SAGE Open Medical Case Reports
Volume 11: 1–8

DOI: 10.1177/2050313X231187977
journals.sagepub.com/home/sco
Sage

Bilateral insufficiency fracture of coracoid process: A rare case report

Hai-En Luo, Wen-Qi Yu, Xin-Ping Su, Can-Yu He, Zhen-Xiang Lu, Dao-Wei Zhang and Xu-Yi Tan

Abstract

A 69-year-old man was admitted to the hospital for a left femoral neck fracture. A preliminary chest computed tomography scan showed no coracoid process fracture. The patient had no history of trauma during his hospitalization. However, subsequent in-hospital computed tomography scan revealed bilateral coracoid process fracture. The patient underwent hip replacement surgery for femoral neck fracture, while conservative treatment was administered for the bilateral coracoid process fracture. After 1-year follow-up, the patient was diagnosed with bilateral insufficiency fracture of coracoid process after ruling out other types of fractures. The fractures did not heal while functions in both shoulders were adequate. Insufficiency fracture should be considered when fractures occur without trauma, especially in the presence of associated risk factors such as chronic renal failure and osteoporosis. For bilateral insufficiency fracture of coracoid process, conservative treatment is acceptable.

Keywords

Coracoid process, insufficiency fracture, conservative treatment, case report

Date received: 21 March 2023; accepted: 26 June 2023

Introduction

Insufficiency fracture (IF), which was first proposed by Professor Pentecost in 1964, results from application of normal or physiological stress to the bone with decreased mineral content and deficient elastic resistance, leading to a weakened zone in the bone.[1] This defect (IF) often occurs in the sacrum and ilium.[2] To date, no bilateral IF of coracoid process has been reported, let alone the outcome of follow-up after conservative treatment.

The coracoid process is located anteriorly above the scapula, and it is an important structure for the stability and function of the shoulder joint.[3] Most coracoid fractures occur in conjunction with other shoulder injuries, including dislocations and fractures.[4] Thus, simple coracoid process fractures are rare, and simultaneous fractures of bilateral coracoid processes are even rarer.

In this report, we present a rare case of a patient with bilateral IF of coracoid process. The patient was initially admitted to the hospital with left femoral neck fracture. Bilateral coracoid process fracture occurred during his hospitalization. The patient underwent hip replacement surgery for femoral neck fracture, while conservative treatment was administered for the bilateral IF of the coracoid process. After 1 year of follow-up, the functions of both shoulders were adequate, and a good outcome was achieved.

Case report

A 69-year-old man was injured after a fall at home on 20 December 2020, which resulted in pain and limited movement of the left hip joint. Following X-rays and computed tomography (CT) scans performed at a local hospital, a left femoral neck fracture was revealed (Figures 1 and 2). He was admitted to our hospital on 26 December 2020 for further diagnostic evaluation and treatment.

After admission, the patient was given bed rest, and a left leg traction was maintained. Physical examination on admission revealed pain and limited movement of the left hip joint, and the left lower extremity was shortened with external

Department of Orthopedic Surgery, Hunan Academy of Chinese Medicine Affiliated Hospital, Changsha, Hunan Province, China

Corresponding Author:
Xu-Yi Tan, Department of Orthopedic Surgery, Affiliated Hospital of Hunan Academy of Chinese Medical Science, No.58, Lu Shan Road, Yuelu District, Changsha, Hunan Province 410006, China.
Email: txy-inspire1985@163.com

rotation deformity. The Harris score of left hip was 10.[5] The patient wanted hip surgery to relieve left hip pain. Therefore, on 26 December 2020, CT scan was used to evaluate the condition of the lungs before hip surgery, and it showed no coracoid process fracture (Figure 3).

Since the patient had a history of chronic renal failure and received resection for an esophageal tumor in 2011 without postoperative chemotherapy. And, the patient had no history of epilepsy and no history of medications that would cause osteoclast hyperactivation. Laboratory studies revealed serum creatinine level of 815.8 µmol/L (reference range: 53–110 µmol/L), and blood urea nitrogen (BUN) level of 28.68 µmol/L (reference range: 2.88–7.2 µmol/L).

After consulting the Nephrology Department and receiving eight cycles of hemodialysis to reduce levels of creatinine and BUN, the surgical requirements were finally met. However, a subsequent in-hospital CT scan done on 8 January 2021 to reevaluate the lung condition revealed bilateral coracoid process fracture, with no obvious bone lesion at the fracture end (Figure 4). Bilateral coracoid process fracture was still present when a CT scan was repeated for the third time on 13 January 2021 (Figure 5). The patient was treated in bed with traction because of a left femoral neck fracture, and the patient sustained no trauma since admission. We believe this could be attributed to a pathological fracture. Further examination revealed the following: serum alkaline phosphatase was 138.85 U/L (reference range: 30–130 U/L), bone mineral density assessment (lumbar spine) revealed *T* score of −2.8, while tumor markers and tuberculosis antibody were negative.

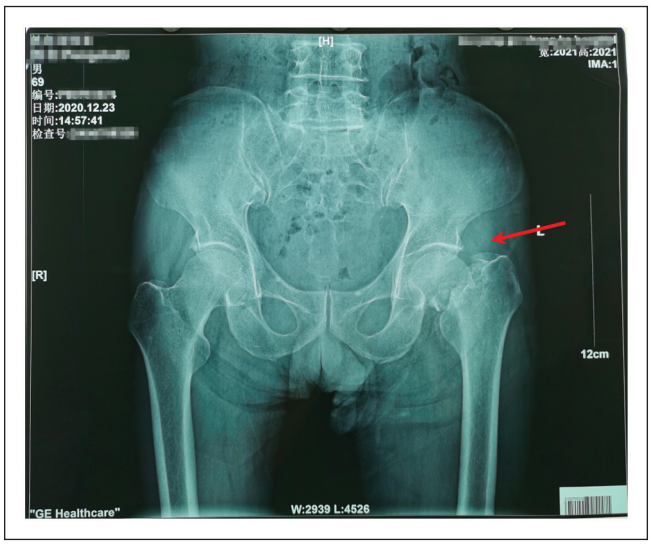

Figure 1. Hip X-ray on 23 December 2020, indicating a left femoral neck fracture (red arrow).

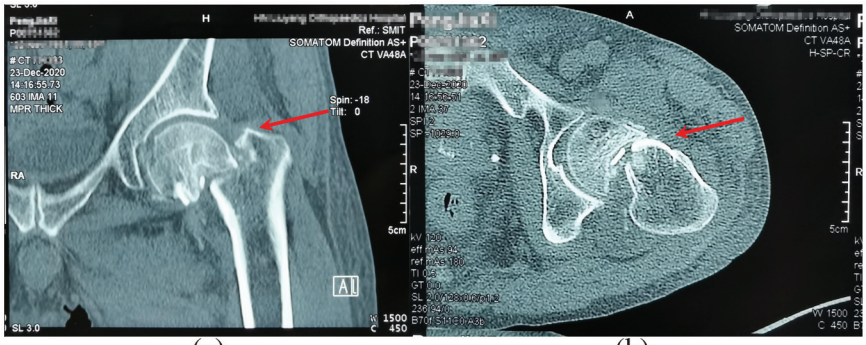

Figure 2. CT scan of the hip on 23 December 2020, showing left femoral neck fracture with marked displacement (red arrows).

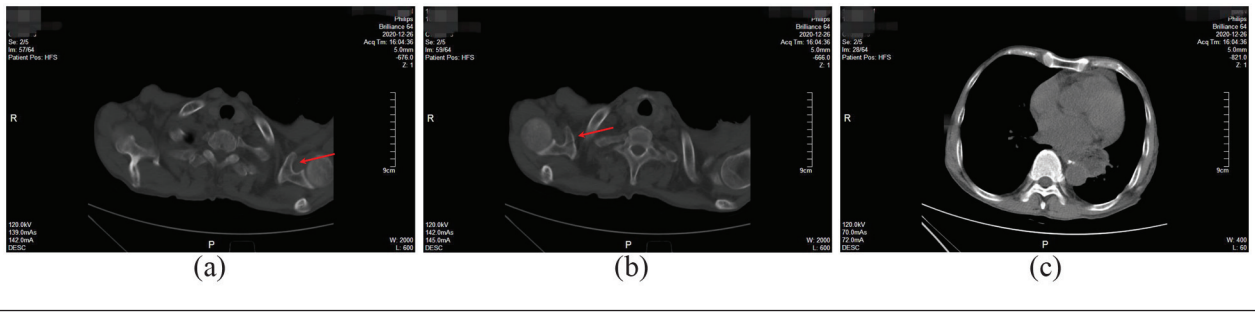

Figure 3. CT scan on 26 December 2020, used to evaluate lung condition before hip surgery. It shows that the bilateral coracoid process was continuous (a and b, red arrows) with no sign of fracture and no pleural effusion (c).

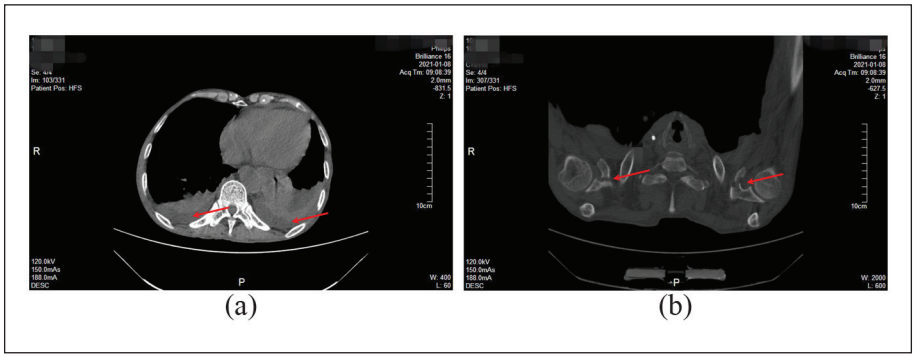

Figure 4. CT scan on 8 January 2021, indicating bilateral pleural effusion (a, red arrows) and bilateral coracoid process fracture, with no obvious bone destruction at the fracture end (b, red arrows).

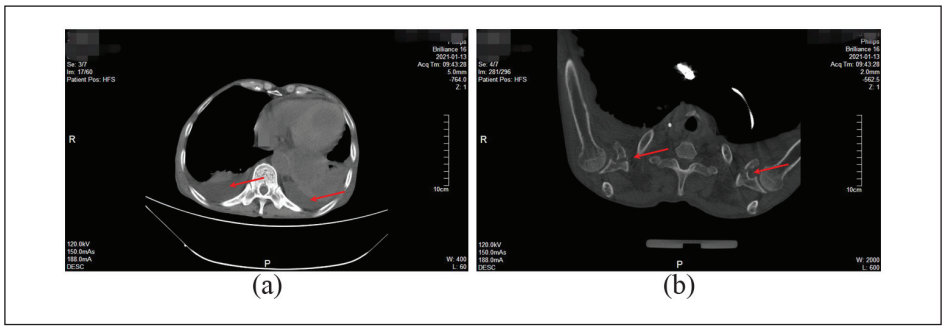

Figure 5. CT scan on 13 January 2021, revealing the presence of a slightly increased bilateral pleural effusion (a, red arrows) and bilateral coracoid process fracture with no obvious bone destruction at the fracture end (b, red arrows).

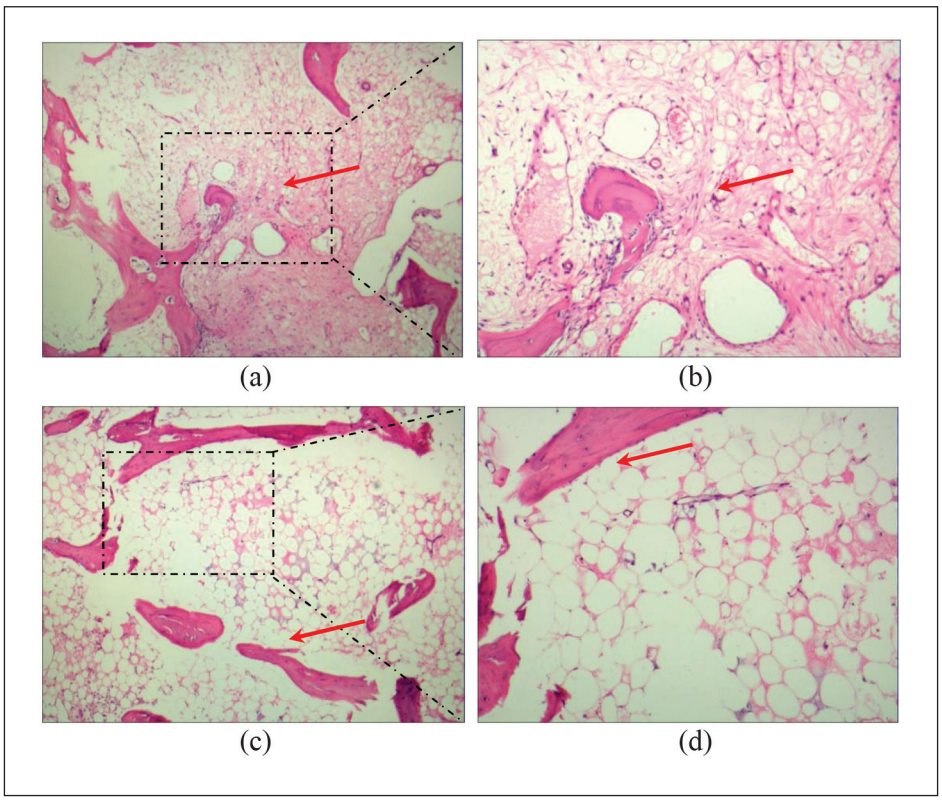

Figure 6. Photomicrographs of H&E staining of the broken end of the left femoral neck fracture showing some new but very few bone tissues with massive fibrous tissues (a and b, red arrows) and a thin and loose trabecular bone (c and d, red arrows), but no tumor cells. (×40 (a and c); ×100 (b and d).)

The patient insisted on hip replacement surgery for femoral neck fracture management.Thus, a left artificial double femoral head replacement was performed on the 20 January 2021, while conservative treatment was administered for the bilateral coracoid process fracture. The conservative treatment comprised reduction in shoulder motion and treatment of osteoporosis *via* injection of Elcatonin and oral administration of Carbonate D3 Granules. Histological examination of the broken end of the left femoral neck fracture through hematoxylin and eosin (H&E) staining revealed some new but very few bone tissues with massive fibrous structure and a thin and loose trabecular bone, but no tumor cells (Figure 6). A plain radiograph of the pelvis after surgery showed that the hip replacement arthroplasty was very successful (Figure 7).

On 7 February 2021, a CT scan was performed for the fourth time. The scan still indicated bilateral coracoid fracture (Figure 8). However, the patient did not feel local pain, and both upper limbs were functional enough to allow him to ambulate with a walker. There was no tenderness in bilateral coracoid processes, and bilateral shoulder joints could also be abducted upward (Figure 9). Therefore, conservative treatment for bilateral coracoid process fractures was continued.

We followed up the patient regularly after the hip surgery and he also underwent hemodialysis twice a week. However, due to financial difficulties, and the fact that he felt he had good functionality in both upper limbs, he refused to be subjected to further X-rays or CT scans for monitoring purposes. It was not until 20 October 2021 that he permitted a hip X-ray which indicated that the left femoral head prosthesis was still correctly positioned (Figure 10). Furthermore, a chest CT scan revealed that there was still a bilateral pleural effusion, in addition to presence of bilateral coracoid process fracture (Figure 11). However, the patient still felt no pain at the fracture site, and both upper limbs were functional (Figure 12). On the 20 December 2021, a reexamination of his shoulder function, as well as CT scan, showed similarity with the conditions in October (Figures 13 and 14).

On the 13 January 2022 (1 year later), a CT scan was performed for the last time. It was found that the bilateral pleural effusion persisted, and bilateral coracoid process fracture failed to heal (nonunion). Moreover, there was sclerosis at the broken ends, while bone destruction was absent (Figure 15). At this time, the patient developed dysphagia, which we suspected was caused by esophageal anastomosis in the original operation. Subsequent gastroscopy confirmed this and no recurrence was found (Figure 16).

Discussion

IF, also known as dysfunction fracture, was first described by Professor Pentecost in 1964. It is caused by normal or physiological stress to the bone with decreased bone mineral

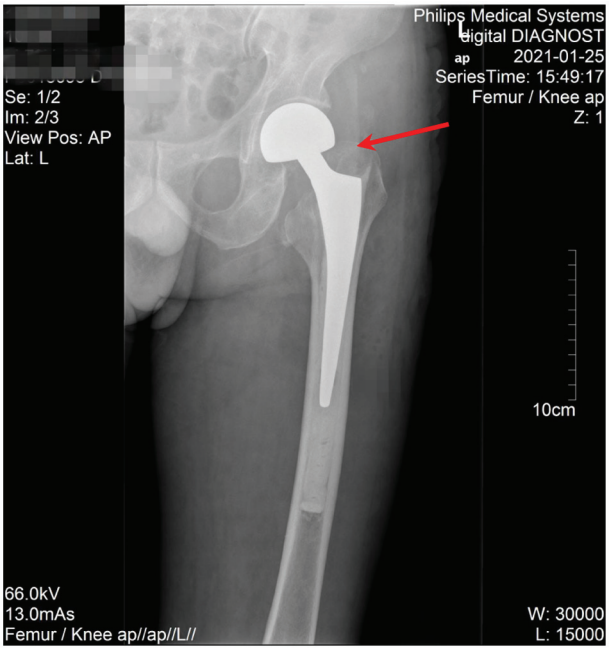

Figure 7. Hip X-ray on 25 January 2021, showing that the left femoral head replacement surgery was successful, with the cemented prosthesis in good position (red arrow).

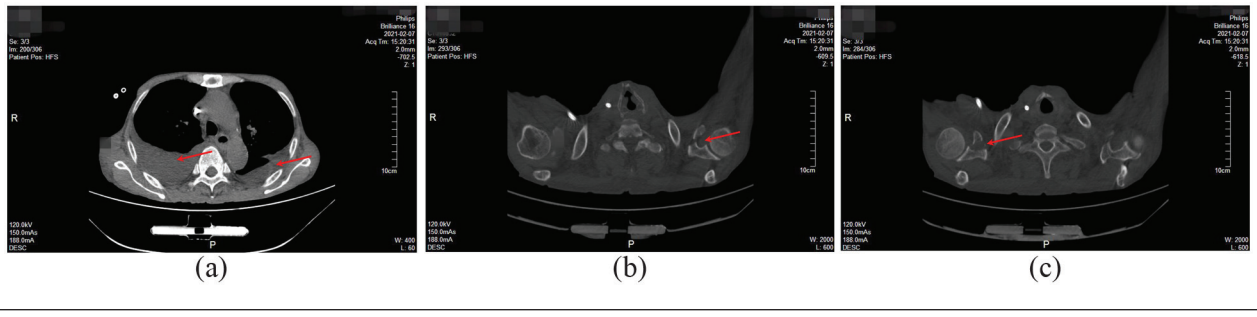

Figure 8. CT scan on 7 February 2021. The bilateral pleural effusion (a, red arrows) and bilateral coracoid process fracture are still present, with no obvious bone destruction at the fracture end (b and c, red arrows).

Figure 9. Functional status of the patient at discharge on 6 February 2021. The patient could walk with the help of a walker (a). He was able to raise his two upper limbs (b).

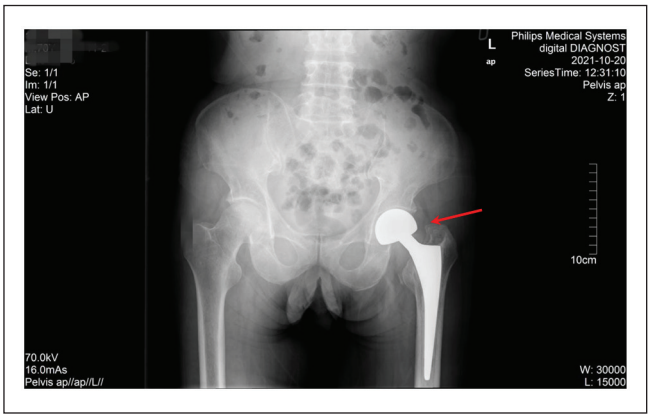

Figure 10. Anteroposterior radiograph of the pelvis on 20 October 2021. The left femoral head was surgically replaced (red arrow).

content and deficient elastic resistance, resulting in a weakened area in the bone.[1] IF is a fracture due to application of normal force to an abnormal bone, and it often occurs in the sacrum and ilium. The common causes of IF are osteoporosis, chronic renal failure, vitamin D deficiency, rheumatoid arthritis, and local radiotherapy.[6,7] However, the diagnostic criteria for IF have not been clearly defined. The diagnosis of IF should be done with due consideration of the associated risk factors, medical history of the patient, symptoms presented, as well as auxiliary examination. Moreover, fracture due to tumor and tuberculosis should be excluded.

The pelvis (sacrum, pubis, and iliac crest) is the most common site of IF.[8,9] However, bilateral IF of coracoid process has not been reported yet. This made the diagnosis of this case very difficult. In this report, the patient was given bed rest, with lower extremity traction, after a left femoral neck fracture was diagnosed. A preliminary CT scan indicated normal coracoid process. There was no trauma during bed traction, and no shoulder fracture or complication due to dislocation during hospitalization. However, a subsequent CT scan revealed bilateral coracoid process fracture. At this point, although bilateral coracoid process fracture was seen, the specific etiology remained unknown. Thus, further examinations were required for a definitive diagnosis.

After a series of tests and follow-up CT scans, since bony destruction was absent at the fracture, we ruled out primary coracoid bone tumor, coracoid bone metastasis, and pathologic fracture due to tuberculosis. Similarly, fatigue fracture was ruled out in this case, since this type of fracture is mostly related to the long-term chronic strain on normal bones. At last, in view of the patient's previous history of esophageal mass resection, poor appetite, chronic renal failure, and low bone mineral density suggestive of severe osteoporosis, which caused decreased bone mineral content and deficient elastic resistance. Meanwhile, the patient was treated in bed with traction because of a left femoral neck fracture, and sustained no trauma. Bilateral coracoid process fracture occured even when normal or physiological stress was applied to the process. The occurrence of bilateral coracoid fractures in the patient was consistent with the definition of IF which was described by Professor Pentecost.Therefore, a diagnosis of bilateral IF of coracoid process was made.

The patient chose hip replacement surgery for the femoral neck fracture. After a successful surgery, he was able to walk

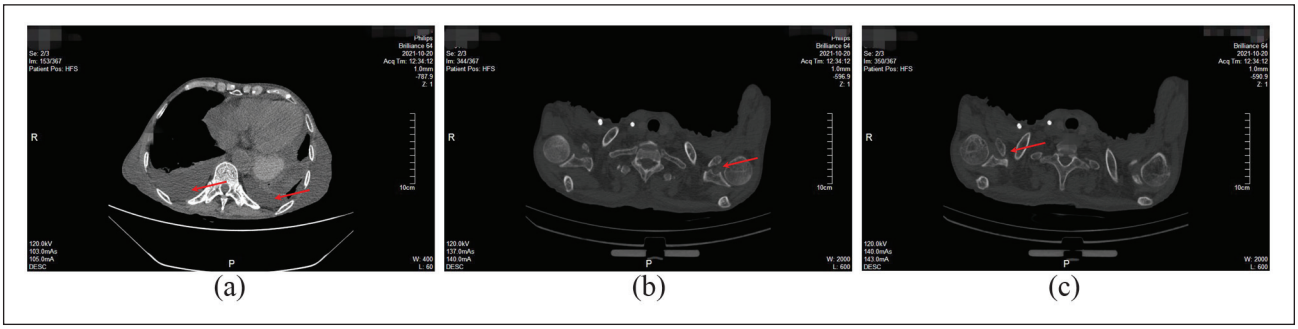

Figure 11. CT scan on 20 October 2021, indicating bilateral pleural effusion (a) and bilateral coracoid process fracture. The fracture did not heal, and sclerosis was present at the broken ends without bone destruction (b and c red arrows).

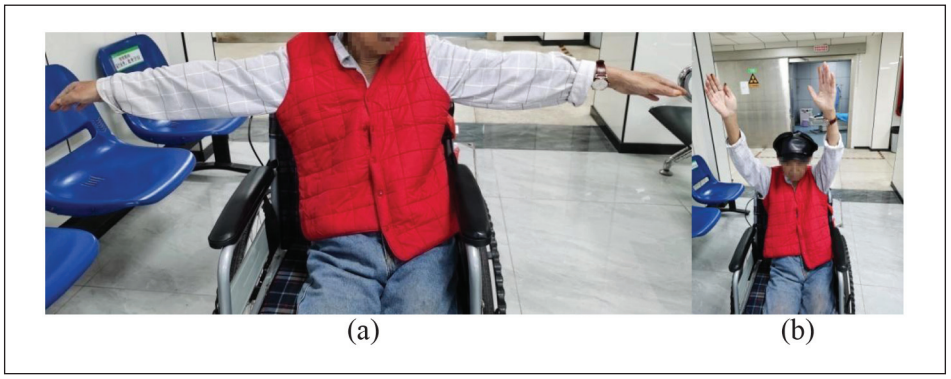

Figure 12. After 10 months of follow-up (20 October 2021), functions in both shoulders were fair enough to meet daily requirements (a and b).

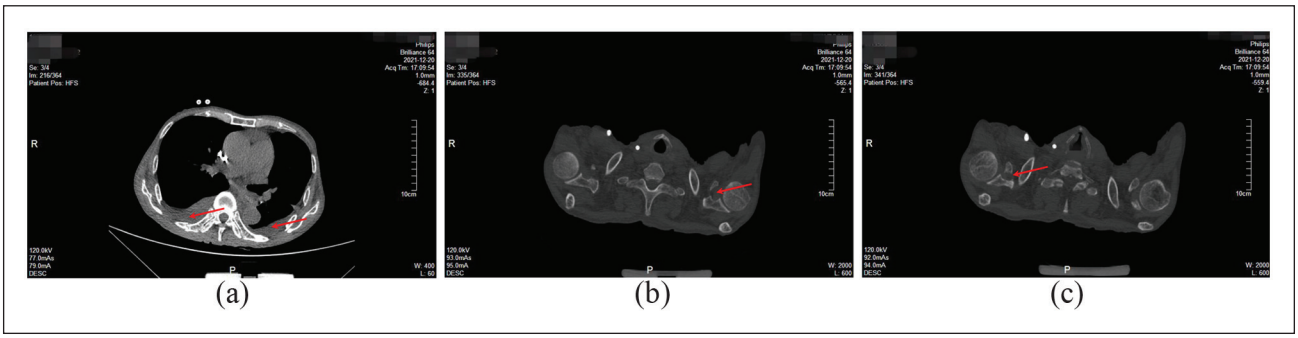

Figure 13. CT scan on 20 December 2021, yet indicating bilateral pleural effusion (a, red arrows) and bilateral coracoid process fracture. The fracture did not heal (nonunion), and sclerosis was present at the broken ends without bone destruction (b and c, red arrows).

with the help of a walker, and his hip function was restored. In addition, conservative treatment was chosen for bilateral coracoid process fracture. After 1 year of follow-up, the patient was satisfied since he felt no pain at the fracture site, and his two upper limbs were functional. Taken together, this case suggests that conservative treatment alone may produce a good treatment outcome for bilateral IF of coracoid process.

Conclusion

IF should be considered when fractures occur without trauma, especially in the presence of related risk factors such as chronic renal failure and osteoporosis. In this study, conservative treatment was effective for bilateral IF of coracoid process, even if nonunion was seen at follow-up. We could not perform further in-depth examinations such as MRI or

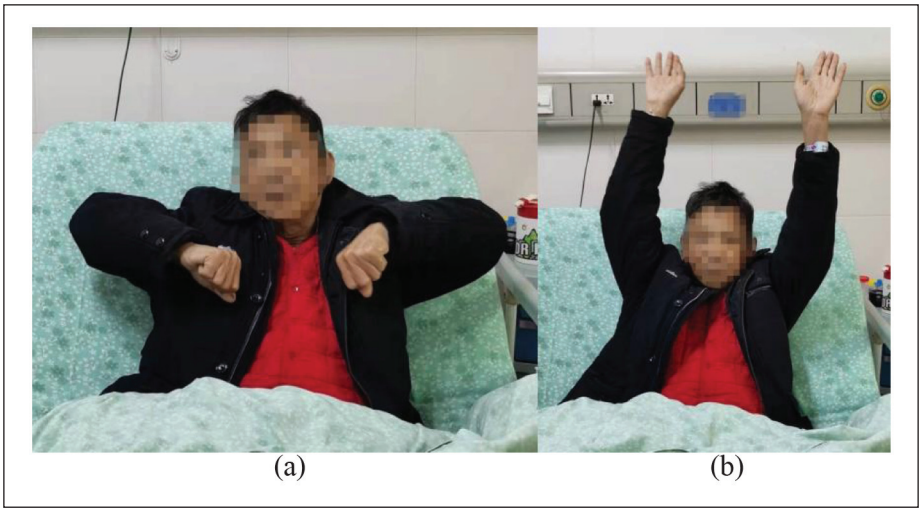

Figure 14. On 20 December 2021, the two shoulders were fairly functional, and they met daily requirements (a and b).

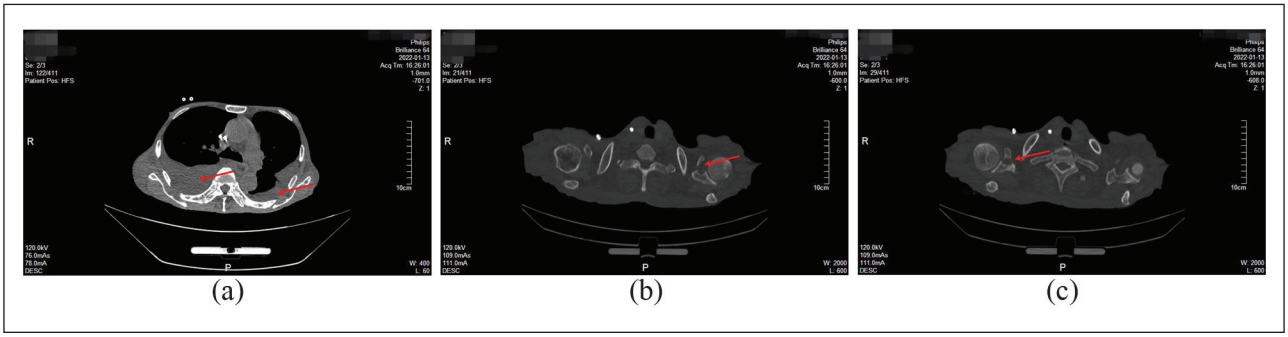

Figure 15. CT scan on 13 January 2022, still indicating bilateral pleural effusion (a, red arrows), and bilateral coracoid process fracture which failed to heal (b and c, red arrows).

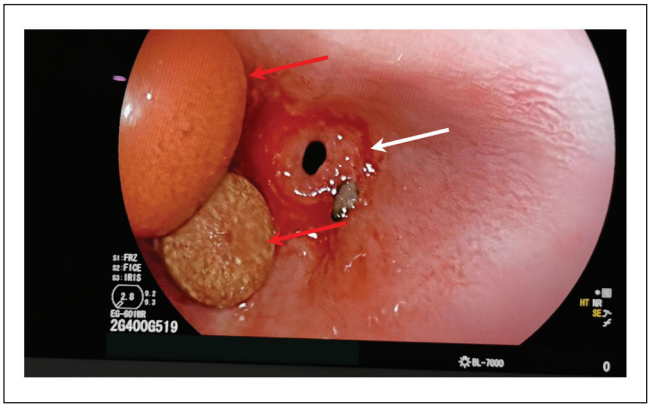

Figure 16. On subsequent gastroscopy on 16 January 2022, a narrow esophageal anastomosis was found to cause dysphagia. The black esophageal anastomosis in the middle was very narrow and surrounded by two round pills (approximately 1 cm in diameter, red arrows), while esophageal anastomotic stenosis was clearly visible, and the mass did not recur (white arrows).

puncture biopsy of bilateral coracoid process fracture site, due to the patient's refusal. Thus, the exact etiology of the fracture could not be ascertained.

Acknowledgements

We would like to acknowledge the patient for allowing this case report to be published.

Author contributions

Hai-En Luo and Wen-Qi Yu conceived the original ideas of this article. Xin-Ping Su participated in the surgical and medical treatments. Can-Yu He and Zhen-Xiang Lu executed the follow-up examination and collection of materials. Xu-Yi Tan analyzed the data and prepared the article. All authors read and approved the final article.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This project was supported by the science and technology innovation Program of Hunan Province (grant no. 2022RC1225).

Ethical approval

This case report does not involve any experimental research on animals or human patients, ethical approval is not necessary.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

ORCID iD

Hai-En Luo https://orcid.org/0000-0002-5397-0890

References

1. Pentecost RL, Murray RA and Brindley HH. Fatigue, insufficiency, and pathologic fractures. *JAMA* 1964; 187(13): 1001–1004.
2. Tan XY, Lei T, Wu GB, et al. Successful treatment for bilateral femoral neck insufficiency fractures: a rare lesion case report and an updated review of the literature. *BMC Musculoskelet Disord* 2020; 21(1): 102.
3. Li CH, Skalski MR, Matcuk GR Jr, et al. Coracoid process fractures: anatomy, injury patterns, multimodality imaging, and approach to management. *Emerg Radiol* 2019; 26(4): 449–458.
4. Galvin JW, Kang J, Ma R, et al. Fractures of the coracoid process: evaluation, management, and outcomes. *J Am Acad Orthop Surg* 2020; 28(16): e706–e715.
5. Liu J, Yang S and Ling N. *Orthopaedic surgery diseases diagnostic classification and functional assessment standards*. Beijing: People's Military Medical Press, 2012, p. 217.
6. Krestan CR, Nemec U and Nemec S. Imaging of insufficiency fractures. *Semin Musculoskelet Radiol* 2011; 15(3): 198–207.
7. Vaishya R, Agarwal AK, Banka PK, et al. Insufficiency fractures at unusual sites: a case series. *J Orthop Case Rep* 2017; 7(4): 76–79.
8. O'Connor TJ and Cole PA. Pelvic insufficiency fractures. *Geriatr Orthop Surg Rehabil* 2014; 5(4): 178–190.
9. Urits I, Orhurhu V, Callan J, et al. Sacral insufficiency fractures: a review of risk factors, clinical presentation, and management. *Curr Pain Headache Rep* 2020; 24(3): 10.