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CLINICAL CASE

Blunt chest trauma with pneumomediastinum and pneumoperitoneum secondary to Macklin effect.

Case report[☆]

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KEYWORDS

Pneumomediastinum;
Pneumoperitoneum;
Macklin effect

Abstract

Background: Pneumomediastinum is the presence of free air around mediastinal structures, which may be spontaneous or secondary, and can occur in 10% of patients with blunt chest trauma, with the Macklin effect being its main pathophysiology.

Clinical case: A 21 year old male, hit by motor vehicle, with alvéolopalatal fracture and blunt chest trauma, who, 72 h after admission, shows subcutaneous emphysema in the anterior chest. A simple tomography of the chest and abdomen was performed, finding a pneumomediastinum, bilateral pulmonary contusions and pneumoperitoneum. Oesophageal, tracheobronchial or intra-abdominal viscera injuries were ruled out, establishing the cause of pneumomediastinum and pneumoperitoneum due to the Macklin effect. This required conservative management in intensive care unit, with a favourable clinical course and discharged after a 10 day hospital stay.

Discussion: Macklin effect is caused by dissection of air medially along the bronchoalveolar sheath (interstitial emphysema), secondary to alveolar breakdown and extending into mediastinal and other anatomical structures (pneumoperitoneum). It has been documented in blunt

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trauma, as well as in acute asthma, positive pressure ventilation, or after Valsalva manoeuvres. The imaging method of choice is computed tomography, and its characteristic findings, interstitial emphysema adhering to a bronchus and pulmonary blood vessel.

Conclusions: In the presence of pneumomediastinum and pneumoperitoneum is necessary to rule out oesophageal and tracheobronchial injury before establishing the Macklin effect as its cause. The diagnosis is made with computed tomography and managed conservatively.

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PALABRAS CLAVE

Neumomediastino;
Neumoperitoneo;
Efecto Macklin

Trauma contuso de tórax con neumomediastino y neumoperitoneo secundario a efecto Macklin. Reporte de un caso

Resumen

Antecedentes: Neumomediastino es la presencia de aire libre en mediastino que puede ser espontáneo o secundario; se presenta en el 10% de los pacientes con trauma contuso de tórax, y su principal fisiopatología es el efecto Macklin.

Caso clínico: Hombre de 21 años de edad, arrollado por vehículo automotor, con fractura alveolopalatina y trauma contuso de tórax. A las 72 h después de su ingreso, presentó enfisema subcutáneo en tórax anterior, por lo que se le realizó tomografía simple de tórax y abdomen que presentó datos de neumomediastino, contusiones pulmonares bilaterales y neumoperitoneo. Se descarta lesión esofágica, traqueobronquial y de víscera intraabdominal. Se establece como causa del neumomediastino y neumoperitoneo el efecto Macklin. Es manejado conservadoramente en la unidad de cuidados intensivos, con adecuada evolución clínica y es egresado al décimo día de estancia hospitalaria.

Discusión: El efecto Macklin es causado por la disección de aire medialmente a lo largo de la vaina broncoalveolar (enfisema intersticial), y es secundario a la rotura alveolar, que se extiende al mediastino y a otras regiones anatómicas (neumoperitoneo). Se ha documentado en trauma contuso, crisis asmática, ventilación con presión positiva o después de maniobras de Valsalva. El estudio diagnóstico de elección es la tomografía computada y sus hallazgos característicos son la presencia de enfisema intersticial adherente a bronquio y a los vasos sanguíneos pulmonares.

Conclusiones: Ante la presencia de neumomediastino y neumoperitoneo, es necesario descartar lesión esofágica y traqueobronquial, antes de establecer el efecto Macklin como su causa. El procedimiento de elección para su diagnóstico es la tomografía computada y se maneja conservadoramente.

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Background

Pneumomediastinum is defined as the presence of free air around the mediastinal structures, also known as mediastinal emphysema. It can be divided into 2 groups: *spontaneous*, with no obvious primary cause; and *secondary*, with a triggering pathological event, first described by Laennec.¹

According to Kelly et al.² the first series of cases on spontaneous pneumomediastinum was conducted by Louis Hamman in 1939, hence its being termed Hamman's syndrome. The pathophysiological process was demonstrated experimentally by Macklin and Macklin in 1944, known as the Macklin effect. Its fundamental mechanism is alveolar breakdown secondary to pressure gradients which cause air to leak into the interstitium and the pulmonary lymph nodes (interstitial emphysema), which dissects through the interlobar septums adjacent to the blood vessels and bronchial

system until it reaches the hilum, then the mediastinum and other anatomical regions.³

Pneumomediastinum can present in 10% of patient with blunt chest trauma, and the Macklin effect can be attributed as the cause. Tracheobronchial injury presents in fewer than 10% and oesophageal injury presents in a lower percentage.⁴

We report the case of a patient with blunt chest trauma who presented with pneumomediastinum and pneumoperitoneum secondary to the Macklin effect, managed medically by the General Surgery Department in the *Hospital General de Zona Norte*, Ministry of Health, Puebla.

Clinical case

A 21-year-old male, originating from and resident of Tlaxcala, with no history of degenerative chronic disease, previous surgery, allergies or drug abuse.

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