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Commentary

Commentary on "Deep Learning-Assisted Quantitative Measurement of Thoracolumbar Fracture Features on Lateral Radiographs"

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The use of a convolutional neural network (CNN) model for automatic segmentation in lumbar lateral radiographs has the potential to enhance efficiency in evaluating various spinal parameters. This method saves time for clinicians by automating measurement and detection of normal or abnormal spinal parameters.[1] With CNN algorithms, lesion detection can be applied in various clinical fields. For instance, in the detection of lung lesions, CNN utilizes target detection to identify and locate diseases in chest x-rays, significantly improving work efficiency.[2] The algorithm of artificial intelligence, based on radiological examinations, is not only used for identification of anatomical landmarks but also for lesion detection.

This study's objective was to develop a deep learning (DL) algorithm for quantifying thoracolumbar (TL) fracture features using lumbar spine x-rays.[3] The DL algorithm, based on Mask R-CNN (Mask Region-Based Convolutional Neural Networks), was trained on a dataset of 1,000 nonfractured and 318 fractured images. Validation was conducted with 213 internal and 200 external fractured images compared against measurements by an experienced radiologist (ground truth). The DL algorithm showed good to excellent agreement with ground truth for compression rate, Cobb angle, Gardner angle, and sagittal index in both internal and external validations. DL-assisted measurements significantly improved values, particularly for trainees. The study concludes that the DL algorithm is an accurate tool for quantifying TL fracture features, expected to expedite diagnoses and improve reliability, especially for trainees.

Early detection of pathological fractures is crucial for patients to receive timely treatment. For osteoporotic vertebral compression fractures (OVCF), 34 English-published randomized controlled trials on adults were analyzed, totaling 4,384 patients.[4] Short-term results favored kyphoplasty with facet joint injection (KIJ) (87.7%), while long-term relief was better with unipedicular kyphoplasty (UKP) (74.9%). Vertebroplasty with facet joint injection (VIJ) was preferred for short-term disability (98.4%), and kyphoplasty for long-term (66.0%). Surgeries surpassed conservative treatment, with vertebral augmentation devices causing fewer new fractures, and curved vertebroplasty showing less cement leakage. UKP

and VIJ demonstrated effectiveness for postoperative pain relief, with VIJ showing better disability improvement. The study recommends KIJ for short-term pain relief, and VIJ and UKP for long-term efficacy, highlighting VIJ's benefits in disability outcomes and emphasizing comprehensive OVCF management.

Apart from surgical intervention, medical treatments like monoclonal antibody therapy for OVCFs can be considered. Teriparatide (Forsteo, Eli Lilly and Co., Indianapolis, IN, USA), a recombinant human parathyroid hormone, stimulates osteoblastic bone formation to improve bone quality and mass. Romosozumab (Evenity, Amgen, Thousand Oaks, CA, USA), a monoclonal antibody inhibiting sclerostin, increases bone formation and reduces bone resorption. A retrospective analysis compared 32 romosozumab and 23 teriparatide-treated postmenopausal patients with recent OVCFs.[5] Romosozumab showed significantly higher bone mineral density (BMD) increase in femur total ($p = 0.016$) and lumbar spine ($p = 0.016$) compared to teriparatide. Numerical Rating Scale (NRS) decrease was also significantly higher with romosozumab ($p = 0.013$). While radiologic outcomes did not differ significantly, results suggest romosozumab may be more effective for OVCFs in postmenopausal females, improving BMD and reducing back pain (NRS).

Utilizing algorithms for artificial intelligence provides efficiency in detecting landmarks and lesions, benefiting both experts and trainees. Early diagnosis improves clinician decision-making and treatment outcomes, enhancing patients' clinical outcomes and quality of life.

- **Conflict of Interest:** The author has nothing to disclose.

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