



12-31-2018

An Acute Non-Traumatic Rib Fracture Detected by Ultrasound and a reviewarticle of the Literature

Tze Chao Wee

Chueh-Hung Wu

Tyng-Guey Wang

Follow this and additional works at: <https://rps.researchcommons.org/journal>



Part of the [Rehabilitation and Therapy Commons](#)

Recommended Citation

Wee, Tze Chao; Wu, Chueh-Hung; and Wang, Tyng-Guey (2018) "An Acute Non-Traumatic Rib Fracture Detected by Ultrasound and a reviewarticle of the Literature," *Rehabilitation Practice and Science*: Vol. 46: Iss. 1, Article 6.

DOI: [https://doi.org/10.6315/TJPMR.201806-46\(1\).06](https://doi.org/10.6315/TJPMR.201806-46(1).06)

Available at: <https://rps.researchcommons.org/journal/vol46/iss1/6>

This Case Report is brought to you for free and open access by Rehabilitation Practice and Science. It has been accepted for inclusion in Rehabilitation Practice and Science by an authorized editor of Rehabilitation Practice and Science. For more information, please contact twpmrscore@gmail.com.

Case Report

An Acute Non-Traumatic Rib Fracture Detected by Ultrasound and a Review of the Literature

Tze Chao Wee¹, Chueh-Hung Wu², Tyng-Guey Wang²

¹Department of Rehabilitation Medicine, Changi General Hospital, Singapore;

²Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, Taipei, Taiwan.

Ultrasound is increasingly used for the diagnosis of musculoskeletal conditions, particularly in soft tissue injuries. In some cases, it is useful for the evaluation of fractures. A 54-year-old woman presented with focal a non-traumatic right-sided chest pain. Physical examination revealed a focal area of tenderness on palpation. Erect chest X-ray was unremarkable. A focused musculoskeletal ultrasound was carried out to examine the area of tenderness and a rib fracture which was not detected on the erect chest X-ray was diagnosed during sonographic examination. A brief literature review on the use of ultrasound in the diagnosis of fracture, in particular rib fracture is presented. Ultrasound may be considered as a potential form of imaging in cases with strong suspicion of fractures with negative X-rays. (Tw J Phys Med Rehabil 2018; 46(1): 47 - 51)

Key Words: rib fracture, ultrasound, sonography

INTRODUCTION

The diagnosis of rib fracture is usually suspected based on clinical history and medical examination. Conventional radiography is the usual initial investigation in the evaluation of rib fractures, while chest computed tomography (CT) or a bone scan of the chest wall can be performed as further investigations. However, not all rib fractures are apparent on conventional radiography. Previous studies showed that sonography was superior to conventional radiography for the detection of rib fractures.^[1-3] Most of the studies were done in patients who presented to the emergency department after acute trauma.

We present a case report of a patient who presented with localized non-traumatic chest pain and a chest X-ray which was negative for rib fracture who was subsequently diagnosed with a rib fracture using ultrasound.

CASE REPORT

A 54-year-old woman presented with focal left-sided chest pain of 1 week duration. The pain started after she reached across her bed to reach for an object. The pain was worse with deep respiration and cough. Her initial pain score was 9 using the numerical rating scale.

She has a history of right breast carcinoma (T2N3M0) diagnosed in late 2006, for which a modified

Submitted date: 20 December 2017

Revised date: 12 February 2018

Accepted date: 14 February 2018

Correspondence to: Dr. Tyng-Guey Wang, Department of Physical Medicine and Rehabilitation, National Taiwan University Hospital, No.1, Changde Street, Zhongzheng District, Taipei 100, Taiwan.

Tel : (02) 23123456 轉 67587 E-mail : tgw@ntu.edu.tw

doi: 10.6315/TJPMR.201806-46(1).06

right radical mastectomy had been performed. She had completed chemotherapy and radiotherapy in 2007. She is still on regular tamoxifen. She has osteoporosis for which she is on 6-monthly zoledronic acid and her last bone mineral density was in January 2016 with a T-score of -2.5 (osteoporotic range).

On examination, there was focal exquisite tenderness on the left 8th rib along the mid axillary line, which reproduced the pain experienced by the patient. There was no overlying swelling or hematoma. The area was marked with a surgical marker.

Ultrasound was performed with a Toshiba Aplio 500 ultrasound machine using a high resolution 7-18MHz linear transducer. The patient was lying in the right lateral decubitus position. The transducer was placed directly

over the marked spot. Transverse and longitudinal views revealed cortical discontinuity with a step deformity representing a minimally displaced fracture with an adjacent hypoechoic area corresponding to a hematoma. Sonopalpation reproduced the pain. There was no vascularity, mass formation nor bony destruction. The ribs immediately above and below the fractured rib were also imaged and were normal. Erect chest radiograph done earlier was unremarkable. Further imaging to confirm the rib fracture was not considered clinically indicated.

She was managed conservatively with oral analgesics and taping. The pain had resolved completely when she was reviewed 6 weeks after onset.

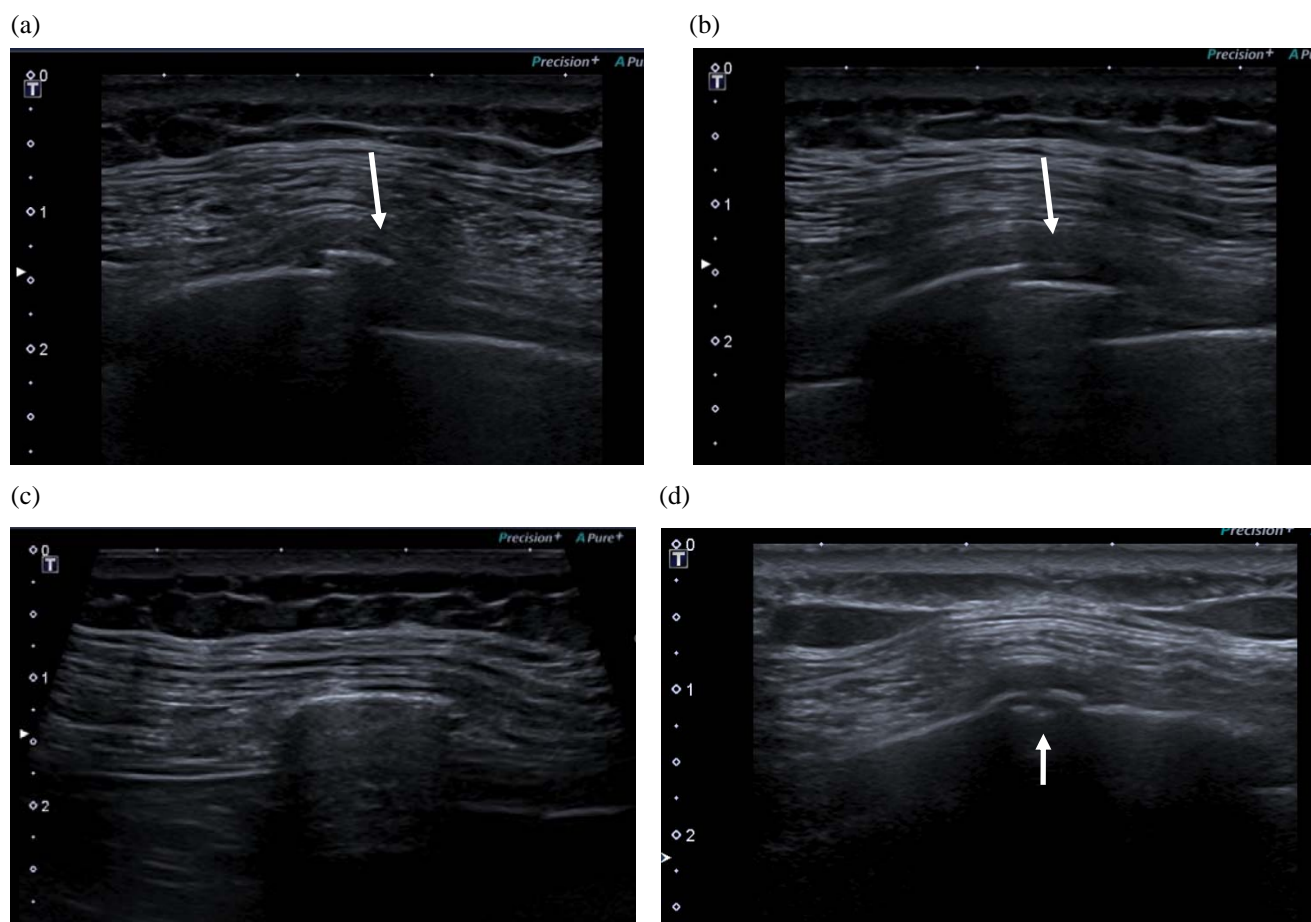


Figure 1

Sonogram of the fracture rib

(a) The longitudinal view of the fracture rib showing the disruption of hyperechoic line (arrow) with surrounding hypoechoic area (b) The transverse view of the fracture rib showing the disruption of hyperechoic line (arrow) (c) The transverse view of a normal rib showed the good continuity of hyperechoic line (d) Follow-up sonogram (5 weeks later) showing callus formation (arrow)

DISCUSSION

On sonography, the normal rib usually appears as a thin continuous echogenic line, while a fracture will usually appear as a disruption of the echogenic line with an adjacent hypochoic area corresponding to a haematoma.^[1-3]

Sonography is superior in the detection of rib fractures. The detection rates of rib fractures in patients with clinical suspicion of rib fractures was more than 70% using sonography as compared to anything from 0% to just under 50% using conventional radiography.^[1-3] In a recent cross-sectional study, 61 patients who presented to the emergency department with suspected rib fractures after blunt trauma were assessed with both sonography and radiography and a total of 58 (98.3%) rib fractures were detected by sonography, whereas oblique rib view and erect chest radiography showed 27 (45.8%) and 24 (40.7%) rib fractures, respectively.^[1] In that study, a posterior rib fracture located anterior to the scapula was picked up on radiography but missed on sonography. In an earlier study consisting of 50 patients who presented to the emergency department after chest injury and were examined with sonography in the radiology department within 3 days of injury, sonography detected rib fractures in 78% of the patients compared with 12% using chest radiography.^[3]

Apart from the use of ultrasound in the detection of rib fracture, point of care ultrasound has also been used to diagnose various fractures in both adults and children with seemingly normal radiographs. The various fractures detected included hip, scaphoid, calcaneus, sternum, fibula and metacarpal bone.^[4-9] Ultrasound has also been used to diagnose stress fractures in the tibia and metacarpal bone.^[10-11]

In a case series, twenty-four patients whose initial plain radiographs were negative for fracture had occult fractures in the ankle and foot demonstrated by sonography. The fracture sites included calcaneus, metatarsal, talus, navicular bone, cuboid bone, cuneiform bone and lateral malleolus.^[12] A systematic review and meta-analysis showed that ultrasound has high accuracy for the detection of distal forearm fracture in children

with a pooled sensitivity and specificity of 97% and 95% respectively.^[13] In a prospective study of 212 children and young adults with 348 suspected non-long bone and long bone fractures, the overall sensitivity and specificity was 73% and 92% respectively. The sensitivity for detecting long bone and non-long fractures was 73% and 77% respectively while the specificity was almost similar. More than 85% of the errors occurred at the ends of bones.^[14]

There was concern that the fracture in this patient was secondary to bone metastasis in view of the history of breast carcinoma. Bone metastasis was considered unlikely as there was no mass formation nor irregular bone destruction on sonography. Her history of osteoporosis alone may explain the occurrence of minimal trauma fracture. Paik et al found that metastatic lesions were associated with formation of a mass or irregular bone destruction and fractures were associated with cortical disruption with or without haematoma, cortical deformity or callus formation.^[15] However, sonography will be negative if the metastatic lesion involves only bone marrow with intact bone cortex as ultrasound waves cannot transmit through intact bony cortex. In this case, the pain had resolved completely within 6 weeks, hence the probability of a metastatic lesion is considered highly unlikely. However, we acknowledge the limitation of this case report being the lack of further investigations to confirm the presence of the rib fracture and to rule out bone metastasis.

There are limitations with sonography for the detection of rib fracture. Certain areas may not be accessible to sonography such as the upper posterior ribs under the scapula and the first rib under the clavicle. It may be worthwhile to note that almost half of all rib fractures occur in the 7th and 8th ribs. Obesity and patients with large breast may also be challenging for the use of high frequency transducers.

American College of Radiology (ACR) Appropriateness Criteria recommends that a standard erect chest radiograph is often the only radiological investigation required after chest trauma.^[16] Although a sonography proven rib fracture does not alter the clinical management, it does have prognostic implication as the clinician will be able to explain to the patient that the pain

may take a longer period of time to settle as opposed to pain from a simple chest contusion. In the event when further imaging is considered, such as for medico-legal purposes, sonography also has the advantage of having no ionizing radiation compared to other imaging modalities such as a computed tomography (CT) scan of the ribs.

CONCLUSION

In conclusion, sonography may be considered for the evaluation of rib fractures if the initial chest radiograph is negative.

REFERENCES

1. Pishbin E, Ahmadi K, Foogardi M, et al. Comparison of ultrasonography and radiography in diagnosis of rib fractures. *Chin J Traumatol*. 2017;20:226-8.
2. Turk F, Kurt AB, Saglam S. Evaluation by ultrasound of traumatic rib fractures missed by radiography. *Emerg Radiol*. 2010;17:473-7.
3. Griffith JF, Rainer TH, Ching AS, et al. Sonography compared with radiography in revealing acute rib fracture. *AJR Am J Roentgenol*. 1999;173:1603-9.
4. Medero Colon R, Chilstrom ML. Diagnosis of an Occult Hip Fracture by Point-of-Care Ultrasound. *J Emerg Med*. 2015;49:916-9.
5. Tessaro MO1, McGovern TR, Dickman E, et al. Point-of-care ultrasound detection of acute scaphoid fracture. *Pediatr Emerg Care*. 2015;31:222-4.
6. Augustin-Coley BM, Pigott DC, Gibson CB, et al. Diagnosis of a radiographically occult calcaneus fracture with bedside sonography. *J Ultrasound Med*. 2016;35:1363-6.
7. Lahham S, Patane J, Lane N. Ultrasound of sternal fracture. *West J Emerg Med*. 2015;16:1057-8.
8. Kardouni JR. Distal fibula fracture diagnosed with ultrasound imaging. *J Orthop Sports Phys Ther*. 2012;42:887.
9. Ruskis J, Kummer T. Diagnosis of metacarpal fracture with equivocal x-ray by point-of-care ultrasound: a case report. *Am J Emerg Med*. 2014;32:821.e1-3.
10. Amoako A, Abid A, Shadiack A, et al. Ultrasound-Diagnosed Tibia Stress Fracture: A Case Report. *Clin Med Insights Arthritis Musculoskelet Disord*. 2017;10:1179544117702866.
11. F Banal, F Etchepare, B Rouhier, et al. Ultrasound ability in early diagnosis of stress fracture of metatarsal bone. *Ann Rheum Dis*. 2006;65: 977-8.
12. Wang CL, Shieh JY, Wang TG, et al. Sonographic detection of occult fractures in the foot and ankle. *J Clin Ultrasound*. 1999;27:421-5.
13. Douma-den Hamer D, Blanker MH, Edens MA, et al. Ultrasound for Distal Forearm Fracture: A Systematic Review and Diagnostic Meta-Analysis. *PLoS One*. 2016;11:e0155659.
14. Weinberg ER, Tunik MG, Tsung JW. Accuracy of clinician-performed point-of-care ultrasound for the diagnosis of fractures in children and young adults. *Injury*. 2010;41:862-8.
15. Paik SH, Chung MJ, Park JS, et al. High-resolution sonography of the rib: can fracture and metastasis be differentiated? *AJR Am J Roentgenol*. 2005;184:969-74.
16. Expert Panel on Thoracic Imaging, Henry TS, Kirsch J, et al. ACR Appropriateness Criteria® rib fractures. *J Thorac Imaging*. 2014;29:364-6.

無創傷性肋骨骨折的超音波診斷－病例報告與文獻回顧

黃子超¹ 吳爵宏² 王亭貴²

新加坡樟宜綜合醫院 復健部¹ 國立台灣大學醫學院附設醫院 復健部²

近年來超音波越來越普遍被使用在肌肉骨骼疾病的診斷，特別是軟組織損傷。在某些情況下，它也可以被用來評估骨折存在與否，甚至比 X 光檢查更 useful。一名 54 歲的女性主訴無創傷性右側胸痛，曾有用力拿物的病史，理學檢查顯示有明顯的局部壓痛點，但直立胸部 X 光並無異常。在肌肉骨骼超音波的檢查下，發現肋骨有骨頭皮質不連續，疑是有骨折可能，經固定後，疼痛明顯改善。謹以本病例報告，文獻回顧，提供臨床參考。在最初的 X 光片可能是陰性，但又高度懷疑骨折的情況下，超音波可成為醫學造影的考量之一。（台灣復健醫誌 2018；46(1)：47 - 51）

關鍵詞：肋骨骨折(rib fracture)、超音波(ultrasound, sonography)

