Chapter 9
Hip Injuries

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Introduction

Hip injuries are becoming an increasing problem in the population in general, and they have had a significant impact on the military with its young, soldier athletes. The physical and tactical training requirements of military personnel cause tremendous amounts of both force and torque to travel through the hip joint. These forces generated during military training are analogous to those experienced by high-level athletes during intense training and competition. The ground reaction forces transferred through the body from these activities have been linked to musculoskeletal injuries [1]. During normal walking and running, the hip experiences loads 6–8 times the body weight [2]. Recent advances in the understanding of injuries around the hip and their treatment have created the potential for individuals to return to an active lifestyle. The importance of hip pain evaluation and treatment has gained growing importance in the active, athletic population.

Several studies have been performed looking at the impact of various types of injuries it has on various populations [3–6]. The impact of these injuries results in significant strain on the patient and economy. The military population is required to perform duties and activities that place greater strain on the hip joint than the average population. These injuries, along with others, result in loss of man-hours, depletion of manpower for deployment, and increased health-care costs [7–10].

There are several conditions that cause hip pain, some of which are only now becoming better understood. Hip pain can be classified into intra-articular, extra-articular, or mimickers. Historically, many injuries would be treated with

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prolonged activity restriction and therapy; however, recent advancements in imaging and understanding of anatomy have enabled physicians to better diagnose and select new and emerging treatment options for these complex patients.

Anatomy

The bony anatomy of the hip joint is comprised of the acetabulum and the femoral head. They articulate as a true ball and socket joint allowing motion in multiple planes. A capsulolabral complex that includes the labrum, capsule, and ligaments provides stability and support during normal motion [11, 12]. While the bony anatomy and capsulolabral complex set the permitted motion of the hip joint, the surrounding musculature is responsible for providing the motion.

Knowledge of the muscular anatomy surrounding the hip is essential to understanding, diagnosing, and treating hip injuries. The iliopsoas and rectus femoris muscles act as the primary hip flexors with secondary flexors including the pectineus, sartorius, and tensor fascia lata muscles [13]. The gluteus maximus and hamstrings are responsible for hip extension. The three adductors (adductor longus, adductor brevis, and adductor magnus) with gracilis facilitate hip adduction, while the gluteus medius and minimus are responsible for abduction. Only the gluteus minimus and the tensor fascia lata in a minor way stimulate internal hip rotation. The muscles assisting external rotation include the gluteus maximus and multiple small external rotators (superior and inferior gemellus, obturator internus and externus, piriformis, and quadratus).

Intra-articular Hip Disorders

Labral Tears

Tears of the labrum are one of the most common causes for subspecialty referral for hip pain. Degenerative tears of the labrum were first identified in dysplastic and arthritic hips as a result of abnormally increased loads about the labrum [14]. Labral tears have now been associated with multiple pathologic states that result in increased strain on the acetabular labrum, including trauma and femoroacetabular impingement [15–17]. As our understanding of hip injuries has evolved, we have recognized that activities that require repetitive pivoting, or twisting, and hip flexion result in an increased incidence of labral tears [18].

Patients will typically present with a gradual onset of pain in the anterior aspect of the hip or groin that may be related to a particular event. This pain is typically exacerbated by activity, especially sports, and prolonged sitting. Some patients describe mechanical symptoms associated with particular movements and may walk

with a subtle Trendelenburg gait [15]. The most predictive physical exam finding is a positive impingement test, placing the hip in flexion, adduction, and internal rotation [15].

Diagnosis of labral tears is difficult, and patients often go extended periods of time before achieving a correct diagnosis [15, 19]. In asymptomatic active duty service members, labral tears can be found in over 80% of the individuals with magnetic resonance imaging [20]. With such a large number of labral tears present in subjects without symptoms of hip pain, it seems reasonable to conclude that the prevalence of hip labral tears would only increase with the appearance of symptoms. However, studies have demonstrated that 22% of the athletes with groin pain and just over half of individuals with mechanical symptoms have labral tears on advanced imaging or arthroscopy [21–23]. Clinically, it is difficult to determine whether a labral tear is the cause of hip dysfunction or if it is present simply as a distracter to the true underlying pathology.

Femoroacetabular Impingement

Femoroacetabular impingement (FAI) typically presents as pain located in the groin. This pain routinely increases with prolonged sitting and activity, especially those activities involving repetitive hip flexion and cutting movements [24]. Most patients describe a gradual onset of pain and increasing limitations. FAI is the result of an anatomic variation of the acetabulum, femoral head-neck junction, or both that causes abnormal contact forces [25, 26]. In a young, active, military population, the prevalence of radiographic evidence of FAI in those who present with complaints of hip pain is over 85% [27].

Patients with hip impingement have reproduction of pain when the hip is brought into flexion, adduction, and internal rotation. They typically have internal rotation of less than 20° and when placed into a figure-of-four position, the affected side will have an increase in the distance from the table to the lateral side of the knee compared to the asymptomatic contralateral side.

FAI is not just a primary cause for injury to the hip in active duty service members. The presence of this anatomic variation may be associated with other problems for the hip as it is subjected to the rigors of military service. Studies evaluating active duty patients with femoral neck stress fractures have found that greater than 50% of the individuals had at least one radiographic finding consistent with FAI [28, 29]. It may also cause athletic pubalgia and sports hernias in high-performance athletes as a result of the abnormal motion in the hemi-pelvis with incidence ranging from 15 to 40% [30, 31]. As this information was collected from nonmilitary, high-performance athletes, the translation of this to the military population may represent an under- or overestimate. More research is needed regarding this topic to determine the prevalence of these types of injuries in a military population.

Osteoarthritis

Hip arthritis is the result of progressive joint degeneration that results in significant pain and dysfunction. It has been reported that arthritis affects over 27 million Americans with a direct yearly cost ranging from $2650 to 5700 per person [32, 33]. The majority of these costs are productivity-based secondary to work time lost. The prevalence of hip osteoarthritis (OA) in the general population ranges from 2.7 to 25% [34, 35]. OA of the hip results in associated comorbidities and a higher mortality rate when compared to non-arthritic individuals [36, 37].

A patient with an arthritic hip will complain of the gradual, usually atraumatic onset of pain. The hip is painful and stiff in the morning with improvement in symptoms after beginning activity. This pain worsens again in the afternoon and with periods of prolonged standing or activity. Typical radiographic findings include joint space narrowing, subchondral sclerosis and cysts, and osteophyte formation. Despite the uniformly good results of total joint arthroplasty for hip arthritis, it results in significant lifestyle and activity limitations for the relatively young military members treated in this way.

The incidence of hip arthritis in the military may be lower than in the civilian population, estimated at 35/100,000 person-years compared to 56–88/100,000 person-years, respectively [7]. Branch of service (particularly Army, Navy, and Marines), sex (female), age (>40), and race (black) were associated with increased adjusted incidence rate ratios for the development of arthritis [7]. While the overall incidence of hip OA in the military is lower than the general population, this is likely secondary to the large percentage of young individuals that make up the military. An incidence of 140 per 100,000 person-years in service members over 40 years old is much larger than the incidence in general population [7].

Stress Fractures

Stress fractures are another common cause of hip pain in active duty service members. These injuries can occur in the femoral neck, acetabulum, or pubic rami. Stress-related injuries are not unique to a military population but do occur at a higher rate given the requirements of rigorous training particularly among initial entry trainees. Stress fractures of all anatomic regions have been reported to occur in up to 30% of the trainees, with pelvic or acetabular stress fractures representing the smallest fraction between 1–10% of all stress injuries [38–40]. Stress fractures result from a sudden increase in loads placed on healthy or compromised bone. The repetitive stress causes a normal response of bone remodeling with resorption and new bone formation. There is an imbalance in the normal remodeling process that occurs resulting in the reparative process being overwhelmed. Nutrition, endocrine, and other mechanical factors can significantly affect this process.

Secondary to the nature of military service and entry training, these other factors play a significant role in increasing the prevalence of this injury. The prevalence

of femoral neck stress fractures in military trainees has been reported at 12 in 10,000 recruits [41]. It has been noted that 40% of the individuals who sustain femoral neck stress fractures during military training were medically discharged from service [41].

Extra-articular Disorders

Greater Trochanteric Pain Syndrome

Greater trochanteric pain syndrome (GTPS) accounts for 10–20% of the hip pain patients presenting to primary care physicians [42, 43]. A cadaveric study has demonstrated six bursae surrounding the greater trochanter associated with the gluteal tendons [44]. The gluteal tendons have been compared to the rotator cuff of the hip [45]. While there is no proven etiology for GTPS, overuse and injury to these muscles and tendons have been postulated to bring about this pathologic state.

In active duty service members, there is a reported overall incidence of 2.03 cases/1000 person-years with a significant difference between men and women, 1.33 versus 6.16/1000 person-years [9]. Comparing the branches of service, individuals serving in the Army were more likely to have GTPS at a rate of 3.15/1000 person-years, the next service was the air force at 1.67 [9]. Similar to studies performed on a civilian population, the incidence of GTPS in the military was highest among older service members with an incidence of 3.23 in those 40 or older compared to 2.94/1000 person-years in service members less than 20 years old [9]. This study also demonstrated a racial difference in service members with white service members being at higher risk than blacks [9].

While this study does provide us with information on risk factors for GTPS, it does not address the man-hours lost to training and deployment, medical costs to include physical therapy, or productivity. This information is vital to improving our ability to prevent and develop improved treatment plans for this and other disorders.

Miscellaneous Hip Disorders

There are other sources of hip pain that affect active individuals including snapping hip syndrome, athletic pubalgia, sports hernia, osteitis pubis, and piriformis syndrome. In active duty service members, these injury patterns are seen with some regularity throughout military treatment facilities. However, the incidence and risk factors for these injuries have yet to be explored. It is important for physicians treating musculoskeletal conditions to be aware of these injuries and understand that they are found in active individuals. However, without more research to help

determine the true incidence and risk factors associated with these injuries, physicians will continue to have difficulty finding ways to help units limit the disability of an injured soldier.

Conclusions

Our understanding of hip disease prevalence within populations and incidence rates in various groups has recently become more mature. The natural history of the conditions is continuing to be uncovered and new procedures developed that seek to treat the injuries of the hip joint. The indications and contraindications for various procedures involving the hip are just beginning to mature. Just as the understanding of the anatomical basis of hip disorders has recently undergone great expansion over the past decade or two, the techniques to treat many of these disorders are just beginning to become mainstream in orthopedic subspecialty practice. As the natural history of many of these disorders is poorly understood, it remains difficult to determine whether the outcomes of these newer procedures will represent an improvement, unless well-controlled randomized controlled trials are ultimately performed. To compound the difficulties in providing the best care for hip disorders, the military population is a unique cohort with inherent challenges and extrapolating the incomplete science of hip disorders in the nonmilitary high-demand patient population to the military population is fraught with risks. This should serve as a strong "call-to-arms" in regard to providing resources to fund research that better defines the prevalence and incidence of all hip-related injuries in the military population and to guide diagnosis and treatment guidelines that are evidence-based specifically for military members. In particular, greater understanding of the long-term outcomes of the treatment of FAI in the military population should be a priority due to its high prevalence, its natural history that predictably leads to OA, and compelling early outcomes in civilian populations suggesting improved return to activity at short and medium term follow-up. Should this also be the case in the military population, there is potential to mitigate the disability that occurs from this disease and keep service members performing at a high level for longer periods. Given the relatively slow development of arthritis in the hip joint, study of the military population in regard to arthritis related to FAI could inform treatments for other populations with this disease.

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