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INFLUENCE OF A PRECEDING SOMATOSENSORY PUDENDAL STIMULATION ON MAGNETIC EVOKED EXTERNAL URETHRAL SPHINCTER (EUS) CONTRACTION IS DEPENDING ON ITS TIME INTERVAL

Hypothesis / aims of study

Trying to better understand the underlying mechanism of action of sacral neuromodulation in chronic urinary retention or non relaxing external urethral sphincter we developed a human experimental model. The aims of the study were *first* to answer the question what happens to lumbosacral magnetic evoked external urethral sphincter contraction when a low current stimulation from strictly afferent nerve fibres precedes it? *Second*, at which time period should the preceding afferent stimulation happen to evoke greatest effects? *Third*, is there any change in the evoked external urethral sphincter response measured after combined magnetic and electrical stimulation according to the degree of bladder filling?

Study design, materials and methods

The local ethics committee approved the experimental procedure. Eight healthy male volunteers provided informed consent and underwent EUS pressure measurement using an intraurethral microtip transducer catheter after exclusion of urinary tract infection. At baseline, magnetic stimulation of the lumbosacral spinal cord above motor threshold evoking the Bulbocavernosus Reflex (BCR) was performed and the evoked pressure responses of the EUS were recorded. The 14cm diameter coil with a maximum output of 1.8 Tesla was placed in the midline of lumbar spinal cord at the level of L1. Single biphasic stimuli with duration of 0.2 ms were applied. During the experimental protocol the lumbosacral magnetic stimulation was repeated with the same intensity, while a selective square-wave electrical dorsal penile nerve stimulation below the motor threshold with a duration of 0.2 ms preceded the sacral stimulation at five different intervalls (10, 20, 30, 50, 100 ms). The entire protocol was performed in two experimental condition: empty and full bladder. The recorded EUS responses at baseline were statistically compared to those recorded with combined stimulation by ANOVA for repeated measures. For the pair-wise comparisons, α was corrected for the number of comparisons made (α=0.05/6=0.0083).

Results

Electrical pudendal nerve and sacral magnetic stimulation was well tolerated by all volunteers. Median baseline EUS pressure response after magnetic stimulation alone was 43 cm water.The combined stimulation with the electrical dorsal penile nerve stimulation below the motor threshold preceding the lumbosacral magnetic stimulation by 20 ms (38 cm water), 50 ms (35 cm water) or 100 ms (40 cm water) reduced the evoked EUS contraction significantly (p=0.0048, p=0.0039, p=0.0002) compared to that recorded after lumbosacral magnetic stimulation alone. At the 10 ms and 30 ms interval with empty bladder the median EUS pressure amplitude was raised (not significant) compared to magnetic stimulation alone.
With a filled bladder the median baseline amplitude of the EUS was 86 cm water. In this condition there was a significant reduction of the evoked EUS pressure at an interval of 50 ms (61 cm water, p<0.0001). The EUS responses to the combined stimulation with intervalls of 10 ms, 20 ms, 30 ms and 100 ms were also reduced, but not significantly.

Interpretation of results

A low current stimulation of the afferent part of the pudendal nerve can influence the contractile behavior of the evoked EUS response after magnetic stimulation. When this low current stimulation preceds the magnetic one by 50 ms we recorded the greatest effects, especially at the condition of a filled bladder when this influence could only be detected at this interval.

Concluding message

Our findings may indicate that somatosensory fibres of the pudendal nerve modulate the effect of a lumbosacral magnetic stimulation on the EUS and suggest that a combined

pudendal afferent and lumbosacral magnetic stimulation could be an approach to enhance the effect of the sacral neuromodulation for chronic urinary retention in terms of efficacy. This approach could also be an interesting option in reducing EUS contraction in spinal cord injured patients suffering from detrusor-sphincter-dyssynergia.

FUNDING: Swiss National Foundation (Grant-No: 32.52562.97) and the European Community (Grant: REBEC QLG5-CT-2001-00822)