The Cervicocavernosus Reflex: Description of the Reflex and its Role in the Sexual Act

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Abstract: The paper studies the action and clinical significance of a reflex termed the 'cervicocavernosus' reflex. Twenty-two healthy women (mean age 39.7 ± 10.2 SD years) entered the study. The cervix uteri was stimulated both mechanically and electrically by a needle electrode. The response of the bulbo- and ischiocavernosus muscles was recorded by a needle electrode inserted in each muscle. In 10 subjects, the cervix was anesthetized and the cavernosus muscles' response to stimulation of the anesthetized cervix was recorded. The vaginal pressure was measured at rest and on cervical stimulation by means of a balloon-tipped catheter introduced into the vagina. The mean vaginal pressure at rest was 5.2 ± 1.8 SD cmH2O and on cervical stimulation 38.8 ± 10.6 cmH2O. The cavernosus muscles showed no resting activity. Upon cervical stimulation, the muscles contracted with a mean amplitude of 286.4 ± 55.6 SD μV for the bulbocavernosus muscle and 176.6 ± 48.8 μV for the ischiocavernosus muscle; the mean latency of the reflex response was 59.2 ± 10.6 SD ms. Stimulation of the anesthetized cervix did not evoke contraction of the muscles. The cervicocavernosus reflex could play a role in enhancing both clitoral and penile erection during the sexual act.

Keywords: Bulbocavernosus muscle; Clitoris; Corpora cavernosa; Erection; Impotence; Ischiocavernosus muscle; Potency

Introduction

Attempts to explain the physiological mechanisms of erection have increased dramatically during the past decade, but much still remains to be explained. The mechanism of female sexual behavior is controlled by reflex actions, many of which are not yet fully explored [1-4]. The sexual sensory signals are mediated to the sacral segments of the spinal cord through the pudendal nerve and sacral plexus, and are then transmitted to the cerebrum [3,5-7]. Also, local reflexes integrated in the sacral and lumbar spinal cord may share in the sexual reaction [8-13].

During our study of the female perineal musculature, it was found that mechanical stimulation of the uterine cervix led to contraction of both the bulbocavernosus and ischiocavernosus muscles. This reflex action was reproducible and is called the 'cervicocavernosus reflex'.

Physioanatomic Considerations

The bulbocavernosus muscle surrounds the vaginal introitus and covers the bulb of the vestibule [14] (Fig. 1). Posteriorly, it is continuous with the perineal body and external anal sphincter. Its fibers pass forward over the vestibular bulb on each side of the vagina and meet its contralateral part through a fascial expansion on the dorsum of the clitoris. The fascial expansion is attached to the corpora cavernosa of the clitoris and overlies the deep dorsal vessels. On contraction, the muscle narrows the vaginal orifice and may contribute to clitoral erection by compressing its deep dorsal vein [14].

The ischiocavernosus muscle arises from the ischial ramus and tuberosity. It covers the crus of the clitoris...
Material and Methods

Twenty-two women volunteered for this study, ranging in age from 24 to 56 years (mean 39.7 ± 10.2 SD years). All were married; 4 were nulliparous and 18 were multiparous with a history of normal labor. They had no urogynecological complaints at the time of presentation or in the past. Informed consent was given by each subject before entering the study.

EMG Studies

The uterine cervix was stimulated both mechanically and electrically. With the subject lying in the lithotomy position, a speculum was introduced into the vagina and the cervix exposed. A concentric needle electromyographic electrode \[15,16\], 65 mm long and 0.65 mm in diameter was inserted 1 cm into the musculature of the cervix lateral to the cervical os to serve as the stimulating electrode.

The response of the bulbocavernous muscle to cervical stimulation was recorded by a second concentric needle electrode, 45 mm in length and 0.65 mm in diameter, introduced into the muscle 0.5–1 cm lateral to the vaginal introitus. A third similar needle electrode was inserted into the ischiocavernous muscle. The ischial ramus was palpated and the needle electrode was introduced into the muscle on the medial aspect of the ramus. A ground electrode was applied to the thigh.

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The correct position of the needles in the muscles should be ascertained. Both the ischio- and bulbocavernous muscles lie under the skin, on the top of the ischiocavernosus and bulbocavernosus spongy tissue respectively. The needle was introduced through the skin for a few millimeters to enter the muscle. The proper location of the needle was monitored by the burst of activity heard on the loudspeaker and visualized on the oscilloscope screen when the needle had entered the muscle. The normality of the EMG potentials recorded in the bulbocavernosus muscles was examined prior to the experiment. The two muscles had normal EMG activity in all the subjects.

To ensure the constancy of the reflex response of the bulbocavernosus muscles to cervical stimulation, the cervices of 10 women were infiltrated with 2 ml of 1% xylocaine to anesthetize the muscle bundles around the electrode, and the cervix was then stimulated. The procedure was repeated with an injection of saline.

Mechanical stimulation of the cervix uteri was induced by stroking the cervix with a pencil electrode, while recording the bulbocavernosus muscle response. Multiple recordings were performed to ensure reproducibility.

Manometric Studies

The vaginal pressure was measured by a balloon-tipped 16 catheter introduced into the vagina for 2–3 cm from the vaginal introitus. The catheter was strapped to the thigh and was connected to a strain-gauge pressure transducer (Statham, 230 B, Oxnard, CA, USA). The vaginal pressure was measured at rest and on cervical stimulation. The aforementioned methods were repeated at least twice to assure reproducibility in the individual subject.

Statistical Analysis

The results were analyzed statistically using the Student's t-test.

Results

The vaginal pressure under resting conditions varied from 3 to 10 cmH2O with a mean of 5.2 ± 1.8 SD cmH2O. Stimulation of the cervix uteri, both electrically and mechanically, was accompanied by elevation of the vaginal pressure. On stimulation by a train of five square pulses of 1 ms duration and separated by 1 ms, the threshold varied from 30 to 72 mA, with a mean of 49.6 ± 12.2 SD mA, and the vaginal pressure at threshold varied from 18 to 56 cmH2O, with a mean of 38.8 ± 10.6 SD cmH2O. The pressure elevation was