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Evaluation of Magnetic Resonance Imaging Signal Changes in Vertebral Depressed Fractures to Determine the Fracture Time

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Abstract: This research is based on studying MRI signal changes in depressive vertebra fractures in order to determine the time of damages. With this information, difficulty for both clinicians and insurance companies will be resolved. In this descriptive analytical study, the MRI of the patients with vertebral collapse was evaluated. In all cases, during the twelve month study, all fractured vertebras had complete isodense sequences in T1-W and T2-W. This study confirms that any fractured vertebra in contrast with its adjacent normal vertebra has a specific amount of signal change in determined time passing.

Key words: Magnetic resonance imaging, vertebral depressed fractures, fracture time

INTRODUCTION

Vertebral fracture is one of the most common bone fractures. About 30,000 cases of spinal column damages are reported yearly in the United States of America (Alanay *et al*., 2004). Car accidents and falling are the two basic causes of those damages (Goldust *et al*., 2012; Hrabalek *et al*., 2011). Traumatic vertebra damages are among those sicknesses which can cause disability; however, in the recent two decades, progress in imaging techniques provides better diagnose and surgery results (Mohebbipour *et al*., 2012; Wilde *et al*., 2011). Using CT and MRI techniques are the best known ways to diagnose the compressive fracture, a kind of vertebra fracture. CT gives a better evaluation of spinal canal stenosis, bony structure damage and displacement of broken bony elements into the spinal canal, while MRI provides the best information about spinal cord, neural elements and severity of neural injury (Goldust *et al*., 2012; Nieuwenhuijse *et al*., 2011; Tanigawa *et al*., 2011). Knowing the exact time of bone damage and diagnosis between old and new damaged bone is an important problem for doctors, who want to use a specific method to have a better diagnosis and the insurance companies, who are responsible to pay the damages (Denaro *et al*., 2010; Goldust *et al*., 2013). This research is based on studying MRI signal changes in depressive vertebra fractures in order to determine the time of damages. With this information, difficulty for both clinicians and insurance companies will be resolved.

MATERIALS AND METHODS

In this descriptive analytical study, the MRI of the patients who were referred to Sheykh-o-Raees MRI center, Tabriz with vertebral collapse, were evaluated. Among all patients, those who had previously healed fractures, the images of broken vertebra and adjacent normal vertebra in their first visit, third, sixth, ninth and twelfth month intervals were studied. Data of each patient was collected in registration forms and statistically analyzed.

RESULTS

The mean age of the studied patients was 29.2±5.48. Maximum age was thirty-nine and minimum age was twenty-one years old, respectively. A 13.4% of the patients were female and 86.6% of the patients were male. Falling from heights was the reason for 40% of trauma and the rest were caused by car accidents. In 46% of male patients, falls were the secondary reason for trauma and in 54% of male patients car accidents were the primary reason of trauma. In contrast, no case of trauma in females was caused by falling from heights, instead car accidents were the cause for trauma. The most common vertebral fracture was in vertebra L1 with 44.4% and the least fracture was in T9 with 2.2%. The average signal differentiation between broken and normal vertebra in T1-W images in the first visit was 37.8±5.4. These numbers in the third month decreased to 27.93±4.9 in the 6th month increased to 20.45±5.86% and finally in the 9th month, it decreased to 1.56±1.45%. The average changes in T2-W signals between broken and normal vertebra in the first visit was 44.2±1.26. As with the other signal, there was a decrease in numbers. In the third month this amount decreased to 23.15±2, in the 6th month to 13.75±4.16 and by the 9th month 1.7±1.56. In all cases, during

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the twelve month study, all fractured vertebras had complete isodense sequences in T1-W and T2-W.

DISCUSSION

In this study, the mean age of patients was 29.2±5.48. In this regard, young and middle age are the most active period of a person's life, therefore having trauma or injury from accidents is expected. Fractures among men were more prevalent than the women. This difference can be based on men more activeness in outdoor jobs than women. In this study, car accidents are the main cause of trauma in female patients. The rate of motor vehicle accidents in Iran is high; therefore, the high number of injured persons is substantial. In the previous study, changes of signals in fractured vertebrates when measured against normal ones (vertebra) after a period of time had elapsed was evaluated. There was an increase in the T2-W image of fractured vertebra and there was a decrease in signals of T1-W images (Jiang *et al*., 2010; Sadighi *et al*., 2011). The previous studies established the current result (Benz *et al*., 2009; Goldust *et al*., 2011). In Garrido *et al*. (2008) study, after six months, half of the patients had hypo-intense vertebra and the other half had isointense vertebra in their pulse sequences. Between six to twelve months, most of the patients developed iso signal vertebra in T1-W and T2-W. A few patients were iso signal in T2-W and hyper signal in T1-W (Garrido *et al*., 2008). However, in our study, although there is a change in signals of vertebra in the sixth month, these changes were not the same as the Garrido *et al*. (2008) study. This difference in the results can be related to race, location and geographical conditions of the patients.

CONCLUSION

This study confirms that any fractured vertebra in contrast with its adjacent normal vertebra has a specific amount of signal change in determined time passing. Therefore, it is possible to design a diagnosis range of signal changes in broken vertebra in a determined time.

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