and 45 degrees of abduction for several weeks. Because containment requires several weeks of immobility, hip ROM must be restored before it is initiated.1,4

Surgical management of LCPD is generally recommended. The extent of the femoral head that is involved and the age of the client are criteria that influence the likelihood of surgical intervention success, including the extent to which the femoral head demonstrates abnormality and the age of the patient. A variety of surgical methods are used, but outcomes have not been found to be significantly different.2,5,6 Because the pathophysiology of LCPD is unclear, expert opinions about best practices for its management differ. The goals of LCPD rehabilitation are essentially the same as for other hip disorders: decreasing inflammation, decreasing pain (through reduction of weight-bearing activity), and increasing hip ROM. Restoration and maintenance of hip ROM is believed to be the most important aspect of LCPD rehabilitation.6

Aquatic Exercise vs. Land-based Exercise

Incorporation of aquatic exercise as a component of LCPD rehabilitation will be fun and beneficial for the child patient. Aquatic exercise may increase ROM to a greater extent than land-based exercises alone, and the buoyant environment has other benefits. Reduction of compressive force on the joints of the lower extremity facilitates restoration of normal movement patterns in patients who are unable to perform normal weight-bearing activities or are unable to walk without a gait abnormality. Although research evidence for aquatic exercise benefits for LCPD patients do not exist, several studies have demonstrated benefits for individuals with rheumatic diseases. Templeton et al.9 reported that 94% of patients with rheumatic disorders experienced a decrease in pain and improved their functional abilities. Hinman et al.10 reported that 72-75% of patients with hip and knee osteoarthritis who participated in a 6-week aquatic program experienced pain reduction.