1998

A Review of Osteochondritis Dissecans in the Knee and Elbow

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A REVIEW OF OSTEOCHONDRAISIS DISSECSANS IN THE KNEE AND ELBOW

by

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An Independent Study

Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
University of North Dakota

in partial fulfillment of the requirements
for the degree of
Master of Physical Therapy

Grand Forks, North Dakota
May
1998
This Independent Study, submitted by Kimberley Claire Dalere in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Signatures)

(Faculty Preceptor)

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ABSTRACT

Osteochondritis dissecans (OCD) is a condition or injury that causes a separation on the subchondral bone and articular cartilage.\textsuperscript{1,2} The reported incidence of OCD is 30-60 cases per 100,000 people.\textsuperscript{3} It is primarily found in the knee and elbow joints.\textsuperscript{1,2,3} The male to female ratio has been reported as two to one in the knee joint and three to one in the elbow joint, with thirty three per cent having bilateral involvement in one occurrence.\textsuperscript{1,4,5,6} Since OCD has a high incidence rate in men and women, the purpose of this study is to compare and contrast OCD in the knee versus in the elbow. This review of the literature will also explain why OCD can occur in both a weight-bearing and a non-weight-bearing joint with the same possible etiologies. This review of the literature will also explain the conditions, classifications, clinical features, and management and treatment of OCD in the knee and in the elbow. It was concluded that OCD has no significant evidence or relationship of occurrence in a weight-bearing versus a non-weight-bearing joint.
CHAPTER ONE

INTRODUCTION

Osteochondritis dissecans (OCD) is a condition or injury that causes a separation on the subchondral bone and articular cartilage.\textsuperscript{1,2} The reported incidence of OCD is 30-60 cases per 100,000 people.\textsuperscript{3} Patients usually present in their teenage years, but the disorder may occur later in life. It is primarily found in the knee and elbow joints.\textsuperscript{1,2,3} The male to female ratio has been reported as two to one in the knee joint and three to one in the elbow joint, with thirty three per cent having bilateral involvement in one occurrence.\textsuperscript{1,4,5,6} Since OCD has a high incidence rate in men and women, the purpose of this study is to compare and contrast OCD in the knee versus in the elbow. This review of the literature will also explain why OCD can occur in both a weight-bearing and a non-weight-bearing joint with the same possible etiologies.

As early as 1558, Ambrose Pare has been credited with the first removal of loose bodies assumed to be osteochondral fragments from joints.\textsuperscript{2} It was first described as “quiet necrosis” by Paget in 1870.\textsuperscript{1,2} In 1888 “osteocondritis dissecans” was termed by Konig based on the hypothesis that these “corpora mobile” were caused by a pathological condition or by spontaneous necrosis resulting from trauma. He believed that there was inflammation of the ostochondral joint surface which caused separation of the bone itself. Through research studies and medical advances, the absence of inflammatory cells in excised osteochondral loose bodies was found and trauma became more of an etiological
factor. Nevertheless, the use of the original name has been maintained and continues to be used today.

In earlier literature, osteochondritis dissecans was treated either non-operatively or with an arthrotomy for removal of the loose fragments.\textsuperscript{1} Non-operative procedures are still preferred for patients who are in the early process of the disease and for those who have open physes. As diagnostic advances and further knowledge of osteochondral healing have progressed, other options and alternatives have become available for operative treatment of lesions in its later stages.\textsuperscript{1} Magnetic resonance imaging has become useful in the management decision of lesions in the knee and elbow.\textsuperscript{1,2,5,7} Radiography, arthroscopy, MRI and bone scans are all useful in determining the stages of the lesion as well as reliable findings on whether conservative treatment will be beneficial for the patient.\textsuperscript{5,7,8}
CHAPTER TWO
CONDITIONS/FACTORS OF OSTEOCHONDRITIS DISSECANS IN THE KNEE

Osteochondritis dissecans (OCD) is a painful fragmentation of an articular surface which most commonly affects the medial femoral condyle of the knee joint in 80%-85% of the cases. Within the knee, OCD lesions also occur at the lateral femoral condyle (10% to 15% of cases), and the patella (5% of cases). Lesions to the medial femoral condyle commonly occur on the outer non-weight-bearing surface of the condyle.

Classification

The OCD fragment consists of an articular cartilage that remains intact with a piece of subchondral bone that varies in thickness. A stable fragment remains in its normal anatomical location with a smooth articular surface. An unstable lesion may detach to become a loose body within the joint space.

The cartilage is nourished by synovial fluid rather than direct blood supply, therefore the cartilage remains alive even if the fragment is a loose body. However, with repetitive trauma and the loss of mechanical support, the cartilage may undergo softening and degenerative changes.

The fragment portion of the bone is relatively avascular which results in a chronic fibrocartilaginous scar that covers the fragment, similar to that seen in a fracture nonunion. However, the bone that lies under the femoral base from which the fragment
separates has normal vascularity.\textsuperscript{10} This is the main distinguishing factor between OCD and osteonecrosis, in which the underlying bone is avascular.

Although OCD has been described in detail, the cause of the disorder remains unclear. There has been many proposed etiologies, including trauma, ischemia and additional factors that may predispose a patient to this disorder.\textsuperscript{1-3,5,6}

In a variety of studies, authors have supported a possible etiology as being trauma.\textsuperscript{1,2,5,10} Approximately 60\% of patients presenting with OCD participate in a high level of athletic activity, and 40\% of patients presenting with OCD of the knee have a history of major repetitive knee trauma.\textsuperscript{10}

Normal knee anatomy may be a causal factor in OCD. The medial tibial spine inserts a broad attachment of the posterior cruciate ligament which lies close to the medial femoral condyle. The frequency of lesion over the lateral aspect of the medial femoral condyle may be due to the repeated shear stress from the tibial spine during activity and traction from the posterior cruciate ligament.\textsuperscript{3,5,6,9}

Exacerbated underlying knee abnormalities, including biomechanical malalignment and internal derangement may also be due to trauma. For example, OCD has been associated with meniscus tears, genu varum, and genu valgum.\textsuperscript{6,10} In 20\% of patients with OCD of the lateral femoral condyle, the micro tears of the menisci have been noted. Ligament laxity and trauma are associated with patella subluxation and OCD of the patella which suggest that patients with patella subluxation tend to also have OCD of the patella.\textsuperscript{6}

It is likely that vascular insufficiency leads to fragment separation, but the starting point for the development of OCD may be trauma. In rapidly growing bone, the
secondary centers of ossification and blood supply to the epiphysis can be made weak and thin.\textsuperscript{3,5}

Trauma and ischemia alone are difficult to explain the high incidence of multiple and bilateral lesions.\textsuperscript{3,4} Therefore, this suggests that there are true additional factors that may predispose some people to develop OCD. Various authors and theories have been taken into consideration for possible causes of OCD including genetic or endocrine factors, generalized ligamentous laxity, and abnormalities of secondary ossification centers.\textsuperscript{3,9,10} It is likely that OCD's etiology is multifactorial based.

Clinical Feature

Patients with OCD of the knee are commonly associated with poorly defined symptoms.\textsuperscript{1,2,10} These include poorly localized knee pain and swelling. As the lesion progresses, symptoms of the knee locking or giving away may be noted. The lateral aspect of the medial femoral condyle is the site that is commonly affected in the knee. Internal rotation of the tibia causes the tibial spine to strike the lateral aspect of the medial femoral condyle which results in an exacerbation of pain due to the strenuous activity and twisting motions. As a result of a lesion to the medial femoral condyle, patients may walk with the affected leg externally rotated. A painful "clunk" with knee flexion and extension is also noted with this type of lesion.

Full range of motion of the affected knee is usually maintained on a physical exam unless loose bodies are present which causes more constant symptoms of a mechanical locking, swelling and pain.\textsuperscript{1,2,5} The physical examination may also reveal crepitus in the medial portion of the knee. Thigh circumference measurements may be diminished on the affected side because of disuse atrophy. If the patient has been active,
joint effusion may be noted due to mechanical irritation. Diffuse tenderness and poorly localized pain over the involved femoral condyle may be elicited with knee flexion in the early stages of the disorder, but well defined point tenderness is usually present in the later stages.

Wilson\textsuperscript{11}, illustrated a physical sign for OCD of the medial femoral condyle that physical therapists as well as physicians can use to differentiate OCD from other disorders of the knee. The sign is elicited by the examiner whom positions the knee in 90 degrees of flexion and internally rotates the tibia while bringing the knee into extension slowly. The patient experiences a positive sign when pain is experienced at approximately 30 degrees of knee flexion. The reason behind this is that the medial tibial spine rubs against the medial femoral condyle causing an increase in pain.

Patients with OCD of the patella present with retropatellar pain and crepitus.\textsuperscript{10} Upon a physical exam the findings are similar to other causes of anterior knee pain, such as patellofemoral syndrome. The fragments remain intact, which rarely become loose bodies. Patients who have patellofemoral symptoms are at high risk of OCD of the patella especially at a young age.

Management and Treatment

OCD is usually confirmed by radiographic findings. Plain radiographs are adequate to see the lesion and should include a notch or tunnel posteroanterior view.\textsuperscript{1,2,12} For lesions that are not easily seen on a standard AP radiograph, the tunnel view is particularly useful. The typical finding that is usually seen is a radiolucent semilunar line that outlines a circumscribed area of sclerotic subchondral bone separated from the
remained epiphysis. An unstable fragment and a poor prognosis for spontaneous healing is classic for sclerosis of the underlying femoral base.

Lesions of the lateral femoral condyle, on a lateral radiograph, are seen posterior to a line extending from the posterior femoral cortex.\textsuperscript{1,2,5} It is usually larger, more posterior, and involves more of the weight-bearing surface of the tibiofemoral joint. With knee flexion and extension, many patients feel a painful "clunk".\textsuperscript{12} In the same regards, the diagnosis of OCD of the patella is also made radiographically. This typical lesion is located at the inferior aspect of the underlying surface of the patella.

Arthrography, computed tomography (CT), magnetic resonance imaging (MRI), and bone scan are other radiographic techniques that have been used to diagnose and characterize OCD. Arthrograms are useful in determining a loss of continuity of the articular cartilage, but in the presence of a stable lesion they are of little value.\textsuperscript{5} CT scans are able to provide detailed evidence of the bone, but cannot be used to assess fragment instability.\textsuperscript{5,7} Therefore, insufficient findings for the diagnosis and management of OCD cannot be provided by arthrography or CT alone.

MRI is useful in OCD management decisions because it provides visualization of loose bodies which helps determine the size and degree of displacement of the major fragment, as well as revealing information about fragment stability.\textsuperscript{1,2,5,7} In T\textsubscript{2}-weighted images, synovial fluid or effusion are easily seen between the fragment and the subchondral bone.\textsuperscript{7} This finding shows that the fragment is detached and will require surgical treatment. MRI is also helpful in determining the progress of fragment healing responses and revascularization of the lesions.\textsuperscript{3,7}
As a prognostic indicator for operative intervention or conservative management, a bone scan can be used. Radionucleotide uptake by the bone and healing potential have a close correlation. A better prognosis is seen when the lesion starts to increase its uptake and increase blood flow to the area. If serial bone scans reveal stable or decreasing radionucleotide uptake in the presence of constant, abnormal roentgenograms, the lesion is unlikely to heal with conservative management.

Once the physician has determined a diagnosis of OCD, the goals of treatment are to reduce pain, restore the continuity of the articular surface, and decrease the likelihood of future displacement or degeneration of the femoral fragment. Referral to an orthopedic surgeon is highly recommended with lesions of the lateral femoral condyle because these lesions are less stable, difficult to manage, and often require surgical treatment. An aggressive surgical approach would be an osteotomy, hemiarthroplasty, or allograft especially if it involves a large portion of the weight-bearing surface of the femoral condyle. Lesions to the medial femoral condyle usually have a management option depending on the patient’s age and the stability, location, and size of the lesion. In cases of patients with patellar OCD, the prognosis is unclear in regards to their age. Younger patients tend to have a better prognosis than older patients when it comes to management.

Nonsurgical management is indicated for a juvenile/young adult patient (includes children up to the age of early adolescence, girls 11 and younger and boys 13 and younger with open physes, and females 12 to 20 and males 14 to 20 who have near skeletal maturity) with a lesion in the medial femoral condyle and no evidence of fragment instability on plain radiographs. Patients using conservative management
need to modify activity to promote bone healing at the site of fragment separation for 6 to 12 weeks. Younger patients generally require a shorter period activity modification than older patients. To control the pain and to start the healing process, immobilization and splint casts may be needed to minimize weight-bearing in the initial 1 to 2 week period. However, joint motion is important for bone nutrition and healing. Prolonged immobilization and casting should therefore be avoided along with highly repetitive or rapid movements especially, figure eights, running and jumping.

Every day activities and upper body strengthening exercises are recommended to maintain tone and cardiovascular endurance. Low-impact exercises such as walking and swimming are usually recommended initially as long as the patient is able to tolerate it.

After the period of activity modification, decisions regarding a patient’s return to normal physical activity should be based on the individual’s symptoms. This is followed by a gradual return to full activity.

Full activity may be permitted once the following criteria are met:

1. The patient has no complaints of pain.
2. The physical examination is normal, including full range of motion, no joint swelling, and no tenderness.
3. The disappearance of the radiolucent line that outlines the fragment on the radiographic images.

Plain radiographs usually show some healing between 3 and 6 months after the last treatment. If a patient is improving clinically with nonsurgical management during the first 12 weeks, no further radiographic imaging or referral to an orthopedic surgeon is needed. It is not necessary to perform a MRI or bone scan initially with instability and
poor healing potential. Rather, MRI and bone scan may be used to follow the progress of healing if the patient has no improvement of symptoms over the first 4 to 6 weeks of conservative therapy and if radiographs are constantly showing abnormalities after 12 weeks.

“Silent” OCD noted accidentally on radiographs of an asymptomatic juvenile or young adult patient usually needs no further evaluation or treatment and can be managed by observation alone. However, surgical treatments for silent lesions in adults is highly recommended to prevent further degeneration of the bony fragments.

If conservative therapy fails to relieve symptoms or if there is no radiographic evidence of healing after 12 weeks, surgery may be the only alternative for juvenile/young adult patients with stable lesions of the medial femoral condyle. Regardless of the stability of the lesion, adult patients are recommended for surgical repair. Patients with unstable fragments require surgery regardless of age.

There are many types of surgical interventions that have been used or proposed for OCD treatment. The overall objective of these procedures are to promote healing at the junction of the fragment subchondral bone and the underlying bony base, and to restore a normal, smooth articular surface.
CHAPTER THREE

CONDITIONS/FACTORS OF OSTEOCHONDRITIS DISSECANS IN THE ELBOW

Osteochondritis dissecans (OCD) of the elbow is a rare disorder, and its prognosis is not well documented. The most common area for OCD to develop in the elbow is at the capitellum. The occurrence of this relatively rare disease in more than one member of a family and the observation that the disease may affect multiple joints in one person, suggests that some patients have more of a tendency toward the disease than others. However, the predominance of the disease is in males and the frequency in which the right elbow only is involved, suggests that excessive use may cause the disorder.

Classification

Although OCD of the elbow is an uncommon disorder in the general population, the condition is neither unusual nor rare in young adolescent athletes whom are engaged in throwing activities or any other athletic endeavors. It is first important to differentiate between osteochondrosis of the capitellum and osteochondritis dissecans of the capitellum. The differences are related to age and degree of involvement of the capitellar secondary ossification center or growth center. Osteochondrosis is defined as a disorder of the growth or ossification centers in children that begins as a degeneration or necrosis which is followed by regeneration or recalcification. This condition is also known as Panner’s Disease, and its treatment is completely different from that of osteochondritis dissecans of the capitellum.
OCD of the capitellum is a condition where the capillaries in the tissues of the head of the radius get damaged to the point that they do not bring the necessary nutrients to the bone, causing the bone to eventually die. This would indicate fragmentation and possible separation of a portion of the articular surface.\textsuperscript{16} OCD has also been described as an inflammation of cartilage and bone, resulting in the splitting of pieces of cartilage into the joint.\textsuperscript{14} It is important to understand that the capitellum usually appears in males at age 2 years and fuses at age 14.5 years. Therefore in adolescence, the skeletal maturation is nearly complete when the condition occurs.

The cause of OCD is controversial, although the role of trauma is undeniable in most instances.\textsuperscript{16-20} There have been reports of familial tendency\textsuperscript{21,22} and of multiple joint involvement in the same patient, which confuses the issue of whether trauma or ischemia is the cause. There is no conclusive evidence that OCD of the capitellum is an inheritable disease in spite of these reports.\textsuperscript{13}

A traumatic etiology was popular in the past, but there is no convincing evidence that a single traumatic episode has produced OCD of the capitellum.\textsuperscript{9,14,19} In contrast, a history of repetitive use of the elbow on a regular basis in sports has commonly been associated with this condition. Two major factors in predicting the frequency of elbow problems are known to be pitching and repetitive trauma.\textsuperscript{9} When one studies the biomechanical forces of the throwing motion, a considerable distractive force is concentrated on the medial aspect of the elbow in the cocking phase, which results in compressive forces on the lateral side of the elbow and a translatory force across the humeral olecranon articulation.\textsuperscript{9} These forces neutralize as the arm is brought forward in the acceleration phases. As the follow-through is initiated, two major forces act on the
posterior and anterior aspects of the elbow: triceps contraction through its insertion on the olecranon, and the force delivered by a rapid rotational pronation of the forearm, associated with a combined shearing and compressive force of the radial head on the capitellum. In baseball pitchers it is repetitive trauma, especially forceful extension and pronation of the elbow, that creates the most severe compressive shearing forces transmitted by the radius to the adjacent articular surface of the capitellum. This may result in inflammation of an area of subchondral bone in the overlying articular cartilage which is not yet securely intact to the rest of the epiphysis by normal bony maturation.\textsuperscript{14,20}

Ischemia is the third theory of etiology of OCD of the capitellum. This theory is primarily based on the fact that the capitellum is the receiving end of vessels that terminate in the subchondral plate. Also, due to the interruptions of the subchondral terminal arterial vessels, the histopathological characteristics of the involved area are typical of bone separations.\textsuperscript{14} Viable osseous tissue is replaced when the cartilage remains intact following the ischemic episode allowing for an absorption of the avascular segment to occur. The normal structure of the articular surface is preserved because this is not a weight-bearing joint. If however, the articular cartilage is fractured during the initial stage of the disease, the osteochondral fragment may become separated and may result in an intra-articular loose body.\textsuperscript{13}

Clinical Feature

Athletes suffering from OCD of the capitellum commonly complain of pain. The pain is usually exacerbated with activity and relieved by rest. For many baseball pitchers, the first symptom is pain in the elbow after a season of pitching. The elbow pain can also
occur with any other type of activity such as tennis, discus throw in track and field, and
golf etc. These subjective findings may be accompanied by intermittent swelling. These
symptoms usually occur early in the course of the disorder, when there are no intra-
articular loose fragments.13

As the disorder progresses, the next most frequent complaint is the inability to
fully extend the elbow. This can be accompanied by clicking, locking, and severe
intermittent pain. These complaints are generally encountered when loosely attached or
free bodies are dislodged into the joint. Less common complaints, such as limitation of
flexion of the elbow, and pronation and supination of the forearm, may also occur.13

The physical examination of an athlete with this condition shows some decrease
in the range of motion of the elbow, as previously explained. Crepitus is also noted
throughout the range of motion and with direct palpation, there is often pain located over
the lateral aspect of the elbow. An uncommon but positive physical finding is an
interposed osteochondral fragment which results in locking of the elbow through flexion
and extension.13

Radiographic changes of the capitellum or radial head observed by a physician
helps to determine the progression of OCD. Irregular ossification in the capitellum is
usually seen on the articular surface. This is mostly seen on the anteroposterior view of
X-rays. Flattening and irregularity of the capitellar articular surface is usually seen on
the lateral view. Multiple loose fragments within the joint are more common in the
advanced stages of the disease. Tomograms used with contrast medium can be more of
an accurate method of establishing a diagnosis if plain radiographs are difficult to see.13
As the disease progresses, an enlarged radial head is shown on the radiograph compared to the opposite elbow. Comparing the affected elbow with the unaffected normal elbow, premature skeletal maturity is evident. The last stages of this condition may include degenerative changes of both the capitellar and radial head articular surfaces, characterized by irregularity and incongruity of these surfaces.

If sequestration does occur, multiple loose fragments can be seen within the elbow joint. Along with loose fragments, irregularity of the articular surface of the capitellum can occur. If sequestration does not occur, the central sclerotic fragment gradually becomes less noticeable and opaque with time, and the surrounding area of irregularity gradually ossifies as the lesion heals. This may take several years to occur, long after objective complaints have subsided.

Management and Treatment

Depending on the stage of the disease, the treatment of OCD of the elbow may vary. The stage of the disease is dictated by the clinical findings and the radiographic appearance. In addition, arthroscopy is occasionally used to determine whether or not the osteochondral fragment has separated. Three types of OCD lesions and their treatment will be described in the following paragraphs.

Type one lesions have no evidence of subchondral separation or fracture of the articular cartilage as noted on contrast tomography. Most authors manage this entity nonoperatively. The nonoperative protocol involves rest of the elbow and avoidance of all activity requiring the use of the elbow. The elbow is casted or splinted if pain continues to be a significant complaint after rest. Active range of motion exercises of the elbow are begun almost immediately to preserve motion even if the joint is
splinted. To confirm the maintenance of the osteochondritic portion of the capitellum, serial radiographs are performed every three to six months. Rest of the elbow is continued indefinitely until the affected area revascularizes. Athletes are recommended to refrain from all sporting activity to control pain and elbow stiffness.

Type two lesions, on radiographic or arthroscopic review, show that there is evidence of subchondral detachment or fracturing of the articular cartilage. If this is the case, the surgeon is left with two options: 1) to try to reattach the area of avascular bone surgically, or 2) to take the fragment out to prevent loose body formation. Pappas agrees with the removal of the loosened fragment as well as Roberts and Hughes but they do not recommend any other surgical procedure, drilling, or trimming of the remaining crater after removal of the loose body; however Smillie does recommend the latter debridement procedure. There has been no evidence that surgical procedures on the crater either help or hinder the overall prognosis of this Type two disease. In Woodward and Bianco’s study, the poorest results were associated with bone grafting of the defect or replacement of the loose fragment.

If a surgeon decides to pin the partially detached lesion, several unthreaded Kirschner wires may be used. The wires are inserted following exposure of the capitellum through a Kocher approach. The tips of the pins are embedded deep into the articular cartilage so that they do not protrude into the joint. They are brought out through the skin in the lateral epicondyle and may be removed under local anaesthesia at six to eight weeks.

Evidence of healing shows a reabsorption of the sclerotic bone at the base of the lesion with preservation of the articular surface. Even with a successful reattachment,
reabsorption of the sclerotic bone is not guaranteed. Occasionally, deformation and collapse of the capitellar articular surface may occur. 14

Type three lesions are diagnosed if loose bodies have formed and causing symptoms which is an indication of removal. To relieve the symptoms of locking, Smillie 10 recommends removal of the loose fragments, however this may not improve range of motion. This has also been demonstrated by Woodward and Bianco 20 . Arthroscopy is the most effective form of removal; yet loose bodies may also be removed by open arthroscopy. 14 Unfortunately, late degenerative arthritis still may be a problem with this condition, even with removal of intra-articular loose bodies. 13

If significant radiocapitellar degenerative changes are noted, excision of the radial head may improve lateral elbow pain and restore some pronation and supination to the forearm. This is contraindicated in an adolescent with a skeletally immature body structure. 13, 14
CHAPTER FOUR
COMPARISON OF OCD IN THE KNEE AND ELBOW

The etiologies of OCD of the knee and OCD of the elbow are rather controversial. However, repeated trauma, ischemia, and/or genetics can play an important role in the mechanism in both of these areas of the disorder. Although OCD of the knee commonly occurs in males less than ten years of age and older than fifty years of age, OCD of the elbow frequently occurs in males between the ages of ten and sixteen years.

There are various areas that OCD can occur in the body. OCD of the knee commonly occurs on the medial femoral condyle and OCD of the elbow occurs on the capitellum. The complaint that most people experience in both of these areas is pain. The pain in the knee is diffuse with aching after exercise but the pain in the elbow is exacerbated with activity and relieved with rest.

Patients with OCD of the knee usually have an inhibition of full knee flexion accompanied with stiffness, clicking and occasional locking. Whereas, patients with OCD of the elbow have an inability to fully extend the elbow and is accompanied by clicking and locking. Muscle atrophy and mild joint swelling can also be noticed in both the knee and the elbow as the condition progresses.

The treatment of OCD of the knee and the elbow may vary depending on the stage of the disease. Radiographs and other methods are used in both conditions to confirm the findings. Children who have a lesion of the knee or elbow usually do well irrespective of
the method of treatment, and those who have a persistently symptomatic lesion generally respond well to operative arthroscopy if limitation of activity and protected weight-bearing have failed. Because the knee is a weight-bearing joint, a lesion of the knee in an older patient is unlikely to heal with non-operative treatment; therefore, treatment should include techniques that promote revascularization of the subchondral bone and restoration of the fragment with or without bone grafting. On the other hand, because the elbow is not a weight-bearing joint, patients with OCD are recommended not to engage in any type of activity until the injury is completely healed and revascularization has occurred. Controlling the pain and increasing the range of motion in the elbow is the primary focus of management, however surgical intervention is usually performed in the latter stages of the disease when conservative treatment has not been successful and loose bodies are present.

Although OCD of the knee is a completely different disorder than OCD of the elbow, one can see that there are many similarities between the two. From their etiologies to their treatment, the differences are so minute even though one condition is a weight-bearing joint and the other is not.
CHAPTER FIVE

SUMMARY

The past and current research of OCD suggests that there is still no clear cut etiology. The mechanism of the injury is generally assumed to be related to a variety of reasons (i.e. repetitive trauma, ischemia, and genetics) at a susceptible location. There are two different populations of patients, children and adults, that are affected by OCD of the knee and/or elbow and the result of treatment is largely determined by the status of the physes. Conservative treatment should be emphasized in the young patient who has open physes and a more aggressive approach is used in the older patient that is symptomatic. Drilling is useful in the loose unseparated fragment. Free fragments should be replaced when possible if they involve a portion of the weight-bearing articular surface. When replacement is impossible, treatment must be individualized and joint range of motion exercises with non-weight-bearing activities are essential. In cases which involve a large portion of the weight-bearing surface of the femoral condyle, a more aggressive treatment such as an osteotomy, hemiarthroplasty, or allograft is performed.
REFERENCES


