

Verbal Apraxia in Cases of So-called Broca's Aphasia in the Light of Electromyographic Studies in Vowel Articulation

B. Weiss

Wrocław, Poland

1. Procedure

Studies on the bioelectric activity of the muscles involved in the speech act are scarce in the pertinent literature. None deals with the bioelectric activity of the articulatory muscles in aphasia.

Examinations were made in 3 men at the age of 50-60 years, with high education, after 1 year rehabilitation; they exhibited articulatory disorders due to apraxia; 3 normal persons served as control.

A DISA electromyograph attached, by means of collodion, to the left and right side of the upper lip were used for examination; bioelectric activity was recorded with repeating with and without visual control and while reading in the following systems: V1, V2, V3; V1, V4, V5; Cn, Vn; Cn, Vn, Cn; Cn, Vn, Cn, Vn. The material obtained will be exemplified by data concerning the expression of the systems: Vi, V2, V3 = a, e, i and V1, V4, V5 = a, o, u.

- a - in Engl. corresponding to a e.g. in car
- e - in Engl. corresponding to e e.g. in pen
- i - in Engl. corresponding to i e.g. in sea
- o - in Engl. corresponding to o e.g. in pot
- u - in Engl. corresponding to u e.g. in put

2. Results

In the healthy and normally speaking subjects bioelectric activity is similar in repetition and reading (Fig. 1). With vowels a, e the activity is absent and with i only slight (Fig. 2). Activity appears before the articulation of o, u passing to the articulation phase of the syllables. It appears and fades away gradually reaching its peak at the articulation of u. The interferential record is low.

Considering the electromyograms from all 3 trials, the following regularities can be observed:

1. Fig. 3. The bioelectric activity from the left side of the musculus orbicularis oris is higher on repetition with visual control. Right side interferential records are low or intermediate as with a. The left side is clearly increased, particularly with u. Volley discharges, basal line oscillations are visible. This record reflects an action of 'searching' the articulatory system.

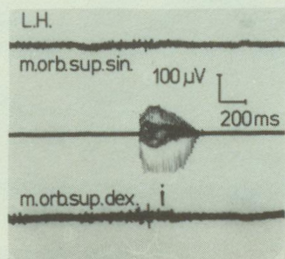
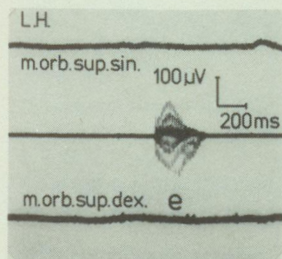
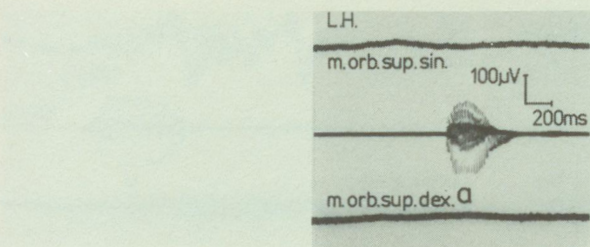


Fig. 1.

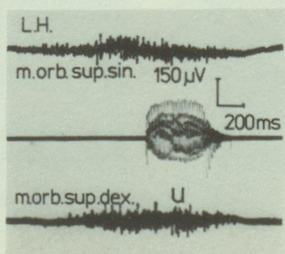
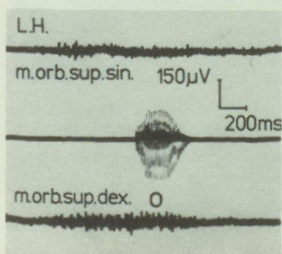
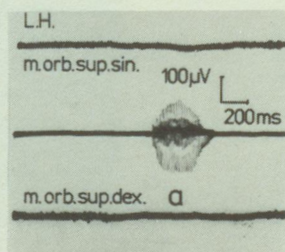


Fig. 2.

Striking is also the short time of the muscle activity before the production of vowel o.

2. Fig. 4. Bioelectric activity invariably occurs with the production of a, e, i; the interferential records are low, irregular, especially with i, on the left side.
3. Fig. 5. There is a tendency for the activity from the left and right side of the m. orbicularis oris to become uniform on repetition without visual control. This uniformity is to be seen bilaterally. The activity of the muscle lasts longer and fades away only after the production.

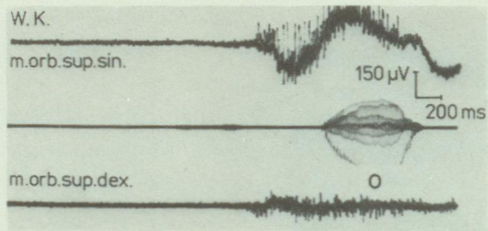
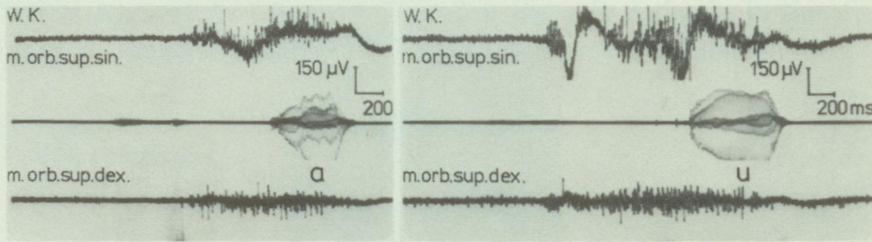


Fig. 3.

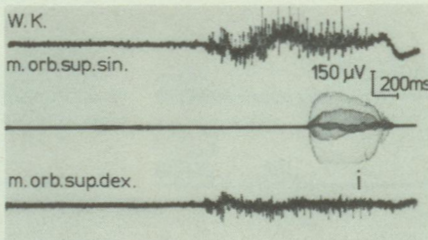
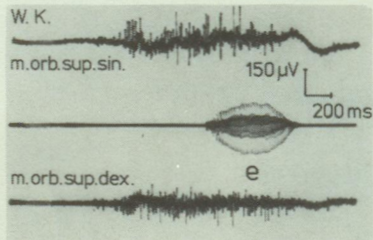
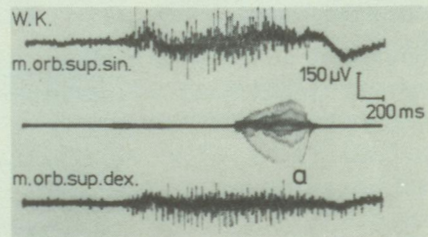


Fig. 4.

4. Fig. 6. A great variability of the bioelectric activity is observed on reading. With a, a volley-like interferential record is obtained on the left and a group discharge on the right side. During expression of o there is a long lasting activity of the muscle (2200 ms); with u, a left side rudimentary record with a tendency for rhythmization is obtained.
5. All the above given examples also indicate the time of bioelectric activation before the expression of the vowels; it ranges, on average, between 500 and 2200 ms; the shortest on repetition with visual and auditory control and the longest one on reading, though repetitions tend to reduce it. Regularities pointing to abnormalities which in turn reflect the com-

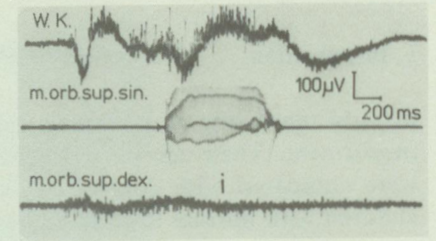
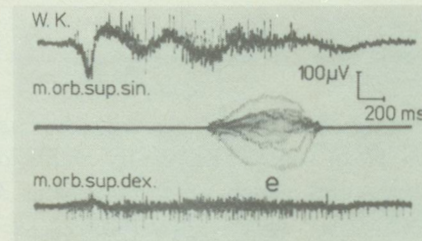
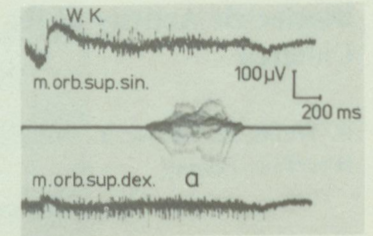


Fig. 5.

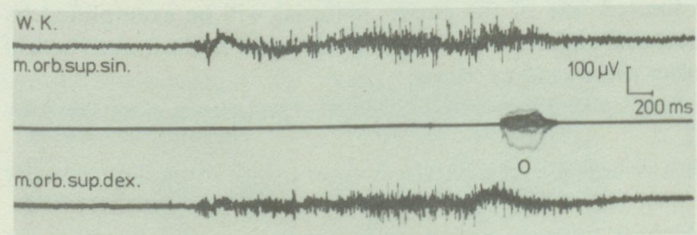
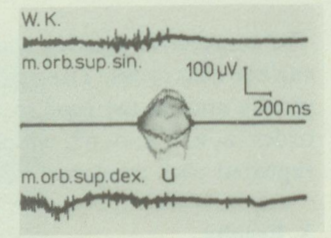
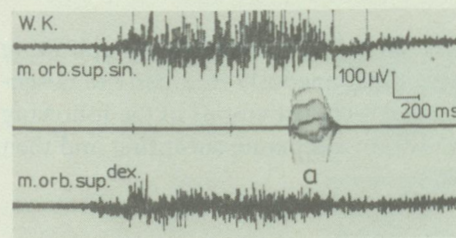


Fig. 6.

plexity of the problem under observation can by no means be regarded as binding conclusions. They do, however, prove the necessity of continuing studies the effectivity of which, considering the pathomechanism of the disorder itself and methods of its rehabilitation, is hardly predictable. Nonetheless, it appears that rehabilitation of patients with speech production disorders in aphasia due to apraxia should be based on administration of visual articulatory models under auditory control with concomitant demonstration of written patterns.