

Femoral Neck Stress Fractures in Military Personnel

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ABSTRACT

Introduction: Stress fractures are common during military training but femoral neck stress fractures are uncommon and sometimes pose diagnostic and therapeutic challenges. An incomplete stress fracture with excellent prognosis, if left unprotected, can lead to displaced femoral neck fracture with almost 63% complication rate even with best of the treatment. The aim of this study was to analyze various aspects of the femoral neck stress fracture so that early diagnosis can be made to prevent devastating complications like osteonecrosis and non-union.

Methods: The four year army hospital record of 16 patients with femoral neck stress fracture were studied. Their demographic profile, type of fracture, presentation delay, on set of clinical symptoms and complication of femoral neck stress fracture were critically analyzed.

Results: The mean age of the patient was 19.94 years. Total 74% of them developed first symptoms of stress fracture between four to seven weeks of training. There was 3.4 weeks delay from the clinical onset of symptoms to the diagnosis of stress fracture. The type of femoral neck stress fracture were compression (31.25%), tension (18.75%) and displaced (50%). Out of eight displaced type of fractures, 5 (62.5%) had developed complications (3 osteonecrosis and 2 nonunion).

Conclusions: Femoral neck stress fracture occurs in initial four to seven weeks of training. The high index of suspicion in initial period of training can help to detect and decreases significant morbidity.

Key Words: *displaced stress fractures, non-union, osteonecrosis, recruits*

INTRODUCTION

Stress fractures are usually reported in young military recruits and trainees.¹⁻⁴ But femoral neck stress fractures constitutes only in 5-10% of all stress fractures, but poses diagnostic and therapeutic challenges.^{5,6} An undisplaced femoral neck stress fracture with excellent prognosis if neglected, leads to displacement with increased complications. Higher incidence of stress fractures has a marked impact on the health of recruits and inflicts a significant financial burden on

the organization by increasing the length of training time, treatment costs and time to military readiness.³ In recent annual audit of our orthopedic department, we noticed that five young soldiers who underwent total hip replacement were case of femoral neck stress fracture. Osteonecrosis of the femoral head or nonunion was the indication for surgery. Based upon these facts, this retrospective study was conducted to analyze femoral neck stress fractures among military personnel for better patient care.

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METHODS

A retrospective study was carried out at Shree Birendra Army Hospital, Kathmandu, Nepal from January 2001 to June 2004. After obtaining ethical approval, case records of all the patients who were admitted at orthopedic ward with diagnosis of femoral neck stress fracture between were analyzed, irrespective of the place where they underwent training, duration of training and the methods of instructions. Cases not having sufficient clinical records and X-rays were excluded from the study. Clinical findings of stress fracture in terms of age, rank, duration of symptoms, delay in diagnosis, type of fracture, method of treatment and complications were analyzed. Statistical analyses were done by using statistical package for social sciences (SPSS) version 11.5 for windows.

RESULTS

A total of 24 patients with femoral neck stress fracture were admitted during the study period of four year but only 16 had sufficient clinical and radiological data to be included in the study. The patient's age ranged from 18-26 years (mean 19.94). Right and left side was involved equally (Table 1).

Among them 11 (68.8%) patients noticed first symptoms between four to seven weeks of training and the most frequent clinical symptom was pain in the groin (69%) (Figure 1, 2). The mean duration of onset of clinical symptom were 5.69 ± 2.5 weeks ranging from 2-11 weeks of the training. The mean week of presentation to the hospital was 9.13 ± 3 weeks ranging from 4-15 weeks of the training. There was 3.44 ± 1.3 week delay in the presentation of the patient to the hospital from the onset of clinical symptoms.

Majority (68%) of the patients were admitted through the emergency because of sudden onset of severe pain and inability to bear weight on affected limb. Only 32% of the patients visited out patient department. Those who were admitted through the ER had higher rate of complications because most of them had displaced fractures. Eight (50%) patients had Displaced type followed by compression (32%) and tension type (18%) femoral neck stress fracture.

Of all admitted patients (16), 5 (31%) were managed conservatively and 11 (69%) had to undergo internal fixation with 6.5 mm partially threaded cannulated cancellous screws with or without closed reduction. Of the patients managed operatively, 5 (45.45%) developed complications. Three of them had femoral head osteonecrosis and two had non-union of femoral neck fracture. All these five patients who developed complications had displaced type of femoral neck stress fracture.

DISCUSSION

Femoral neck stress fractures, though rare can have devastating complications like osteonecrosis and nonunion. In recent years the incidence of stress fracture has shown increasing trends not only in the military but also in civil population.^{3,4} Although we lack epidemiological data, increased interest of younger population towards sports has become very obvious, thus higher incidence of stress fracture in civil population can be expected. On the other hand high demand physical training in armed forces to meet ever growing challenges leads to higher rates of stress fractures in military population too. Most authors agree to the fact that a displaced femoral neck stress fracture have higher incidence of complications, so a preventive measures is the most appropriate mode of its management.

Almost 90% of our patients were recruits who were put in to vigorous physical training schedule without preconditioning training. Since many studies have proven a role of preconditioning training we also felt such training or gradual increase in intensity will have some impact in decreasing incidences of stress fractures.^{7,8} Almost equal distribution of side involvement in our case was similar to that of Sallis's study.⁹

Femoral neck stress fracture are popularly classified by Fullerton and Snowdy, because of its therapeutic and prognostic value.¹⁰ In our study we found that 50% of the patients had type III (displaced) fracture and the presenting complaints were either inability to run or sudden fall while running. Stress fracture has a stage wise progression, starts with periosteitis, then becomes incomplete fracture before being fractured completely.³ Considering this fact, 50% patients presenting as displaced fracture indicates that there is ignorance to early signs and symptoms. Furthermore, 11 (69%) patients had history of pain in the groin few weeks prior to presentation. They were brought to the hospital only when the pain was so severe that the patient could no longer run or unable to walk after sudden fall. This may be the cause why 68% of our patients were admitted via emergency. These facts clearly indicate that there is lack of awareness about the clinical features of stress fractures.

In our study 69% of the patients started having clinical symptoms in four to seven weeks of training. The mean duration of onset of clinical symptom was 5.69 weeks. In contrast to our study, Stoneham reported that most of their stress fractures presented in the last few weeks of training, which according to them may be because of increased intensity of training towards the end.¹¹ Although we have not compared the training schedules, but we found that training is intense in initial phases of training compared to later phases. This may be the reason of early onset of stress fracture in our setup. This further emphasizes the need of a preconditioning

Table 1. Different parameters of the patients

SN	Rank	Age	Side	Type	Week of clinical onset	Week of presntn	Delay in hosp presntn (in weeks)
1	Recruit	19	Left	2	5	10	5
2	Recruit	20	Left	3	3	7	4
3	Recruit	19	Right	1	7	10	3
4	Recruit	20	Right	3	6	8	2
5	Private	21	Left	2	5	7	2
6	Recruit	18	Right	3	4	8	4
7	Recruit	19	Right	1	5	10	5
8	Recruit	19	Left	3	4	8	4
9	Recruit	20	Left	2	11	14	3
10	Sergeant	26	Left	2	9	12	3
11	Recruit	19	Right	3	2	4	2
12	Recruit	20	Right	2	4	5	1
13	Recruit	20	Left	3	10	15	5
14	Recruit	20	Left	1	5	8	3
15	Recruit	19	Right	3	6	12	6
16	Recruit	20	Left	3	5	8	3
	14-Recruits 1-Private 1- Sergeant	Mean 19.94Yrs	Left-9 Right-7	I-3 II-5 III-8	Mean-5.69	9.13	3.44

training and gradual increase in intensity over the period.

The mean delay in seeking treatment (duration from onset of clinical symptoms to the patients' presentation at the hospital) was 3.44 weeks. Considering 14 weeks diagnostic delay in Johanson's study we were too early to diagnose, but unfortunately all these diagnoses were passive.¹² We did not actively detect them, they themselves landed to the hospital with severe symptoms. We believe that with slight modification in our training programme in the initial period of 4 to 7 weeks and awareness of the trainers as well as the trainees would help a lot to reduce the morbidity. Therefore both of them have to be vigilant regarding the features of possible stress fractures. By doing this, we will be able to detect not only femoral neck stress fractures but also stress fractures of the other sites as well.

All compressile (5) fractures were managed conservatively. Three tensile and eight displaced fractures were operated (CRIF – Closed reduction and internal fixation by three 6.5 mm partially threaded cannulated cancellous screws). All tensile type fracture united without any complications but 5 (62.5%) out of 8 displaced femoral neck stress fractures developed complications (3 osteonecrosis and 2 non union). Total 62.5% complication rate in displaced femoral neck stress fracture is comparable with 63% complication rate in study of Harri KP.⁸

One aspect which is neglected in our part of the world is cost of treatment of these fractures. In view of prolonged bed-occupancy (mean 52.8 days), multiple operations (mean, 2.3 times) and possible total hip replacement needed for many of these patients in early age and future revision of total hip replacement (THR), the cost of treatment of would be very high. Although cost calculation is not made in our study, the costs which might be incurred in the treatment of femoral neck stress fractures may justify the expenditure needed for the prevention and early detection of femoral neck stress fractures.

When we scrutinized the records of complicated cases, few facts became transparent. All cases, which later developed complications, were brought to ER when they fell down while running and were unable to walk thereafter. Everybody mentioned that they were having pain in the groin for the previous few weeks. All of them were found to have type III (displaced) stress fractures neck of femur.

Various studies have highlighted the importance of early detection and aggressive treatment of femoral neck stress fracture, delay in treatment have shown to increase recovery period resulting in high training costs.^{14,15} Though the clinical presentation may vary, the recruits describe gradually progressive onset of pain with activity. Initially, the pain occurs only with activity and resolves with rest, this is why trainees are prone to take rest for few days and again start training until the pain

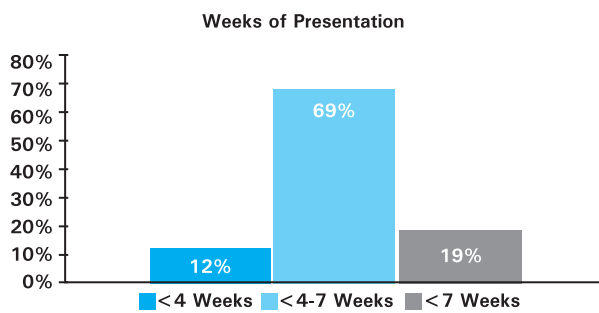


Figure 1. Weeks of presentation

become constant, making them unable to run or play.¹⁴ This explains why most of our patients seek medical attention when fracture is complete or the symptoms are severe enough to limit them from activities. There are very few physical findings but still point tenderness on palpation of the affected bone is the hallmark of stress fractures.¹⁴ X-Ray remains the method of choice to establish the diagnosis of stress fracture even if only 50% of stress fractures will be visualized on initial plain radiograph. This is why repeating the radiographs after 2-3 weeks was advised by many authors.^{14,15} Since MRI and Bone scan both are very costly investigation, we keep them as a reserve method of investigation when there is high index of suspicion with normal X-ray after 2-3 weeks.

Although only 24 cases were admitted during study period, we frequently encounter cases of hip pain after training and on X-ray callus is seen, but were

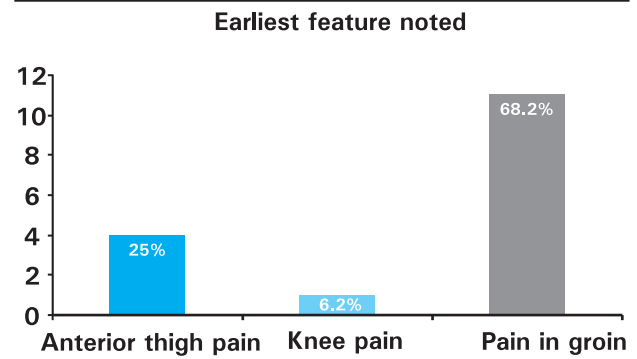


Figure 1. Earliest signs of femoral neck stress fracture

not included in this series as they were not admitted. This indicates that the true incidence of femoral neck stress fractures might be higher than recorded. This is a small retrospective study with only descriptive analysis of secondary data available from the case records. A well planned trial to explore various aspects of femoral neck stress fracture is justified to come to a definitive conclusion.

CONCLUSIONS

Complete elimination of stress fracture incidences is impractical. A high degree of suspicion and a careful watch on trainees in initial four to seven weeks of military training is must. Health education about femoral neck stress fracture to the trainee and trainer will help in early diagnosis and treatment to decrease the significant morbidity associated with it.

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