

Ludwig Traube

The Man and His Space

● The detection of dullness to percussion in the left hemithorax raises the possibility of pleural effusion, consolidation, or atelectasis. Percussion of Traube's space, a semilunar tympanic area overlying the gas bubble in the stomach, is a valuable maneuver in this regard: obliteration of Traube's space favors a pleural effusion. Knowledge of the remarkable life of Traube, and the ability to demonstrate the utility of his sign on rounds, provides an opportunity in a technologic age to remind the medical student of the romance of bedside medicine.

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To carefully observe the phenomena of life in all its phases, normal and perverted, to make perfect the most difficult of all arts, the art of observation, to call to aid the science of experimentation, to cultivate the reasoning faculty so as to be able to know the true from the false—these are our methods.

WILLIAM OSLER

Contemporary medicine has a basis in the experimental and imaginative methods of scientists of the past. By the unique medium of the medical eponym, some names are invoked daily at the patient's bedside¹; those whose names were never so associated may vanish into obscurity. A third and perhaps worse fate is to have generated a medical eponym only to have the eponym be untaught, or poorly understood even when it is taught.² If the physical sign described by Ludwig Traube (Fig 1) did not remain useful at the bedside, there would be little cause for lament. We contend that an understanding and demonstration of Traube's space is a practical and handy clinical skill. Additionally, a knowledge of the remarkable life of Ludwig Traube might perhaps be inspirational to student and specialist alike.

THE MAN

Ludwig Traube was born in 1818 in Silesia. During his medical studies in Germany at the University of Breslau and later at the University of Berlin, he was influenced by Johannes Müller (1805-1858), François Magendie (1783-1855), René Laënnec (1781-1826), and Johann Schönlein (1793-1864). The work of Laënnec on auscultation and percussion was to have deep influences on his thinking.³

In 1840, he received his medical degree from the University of Berlin and moved to Vienna, Austria, where he spent a year of stimulating work with Josef Skoda (1805-1881) (of "skodaic resonance" fame) in clinical medicine and with Carl Rokitansky (1804-1874) in pathologic anatomy. He returned permanently to Berlin in 1843, equipped to begin a career in experimental and clinical medicine.³

During the early 19th century, Germany was in the throes of political and economic upheaval. The prevailing system of investigation at that time was one of *Naturphilosophie*, a speculative and mystical approach to medical practice and scientific understanding, largely influenced by the philosophers Friedrich von Schelling and Hegel. In the early 1820s, disillusioned by the "armchair theorizing" of their contemporaries and influenced by the French schools of Magendie and Claude Bernard (1813-1878), German physicians in the mold of Wilhelm von Humboldt (1767-1835) began to use scientific reasoning and controlled experimentation. It was at this critical transition that Ludwig Traube made his entry into the world of experimental medicine.⁴

In 1847 Traube secured a position as *Privatdocent* at the Charite Hospital under Schönlein. This acceptance



Fig 1.—Ludwig Traube (1818-1876).

at Charite was later recorded by Traube as the happiest day of his life. Traube immersed himself in experimental medicine. One of his first papers, on pneumonia resulting from the cutting of the vagus nerves, appeared along with the experiments of Rudolf Virchow (1821-1902) on thrombosis and embolism in the early editions of a journal that Traube cofounded with Virchow. Traube's work on suffocation was done in 1847, and he introduced the thermometer in his clinic in 1850. In 1853, he was made an assistant professor at Charite, and by this time he was married to Cora Markwald.⁵

Between 1862 and 1867, Traube went through turbulent times, suffering from angina pectoris and losing a son to diphtheria. However, the same period saw him describe the Traube-Herring waves. Traube had a particular interest in correlating clinical pulmonary disease with the underlying abnormality: he described the characteristic sputum of lung abscess and gangrene, he described putrid bronchitis, and, in the course of his study of "ileotyphus" (presumably typhoid fever), he de-

scribed the respiratory aspects of the disease, including the laryngitis and bronchitis. He demonstrated bronchial breathing in alveolar consolidation, coined the term *metallic-sounding wheeze* in asthma, and was able to describe accurately the clinical picture of pleurisy and croup.⁶ In 1872, he was nominated professor, and by that time had published two volumes of his work on physiology and clinical medicine. In 1872 he was nominated as an honorary member of the society of German doctors in Paris, and in the same year the famous William Osler visited the laboratories of Traube, Virchow, and Freirichs. Osler was so impressed that he is said to have stated his ambition was "to build a great clinic on Teutonic

lines here in America . . . lines which have placed the scientific medicine of Germany in the forefront of the world."⁴ After the celebration of Traube's 25th anniversary at the University of Berlin, he received many honors and continued his academic tenure until his death due to angina and heart failure in 1876, only 2 months after his wife's death due to cancer.

THE SPACE

It is for his description of a semilunar space on chest percussion that Traube will be remembered. Anatomically the space is bounded medially by the left edge of the liver, laterally by the medial edge of the spleen, and superiorly by the lower border of the heart.⁷ The space can be mapped by dropping perpendicular lines down from the sixth rib at the costochondral junction and the ninth rib at the anterior axillary line to the costal margin. An irregularly quadrilateral space is thus defined (Fig 2). In the words of Professor Jacoud, "In the state of the vacuous stomach, and all the organs in the region being healthy, one can ascertain in the semi-lunar space a sharp tympanism with percussion, the absence of vocal vibrations by palpation and the absence of respiratory noise with auscultation."⁸

In the winter of 1868, Traube was asked to see a young man admitted with fever, chills, headache, and a "stitch-like" pain in the left side of

the chest. Traube noted the patient to be dyspneic and coughing up rust-colored sputum. Examination of the patient revealed a reduction in the half-moon space on percussion and decreased pectoral fremitus on the left. Moreover, the patient had loud bronchial breath sounds below the left scapula and a systolic rub over the sternum. The patient died 2 days later. On the basis of his clinical findings, Traube surmised the following: (1) The rusty sputum indicated an inflammation of the lung parenchyma, ie, pneumonia. (2) The diminution in the space associated with the stabbing left-sided chest pains indicated pleural exudate, ie, empyema. (3) The systolic rub over the sternum indicated an exudate around the heart. All of these findings were confirmed at autopsy.⁹ In another patient with an accumulation of pleural fluid due to trauma, Traube noted that resorption of the pleural fluid was heralded by an increase (a return to normal) in the size of the semilunar space, long before the dull percussion note over the affected lung resolved.¹⁰ Ironically, Traube did not write much more about this semilunar space, and it was left to his student Fraentzel^{9,11} to popularize this space:

The fact that in the lowest part of the left thorax there is a tympanitic percussion note has been known for a long time. Investigation of this subject was undertaken recently by professor Traube. The

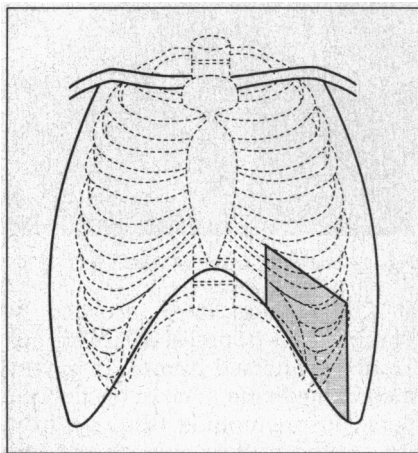


Fig 2.—Surface anatomy of Traube's space.

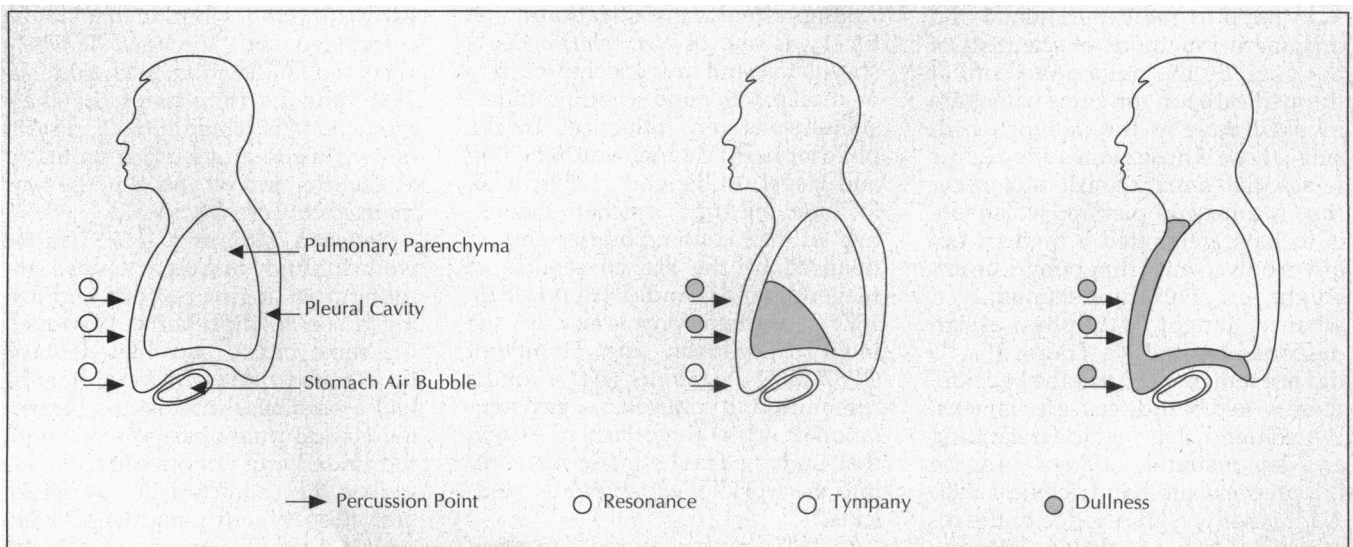


Fig 3.—Schematic drawing of percussion findings in the left lower hemithorax in a normal lung (left), consolidation (center), and pleural effusion (right).

results of this investigation may be summarized as follows: a) The above mentioned area of tympany is shaped like a half moon; below its border is the rim of the rib cage, above it is limited by a bowl-like line with its concavity pointed downwards. b) The half moon shape begins anteriorly below the fifth or sixth rib and extends along the edge of the thorax, and posteriorly to the anterior end of the ninth or tenth rib. c) Its greatest width approaches three to three and a half inches. d) Percussion in this area differs not only in its tympanic note but also by its loudness in comparison with the rest of the lung. e) When the lung expands during inspiration, the half moon space becomes smaller and thus shows that the lung is capable of expanding. f) A considerable increase in the semilunar space is usually a sign of immobility of the lower edge of the lung and thus serves as an indicator of scarring. g) In the presence of pleural effusion, the half moon space may disappear and its reappearance heralds the beginning of reabsorption. The progress of recovery will be best determined by the increase of the half moon space. h) During pneumonic infiltration of the entire lung, the half moon space remains either intact or is only slightly narrowed.

Professor Jacoud, who undertook an intense evaluation of Traube's space, emphasized two caveats regarding this sign. First, a reduction in the space may be the only sign of a subpulmonic pleural effusion. Second, and more important, a reduction in the tympanism over the space could arise with pleural adhesions ("phrenocostal symphysis") and not solely from pleural effusion.⁸ Given a patient with reduction in the semilunar space, differentiation between pleural fluid and adhesions would be possible by observing respiratory movements; in the latter, one would see a classic retraction of the lower intercostal spaces with each inspiration, a finding not observed in effusions.⁸ In the words of Professor Neumann, however, dullness over Traube's space was highly sensitive for effusions: "this can reveal the presence of pleural effusions in the left pleura that sometimes can be missed by expert radiologists and this has been confirmed on multiple occasions by thoracentesis."¹²

Traube never associated dullness in this space with splenic enlargement, a common misconception that persists today. A recent report sug-

gested that percussion of Traube's space compares favorably with other commonly used clinical maneuvers (none of which are sensitive) and is better than chance alone in determining the presence of an enlarged spleen.¹³

We find demonstrating Traube's space of the greatest utility (even in this era of portable chest roentgenography and ultrasound) as a specialized maneuver when dealing with a patient with dullness in the left hemithorax (Fig 3). The maneuver can be performed with the patient supine or sitting. Preservation of Traube's space suggests that the dullness is from consolidation or atelectasis; if Traube's space is obliterated, a pleural effusion is suspected. An exception may be the patient with consolidation of the left anterior basal segment and contiguous lingula, where the resonance of Traube's space may be impaired (K. V. Thiruvengadam, MD, written communication, April 22, 1991). Although each of these conditions will have their unique signs (bronchial breathing in consolidation, stony dullness and mediastinal shift in pleural effusion), we believe that accurate bedside diagnosis rests on the availability of *more than one physical sign* to buttress a diagnosis.

As the ward team troops en masse to Radiology at the end of ward rounds, we, as long-time clinical teachers, continue to be amazed at the slack-jawed expressions of wonder on the faces of students and house staff when bedside diagnosis correlates with roentgenologic diagnosis—as if an insidious and deeply rooted distrust of the hands-on examination is being shaken. It is ironic that the ready availability of diagnostic technology has not, it seems, enhanced bedside skills but instead has encouraged their atrophy.^{14,15} The teaching of Traube's space is a reminder of the remarkable bedside skills of years gone by; in addition, by invoking this medical eponym, the memory of a remarkable man lives on.

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This article is dedicated to K. V. Thiruvengadam, MD, bedside clinician extraordinaire.

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