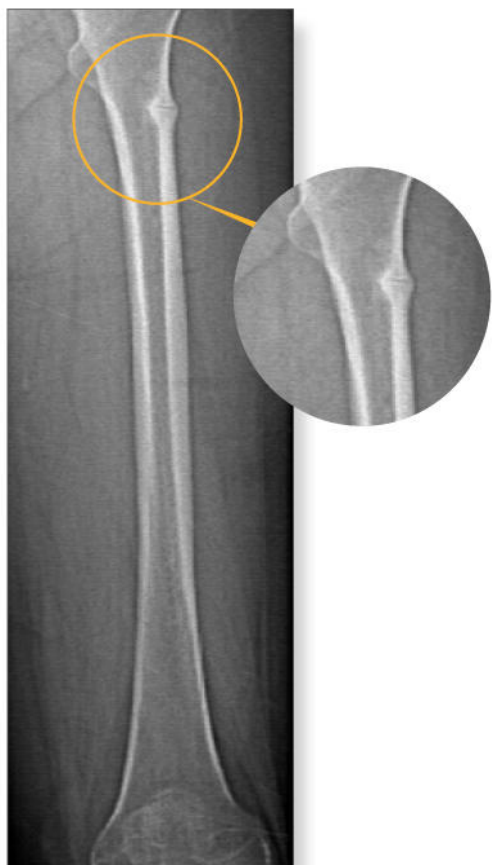
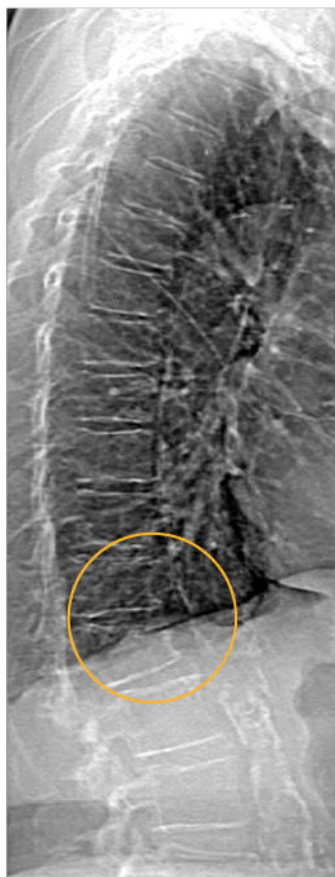


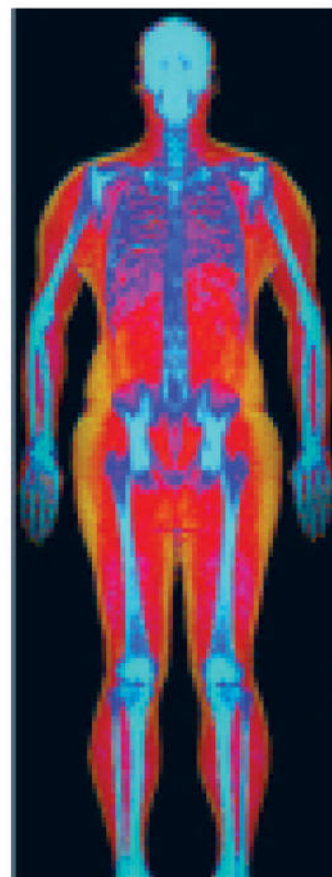
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# Corticosteroid-Induced Osteonecrosis in COVID-19: A Call For Caution

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## To the Editors:

We read with great interest the article by Yu and colleagues<sup>(1)</sup> in the *Journal of Bone Mineral Research* entitled "Osteoporosis Management in the Era of COVID-19." The authors provide excellent guidance on treatment of osteoporosis patients during the corona virus 2019 (COVID-19) pandemic. In addition to previous osteoporosis, we should also pay close attention to other musculoskeletal complications caused by COVID-19. As of June 30, 2020, there were more than 10.39 million confirmed COVID-19 cases worldwide, with 5,07,416 deaths. Until now, no specific treatments have been recommended for COVID-19 except for meticulous supportive care. To fight against the cytokine storm caused by COVID-19 infection, some patients have received treatment with systemic corticosteroids, especially severe and critically ill patients.<sup>(2)</sup> In China, low-dose (<1 to 2 mg/kg), short-term (3–5 days) methylprednisolone is recommended as adjuvant treatment for COVID-19,<sup>(3)</sup> which was derived from the lesson of the severe acute respiratory syndrome (SARS) epidemic in 2003. However, improper use of systemic corticosteroids can increase the risk of osteonecrosis of the femoral head (ONFH).

Many recovered patients with SARS suffered from avascular osteonecrosis as a consequence of corticosteroid usage during their infection. Higher cumulative doses and longer treatment durations of steroids are more likely to lead to the development of osteonecrosis in SARS patients.<sup>(4)</sup> In a retrospective study of 539 patients with SARS who were treated with steroids, the incidence of steroid-induced ONFH was 24.1%.<sup>(5)</sup> This study suggested that male gender, younger age, total dose of steroids, and the use of more than one type of steroid were associated with an increased incidence of ONFH.<sup>(5)</sup> During long-term follow-up of SARS patients 7 years after steroid administration, Zhao and colleagues<sup>(6)</sup> found that larger lesions and less viable lateral column were the crucial risk factors for progression of ONFH, and small ONFH lesions seldom collapsed.

Corticosteroids should be administered with caution, including minimizing dose and duration, avoiding the use of multiple types. New drugs, such as tocilizumab, may be an alternative to control the cytokine storm instead of corticosteroids.<sup>(7)</sup> We should develop a risk stratification system of ONFH for COVID-19

patients<sup>(8)</sup>: (i) low-risk patients would receive no corticosteroids; (ii) moderate-risk patients would receive corticosteroids with duration <1 week and cumulative dose <2000 mg; and (iii) high-risk patients would receive corticosteroids with duration  $\geq$ 1 week and cumulative dose  $\geq$ 2000 mg or intravenous pulse  $\geq$ 80 mg/day lasting for at least 3 days. Different follow-up plans should be made in COVID-19 patients after discharge according to various risks, with MRI as the preferred imaging tool for early detection of ONFH. During corticosteroid treatment, bisphosphonates and vitamin E should be prescribed to patients; anticoagulants, vasodilators, and traditional Chinese medicine could also be alternatives.<sup>(9)</sup> Physical therapy and combined pharmacotherapy can be used to delay or prevent collapse of steroid-induced ONFH in early stages.<sup>(10)</sup>

## Disclosures

The authors declare no competing interests.

## Author Contributions

**BZ:** Conceptualization; investigation; writing-original draft. **SZ:** Conceptualization; writing-review and editing.

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