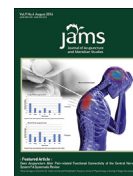


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CASE REPORT

Auricular Acupuncture Analgesia in Thoracic Trauma: A Case Report

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Abstract

We report a case of thoracic trauma (rib fractures with pneumothorax and pulmonary contusions) with severe chest pain leading to ineffective ventilation and oxygenation. The patient presented to our emergency department. The patient had chronic obstructive pulmonary disease and was completely unable to take deep breaths and clear secretions from his bronchial tree. After obtaining informed consent, we applied auricular acupuncture to ameliorate pain and hopefully improve his functional ability to cough and breathe deeply. Within a few minutes, his pain scores diminished considerably, and his ventilation and oxygenation indices improved to safe limits. Auricular acupuncture analgesia lasted for several hours. Parallel to pain reduction, hemodynamic disturbances and anxiety significantly resolved. A second treatment nearly a day later resulted in almost complete resolution of pain that lasted at least 5 days and permitted adequate ventilation, restored oxygenation, and some degree of mobilization (although restricted due to a compression fracture of a lumbar vertebra). Nonopioid and opioid analgesics were sparsely used in low doses during the entire hospitalization period. Hemodynamic alterations and anxiety also decreased, and the patient was soon ready to be discharged.

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1. Introduction

Thoracic trauma with rib fractures is associated with increased morbidity and mortality [1,2]. Respiratory system complications arise from inefficient ventilation resulting from the restricted mobility of the rib cage (due to pain) and possible instability produced by the rib fractures [3]. Variable analgesia regimens, including nonsteroidal anti-inflammatory medications, epidural analgesia, intravenous opioids, patient-controlled analgesia, and intercostal or paravertebral nerve blocks, are applied and validated in patients with rib fractures [4–10].

Data in the literature depict significant effectiveness of nonpharmaceutical treatments. Some report short-term pain relief with acupuncture in 50% to 80% of cases, but large, well-designed studies are needed to accurately assess its contribution to pain management [11].

2. Case Report

A 60-year-old man was transferred from a primary care hospital to our emergency department following a car accident. At presentation, he was fully alert (Glasgow Coma Scale, 15/15) but anxious and speaking with difficulty at a low volume. He had obvious difficulty breathing, and he reported intractable pain at the front and right lateral area of the chest and in the lumbar region. At the primary care hospital, a chest tube had been inserted at the right hemithorax to evacuate a right pneumothorax. There was extended bruising of the right inguinal region and an open laceration on the anterior abdominal wall. His visual analog pain scale (VAS) score was 10 and his breathing pattern was primarily abdominal. His pulse oxygen saturation (SpO₂) was 82% despite breathing oxygen at 5 L/min via a face mask. Blood gas analysis revealed increased carbon dioxide tension (PaCO₂, 48 mm Hg) and severe hypoxia (PaO₂, 54 mm Hg). His arterial blood pressure was elevated (179/95 mm Hg by noninvasive measurement) and his heart rate (HR) was 115 beats/min (bpm). His past medical history revealed another incident of spontaneous pneumothorax and chronic obstructive pulmonary disease as a result of heavy smoking.

Skull computed tomography (CT) revealed a fracture containing air bubbles at the internal rim of the ocular cavity and opacification of the ethmoid turbinates. Chest CT revealed right pneumothorax with a drain tube ending in the middle lobe, pulmonary contusion with atelectasis of the posterior segments of the right upper and lower lobes, subcutaneous emphysema, emphysematous dysplasia of the right middle lobe, and multiple, small, bilateral air cysts in the remaining pulmonary parenchyma. It also showed retrosternum hematoma with a few air bubbles, fracture of the right lateral edge and the main body of the sternum, bilateral fractures at the anterior cartilages of the lower ribs, precipitation fracture of the second lumbar vertebra, and a small subcapsular hematoma in the liver. Prior to CT examination, an initial dose of 25 mg of meperidine was administered.

After our primary evaluation, the attending anesthetist obtained informed consent and applied auricular acupuncture with 0.15 mm × 15 mm needles at the

cingulate gyrus, 26a (thalamus), Omega 2, Point 0, and Shen Men instead of instituting an opioid-based analgesia scheme (Fig. 1) [12,13].

Within a few minutes, the patient reported complete regression of chest pain. His anxiety resolved quickly, he was keeping his eyes open, and his voice became clear and stable. His breathing regained a thoracic pattern with normal expansion at a respiratory rate of 20 breaths/min. His pulse oximetry rose to 92%, and after stimulation to breathe deeply, his oxygen saturation rose to 97%. Blood gas analysis revealed a significant drop in PaCO₂, to 38 mm Hg.

The patient was transferred to an advanced care unit in a significantly improved condition and free of pain. During the next few hours, his SpO₂ fluctuated around 94% (89–97%). The patient deteriorated 22 hours later with rapidly increasing pain, gradually returning to VAS 10, preventing him from effective coughing and expectoration. He succumbed to an abdominal pattern of breathing, his SpO₂ fell to 79%, respiratory rate rose to 36 breaths/min, HR rose to 121 bpm, arterial pressure became 189/99 mm Hg and his blood gas analysis showed PaO₂ was 51 mm Hg and PaCO₂ was 45 mm Hg.

The patient, an anesthetist himself and in severe respiratory distress, stressfully requested that the intensivists proceed with mechanical ventilation. A 50-mg dose of tramadol failed to reduce the pain, and the attending anesthetist proposed and applied a second round of auricular acupuncture using the same scheme, adding points Pulmo I and II (Fig. 1).

The intervention proved successful again within a few minutes, and the patient's pain was rated around VAS 3. The patient was able to take deep breaths and cough effectively. His SpO₂ returned to 97% to 100%, HR fell to 90 bpm and arterial gases renormalized. This intervention had

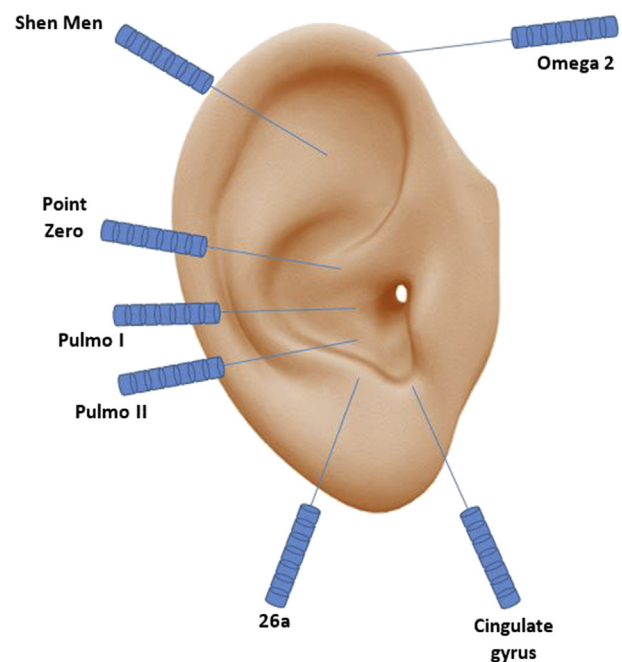


Figure 1 Initial and supplemental auricular acupuncture points used.

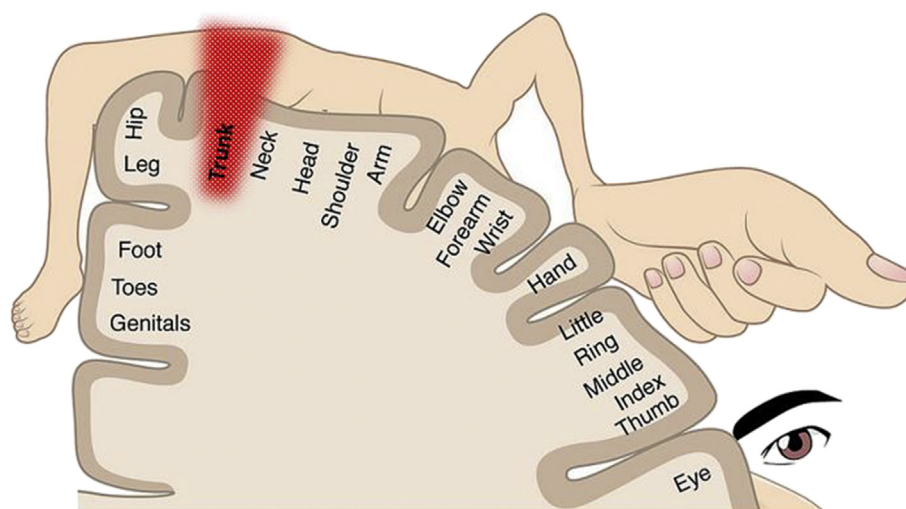


Figure 2 Penfield homunculus and associated sensory area (red dotted area). Modified from: Scientists say: cortical homunculus [20].

a significantly prolonged effect, lasting approximately 5 days, whereupon he was transferred to the ward. During the 5 days in the advanced care unit, the patient received a total of 6-g paracetamol in 1-g doses administered sporadically when moving him for sheet changing.

3. Discussion

Auricular acupuncture in emergency medicine has rarely been studied [13]. In a randomized study of 18 patients with skull fractures, auricular acupuncture combined with vakaria seeds at the acupuncture points provided effective analgesia and reduced anxiety [14]. Another randomized controlled study in a military emergency unit showed that it significantly reduced the pain of multiple acute pain syndromes [15].

Auricular acupuncture is more widely accepted as an effective treatment for postoperative pain. Randomized controlled studies revealed significant pain reduction together with lower pharmaceutical analgesic requirements in patients receiving knee arthroscopy [16,17], total hip replacement [18], or laparoscopic nephrectomy [19], with the application of either auricular or electroauricular acupuncture.

The puncture points used in our intervention belong to the Battlefield protocol that was developed by Niemtzw [12] in 2001 to achieve rapid pain relief in the battlefield (thus the name) [15]. This intervention offers significant pain relief within a few minutes, and it will persist for a few hours to months. In our case, no indwelling semipermanent needles were available; therefore, we used ordinary 0.15 mm × 15 mm acupuncture needles.

It is speculated that stimulation of the auricular points favorably modulates the processing and formation of pain perception in the central nervous system; primarily the hypothalamus and thalamus [12]. Our auricular acupuncture sessions resulted in remarkably long-lasting analgesia and anxiety reduction, proven by the prolonged rebalancing of sympathetic tone (decline in HR and blood pressure) together with restoration of deep breathing and coughing abilities and of normal ventilation and oxygenation (Fig. 2) [20].

Ho et al [21] reported the only similar cases in the literature; a randomized controlled study in which 58 patients with rib fractures experienced significant pain relief with acupuncture when compared with controls. The analgesic effect lasted for at least 6 hours, and the patients were able to take deep breaths, cough effectively, and tolerate body roll turning in bed. The intervention required patient cooperation to accurately locate painful areas while breathing deeply, coughing, and rolling. From these points, vertical lines were dropped to perpendicularly cross the level of the umbilicus. The crossing points were used as stimulation points. We could not complete this procedure because our patient did not cooperate due to severe respiratory distress.

Epidural analgesia is considered superior to alternative treatments (intercostal and paravertebral blocks or intravenous opioids) in patients with more than three rib fractures and chest trauma [22]. Avoiding possible complications from these techniques, we applied a completely noninvasive analgesic option that has no known complications. It resulted in immediate and effective analgesia, restoration of normal ventilation, anxiolysis, and restoration of a regular hemodynamic profile in a patient with chest trauma and chronic obstructive pulmonary disease. It also facilitated the patient's transfer through the advanced care unit to the ward, and finally, to discharge. Our experience could trigger further systematic research on the utility of acupuncture for thoracic trauma.

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