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Case report

A case report on hemopneumothorax caused by acupuncture at Huatuo–Jiaji points

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ABSTRACT

Acupuncture is generally safe; however, severe side effects, such as syncope and pneumothorax (PTX), have sometimes been reported. No cases of hemopneumothorax following acupuncture have been reported in Korea. This study reports a case of progression and prognosis of hemopneumothorax after acupuncture in a patient who visited a hospital for digestive disorders and underwent acupuncture treatment at the Huatuo-Jiaji points to control the autonomic nerves. The patient complained of shortness of breath and chest pain after acupuncture. However, neither the patient nor the doctor suspected PTX. Chest radiography, conducted after a day, confirmed hemopneumothorax of the right lung, and the patient was immediately hospitalized. During hospitalization, oxygen therapy and medication were administered, and the patient was discharged 6 days later. However, PTX recurred, and the patient was rehospitalized. The patient was discharged after 4 days, and it was confirmed that he was completely cured, as evident from both radiation findings and patient symptoms on day 20. This study demonstrates that physicians should pay more attention to and be aware of PTX and its symptoms when performing acupuncture on the thoracic chest.

1. Introduction

Acupuncture is a therapy to restore the balance in the body, including in the intestines and other organs, to normal levels by stimulating acupoints [1]. According to the “2020 Korean Medicine Survey,” 87.7 % outpatients and 95.9 % inpatients receive acupuncture treatment, making it the most frequently used treatment in Korean Medicine [2]. In addition, a study reported that 10.5 % patients select acupuncture treatment "because of fewer side effects," suggesting that acupuncture is generally considered safe [2].

However, because acupuncture is an invasive treatment, side effects have been reported. A systematic review reported the side effects of acupuncture treatment including syncope, pneumothorax (PTX), tissue damage, and infection. PTX was the second most

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frequent side effect after syncope [3].

PTX is defined as the collection of air outside the lungs but within the pleural cavity. It occurs when air accumulates between the parietal and the visceral pleura in the chest. This accumulated air can exert pressure on the lungs and cause their collapse. Hemopneumothorax is characterized by the presence of both air and blood in the chest cavity and can occur due to lung injury. Acupuncture-related hemopneumothorax is usually associated with paraventricular, infraclavicular, or thoracic needling. These thoracic acupoints have minimal subcutaneous tissue, predisposing the patient to disruption of the bulla and air migration through the bronchial tree into a potential space [4].

One of the most frequently used thoracic acupoints is the Huatuo–Jiaji point. The Huatuo–Jiaji points are a group of 34 points on both sides of the spinal column, 0.5 cun lateral to the lower border of each spinous process, from the first thoracic vertebra to the fifth lumbar vertebra. In Korean Medicine, Huatuo–Jiaji points are used to treat visceral diseases. The autonomic nervous system controls the visceral functions of the body, and acupuncture at the Huatuo–Jiaji points stimulates related segmental autonomic nerves. However, perpendicular needle insertion into the Huatuo–Jiaji points is dangerous, and superficial needling may not achieve the best effect [5]. Therefore, to perform the procedure safely, the doctors must ensure that needles are in the correct position while performing acupuncture at these points and that the needle tips touch the lamina of the spine.

Hemopneumothorax after acupuncture is a life-threatening side effect; however, no related research has been conducted in Korea. Therefore, this case report highlights the symptoms and recovery process of hemopneumothorax caused by acupuncture.

2. Case presentation

This retrospective case study was approved by the Woosuk Korean Medicine Hospital of the Woosuk University Institutional Review Board (No.: WSOH IRB H2204-01). The patient was informed that the images of the thorax and treatment history would be reported without personal information. We obtained consent from the patient for the academic publication of this case.

3. Case report

3.1. Chief complaints

Acute indigestion, tenderness, and pain in the midback.

3.2. Onset

October 5, 2021, after having lunch.

3.3. Present illness

A 26-year-old man visited the Korean Medicine Hospital for acute indigestion with no other complaints or abnormalities.

3.4. Social history

Smoking(+): 0.1 box/day.
Alcohol(+): 1 time/month, 2 bottles of soju

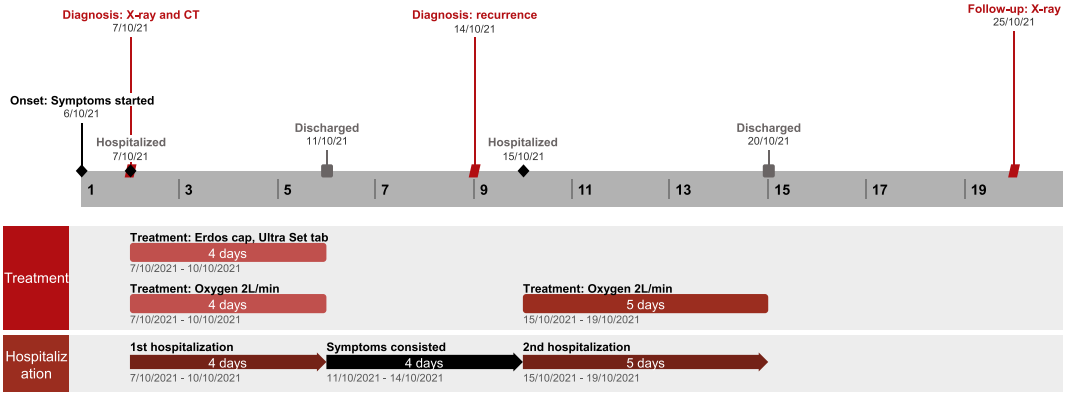

Fig. 1. Timeline.

3.5. Treatment methods

Standardized, disposable, sterilized stainless steel needles sized 0.30 × 60 mm (Dongbang Medical, Seongnam) were used to perform acupuncture on patient's back. For improved outcomes, the doctor selected Huatuo–Jiaji points from the T6 to T8 vertebrae. Six needles were inserted into the skin approximately 4–5 cm deep and kept in place for 10 min.

3.6. Clinical history (Fig. 1)

1) Onset: Six needles were inserted into the skin; however, the doctor felt that one needle did not touch the spine. After removing the needles, the patient experienced chest pain while breathing and shortness of breath. Although the symptoms did not disappear, the pain and respiratory discomfort subsided, leading to the conclusion that the symptoms were due to simple intercostal tension caused by thoracic nerve stimulation. Thereafter, chest pain while breathing and shortness of breath persisted; however, the patient considered the symptoms to be tolerable. In addition, the patient had no sleep problems.
2) Day 2: When the patient woke up, he felt that his symptoms had aggravated; however, he carried out usual work because the pain was tolerable. Symptoms persisted until the afternoon without any imprvement; therefore, he underwent a chest X-ray (XR) examination, which revealed PTX (Fig. 2). Subsequently, he visited the S Hospital emergency room with a medical treatment request and a CD containing XR images. The attending physician of S Hospital performed both XR and computed tomography (CT), and the patient was diagnosed with hemopneumothorax. The patient was hospitalized and was advised chest tube insertion for PTX. However, chest tube insertion was not performed because the patient did not consent to it (Fig. 3).

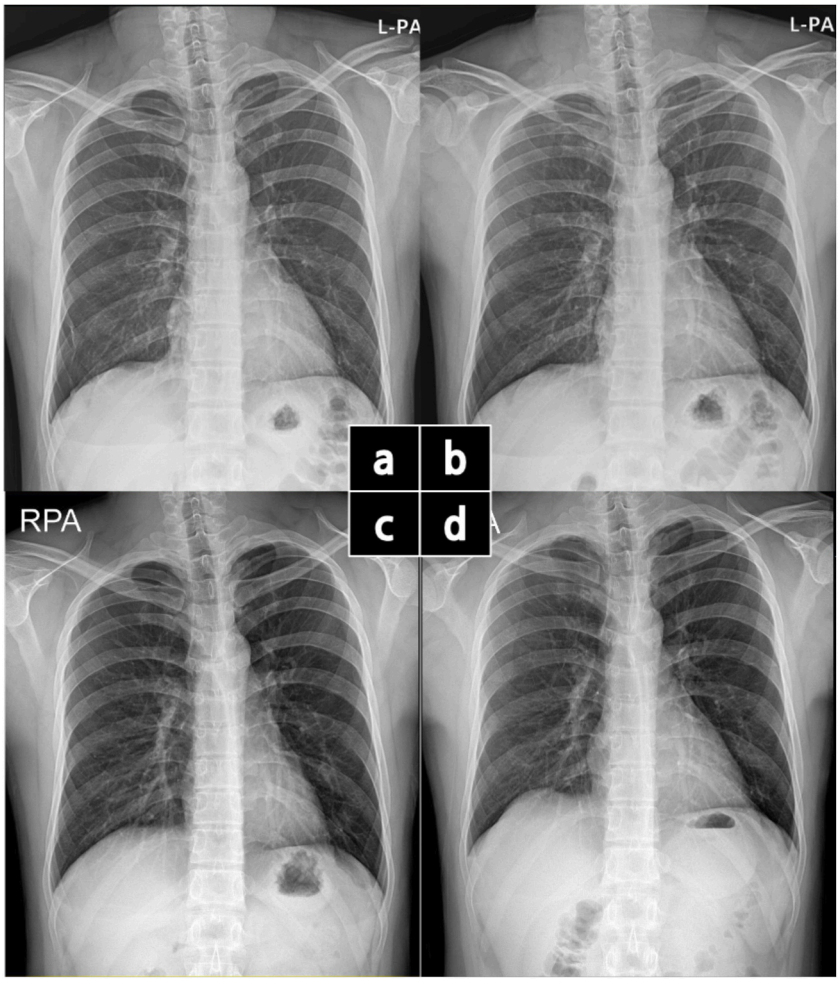

Fig. 2. X-ray imaging
a The patient was diagnosed with PTX (S hospital, 10/6). **b** The doctor discharged the patient from the hospital on 10/10 and a chest XR was obtained before leaving the hospital (10/8). **c** The patient visited S Hospital as an outpatient. The doctor diagnosed the patient with a recurrence of PTX (10/14). **d** A follow-up XR was performed (10/25).

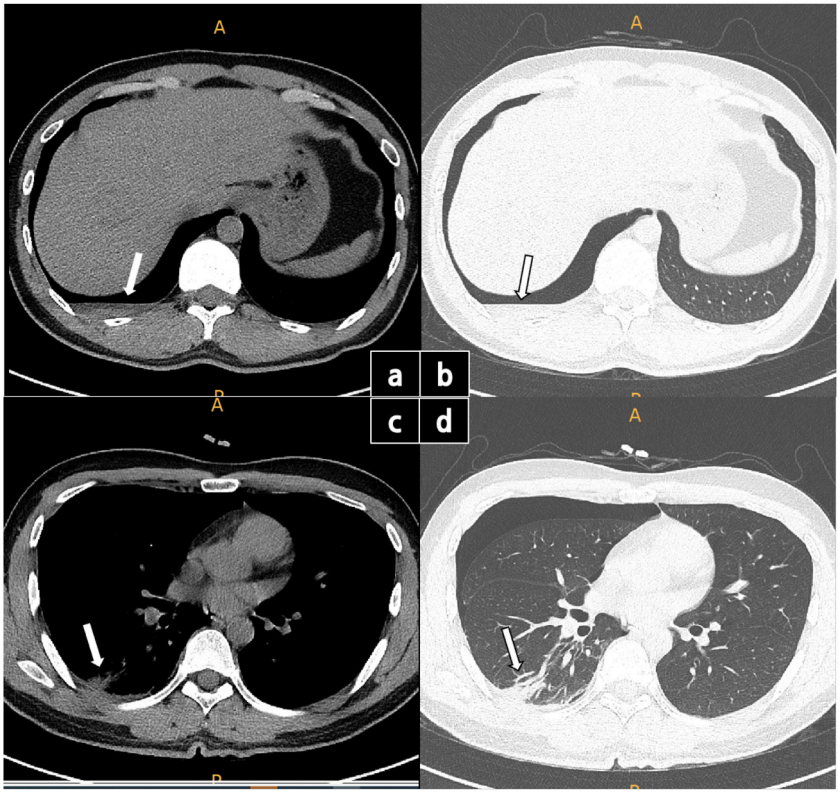

Fig. 3. CT scan
a b Hemopneumothorax was detected in the patient's lung (S hospital, 10/6). **c and d** Pulmonary hemorrhage was detected in the patient's lung (S hospital, 10/6).

3) Day 3–5: The patient was administered oxygen via nasal cannula at 2 L/min as well as intravenous injections and some medications. The list of medications is provided in Table 1.
4) Day 6: He was discharged from the hospital per the doctor's advice; however, he continued to expereince chest pain while breathing and shortness of breath. It was difficult for him to walk even 20 steps, indicating that he was not completely cured; therefore, he rested at home for 2 days.
5) Day 7, 8: He went back to work; however, chest pain while breathing and shortness of breath continued.
6) Day 9: He visited S Hospital as an outpatient due to persistent chest pain and shortness of breath. The attending physician took the XR again and diagnosed a recurrence of PTX. For hospitalization, the patient was tested for coronavirus disease 2019, which was negative.
7) Day 10–14: He was re-hospitalized at S Hospital. This time, only oxygen therapy was administered via nasal cannula at 2 L/min.
8) Day 15: The patient was discharged from the hospital after complete recovery. Despite taking precautions during movements, the patient continued to experience little pain.
9) Day 20: The patient underwent follow-up XR, and the image confirmed complete recovery.

Radiography images

Refer to Figs. 2 and 3.

Table 1
Prescription drug.

Name	Components	Frequency
Erdos cap 300 mg	Erdosteine 300 mg	1 tab tid
Ultra Set tab	Tramadol 37.5 mg Acetaminophen 325 mg	1 tab tid

*cap: capsule, tab: tablet, tid: ter in die.

4. Discussion

Acupuncture is frequently used in Korean medical institutions and has been evaluated as a relatively safe treatment with a few side effects. However, because it is an invasive procedure, side effects are often reported [6]. Traumatic PTX is a life-threatening side effect caused by acupuncture and can occur when performing acupuncture around the scapula, subclavicle, and thoracic spine adjacent to the pleura [4]. Several surveys have been conducted regarding the safety of acupuncture. For example, an observational study was conducted on 229,230 patients treated by practicing physicians in Germany [7]. Adverse effects, such as broken or forgotten needles, pneumothorax, and burns after moxibustion, which indicate negligence or malpractice, account for 0.1 % of all adverse events, and PTX occurred only in two cases. In Japan, 847 (6.03 %) adverse events were reported in 14,039 sessions [8]. The most common adverse event was bleeding, followed by discomfort and residual pain at the insertion points. No infections or serious adverse events observed were reported. In contrast, Wenju et al. [3] reviewed Chinese studies on safety from 1956 to 2010 and reported that the most frequent severe adverse event was PTX (307 of 1038 cases). According to these studies, acupuncture is safe but rarely causes mild or severe adverse events. PTX is the most common severe adverse event; therefore, practitioners must be mindful of this. This report describes a case of hemopneumothorax that developed after acupuncture on the thoracic multifidus muscle in a healthy man in his 20s who presented with acute indigestion.

Traditionally, the depth of needling at acupoints was measured by “cun,” and there is no difference in using “cun” according to factors such as age, sex, height, and weight. Therefore, the appropriate depth of the needle is usually decided by the practitioners based on their clinical experience and the response of the patients [9]. The textbook of CRC Press recommends 0.5 inches (12 mm) at GB21 [10], and the best way to prevent PTX is to lift the trapezius and perform needling front to back instead of perpendicularly [11]. However, in Chen’s study [12], the researchers noticed that the pleural lines were only 10.1–12 mm beneath the skin at the GB21 acupoint in a few thin young individuals and in women with obesity who are thought to have sufficient space. Because of this problem, most practitioners desire to develop new methods to minimize adverse effects.

One such method is ultrasound (US), which can be used for live monitoring during acupuncture. Kim et al. [13] examined the actual depth of the acupoints using US. They considered multiple body factors to reduce the differences between individuals, including neck circumference, shoulder width, waistline, width between the anterior superior iliac spines, and thickness of the subcutaneous fat. Magnetic resonance imaging (MRI) is another method. In Yoon’s study [14], the researchers used 158 MRI images from 158 patients to measure the appropriate insertion depth in lumbar vertebrae and reported that practitioners should consider body mass index because it affects the acupoint depth. In addition, CT was used to accurately identify the locations of the acupoints [15]. These studies mainly suggested that the characteristics of patients, such as ethnicity, sex, age, body size, and underlying diseases, affects the safe depth.

In this case, we can verify the following three points: First, aggressive treatment can lead to adverse events. The doctor placed needles on the skin to treat a patient with acute indigestion. He selected the Huatuo–Jiaji points of the T6 vertebrae to the T8 vertebrae for a better outcome, placed the needles about 4–5 cm into the skin, and kept them in place for 10 min. Notably, there are several other safe methods for the treatment of indigestion. Therefore, practitioners should carefully select acupoints to treat patients depending upon problem severity.

Table 2
Safe needling depth of acupoints for normal adults.

Acupoints	Normal adults[a] (mean ± 95 % CI)	
	Male	Female
Dazhui (GV14)	5.39 ± 0.40	5.21 ± 0.70
Taodao (GV13)	5.24 ± 0.40	4.97 ± 0.58
Shenzhu (GV12)	4.79 ± 0.35	4.40 ± 0.39
Shendao (GV11)	4.30 ± 0.30	3.97 ± 0.30
Lingtai (GV10)	4.27 ± 0.30	3.83 ± 0.28
Zhiyang (GV9)	4.20 ± 0.27	3.86 ± 0.29
Jianzhongshu (SI15)	6.47 ± 0.59	5.87 ± 0.62
Dazhu (BL11)	6.19 ± 0.49	5.39 ± 0.62
Fengmen (BL12)	5.53 ± 0.47	4.78 ± 0.61
Feishu (BL13)	5.15 ± 0.48	4.43 ± 0.46
Jueyinshu (BL14)	4.76 ± 0.41	4.25 ± 0.43
Xinshu (BL15)	4.54 ± 0.43	3.97 ± 0.32
Dushu (BL16)	4.52 ± 0.48	3.86 ± 0.30
Geshu (BL17)	4.55 ± 0.46	3.92 ± 0.37
Jianwaishu (SI14)	5.39 ± 0.43	4.91 ± 0.48
Fufen (BL41)	4.37 ± 0.37	4.07 ± 0.42
Pohu (BL42)	3.75 ± 0.35	3.53 ± 0.31
Gaohuang (BL43)	3.34 ± 0.35	3.15 ± 0.31
Shentang (BL44)	2.98 ± 0.30	2.75 ± 0.27
Yixi (BL45)	2.76 ± 0.28	2.56 ± 0.23
Geguan (BL46)	2.63 ± 0.28	2.53 ± 0.28
Quyuan (SI13)	4.76 ± 0.35	4.32 ± 0.39

[a] The criteria of "normal adults" are from the guidelines of the Department of Health, Taiwan. Ideal body weights differ between countries; therefore, the data are only a suggested reference.

Second, if a patient has symptoms suggestive of PTX, the physician must carefully evaluate the patient's condition. Herein, six needles were placed on the skin, and the doctor felt that one of them did not touch the spine. After removing the needles, the patient experienced chest pain during breathing and shortness of breath. The physician was aware of the possibility of PTX occurrence; however, the doctor did not investigate further on those lines because the patient considered the symptoms to be tolerable. The symptoms continued until the next day. The diagnosis of PTX was confirmed after chest radiography, and the patient was immediately hospitalized.

Finally, informed decision making by doctors is critical in patients with PTX. Despite continued pain after 4 days of hospitalization, the patient was discharged. He rested for 2 days at home and then went back to work. However, the symptoms persisted, compelling the patient to visit the hospital's outpatient clinic for re-examination on the third day of work. He was diagnosed with PTX recurrence, was re-hospitalized, received oxygen therapy for approximately 5 days, and was discharged from the hospital after complete recovery. However, PTX should have been detected through XR before the first discharge from the hospital (Fig. 1, d). In our opinion, the patient's PTX did not recur but lasted until the second hospitalization (Fig. 2, a). After 5 days of discharge, chest XR confirmed complete recovery. Therefore, not only the patient's symptoms but also radiographic imaging findings should be considered when diagnosing PTX.

In Korean Medicine, Huatuo–Jiaji points are often used to treat visceral diseases. The autonomic nervous system controls the visceral functions of the body, and the Huatuo–Jiaji points stimulate the related segmental autonomic nerves. Sympathetic neurons innervating the stomach are located at T5–T9. Therefore, the Huatuo-Jiaji points at T5–T9 are considered treatment points [5]. However, needles can easily penetrate the lungs, aorta, heart, and other organs due to their anatomical location. Lin [16] reviewed the safe needling depth of acupoints for adults with normal weight and the results are shown in Table 1. Although the criteria of "normal adults" were obtained from the guidelines of the Department of Health in Taiwan and the study was conducted on Taiwanese patients, the tendency for acupoint depth is consistent to a certain degree. Doctors should be cautious while performing acupuncture on critical acupoints near the Huatuo-Jiaji points in the thoracic region, as listed in Table 2.

There are several causes for PTX, such as rib fractures or penetrating injuries, which cause damage to the lungs or chest. Patients with PTX experience chest pain, shortness of breath, cough, and increased heart rate or breathing. Tension PTX requires needle thoracostomy because it is life-threatening. However, non-threatening PTX is treated differently. If the lesion is very small, no major treatment is required [17]. At S Medical Hospital, the patient was diagnosed with traumatic hemopneumothorax and pulmonary hemorrhage. However, the size of the hemorrhage was relatively small; therefore, the patient did not require surgery. The doctor offered the patient to choose between surgical and conservative treatment, and the patient selected oxygen therapy as the conservative treatment. Modern management of traumatic PTX is shifting toward more conservative management practices such as smaller catheters or observation [18]. Therefore, this type of treatment was appropriate for the patient; however, the doctor made a premature call regarding patient recovery.

This study had several limitations. First, as a single case report, our findings may not be generalizable to all patients undergoing acupuncture. Second, the lack of long-term follow-up limited our understanding of the prolonged effects and potential recurrence of hemopneumothorax. Finally, the study relied on the accuracy of clinical records and patient self-reports, which may have introduced bias. However, this study included detailed documentation of the clinical course and treatment of hemopneumothorax following acupuncture, which provides valuable insights for healthcare professionals. This case report highlights the importance of early diagnosis and appropriate management to prevent serious complications.

This case highlights the importance of careful observation by a doctor after performing acupuncture in critical areas. If a patient complains of PTX symptoms, such as shortness of breath or chest pain after acupuncture, chest XR or CT must be performed for timely diagnosis of the underlying condition. Care must be taken when placing needles at other acupuncture points, such as SI11 [4], GB20, and BL13 [3]. We recommend that practitioners should be familiar with the acupoints or regions that can cause acupuncture-related PTX. In addition, knowledge of the normal anatomical variations is essential for the safe practice of acupuncture [19]. This information is crucial for primary care physicians to understand potential risks and ensure that proper diagnostic and therapeutic measures are taken promptly. This case study underscores the importance of awareness and caution in acupuncture practices, and we hope that it will guide several primary care physicians to improve patient safety during acupuncture treatment.

5. Conclusion

Hemopneumothorax is a life-threatening condition that can develop after acupuncture. Although this occurs infrequently, practitioners should be aware of potential complications and risk factors. If a patient complains of PTX symptoms, such as shortness of breath or chest pain after acupuncture, chest XR must be performed to prevent a major risk.

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Data availability

All data are included in the article.

CRediT authorship contribution statement

Hyein Jeong: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Jun Hyung Kim:** Methodology, Investigation, Formal analysis. **Hyunsuk Park:** Writing – original draft, Validation, Resources, Project administration, Investigation. **Yoo Min Choi:** Writing – review & editing, Supervision, Software, Resources, Project administration. **Soobin Jang:** Validation, Supervision, Software. **Kyeong Han Kim:** Writing – review & editing, Supervision, Funding acquisition. **Seong-Gyu Ko:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Abbreviations

CT	Computed tomography
MRI	Magnetic resonance imaging
PTX	Pneumothorax
US:	Ultrasound
XR	X-ray

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