## Risk factors of Domino osteoporotic vertebral fractures is severe paraspinal muscle fatty degeneration

TOMOYUKI KUSUKAWA<sup>1</sup>, Keishi Maruo<sup>2</sup>, Masakazu Toi<sup>3</sup>, Hayato Oishi<sup>4</sup>, Tetsuto Yamaura<sup>5</sup>, Masaru Hatano<sup>6</sup>, Kazuma Nagao, Toshiya Tachibana<sup>7</sup>

<sup>1</sup>Department of Orthopaedic Surgery, Hyogo College o, <sup>2</sup>Departmet of Orthopaedic Surgery, Hyogo College of Medicine, <sup>3</sup>Departmet of Orthopaedic Surgery, Hyogo Medical Un, <sup>4</sup>Daiwa Chuou Hospital Osthopaedic Surgery, <sup>5</sup>Department of Orthopaedic Surgery, Hyogo Medical U, <sup>6</sup>Hyogo Medical University, <sup>7</sup>Department of Orthopaedic Surgery, Hyogo College of Medicine

## INTRODUCTION:

Domino osteoporotic vertebral fractures (OVFs) involve multiple OVFs occurring simultaneously or sequentially, before healing of the initial OVFs. However, the risk factors and long-term clinical outcomes of domino OVFs are unclear. The purpose of this study is to identify the risk factors associated with domino OVFs and to assess their impact on patients' quality of life (QOL).

## METHODS:

This study was conducted in a multicenter prospective observational cohort study at eight hospitals. The included patients were those with acute osteoporotic vertebral fractures (AOVFs) occurring within 3 weeks, aged 60 years or older, and diagnosed using MRI. Exclusion criteria for this study included previously underwent spinal fusion surgery, required surgery for AOVF, had more than three prevalent OVFs, and those with spinal metastases. Patients with a lack of data or dementia were also excluded in addition to those who had died or withdrew during the twelve-month follow-up period. All patients underwent magnetic resonance imaging (MRI) at 3 months to detect subsequent domino OVFs. Domino OVF group included initial domino OVFs (multiple acute OVFs at baseline) and subsequent domino OVFs at 3 months. Paraspinal muscle assessment was performed using the lumbar indentation value (LIV) and Goutallier classification. The Goutallier classification involved five stages from 0 to 4, among which patients classified as having stage 3 or 4 were considered to have severe fatty degeneration. Patient-reported outcome measures (PROMs), including the Japanese Orthopedic Association Back Pain Evaluation Questionnaire (JOABPEQ), visual analog scale (VAS) scores for low back pain, and the Oswestry Disability Index (ODI) were used to assess clinical outcomes. Questionnaires were completed at baseline, 3 months, and 12 months. Patient characteristics, bone quality, paravertebral muscle degeneration, nutritional status, radiographic parameters, and PROMs were compared between the non-domino and domino OVF groups. Multivariate analyses were performed to identify risk factors for domino OVFs. RESULTS:

This study included 271 patients who were conservatively treated for AOVFs. Of the 81 excluded patients, 22 underwent surgery, 17 died, 13 were lost to follow-up, and 29 had missing data. Finally, 190 patients (follow-up rate: 70.1%) were analyzed over a 12-month follow-up period. Their mean age was  $79.4 \pm 7.2$  years and 149 (78.4%) were women. We evaluated 50 (26.3%) patients with domino OVFs (34 with initial domino OVFs; 20 with subsequent domino OVFs). There were no significant differences in patient demographics, including age, sex, body mass index, prevalence of OVFs, bone mineral density, and Hounsfield Unit between the non-domino and domino OVF groups. The domino OVF group had a higher incidence of severe fatty degeneration in the paraspinal muscles (p < 0.01) whereas the LIV did not differ between the two groups. No significant differences were found between the groups in terms of the type of brace, hospitalization, or anti-osteoporosis medication used. At 3 months, walking ability, social life function, and ODI score were significantly lower in the domino OVF group at all time points from baseline to 12 months. Multivariable logistic regression analysis revealed that severe fatty degeneration was an independent risk factor for domino OVFs (odds ratio: 7.74, 95% confidence interval: 2.4–29.8, p < 0.01).

## **DISCUSSION AND CONCLUSION:**

This observational study found that 26.3% of patients with OVFs had domino OVFs. The domino OVF group showed worse walking ability according to the JOABPEQ, from baseline to the 12-month follow-up. Multivariate analysis revealed that severe paraspinal muscle fatty degeneration was a risk factor for domino OVFs. Our study showed that the quality, rather than the quantity, of paraspinal muscles had an impact on domino OVFs. Preventing the deterioration of paraspinal muscle quality may contribute to the prevention of domino OVFs.

