HISTORY OF NEUROLOGY
Guillaume-Benjamin Amand Duchenne, MD (1806-1875)

“Master of the Master”

Richard J. Barohn, MD
February 10, 2017
Guillaume-Benjamin-Amand Duchenne
1806-1875

• Born: Boulogne-sur-Mer, France
  • Aka Duchenne “De Boulogne”

• One of the greatest clinicians in 19th century
  • Charcot called him his Master!

• Family of fishermen/sea captains
  • Father received Légion d’Honneur from Napoleon for valor as sea captain in French-British wars

• Paris medical school grad 1831; studied under Laënnec, Dupuytren; returned to Boulogne for 11 years but practice was limited so he returned to Paris at age 36 (1842)
  • Began seeing patients in charity clinics/large public hospitals/asylums
  • Never had hospital or university appointment
  • Over time his skill analyzing clinical problems was recognized by Trousseau, Charcot, Aran, Broca

• Visited hospitals with his electrical stimulation gadget
  • Continuously tried new ways of testing nervous functions

• Goal: discovery of new facts about the nervous diseases
Duchenne de Boulogne

Major Contributions

1. Observations and detailed clinical descriptions
2. Electrical Stimulation
3. Biopsy & Histology/Neuropathology
4. Use of medical photography

Did first clinical-electrical-pathologic correlations
Also a gadget-guy
And a biomarker guy
Duchenne de Boulogne
Some of His Important Clinical Observations & Descriptions:

1. Tabetic Locomotor Ataxia
   – Distinguished it from Friedrich from locomotor ataxia
2. Deduced Poliomyelitis was a disease of motor nerve cells in spinal cord
3. Described lead poisoning & response to electrical stimulation
4. Described Progressive Muscular Atrophy
   – Also described by Francois Aran 1850 who acknowledged Duchenne’s help
5. Described Progressive Bulbar Palsy
6. Erb-Duchenne Palsy – upper trunk brachial plexus in babies from childbirth
7. Described pseudo-hypertrophic muscular dystrophy
   – Aka “Duchenne Muscular Dystrophy”
   – Developed “histologic punch” or “histologic harpoon” to bx muscle
   – Led to discussion in lay press of morality of examining living tissues of the body
“This disease is mainly characterized: 1. By feebleness of movement, usually situated at first in the muscles of the lower extremities and of the lumbar spine, ultimately spreading progressively to the upper limbs, and increasing in intensity till all movement is lost; 2. increase in size of most of the paretic muscles; 3. By increase of the interstitial connective tissue of the paretic muscles, and in the more advanced stages by an abundant production of fibrous tissue or of fatty globules. The name I have given to this disease pseudohypertrophic muscular paralysis...has reference to the symptoms... It may be called myo-sclerotic paralysis, a name which is more scientific and justified by pathological anatomy.”

...make such his limbs preserve a front or in profile, figures 4 and 11, one standing proudly, defy the richness of his great, like those I have use, presents one of pseudohypertrophic of some muscles, or development of and latissimus dorsi as already said. We electrical exploration, the convexity of the outer superior sur- 11), which should be a surface in that rectus majors were other small patients, this contrasted with lower limbs...

...only cases similar to that in pseudohypertrophied muscles become apparent. This proposition I have found, I have encountered was more or the start while the muscles of the calf... 

...mentioned one clinical is the degree of passion to the degree of...We have ob- all the above cases (aneurysm) were on, the weakness in action of volume, ex- have been weaker than by muscles that are two, we observe just would extend the foot...
Duchenne de Boulogne
Pioneer of Neuro-Electrical Stimulation

• 1835 became interested in “method of électropuncture” & built his own apparatus in Boulogne

• **Early EMG machine & was early EMGer!**

• **Early biomarker research!**

• 1842 moved to Paris because he needed more patient material

• Used “Localized Electrization” to:
  1) diagnose
  2) treat (presumably through tissue necrosis)
  3) understand the nervous system
Duchenne’s: Le électrisation localisée et son application à la physiologie, a la pathologie e ala therapeutique – 1st edition 1855; 2nd edition 1861; 3rd edition 1872

Created the fundamentals of electrotherapy

Classified electro-physiology of muscular system

Applied electricity to pathology
Demonstration of the mechanics of facial expression. Duchenne and an assistant faradize the mimetic muscles of “The Old Man”.

[Image of a vintage photograph showing a demonstration of facial expression]
Duchenne de Boulogne
Other Books

1. Mécanisme de la physionomie humaine, ou analyse électro-physiologique de l’expression des passions applicable à la pratique des arts plastiques (1862)
   Mechanisms of Human Expression

2. Physiologie des mouvements démontrée à l'aide de l'expérimentation électrique et de l'observation clinique, et applicable à l'étude des paralysies et des déformations (1867)
   Physiology of Motion

3. De l'Électrisation localisée et de son application à la physiologie, à la pathologie et à la thérapeutique (1872)
ÉLECTRO-PHYSIOLOGIE PHOTOGRAPHIQUE

SPECIMEN
A UNE EXPERIENCE ELECTRO-PHYSIOLOGIQUE

MÉCANISME
DE LA
PHYSIONOMIE HUMAINE
EN
ANALYSE ELECTRO-PHYSIOLOGIQUE
DE L'EXPRESSION DES PASSIONS
APPLICABLE A LA PRATIQUE DES ARTS PLASTIQUES

PAR LE DOCTEUR
G.-B. DUCHARNE (de Boulogne)

ALBUM

PARIS
V. JULIEN RENOUARD, LIBRAIRE
6, RUE DE TOUBRON, 6.
1862
Duchanne de Boulogne, Synoptic plate 4 from *Le Mécanisme de la Physionomie Humaine*. 1862, albumen print. In the upper row and the lower two rows, patients with different expressions on their side of their faces.
Charles Bell
Anatomy of Expression - 1806
Charles Darwin

*The Expression of the Emotions in Man & Animals* - 1872
Figure 20 from Charles Darwin’s *The Expressions of the Emotions in Man and Animals* (1872). Caption reads “FIG. 20. – Terror, from a photograph by Dr. Duchenne”
Individual Action and Use of Muscles Which Move the Arm on the Shoulder

These muscles are: the deltoid, the supraspinatus, the subscapularis, latissimus dorsi, teres major, teres minor, subscapularis, long portion of the triceps.

ARTICLE ONE

THE DELTOID

ELECTROPHYSIOLOGY

Experiments

A. When the upper extremity is at rest parallel to the axis of the body, the electrical contraction of the middle portion of the deltoid muscle which originates from the acromion, elevates the humerus directly outward.

The other fibers of the deltoid also produce elevation of the humerus, but move it obligatorily forward and inward, if the most medial fibers are in contraction. The humerus is carried, however, directly forward or backward if the stimulation is applied correspondingly to the fibers located between the most medial and lateral fibers or originating from the spine of the scapula and from the acromion.

B. By the isolated contraction of the deltoid, the maximum elevation of the humerus is just short of the horizontal plane.

This maximum is produced by the most anterior fibers but if the electrodes are moved backward over the fibers of the deltoid the elevation of the humerus diminished gradually; the decrease is most pronounced when the electrodes are over the most posterior parts of the deltoid muscle.
58. The deltoid is thus able to start the elevation of the arm from the position of rest by its own contraction. This was demonstrated electrophysiologically.

But it is observed then that the upper extremity pulling on the external angle of the scapula is responsible for two movements: the external angle of the scapula (1) rotation by which the scapula is depressed while the inferior angle A. Figure 11, is depressed.

Much more pronounced. The elevation of the inferior angle is such that the axillary border of the scapula becomes oblique downward and forward, and the medial angle in its ascent pushes out the skin of the lateral portions of the neck as one can see in Figure 16. These clinical observations demonstrate the degree of usefulness of simultaneous synergistic action of the rhomboid and of the trapezius in the voluntary elevation of the arm.

Figure 14. Abnormal position of the scapula during elevation of the arm in a subject, who lost his serratus anterior, his rhomboid, and the lower third of the trapezius.

78. My electrophysiologic experiments showed that the elevation of the arm above the horizontal line could be obtained by the simultaneous action of the deltoid and the serratus anterior, or the middle third of the trapezius. The last two muscles could mutually substitute for each other in elevation of the arm.

This electrophysiologic observation is also confirmed by pathologic observation, although with certain restrictions, as far as the action of the middle portion of the trapezius is concerned. This part
Duchenne de Boulogne – Later in Life

• Duchenne and Charcot met in 1849 when Charcot was an Intern
• 1862 When Charcot became head of Salpetriere he invited Duchenne back
• Became friends; dined with Charcot every week
• Charcot frequently acknowledged Duchenne in his lectures/writings
• Charcot cared for him when Duchenne had an acute stroke and died at age 69
• Never obtained university position or recognition by Académie de Médecine or Institut de France
• But was made honorary corresponding member of académie in Rome, Madrid, Stockholm, St. Petersburg, Geneva, Leipzig, Florence, Naples, Madrid, Vienna, and Moscow and he traveled widely
• Widely recognized and appreciated in his lifetime
Duchenne de Boulogne
Plaque at Salpêtrière

1806-1875
A Duchenne (de Boulogne)
Electrisation Localisée
Physiologie des Movements  Neuropathologie
Brissaud on Duchenne & Charcot

“What makes Duchenne so famous is the prodigious amount of material he collected in order to build an imperishable scientific monument. He laid the foundation himself and consolidated it’s base, for which he later saw his friend and collaborator, Charcot, become the principle architect.”

Charcot on Duchenne

“How is it that one fine morning Duchenne discovered a disease that probably existed in the time of Hippocrates? Why do we realize things so late, so poorly, with such difficulty....Because our minds have to take in something that upsets our original set of ideas.”