CHAPTER FIVE:

DISCUSSION

GENERAL DISCUSSION

Stress fractures are common overuse injuries among athletes. The most accepted theory concerning the mechanism of injury involves muscle fatigue that subsequently leads to the decreased ability of the muscle to effectively absorb shock, resulting in increased stressed that is placed directly on the bone itself (Hough *et al*., 1994). Muscle fatigue is known to occur more often in less fit athletes than in those who are more fit. For this reason, according to Gaedner and colleagues (1988) the incidence of stress fractures is more common in the least fit and less common in those who are most fit. This may be a possible explanation for the high incidence of stress fracture injury found in the freshman athletes as compared to the other academic classes.

In their study, Goldberg and Pecora (1994) found that in a three-year period 67% of the stress fractures in athletes occurred in freshmen athletes. Like Goldberg and Pecora (1994), the results from this current study show a high incidence of injury among freshmen athletes. Of the total number of injuries, 67.8% of them were found in freshmen. Freshmen athletes entering college are faced with many new challenges. First and foremost is the dramatic increase in training from what they experienced in high school. Often, freshmen athletes are not prepared for the intense physical demands of college athletics and as a result, are often not very compliant with off-season conditioning programs compared to athletes in the other academic classes, so they are not in the proper shape. Thus, when they are faced with an abrupt increase or change in training, their muscles fatigue quicker and they increase their risk for injury. Aside from the increased physical demands of college athletics, they must also adapt to a new social environment and demanding academic schedule, both of which add more stress on the athlete.

Many studies have examined the differences in anatomical sites of stress fractures among athletes. Previous studies have shown that the tibia, metatarsals, fibula and femur are the most frequently involved sites of stress fractures particularly among track and long distance athletes (Goldberg *et al*., 1994). In their study, Matheson *et al*., (1987) reported that of 320 stress fracture cases, 49.1% were found in the tibia and 25.3% in the tarsals. The results in this study were substantially larger than these. Among all of the injuries, 74% occurred in the lower leg (tibia and fibula) of the athletes. It is important to note that there was no significant relationship between the specific sport and the anatomic site of injury. This is not particularly surprising given that all of the sports (basketball, lacrosse and track) in which the injuries occurred involved the repetitive pounding of running and jumping.

Throughout the literature, it has been stated time and time again that one of the main contributing factors of the formation of stress fractures is a sudden dramatic increase or change in training routine (Taunton *et al*., 1981; James *et al*., 1978; Mcbryde, 1985). These changes include things like switching from running on flat surfaces to hills, increased mileage or a change in surface type (Goldberg *et al*., 1994; James *et al*., 1978). These changes are often what the college athlete experiences when they enter pre-season conditioning and as the season progresses to mid and post-season. Though there are no other studies to compare with, one of the aims of this study was to determine if there was a relationship between the incidence of injuries and the time of season. Goldberg *et al*., (1994) reported that the most of the injuries in their study occurred following summer break or off-season semester. In light of this, it was theorized that the majority of the injuries in the current study would have occurred during pre-season. However, there was

no such relationship found in this study. Though the results were not significant, more injuries were reported in mid-season than in pre or post seasons. It is important to point out that athletes by nature are very competitive people. They will do just about anything in order to perform at their highest level, and virtually nothing will keep them from competing. It is this mindset that drives an athlete to "play through" the pain of an injury rather than seeking treatment. In light of this, there may have been more injuries diagnosed in mid-season that actually began in pre-season. The data in this study showed that the injuries diagnosed in pre-season averaged more days to treatment than those of mid-season. This may be misleading because the mid-season injuries could have originated late in the pre-season but were not reported and diagnosed until early in the mid-season. Thus, because of this ambiguity, it is difficult to definitively determine during which season the majority of these injuries are actually occurring.

CONCLUSION

Stress fractures are a serious yet preventable injury in college athletics. This study was designed to look at the incidence and patterns of stress fractures occurring in the collegiate female athletic population. Goldberg *et al*., (1994) showed that the majority of these injuries occurred in freshmen and in women. In addition, they reported that a large percentage of the injuries occurred after a dramatic increase in training. Although there was no data on specific changes in training routine in this study, it is hypothesized that dramatic changes in training do occur at different points in the athlete's season. Thus, it can be inferred that the injuries occurred as a result of increases or changes in training routines. In summary, this study demonstrated that there are factors

that contribute to the formation of stress fractures and that the majority of these injuries occur in a particular population of collegiate athletes. From this, recommendations can be made as to the prevention of these injuries in the future.

SUGGESTIONS FOR FUTURE RESEARCH

The relationship between female athletes and the incidence of stress fractures is a complex one to understand. Increasing amounts of research are being conducted on the presence of the female athlete triad in female collegiate athletes. Researchers have found that athletes with exercise-induced amenorrhea are hypoestrogenic and have a decreased bone mineral density (Barrow & Saha, 1988). Because of this, they are at an increased risk for stress fractures. Due to the lack of data on menstrual irregularities in this study, it was not possible to assess whether or not this was a factor in the formation of the stress fractures. However, this is an area that should be studied further and in greater detail especially on the high school and collegiate levels.

Researchers feel that the dramatic changes and increases in training play a large role in the formation of stress fractures. Many have addressed increases in mileage and changes in surface types as major training errors. However, very few have addressed adding alternative methods of conditioning to athletes training programs, in order to take the strain off of the primary weight bearing bones. Future research on alternative training methods such as, cycling, swimming and aqua jogging would determine whether or not these activities provide the necessary cardiovascular training while preventing overuse injuries.

Finally, there are several different factors that predispose athletes to the formation of stress fractures. Many of these injuries, since they do occur over time, could be prevented if these risk factors were addressed ahead of time. Future studies designed to asses the cost and time effectiveness of screening athletes, particularly incoming freshmen, for certain predisposing risk factors would be extremely beneficial. Most studies note that there are numerous biomechanical factors that predispose athletes to stress fractures. However, corrective orthotic devices are usually not prescribed until after the injury has occurred. If these things could be caught beforehand, it very well may prevent a lot of these injuries from ever forming in freshmen athletes. Thus, in the long run saving the athletic department money on scholarships for athletes that can not compete due to stress fractures.