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Joint Degenerative Disorder Epidemiology in Military Patients by MRI and Comparison with Civilian Patients

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Skeletal-muscle problems are considered as a major cause of disability in developed countries. The articular surface Damages and in the higher levels of disease, subchondral bone injuries, indicate degenerative joint disease progression. Military forces, as a non-communicable disease imposing an extra burden on the health system of armed forces, is paid attention more than before. This study is aimed to investigate the findings of the correlation of demographic and anthropometric images in military patients suffering from pain and to compare the results with *civilain* patients.76 patients referred to Imam Reza Hospital were selected after filling out the personal information and consent forms. Painful Joint pain levels were measured by the numerical scale of Osteoarthritis Index WOMAC (with scoring from 0 = no pain to 10 = maximum pain) by the patient is recorded. MRI images of knee were performed using a circular knee coil by a 1.5 Tesla imaging device, Siemens product. The results were analyzed by SPSS software.The incidence of Talus type I, II, IIA, IIIAVN is rather in military personnel than civilian. The parameters of March fracture (p =0.012) and Calcaneus stress fx (p=0/028) had a more statistical significant difference in Military personnel than civilians (p<0.012). All other parameters are also more in the military than civilians, although the differences were not significant.In recent sturdy, it was specified that the people with military jobs are more susceptible to the joint damages compared to civilians. It seems that it is necessary to use MRI techniques for early diagnosis and the initiation of preventive and therapeutic measures

Key word: Ankle, Military, MRI, Subchondral bone disorders.

In recent decades, the extent of injuries, diseases and work-related accidents has increased with the industrialization of developing countries. One of the most important assets of any organization, especially military organizations is human resources. Therefore, the health of each employee significantly affects the performance of the organization. Skeletal - muscle problems is considered as one of the main causes of disablement in developed societies [1]Restriction of activities, pain, loss of working hours, stress and economic burden all are of the problems associated with skeletal - muscle abnormalities. Degenerative joint disease is the most common rheumatic diseases around the world[2]. In the research conducted outside of Iran, more than 40% of people over age 70 suffer from osteoarthritis of the ankle. This debilitating diseases associate with lowing quality of life and the prevalence of these diseases is recently increasing with the increase in life expectancy[3] Knee pain is the greatest source of disability in patients with osteoarthritis of the knee[4, 5] The importance of investigating the musculoskeletal diseases and especially degenerative joint diseases has been paid more attention than before as the most common cause of musculoskeletal disability in the armed forces, as one of non-communicable diseases which will

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impose an extra burden on the healthcare systems of armed forces. Excessive physical activities, repeated trauma injuries and physical damages imposed on them in the workplace and activity environment of military personnel in different organizations and different categories due to the type of activity, will unintentionally increase the musculoskeletal disease burden on the healthcare systems of armed forces and will result in consequences such as early retirement, increasing the number of exemption from forces' combat and the loss of strong forces because of the lack of early diagnosis and timely intervention to prevent disabling joint injuries[6-8]. Using MRI imaging will provide us a significant capability for predicting and mapping disease pathways and the future which the patient should be waiting for[9, 10] The ability of MRI imaging technique in order to early predict the occurrence of debilitating joint injuries, before, on the one hand, imposing the skyrocketing healthcare costs on the person, on the other hand, reducing the person's ability in doing the organizational mission and operations needed for subordinate forces, can define a modality and guidance to prevent the spread of joint injuries and disability of armed forces personnel resulted from degenerative joint disease (especially the ankle). The aim of this study is to evaluate the disorders and injuries of joint cartilage and *subchondral* bone of knee in military operating forces complaining of pain in the ankle, investigate the relationship between individual and job characteristics and compare it with other people in the society.

Methods

76 patients referred to the orthopedic clinic of Imam Reza Hospital with complaining of pain in one or both ankles between the ages of 45 to 65 referred for imaging with *diagnosis* of osteoarthritis were selected after obtaining informed consent. Exclusion criteria include recent acute trauma to the ankle, history of ankle surgery, ankle arthroscopy, MRI contraindications (pacemakers, cerebral aneurysm clips, cochlear implants, shrapnel in strategic areas of the body, claustrophobia), inability to walk 50 feet without the aid and crutch, hemiparesis of lower limbs, Knee joint replacement surgery program. The knee with the greatest pain will be considered as the studied knee. All patients will fill the questionnaire related to demographic data and history of using analgesic drugs before performing imaging of the ankle and their anthropometric data including weight, height will be measured. The pain level of painful joint is measured and recorded by patients themselves with the numerical scale of WOMAC Osteoarthritis Index (rating from 0 = no pain to 10 = maximum pain). MRI images of knee were performed using a circular coil of knee by 1.5 Tesla MRI imaging device made by Siemens Company. Obtained results were analyzed by using SPSS software and qualitative methods of Chi-square and Fisher's exact test. Chi-square test and Fisher's exact test were used to examine the relationship between qualitative indicators and job of participants in the study.

RESULTS

In this study, in which several parameters were studied, the following results were obtained. Although the number of military personnel with moderate and severe joint effusion is more than civilians,(graph1) this number has no significant difference. There is not any patient with hard joint effusion in civilian patient, while there are 2 and 6militaries with hard and medium joint effusion respectively.

The incidence of talus type I, II, IIA and IIIAVN in military personnel was reported 50, 13, 5 and 10%, and in civilians, 21, 0, 0 and 0, respectively that these values were higher than the prevalence percentage in civilians.(graph2) It is while that, only AVN talus, types of I and II, had statistically significant difference ($p<0.05$)(table1

Civilians with AVN type IV with the prevalence of 6% were reported more than military personnel with the prevalence of 2%. (graph2) But there was no statistically significant difference.

Table 1. Significant difference in AVN(I and II) between militaries and civilians

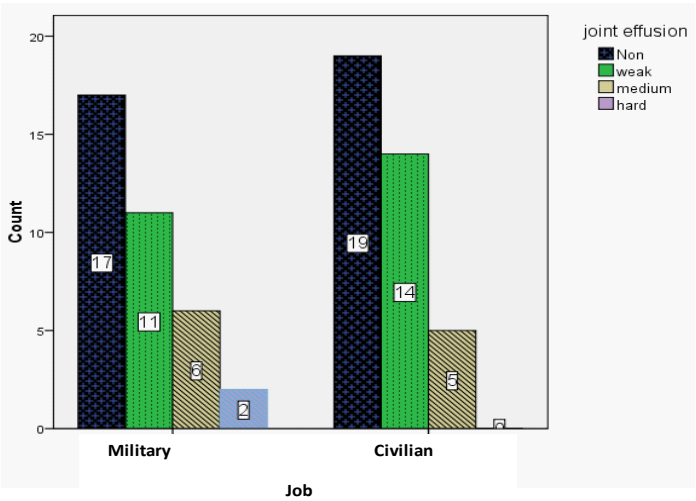
	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Fisher's Exact Test AVN I	0.016	0.008
Fisher's Exact Test AVN II	0.025	0.013
Fisher's Exact Test AVN IIA	0.493	0.247
Fisher's Exact Test AVN III	0.115	0.058
Fisher's Exact Test AVN IV	1.000	0.500

Table 2. Results from Fisher exact test for correlation between joint disorder and job

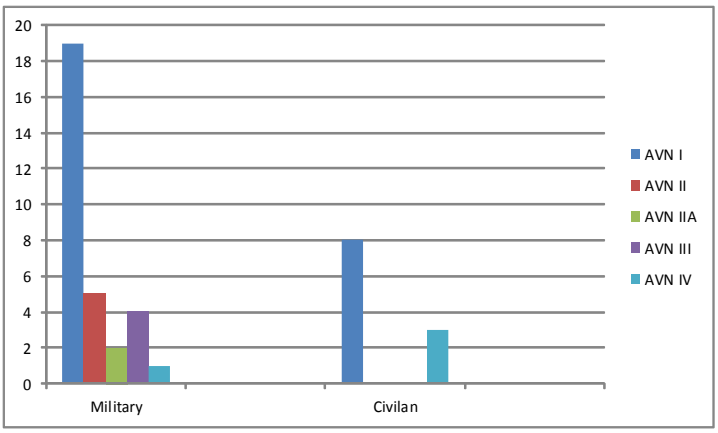
	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Fisher's Exact test March fracture	0.012	0.006
Fisher's Exact test Navicularstreefx	0.493	0.247
Fisher's Exact test Jones fx	1.000	0.753
Fisher's Exact test Calcaneus stress fx	0.028	.014
Fisher's Exact test Sesamoid stress	1.000	0.500
Fisher's Exact test Tarsometetarsal dislocation	1.000	0.500

Statistical data obtained from the questionnaire expressed that among parameters of March fracture, Navicular stree fx, jones fx, Calcaneus stress fx, sesamoid stress and Tarsometetarsal dislocation, only the indicator of March fracture had more significant difference in the military personnel than civilian (p<12%). However, the number of military personnel was more than that of civilians in all these indicators. Prevalence rates of these indicators in the military personnel were reported 18, 6, 3, 18, 3 and 3 percent and in civilians 0, 0, 3, 3, 0 and 0 percent, respectively. In Calcaneusstress and Navicularstress, there are significant different between militaries and civilians patient. (Table 2).

Tendon injury with the effusion seen



Graph 1. Comparison of joint effusion between militaries and civilians



Graph 2. Distribution of different types of ANV talus between military and civilian

around the tendon and tendon rupture were examined in ten areas. That despite the further effusion of military personnel with rupture or effusion around some tendons like Post.tibialis tendon and Proneus brevis, this difference was not statistically confirmed. Ligament injury in five parameters of AtiFL, PTiFL, ATaFL, PTaFL and Calcaneofibular lig were also evaluated among military personnel and civilians. Except the AtiFL parameter in which the number of military personnel and civilians was equal, the number of military personnel was reported more in other parameters that of course, this difference was not statistically significant.

DISCUSSION

Ankle pain is one of the pains that can be greatly annoying and make the walking difficult. There are several factors that can cause acute or chronic pain in the area. Arthritis and joint wear, history of trauma, tendon injuries, and ligament injuries are of important factors that can cause pain in this area. Bone tumors and soft tissues around the ankle and infections in ankle joint and tissue and rheumatic diseases are other factors that can cause the ankle. Intense physical activities of military personnel and subsequently the occurrence of trauma and physical injuries in activity space will unintentionally increase the musculoskeletal diseases and will result in consequences such as early retirement, increasing the number of exemption from forces' combat and the loss of valuable forces. MRI technique can predict the debilitating joint injuries before reaching a critical stage and individual's disability that it can prevent too much cost and reduce the individual's power. This process plays a more prominent role in military forces. In this way that combat power and military operations can be reduced by anticipating such lesions and preventive measures. Such researches are increasingly being conducted in the world.

Guermazi and colleagues[11] in a study on 710 people over the age of 50 years old, residing in Framingham Massachusetts, United States, investigated the prevalence of osteoarthritis in people's MRI. In this study, the most common disorder was osteophyte with an incidence of 74%, then Chondral injury 69%, subchondral bone marrow lesion 52%. In this study it was observed that the more the age, the more the incidence of injury diagnosed in MRI. Roemer *et al*[12] in their famous study titled MOST (Multicenter study of osteoarthritis) conducted a long-term study in people with or at high risk for osteoarthritis. In this study, after examining the prevalence of BML in the initial images, its relationship with the occurrence of subchondral bone attrition over time was investigated. As a result, there was a strong relationship between the incidence and prevalence of SBA and the presence of BML and MRI images, particularly about BML, are known as a proper predictive for OA bone complications (including SBA). BML is also known as early stage and the causes of SBA.

Tanamas *et al*. evaluated the amount of BML and joint cartilage volume in patients' MRI images in a longitudinal study on 109 patients with symptomatic osteoarthritis in a region of Australia and then the same variables were measured two years later[9] Possible surgery of knee replacement was recorded within 4 years later. Based on this study, occurrence of chondral lesions and loss of cartilage volume over the time has a close relationship with BML. Knee replacement surgery performance has a direct relationship with the incidence of BML. Therefore, MRI images are introduced as a suitable guide for predicting the course of disease and the patient's possible need for surgery[13]

Felson *et al*. studied the relationship between prevalence and extent of BML with pain in patients with osteoarthritis in a study in 2001, in which 401 patients with OA were evaluated by knee MRI[14] Among the 351 patients with pain, BML was observed in 272 patients. Among the 50 patients who did not complain of pain, BML was only observed in 15 patients. Among these patients, it was concluded that the BML incidence in knee MRI has a direct relationship with the complaint of pain.

Yeganeh *et al*. evaluated the compliance of MRI findings with radiographic findings and the consistent of both with clinical features and patient complaints by studying 80 patients with knee osteoarthritis[15] Based on the findings, MRI images and radiographic images of cartilage damage, subchondral cyst and bone marrow edema were correlated. But there was no significant relationship

between clinical features and radiographic findings. But MRI images had a close relationship with clinical features and patients' complaints. This study also demonstrates the advantages of MRI over other methods for accurate diagnosis of joint injuries especially in the knee.

Kangarloo *et al*. also examined the prevalence of musculoskeletal disorders in Air Force personnel between years 1992 to 2003 in a retrospective study in 2003. Based on this study, 1931 people who had retired early due to health problems were tested. In its results, the joint diseases with 16.5%, after disc disorders, was the second reason for retirement of Air Force personnel during the 11 years.

The present study it was revealed that people with military jobs are more susceptible to joint damages than civilians, to the extent that this difference was statistically significant in some cases. Therefore, military jobs puts people more at risk of joint damage due to the type of activity and job requirements and hence it seems necessary to use MRI technique for early diagnosis and initiation of preventive and therapeutic measures.

CONCLUSIONS

Risk of joint damages in military personnel is higher than civilians that it must be diagnosed and prevented from making progress before they reach critical stage. MRI imaging is one of the best and most reliable ways to detect this type of injuries that can help armed forces maintain their joint health by its diagnostics power.

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REFERENCES

1. Kendall, J.C., A.R. Bird, and M.F. Azari, Foot posture, leg length discrepancy and low back pain - Their relationship and clinical management using foot orthoses - *An overview.* Foot (Edinb), 2014.
2. Siddiqui, N.A., *et al*., Evaluation of the tarsometatarsal joint using conventional radiography, CT, and MR imaging. *Radiographics,* 2014. **34**(2): p. 514-31.
3. Buckwalter, J., J. Martin, and H. Mankin, Synovial joint degeneration and the syndrome of osteoarthritis. Instructional course lectures, 1999. **49**: p. 481-489.
4. Ridola, C. and A. Palma, Functional anatomy and imaging of the foot. *Ital J Anat Embryol,* 2001. **106**(2): p. 85-98.
5. Kijowski, R., *et al*., Subchondral bone marrow edema in patients with degeneration of the articular cartilage of the knee joint. *Radiology,* 2006. **238**(3): p. 943-9.
6. Moore, K.L., A.F. Dalley, and A.M.R. Agur, *Clinically Oriented Anatomy*2013: Wolters Kluwer Health.
7. Waterman, B.R., *et al*., Epidemiology of ankle sprain at the United States Military Academy. *Am J Sports Med,* 2010; **38**(4): 797-803.
8. Cameron, K.L., B.D. Owens, and T.M. DeBerardino, Incidence of ankle sprains among active-duty members of the United States Armed Services from 1998 through 2006. *J Athl Train,* 2010; **45**(1): 29-38.
9. Tanamas, S.K., *et al*., Bone marrow lesions in people with knee osteoarthritis predict progression of disease and joint replacement: a longitudinal study. *Rheumatology* (Oxford), 2010; **49**(12): 2413-9.
10. Preidler, K.W., *et al*., Conventional radiography, CT, and MR imaging in patients with hyperflexion injuries of the foot: diagnostic accuracy in the detection of bony and ligamentous changes. *AJR Am J Roentgenol,* 1999. **173**(6): p. 1673-7.
11. Guermazi, A., *et al*., Prevalence of abnormalities in knees detected by MRI in adults without knee osteoarthritis: population based observational study (Framingham Osteoarthritis Study). BMJ, 2012. **345**.
12. Roemer, F.W., *et al*., Subchondral bone marrow lesions are highly associated with, and predict subchondral bone attrition longitudinally: the MOST study. *Osteoarthritis Cartilage*, 2010. **18**(1): p. 47-53.
13. Peterfy, C.G., *et al*., Whole-Organ Magnetic Resonance Imaging Score (WORMS) of the knee in osteoarthritis. *Osteoarthritis Cartilage*, 2004. **12**(3): p. 177-90.
14. Felson, D.T., *et al*., The association of bone marrow lesions with pain in knee osteoarthritis. *Ann Intern Med*, 2001. **134**(7): p. 541-9.
15. Yeganeh, A., Correlation of quantified MRI, physical exam and knee radiography in patients with knee osteoarthritis. *Tehran University Medical Journal,* 2011. **69**(3): p. 185-10.