



A rare cause of chest pain: spontaneous sternum fracture

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Abstract: Spontaneous sternum fracture is a rare condition which can be seen especially among patients with known risk factors such as osteoporosis or multiple myeloma. Lateral chest X-ray is sufficient in diagnosis but sometimes can be neglected during the initial evaluation of the chest pain. A 80-year-old female patient with no known risk factors related to fracture and no medical history of fractures presented to the emergency department with chest pain. While cardiac marker enzymes were normal, lateral chest X-ray and CT scan showed displaced fracture line on the sternum, and the patient diagnosed with spontaneous sternum fracture. We have presented the case, reviewed the literature of the disease, and concluded that it is important to remember that sternum fracture with unidentified etiology is one of the rare causes of chest pain.

Keywords: Sternum; spontaneous sternum fracture; geriatric

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Introduction

Three to eight percent of the patients admitted to Emergency Departments with chest trauma have sternum fractures. Spontaneous sternum fracture is a rare condition which can be seen especially among patients with known risk factors such as osteoporosis or multiple myeloma (1). Diagnosis and observation are important because it can be a sign of cardiac injury. We have discussed that spontaneous sternum fracture can be the diagnosis of patients admitted to Emergency Departments with chest pain and gone through the underlying causes.

Case presentation

An 80-year-old female patient presented to the Emergency Department with chest pain. Patient described the pain as a sudden onset sharp pain radiating through the chest. The patient was admitted to a hospital the day before with the same type of chest pain and a serial follow up tests of cardiac marker enzymes and a posteroanterior chest X-ray were obtained, both interpreted as normal.

The patient's vital signs were stable at admission to the Emergency Department, with a blood pressure of 135/75 mmHg, pulse rate: 85/min, respiratory rate: 13/min, SpO₂:

99%, temperature: 36.5 °C. An ECG test is obtained and interpreted as normal. Medical history of the patient showed hypertension and coronary artery disease, without coronary angiography. She had no lifestyle risk factors; including cigarette smoking, or alcohol consumption. Skin screening after full exposure of the chest did not show any abnormal signs. Auscultations of the heart and respiratory system were normal. Patient suffered from pain with the palpation of the sternum. Hemogram, cardiac marker enzymes (troponin T and creatine kinase), coagulopathy tests were measured. Posteroanterior and lateral chest X-rays of the patient were taken. Lateral chest X-ray (*Figure 1—right*) showed displaced fracture line on the sternum while posteroanterior chest X-ray (*Figure 1—left*) showed no pathological signs. CT scan of the chest showed the fracture lines clearly (*Figure 2*). Blood test results were normal. Troponin T level was <0.003.

The patient was discharged after a short period of observation, with analgesics for pain relief, and planned to be treated as outpatient.

Discussion

We describe a case of spontaneous sternum fracture in an 80-year-old female with no known risk factors related to

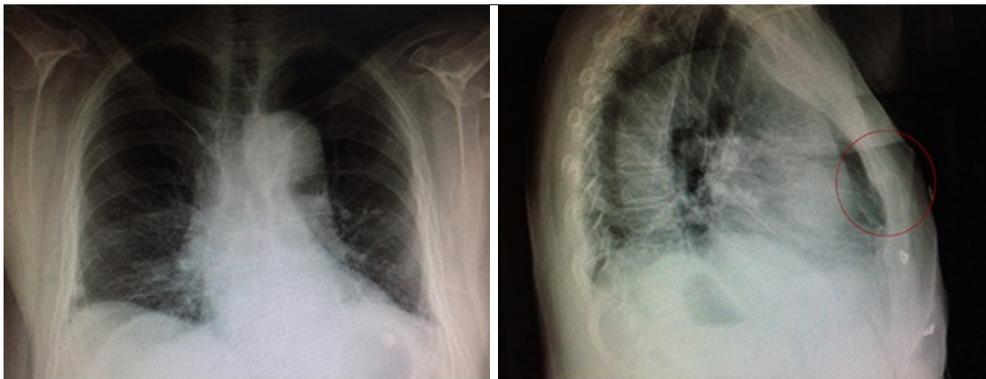


Figure 1 Posteroanterior (left), and lateral (right) chest X-rays of the patient. Fracture line is marked with red circle.

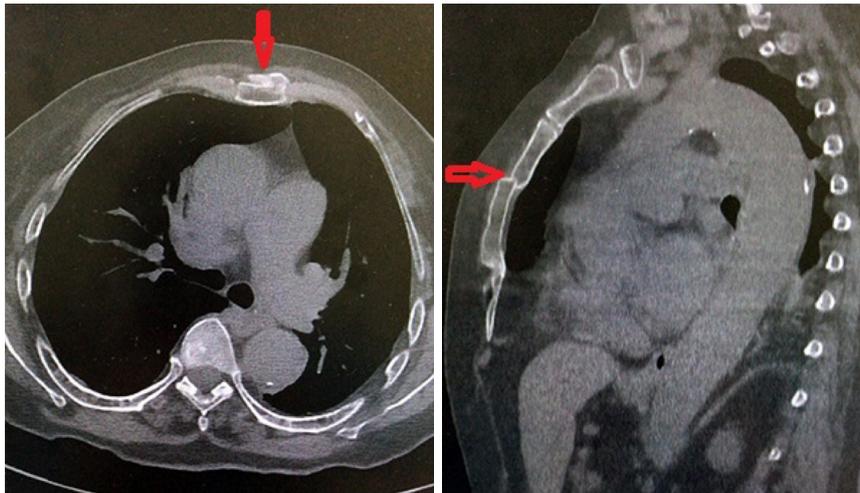


Figure 2 Chest CT scan images of the patient. Fracture line marked with arrows, and can be clearly seen in multiplanar reconstruction view (right).

fracture and no medical history of fractures.

Fractures of the sternum have been mainly reported as resulting from trauma, specifically due to traffic accidents, secondary to malignancy, myeloma and rarely secondary to osteoporosis compounded by thoracic kyphotic deformity without any trauma. The latter fracture was defined as an “insufficiency fracture of the sternum” (2).

Stress fractures which occur due to repetitive minor trauma, and its subtype insufficiency fractures which occur in bones with decreased mechanical strength and pathological fractures can be classified as “spontaneous sternum fractures” (3). All diseases that induce osteoporosis are prone to develop insufficiency fractures. Huang *et al.* analyzed 17 cases of post-menopausal women who had sternal insufficiency fractures. They found that all cases had

osteoporosis as suspected and 13 cases had thoracic vertebral fractures. Other associated diseases were chronic obstructive pulmonary disease (7 cases), rheumatoid arthritis (3 cases), systemic lupus erythematosus (1 case) and asthma (1 case) (4).

The spine, pelvis, and lower extremities are commonly affected by insufficiency fractures. Horikawa *et al.* found that there were only 41 cases of insufficiency sternum fractures reported in the literature as of 2007 (2). Our literature review shows that there are 68 cases of spontaneous sternum fractures, including this case (2,3,5-14) (Table 1). Fifty-four (79.4%) of these cases were females. Forty-six (67.6%) of them presented with chest pain mimicking Myocardial Infarction. Ages of the patients were ranged between 31 and 88. Osteoporosis was seemed as the associated condition for most of the cases, while corticosteroid therapy for

Table 1 Sex, age and associated conditions of spontaneous sternum fractures reported in the literature

Source	Number of cases	Sex	Age, years	Associated conditions
Itani <i>et al.</i> [1982]	3	All female	76, 85, 68	Osteoporosis
Cooper [1988]	4	All female	53 to 82	Osteoporosis
Chen <i>et al.</i> [1990]	7	5 female, 2 male	50 to 85 (mean 68 years)	Osteoporosis
Sapherson and Mitchell [1990]	2	All female	77, 73	Osteoporosis
Schapira <i>et al.</i> [1995]	1	Female	60	Osteoporosis, polymyalgia rheumatica, corticosteroid therapy
Benbouazza <i>et al.</i> [2003]	1	Female	63	RA, corticosteroid therapy
Min and Sung [2003]	15	Female	65 to 88 (mean 73.5 years)	COPD (5 cases), RA (2 cases), MI (2 cases), CHF (1 case), Cor P (1 case), DM (1 case), Tuberculosis (1 case), MM (1 case), DCMP (1 case), none (2 cases)
Soubrier <i>et al.</i> [2003]	1	Undisclosed	Undisclosed	Undisclosed*
Ragucci and Vainrib [2005]	1	Male	Late forties	Idiopathic osteoporosis
Lin and Ponampalam [2006]	1	Female	60	RA, SLE, corticosteroid therapy
Horikawa <i>et al.</i> [2007]	2	Female	65–76	Osteoporosis (2 cases), RA and corticosteroid therapy (1 case)
Stubert and Gerber [2009]	1	Female	31	Spontaneous delivery
Matus Jiménez <i>et al.</i> [2010]	1	Male	62	Osteoporosis
Huang <i>et al.</i> [2012]	17	All Female	PM	Osteoporosis (all cases), osteoporosis, thoracic vertebral fractures (13 cases), COPD (7 cases), RA (3 cases), SLE (1 case), asthma (1 case)
Wong <i>et al.</i> [2013]	1	Male	56	Asthma, COPD, RA, osteoporosis, corticosteroid therapy
Chermiti Ben Abdallah <i>et al.</i> [2013]	1	Male	74	Sternal tuberculosis
Swan <i>et al.</i> [2013]	1	Male	49	Metastatic melanoma
Abrahamsen and Madsen [2014]	1	Male	73	DM, hypercholesterolaemia and hypertension
Aleskerov <i>et al.</i> [2015]	1	Male	75	Coughing, hypertension, CHF
Pickard <i>et al.</i> [2015]	1	Male	58	MM, cyclophosphamide, thalidomide, and corticosteroid therapy
Baker and Demertzis [2016]	2	Male	31, 45	Playing golf (1 case). Weight lifting, AS, NSAIDs, and sulfasalazine therapy (1 case)
Geraci <i>et al.</i> [2016]	1	Female	50	Breast cancer metastasis
Vaishya <i>et al.</i> [2017]	1	Male	53	COPD, corticosteroid therapy
Present case	1	Female	80	Osteoporosis

*, Soubrier *et al.* published a survey of 60 insufficiency cases in 2003, and reported that one of the cases had sternal fracture but no further detail had given (6). COPD, chronic obstructive pulmonary disease; RA, rheumatoid arthritis; MM, multiple myeloma; DCMP, dilated cardiomyopathy; DM, diabetes mellitus; MI, myocardial infarction; CHF, congestive heart failure; Cor P, cor pulmonale; SLE, systemic lupus erythematosus; AS, ankylosing spondylitis; NSAID, nonsteroidal anti-inflammatory drug; PM, post-menopausal.

different illnesses was the associated condition for relatively younger patients. While osteoporosis, and corticosteroid therapy are easy to be thought of as associated conditions; there are some more eye-catching conditions: Stubert and Gerber reported a case of a young patient who had atraumatic sternum fracture while spontaneous delivery (15), and Aleskerov *et al.* reported an atraumatic sternum fracture secondary to forceful coughing (11). Most of the spontaneous sternum fractures which are presented in the literature occurred in the sternal body as seen in our case (3).

Although spontaneous sternum fracture is rare as a diagnosis for patients presented to the Emergency Departments with chest pain, they can mimic cardiac and pulmonary emergencies, and it is important to consider this in the differential diagnosis (2). However, on the contrary, chest pain is the most common presentation of sternum fractures (16). Perez *et al.* argued that increase in the availability of the CT scans around the globe increased the frequency of sternum fracture diagnosis (17).

In the literature; the ribs, sternum, and vertebrae have been described as the most important stabilizing structures of the thorax. Some resources listed sternocostal joints as a fourth structure. Failure of one of these structures puts additional stress on the others and causes insufficiency fractures (18,19). These fractures may cause cardiac injuries which can be fatal (20).

Regular lateral sternum X-ray imaging is sufficiently enough to diagnose sternum fractures. For the patients with a normal ECG, and normal cardiac marker enzyme levels; a short observation period at the emergency department is sufficient, and hospitalization is not needed (3).

Conclusions

It is important to remember that sternum fracture with unidentified etiology is one of the rare causes of chest pain. They can mimic cardiac and pulmonary emergencies and should be in the differential diagnosis of chest pain, especially for elderly patients even if they aren't diagnosed with osteoporosis. Lateral chest X-ray is sufficient in diagnosis but sometimes this imaging method can be neglected or hard to obtain due to patient's discomfort during the initial evaluation of the cases with chest pain. For these patients, chest CT scan is an effective method in diagnosis.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: The patient has given consent for this case report to be published.

References

1. Min JK, Sung MS. Insufficiency fractures of the sternum. *Scand J Rheumatol* 2003;32:179-80.
2. Horikawa A, Miyakoshi N, Kodama H, et al. Insufficiency fracture of the sternum simulating myocardial infarction: case report and review of the literature. *Tohoku J Exp Med* 2007;211:89-93.
3. Abrahamsen SØ, Madsen CF. Atraumatic sternum fracture. *BMJ Case Rep* 2014;2014.
4. Huang ZY, Yi BL, Liu HY. Sternal insufficiency fractures of post-menopausal women: retrospective analysis of 17 cases. *Chin Med Sci J* 2012;27:101-5.
5. Vaishya R, Agarwal A, Banka P, et al. Insufficiency Fractures at Unusual Sites: A Case Series. *J Orthop Case Rep* 2017;7:76-9.
6. Soubrier M, Dubost JJ, Boisgard S, et al. Insufficiency fracture. A survey of 60 cases and review of the literature. *Joint Bone Spine* 2003;70:209-18.
7. Matus Jimenez J, Henriquez Avalos C, Lorenzini Gonzalez G. Spontaneous sternum fracture in a pathologic area. Case report and literature review. *Acta Ortop Mex* 2010;24:33-6.
8. Wong J, Drew B, Stern P. Sternal insufficiency fracture related to steroid-induced osteoporosis: A case report. *J Can Chiropr Assoc* 2013;57:42-8.
9. Chermiti Ben Abdallah F, Boudaya MS, Chtourou A, et al. Sternal tuberculosis causing spontaneous fracture of the sternum. *Rev Pneumol Clin* 2013;69:89-92.
10. Swan JA, Liu DM, Clarkson PW, et al. Cryoablation and cementoplasty of a pathologic fracture in the sternum. *Singapore Med J* 2013;54:e215-7.
11. Aleskerov F, Abdeen Y, Shreshtha P, et al. Spontaneous fracture of sternum secondary to forceful coughing: A case report. *Int J Crit Illn Inj Sci* 2015;5:132-3.
12. Pickard L, Whittaker C, Jayakar V. Spontaneous sternal collapse in multiple myeloma. *Br J Haematol* 2015;168:316.
13. Baker JC, Demertzis JL. Manubrial stress fractures diagnosed on MRI: report of two cases and review of the

- literature. *Skelet Radiol* 2016;45:833-7.
14. Geraci G, Fatica F, Cajozzo M, et al. Surgical treatment of solitary sternal metastasis from breast cancer Case report. *Ann Ital Chir* 2016;87.
 15. Stubert J, Gerber B. Fracture of maternal sternum during spontaneous delivery. *Arch Gynecol Obstet* 2009;280:1007-9.
 16. Buckman R, Trooskin S, Flancbaum L, et al. The significance of stable patients with sternal fractures. *Surg Gynecol Obstet* 1987;164:261-5.
 17. Perez M, Rodriguez R, Baumann B, et al. Sternal fracture in the age of pan-scan. *Injury* 2015;46:1324-7.
 18. Muldoon K, Chu P, Pathria M, et al. Association of posterior rib fractures with exaggerated kyphosis and sternal collapse. *Clin Imaging* 1999;23:311-3.
 19. Vioreanu M, Quinlan J, Robertson I, et al. Vertebral fractures and concomitant fractures of the sternum. *Int Orthop* 2005;29:339-42.
 20. Bar I, Friedman T, Rudis E, et al. Isolated sternal fracture-a benign condition? *Isr Med Assoc J* 2003;5:105-6.

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