GUILLAUME-BENJAMIN-AMAND 
DUCHENNE - BETWEEN MEDICINE AND ART

A. VADANUTA PLOTOGEA¹, A. KERESZTES², M. MOARCAS¹

Abstract: Guillaume-Benjamin-Amand Duchenne was one of the most ingenious minds of the 19th century. By combining physics and a thorough knowledge of medicine, he described several neuromuscular disorders; his work also developed physiology of human facial expression and psychology. Born in 1806 in Boulogne-sur-Mer, he studied medicine in Paris and became a physician in 1831. Duchenne conducted many experiments using electricity as therapeutical and diagnostic tool. In 1850, he published his first results regarding the connection between facial expression and electrical stimulation of muscles. Duchenne studied paralysis and several myopathies. He created a harpoon that could be used to extract sample of muscle tissue and this instrument was a predecessor of modern biopsies. Duchenne wrote three major books summarizing his research: “De l’électrisation localisée”, “Mecanisme de la physionomie humaine” and “Physiologie des mouvements”. Duchenne died in 1875 without having yet obtained respect of the medical community; later, his reputation arouse evidently.

Key words: Duchenne, myopathy, human facial expression.

Introduction
The eponyme Duchenne is well known in relation with the most common form of childhood muscular distrophy, even though Duchenne was not the first to describe this disease, but the one to clarify both clinical manifestations and microscopically characteristics based on muscular biopsy studies. [5] Guillaume-Benjamin-Amand Duchenne was a French neurologist of the XIXth century, a pioneer of muscular electrophysiology based on Galvani’s research. Although the father of modern neurology is thought to be Charcot, he truly appreciated Duchenne’s work and called him „my master”.

Duchenne chose „de Boulogne” as a post-nom in order not to be mistaken for Edouard Adolphe Duchesne (1794-1869) from Paris, a respected doctor of the local salons at the time. [6]

Duchenne’s life
Duchenne (1806-1875) was born on the 17th of September 1806, in Boulogne-sur-Mer (Pas-de-Calais, France), the place where his family had lived since the middle of the XVIII century. His father was marine captain during Napoleon Bonaparte’s wars. He was affectively connected to his birth places for his whole life. Both his personality – active, ambitious, yet very calm and his accent and his look prove his Boulogne origins. [9] Although his family’s tradition was related to sea and his father had hoped Duchenne

¹ Brașov, ² Faculty of Medicine, Transilvania University of Brasov.
would follow his steps, love for science was stronger.

Duchenne went to local school, then to highschool in Douai and he was 19 years old when he got his Bachelor diploma, along with his colleague and famed dr. C. Gros. Next, he studied Medicine at Paris which he graduated in 1831, with a licence thesis about burns called „Essai sur la brûlure”, having probably been influenced in choosing the theme by Dupuytren.

As a doctor, he returned to his birth city where he activated as a general practitioner for 10 years. He got married in 1831, but, after about 2 years, his wife died of puerperal sepsis. Duchenne’s mother in law spread many rumours regarding the fact that, as a sole witness of his wife’s labor, he was responsible for her death; this lead to the separation of his only son.[12]

In 1833, along with dr Gors, Duchenne made the first experiments of electro-puncture, a new technique, invented by Magendie and Saralndiere. Thus was the beginning of his neuroelectrophysiology research. In 1842, Duchenne moved to Paris for research that could not be done in Boulogne. He was viewed reticently and he never received an academic post; at first, he worked in charity hospitals and earned his existence from private practice. He worked for more than 30 years; daily visiting hospitals form Paris in the quest of particular cases he could research, devoting his entire life and passion to medicine and his patients. Lonely spirit, he showed an admirable ambition, in spite of the fact that his merits were appreciated only after death. Duchenne died in the 15th of September 1875, 2 days before his 69th anniversary, following a cerebral haemorrhage.

**Duchenne’s activity and work**

More than his fellow clinicians of the time, Duchenne emphasized the importance of neurology examination and electrophysiological studies. Along the description of diseases named after him, Duchenne also contributed to differentiation of facial nerve paralysis caused by central and peripheral neuron; he described the cog wheel sign in Parkinson disease, the characteristics of Lead intoxications and the epigastric respiratory depression of frenic paralysis is called Duchenne sign. [12]

In „De l’électrisation localisée et de son application à la physiologie, à la pathologie et à la thérapeutique” published in 1955, Duchenne describes the advantages and disadvantages of static and dynamic electric power use in therapy and diagnosis. He presents the influence of electricity on skin and the relationship between intensity and other characteristics of electricity and penetrability in order to obtain a biological effect – muscular contraction and resistance of living structures to electricity, for example. In the same book, there is described also the machine built by Duchenne for nerve and muscle stimulation. There are presented the indications of faradisation, the treatment technique using electricity: profound coetaneous anaesthesia of hands or feet, the method seemed to be the only way to obtain sensation of various degrees, depending on the electrodes and the particularities of the subject; also, electrical stimulation determines focal contraction of the muscles of the face. Duchenne believed there was no other therapeutically agent as efficient as faradisation. The use of the method in various types of muscular dystrophies, atrophies and paralysis are described. Faradisation using wet electrodes was proven to be effective in preventing tisular necrosis. [2]

Using faradisation as a diagnostic tool, with emphasis on contractility, Duchenne discovered the aetiology of poliomyelitis, suggesting that the lesion was in the spinal cord [8]
One of Duchenne’s innovations that brought precision to diagnosis of muscular diseases was a harpoon that allowed the percutaneous prelevation of muscle tissue. The instrument is thought to be a predecessor of modern biopsy. Duchenne used it for the diagnosis of progressive muscular atrophy and pseudohypertrophic paralysis that is nowadays named after him. [8]

Duchenne was the first to describe syphilitic ataxia and chronic progressive bulbar paralysis.

In spite of the fact that pseudohypertrophic paralysis of childhood is Duchenne’s myopathy nowadays, he was not the first to describe it, the controversy between him and Meryon being well known. Duchenne prefer not to read the new scientific discoveries in order not to be influenced by them. [1] Edward had described the condition ever since 1851, mentioning the male predominance, the necrotic aspect of granular degradation. According to Gowers, the first to describe the disease was Charles Bell, in 1831. [7]

Duchenne described the pseudohypertrophic paralysis in 1868, using also his harpoon for the studies Duchenne characterises the muscle weakness that first appears in the lower limbs and lumbar region, followed by progression to upper limbs, the increase in muscle mass due to development of interstitial connective tissue and overproduction of fibroses and adipose tissue in more advanced stages. He thought that the term myo-sclerotic paralysis was more appropriate based on histopathologic aspect. [10]

His first studies about muscular dystrophies date from 1850. In 1849, based on his research, François Amilcar Aran presented a case of progressive muscular atrophy that began in the hands and forearms and arms. In 1870, Duchenne published the description of the aforementioned condition, mentioning the vermicular fibrilar movements of limbs and the fact that the upper limbs were more affected in a northerly fashion. The characteristic positions of hands were also reported: if the abductor pollicis was affected, the first metacarpal muscle is closer to the second than it is normally; whereas, if the interossei muscles are affected the claw hand appears. The muscles of the lower limbs are later and inconstantly affected and control of sphincters is preserved. Duchenne emphasized that the contractility is normal, based on electrophysiological studies. Histopathological studies revealed the loss of muscle fibers striations due to replacement with granular material and adipocytes. [8]

One of Duchenne’s masterpieces is „Mecanisme de la physionomie Humaine” published in 1862. The book combines contraction electrophysiology studies, photography and the study of human reactions and emotions. He was influenced by physiognomy, a conception that the personality and emotions externalize as physical characteristics, especially of the face. Moreover, he thought of the face as a map of spiritual feeling, that divinity had not created face muscles only for mechanical purposes.

By isolated, followed by combined muscle stimulation, he described the role of each muscle of the face: the frontal muscle is for attention, the superior part of orbicularis is for reflection, the great zygomaticus is for joy. The description of Duchenne’s smile remains classical – there can be differentiated a fake from a sincere smile, as the second involves both the contraction of great zygomaticus and inferior part of orbicularis, while the first is the simple contraction of the great zygomaticus. [3]

In his studies, Duchenne used subjects that suffer form a minor mental retard. The most famous one is an old man who suffered from near complete facial anaesthesia that was useful for Duchenne, because the electrodes determine an unpleasant feeling in a person with intact facial sensibility.
Duchenne believed that the reactions of his subjects were common to any individual. In this work, there are also photographs he did in cooperation with Adrien Tournachon. Some of the photographs are compared to classical art masterpiece to show how art does not always reflect the true feelings. (Fig. 1) One of the critics of his time reproached him that he takes away from art its idealism, reducing it to an anatomical realism. [11]

Conclusions

Duchenne remains a remarkable figure of neurology, which he innovated both as diagnosis and therapy. As an open minded brilliant researcher, he had his work recognized only after death, but nowadays, he is considered one of the greatest minds of the XIX century. He was a complex personality, devoting his mind to medicine, but also art, technique and photography.

References

[2] Duchenne, G., De l'électrisation localisée et de son application à la physiologie, à la pathologie et à la thérapeutique: et de son application à la physiologie, a la pathologie et a la thérapeutique, Chez J.-B. Baillière, Paris, 1855, pag 5-35