Signs of Hypocalcemia: Chvostek's and Trousseau's Signs

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Hypocalcemia is a common condition characterized by a net loss of calcium from extracellular fluid in greater quantities than can be replaced by the intestine or bone.[1] Hypocalcemia is caused by a number of clinical entities and often presents with signs of generalized neuromuscular irritability including paresthesia, muscle cramps, laryngospasm, tetany, and seizures. This neuromuscular instability can also be displayed through the elicitation of Chvostek's sign and Trousseau's sign (**Sidebars**). Both Chvostek's sign and Trousseau's sign are time-honored physical predictors that are well-chronicled in medical history and frequently associated with hypocalcemia.

CHVOSTEK'S SIGN

Elicitation: Tapping on the face at a point just anterior to the ear and just below the zygomatic bone

Postitive response: Twitching of the ipsilateral facial muscles, suggestive of neuromuscular excitability caused by hypocalcemia

TROUSSEAU'S SIGN

Elicitation: Inflating a sphygmomanometer cuff above systolic blood pressure for several minutes

Postitive response: Muscular contraction including flexion of the wrist and metacarpophalangeal joints, hyperextension of the fingers, and flexion of the thumb on the palm, suggestive of neuromuscular excitability caused by hypocalcemia

HISTORIC PERSPECTIVE

Frantisek Chvostek

Frantisek Chvostek (1835–1884) was an Austrian surgeon who was born in Moravia, Czech Republic.[2] Chvostek investigated the pathology and treatment of neurologic illnesses, including the use of electrotherapy, and described the sign that was to bear his name in 1876.[2]

Armand Trousseau

Armand Trousseau was a French physician who lived from 1801 to 1867.[2] Trousseau was educated in Paris, graduated in 1825, and soon became a notable figure in Parisian medicine, both as an expert clinician and a superb teacher.[2] Trousseau was the first person in France to perform a tracheotomy, and he introduced thoracentesis as a medical procedure in 1843.[2] In addition to his description of Trousseau's sign, this physician is also credited with describing Trousseau's syndrome, or thrombophlebitis caused by visceral cancer.[3]

CHVOSTEK'S SIGN

Elicitation

The definition of Chvostek's sign varies in the medical literature, as does the sign's interpretation.[4] In fact, two clearly described methods to elicit Chvostek's sign have been reported. The most well-known version of the sign, or the Chvostek I phenomenon, is described as twitching and/or contracture of the facial muscles produced by tapping on the facial nerve at a specific point on the face. This point is located 0.5 to 1 cm below the zygomatic process of the temporal bone, 2 cm anterior to the ear lobe, and on a line with the angle of the mandible (**Figure 1**).[4] A similarly described response, the lesser-known Chvostek II phenomenon, can be produced by tapping on a different location of the face. This point is located on the line joining the zygomatic prominence and the corner of the mouth, one third of the distance from the zygoma (Figure 1).[4]

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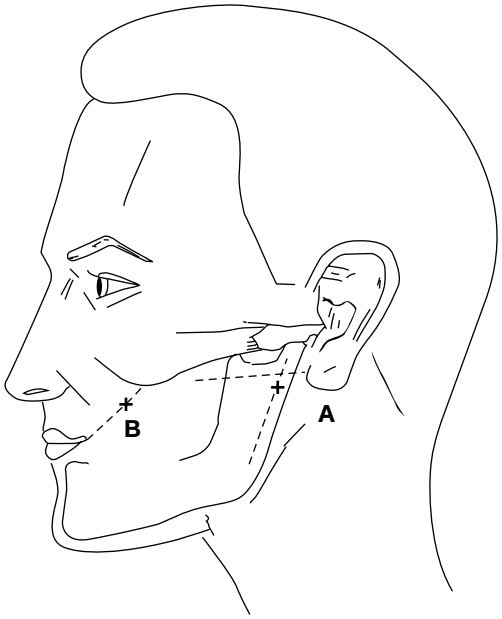

Figure 1. Illustration of the facial points where A) the Chvostek I phenomenon and B) the Chvostek II phenomenon can be elicited. Hoffman E: The Chvostek sign: a clinical study. Adapted with permission from *Am J Surg* 1958;96:33–37.

In both instances, the common feature is the twitching response, which may involve any or all of the muscles supplied by the facial nerve on that side, including the circumoral muscles and the orbicularis oculi.[5,6]

Pathophysiology

The proposed mechanism for Chvostek's sign is thought to involve direct mechanical stimulation of the motor fibers in the facial nerve.[7] Previously, Chvostek's sign was thought to be a reflex. However, this reflex is now believed to occur only occasionally; further, the reflex is believed to only be involved with the Chvostek II version of the sign. Another purported explanation for the mechanism was direct stimulation of the facial muscles, which subsequently contracted and twitched, but this theory has been disproven as well.

Differential Diagnosis

As previously mentioned, Chvostek's sign is a classic signification of hypocalcemia. However, some studies have demonstrated that hypocalcemia is not the only condition in which a positive Chvostek's sign may be seen. Other conditions that have produced Chvostek's sign include rickets, diphtheria, measles, scarlet fever, whooping cough, and myxedema. The sign has also been positive in persons without any known disease. One study demonstrated a positive Chvostek's sign in nearly 25% of healthy individuals.[4] Another study showed that 29% of patients with laboratory-confirmed hypocalcemia had a negative Chvostek's sign.[8] In turn, the medical community considers Chvostek's sign as only a crude indicator of neuromuscular irritability and an unreliable indicator of hypocalcemia.[9]

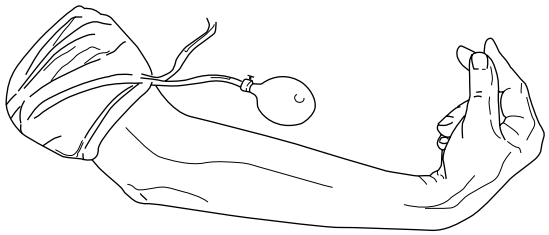

Figure 2. Illustration of the elicitation of Trousseau's sign. Adapted with permission from Netter FH: Clinical manifestations of acute hypocalcemia. In *The Ciba Collection of Medical Illustrations*, vol 4. Summit, NJ: Ciba Pharmaceutical Company, 1965:185.

TROUSSEAU'S SIGN

Elicitation

Trousseau's sign is more consistently defined in the medical literature than Chvostek's sign. Most simply described, Trousseau's sign presents as carpopedal spasm occurring after a few minutes of inflation of a sphygmomanometer cuff above systolic blood pressure.[5] Occlusion of the brachial artery causes flexion of the wrist and metacarpophalangeal joints, hyperextension of the fingers, and flexion of the thumb on the palm, producing the characteristic posture called *main d'accoucheur* (**Figure 2**).[9] Trousseau's sign is thought to be both sensitive and specific for hypocalcemic tetany.[1,9] In addition to the obvious visual manifestations, patients with a positive Trousseau's sign may also experience paresthesia of the fingers, muscular fasciculations or twitches of the fingers, and a sensation of muscular cramping or stiffness.[10]

Pathophysiology

The proposed mechanism for Trousseau's sign is increased excitability of the nerves in the arm and forearm, ostensibly caused by hypocalcemia, which, in turn, causes the muscular contractions. These conditions are exacerbated by ischemia produced by the sphygmomanometer, resulting in the twitching that defines the sign.[5]

Trousseau-von Bonsdorff Test

The Trousseau-von Bonsdorff test has been correlated with the presence of Trousseau's sign.[10] The Trousseau-von Bonsdorff test is performed immediately after deflating the sphygmomanometer. The patient is instructed to breathe deeply at a rate of 40 breaths/min and is then observed for the previously described carpopedal spasm. One study found the Trousseau-von Bonsdorff test to be a useful adjunct to Trousseau's sign when evaluating for the presence of hypocalcemia.[10]

Differential Diagnosis

As with Chvostek's sign, hypocalcemia is not the only condition that can produce a positive Trousseau's sign. Another common clinical entity that has been known to cause a positive Trousseau's sign is hypomagnesemia.[9] Because this condition often occurs concomitantly with hypocalcemia, determination of the electrolyte abnormality responsible for causing the two separate positive responses is difficult.

COMPARISON OF CHVOSTEK'S SIGN AND TROUSSEAU'S SIGN

Although the two signs have never been directly compared, Trousseau's sign is believed to be more specific for hypocalcemia than Chvostek's sign. In one study, 94% of patients with confirmed hypocalcemia had a positive Trousseau's sign, whereas only 1% of healthy patients demonstrated a positive Trousseau's sign.[10] In addition, only 9% of normal patients had a positive Trousseau-von Bonsdorff test.[10]

HYPOCALCEMIA

Clinical entities that may commonly result in hypocalcemia include hypoparathyroidism (especially of the postsurgical variety), chronic renal failure, rhabdomyolysis, pancreatitis, tumor lysis syndrome, nephrotic syndrome, and dietary deficiency.[9] Both Chvostek's sign and Trousseau's sign may be present in patients with all conditions that cause hypocalcemia; however, absence of the signs does not preclude the diagnosis. Modern blood chemistry analyzers have the ability to measure both total and free serum calcium, which has greatly assisted in the diagnosis of hypocalcemia. The treatment of hypocalcemia consists of correcting the underlying pathologic problem (if possible) and replacing the lost calcium through pharmacologic means.

SUMMARY

In the current age of medicine, the utility of Chvostek's sign and Trousseau's sign has diminished with the development of technology that is able to assess serum calcium values. However, the signs may still be helpful as crude determinations of the neuromuscular excitability that occurs in patients with hypocalcemia. Trousseau's sign is likely to be a more specific indicator of hypocalcemia than Chvostek's sign, but both signs are diagnostically useful, and attempts to both perform and interpret the signs are an interesting challenge to physicians and students of medicine. **HP**

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REFERENCES

1. Bushinsky DA, Monk RD: Calcium. *Lancet* 1998;352: 306–311.
2. Firkin BG, Whitworth JA: *Dictionary of Medical Eponyms*, 2nd ed. New York: The Parthenon Publishing Group, 1996;68:401.
3. *Stedman's Medical Dictionary*, 25th ed. Baltimore: Williams and Wilkins, 1990:1539.
4. Hoffman E: The Chvostek sign: a clinical study. *Am J Surg* 1958;96:33–37.
5. Netter FH: Clinical manifestations of acute hypocalcemia. In *The Ciba Collection of Medical Illustrations*, vol 4. Summit, NJ: Ciba Pharmaceutical Company, 1965:185.
6. Noble J: *Textbook of Primary Care Medicine*, 2nd ed. St. Louis: Mosby, 1996:550–554.
7. Kugelberg E: The mechanism of Chvostek's sign. *Archives of Neurology and Psychiatry*. 1951;65:511–517.
8. Fonseca OA, Calverly JR: Neurological manifestations of hypoparathyroidism. *Arch Intern Med* 1967;120: 202–206.
9. Becker KL, ed: *Principles and Practice of Endocrinology and Metabolism*, 2nd ed. Philadelphia: J.B. Lippincott Company, 1995;618:1766–1767.
10. Schaaf M, Payne CA: Effect of diphenylhydantoin and phenobarbital on overt and latent tetany. *N Engl J Med* 1966;274:1228–1233.