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INTRODUCING OASIS (ON ASYMMETRY IN SPHINCTERS) AND SURFACE EMG OF THE SPHINCTERS.

Aims of Study

To investigate functional asymmetry in sphincter innervation and to examine whether such asymmetry contributes to incontinence because of sphincter deficiency. The final goal is to prove whether sphincter asymmetry exists or not; to determine whether there is a difference between incontinent and continent individuals; whether persons at risk can be identified and if treatment indications based on asymmetry can be given.

Methods

The OASIS project started in January 2002, it is structured within the 5th Framework and its consortium is merging interdisciplinary competencies to study innervation asymmetry of both the anal and urethral sphincter by means of surface EMG (SEMG). Special intra-anal and intra-urethral probes have been built to detect SEMG signals of either sphincter. These anal probes (12 and 14 mm diameter) have either one or three circumferencial arrays of 16 equally spaced silver bars (about 8 mm long) whereas the urethral probe has 8 circum-ferential contact bars about 5 mm long and a diameter of 5 mm. SEMG signals are detected, from volunteers and patients who suffer from incontinence, in relaxed conditions, at maximal voluntary contraction and at an intermediate contraction level. SEMG signals elicited with nerve stimulation will be studied during PNE testing of the left or right sacral roots. Direct nerve stimulation and SEMG signal recording from the urethral and anal sphincter will be performed during deafferentation of the dorsal sacral roots combined with ventral root stimulation. Signal features that will be investigated are propagation along the array circumference, amplitude, latency times and motor unit structure and geometry.

Results

Preliminary results from voluntary contractions of the urethral and anal sphincters are presented in Fig. 1 and Fig. 2. Signal propagation around the probe is evident and inner-vation zones can be detected. Individual motor units may be identified. To our knowledge this is the first publication of a circumferential SEMG signal of the urethral sphincter.

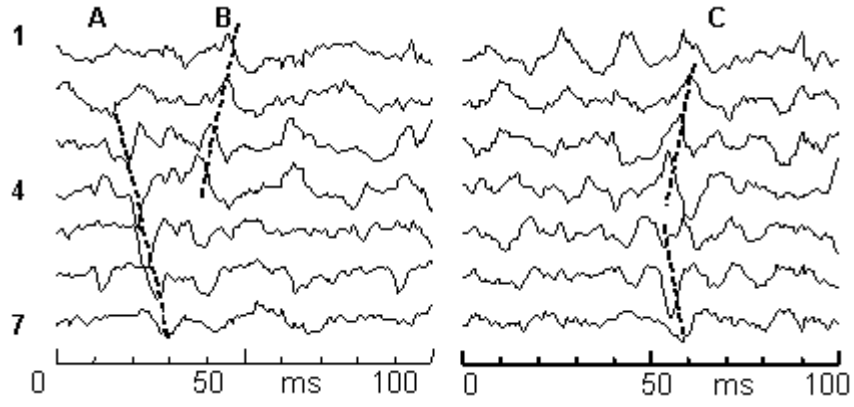

Fig. 1.
Two signal samples from the urethral sphincter detected with a circular array of eight contacts (seven differential signals). Ch. 1 and 7 are in the ventral position, ch. 4 is dorsal.
Three motor units are detected, A is innervated at ch 1, B at ch 5, C between ch 4 and 5.

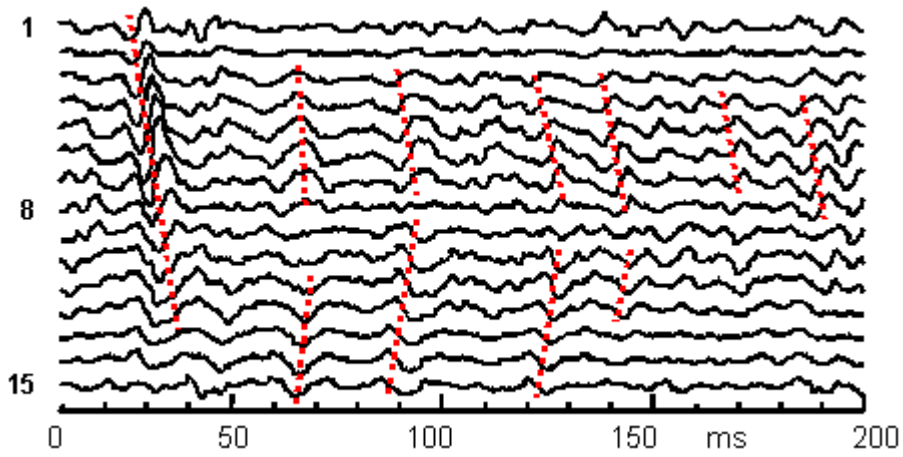

Fig. 2.
Signal sample from the anal sphincter detected with a circular array of 16 contacts (15 differential signals. Ch. 1 and 15 are in the ventral position and 8 is dorsal. Many motor units are evident, the first innervated at ch 1 and extending to ch 14, the others innervated at ch. 3 or 15 and extending bilaterally to ch 8.

Conclusions

We successfully managed to record multi-channel surface EMG of the urethral and anal sphincter.
More research is needed to determine the usefulness of this technique as a diagnostic tool for the evaluation of incontinence and during neuro-urological interventions.