

# Anatomical Basis of Sexual Functions

Igor F. Nikishin, M.D.

## Summary

*This review of anatomical structures involved in sexual activities, their functions and the related clinical implications will address the transmission of sexual sensations, and discuss their participation in erection, orgasm and ejaculation.*

## Transmission of Sexual Sensations

Nothing pierces the pelvic diaphragms composed of muscular layers and the corresponding fascial sheets. The structures "descending" toward the pelvic floor carry with them their "visceral" innervation. The structures "ascending" toward the pelvic floor carry with them their

rectly", with only few interruptions (in the cord), and provide a good localization of the origin of the stimulation. They are stimulated by tactile and caloric changes. Both characteristics make the somatic sensory pathways eminently well suited for transmission of sexual sensations.

## CLINICAL IMPLICATIONS

The "visceral" parts of the urethra, vagina and rectum - proximal 2/3 of the vagina and the rectum proximal to the "white line" - will not be a source of sexual sensation. One does not get orgasm by scratching the cervix or by fundoscopy, nor by overfilling the rectal ampulla in constipation or by procedure on the bladder neck. The "somatic" parts of the urethra, vagina and rectum, will be the appropriate sources of sexual sensation.

The somatic innervation reaches the "somatic" parts of the structures in sexual functions, by the way of the pudendal nerves, the branches of which anastomose with branches of the adjacent nerves: ilioinguinal at the pubis, the posterior cutaneous femoris near the anus and the median cutaneous femoris at the junctions of perineum with the thigh. The divisions of the pudendal nerve are directed toward the penis/clitoris, the scrotum/labia and distal 1/3 of the vagina and the anus.

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"somatic" innervation that has reached them by detouring the diaphragms of the pelvic floor. The "descending" and the "ascending" structures meet in the diaphragms and then connect, establishing the continuous lumen of the urethra, vagina and rectum.

The visceral sensory pathways run with the adrenergic division of the autonomic nervous system and are, therefore, interrupted and interconnected by synapses in many stations and substations - the plexuses. Such an arrangement makes it difficult to localize the origin of stimulations. Sensation is "diffuse", "regional" and, often "referred". Also, stimulus is originated by changes of tension in the wall of the "viscera", not by touch or temperature changes.

Both the poor localization and the absence of tactile or caloric stimulation, make the visceral sensory pathways poorly suited for use in transmission of sexual sensations.

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Thus all the above regions will transmit a stimulus that will pass the pudendal nerve and, therefore, be perceived as sexual sensation. Those are the "erotogenous zones".

While the assertion that babies cry because a light spanking (posterior cutaneous nerve) gives them a sexual pleasure might be too farfetched, the knowledge of the organisation of the transmission of sexual sensations does settle the old argument between the importance of a "clitoral" against a "vaginal" orgasm - both are important and provides an anatomical support for reassuring a patient who expresses concern about the size of his penis: only the distal 1/3 of the vagina transmits sexual sensation and that is reached by any penis capable of insertion. (The proximal 2/3 of the vagina dilates during the orgasm, forming a receptacle for the ejaculate, thus rendering any contact with the penis in that region unlikely.)

The neural organisation also explains the sexual gratification obtainable by anal or urethral intercourse, both parts of homosexual technics, as well as the anal intercourse used by the vestals of the ancient Greek temples as a contraceptive measure.

*The Commonwealth Health Center, P.O. Box 409 CK, Saipan, MP 96950, Northern Marianas.*

The knowledge of the pathways of transmission of sexual sensations is indispensable for surgeons performing vaginal procedures.

One should, however, not lose sight of the fact that the identification of the origin of a nerve stimulation is determined by *perception in the central nervous system*, a process that seems to be influenced by prior experiences and repeated associations. That applies also to the perceived localisation of the stimulus of sexual sensation.

## Motor Sexual Activity

In both genders the external urethral sphincter is located in the deep transverse perineal muscle. While in the male the sphincter surrounds the urethra completely, the location of the urethra in the anterior wall of the hollow organ - vagina - in female, makes a complete surrounding of the urethra by the sphincter impossible. The resulting weakening of the sphincter reliability is made worse by the repeated stretching of the vagina by childbirth.

The sphincteric control of the urethra is, therefore, less reliable in the female than in male, and may result in an occasional loss of urine during the strong contractions of the perineal musculature during the orgasm.

## CLINICAL IMPLICATIONS

The loss of urine by the female partner during a sexual intercourse is a matter of concern to some. Reassurance, on the basis of the anatomical arrangements of the external urethral sphincter in the female, might be of a critical importance to a satisfactory sexual relationship for such a couple. The impact of that knowledge on the surgery of urinary incontinence is obvious.

## Penile/Clitoral Erection

The erectile tissue of the corpora cavernosa of the penis/clitoris forms a network of smooth muscle trabeculae that carries neurovascular bundles providing blood to the caverns and their drainage.

The filling of the caverns results in erection ("tumescence"), the drainage of the caverns results in the flaccid state of the penis/clitoris ("detumescence"). The vascular arrangement in the trabeculae includes an arteriovenous (A-V) shunt that, when open, allows the afferent blood to bypass the caverns and drain directly into the efferent vessel. When closed, the A-V shunt directs the blood into the caverns resulting in an erection.

Cholinergic (parasympathetic) discharges via the splanchnic nerves close the A-V shunts and dilate the

caverns (erect penis/clitoris), adrenergic (sympathetic) discharges open the A-V shunts and constrict the caverns (detumescence of penis/clitoris).

## CLINICAL IMPLICATIONS

The sympathomimetic effects of anxiety on the erectile capability have been recognized for decades and form the basis of the Masters and Johnson treatment of the "performance anxiety" or "the third person in bed syndrome" both terms coined by Masters and Johnson. Removing the anxiety causing factors they have successfully returned erectile potency to their male patients. Similar effects can be achieved by other anxiolytic modalities, including a double Martini (but only one!).

By blocking the alpha-2-adrenergic receptors Yohimbin

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hydrochloride has a similar effect (5 mg, 3 times a day for not more than 10 weeks).

Papaverine injected locally, alone or with a vasoconstricting agent, is quite effective (0.6 or 0.3 ml through a tuberculin syringe).

"EREC-AID SYSTEM" provides vascular engorgement of the corpora cavernosa by placing the penis in a low-pressure chamber ("sucking the blood into the penis") and decreasing the venous outflow by temporary obstruction of the superficial veins by a tourniquet.

The obstruction of the A-V shunts or of the outflow veins by thrombi, emboli or encroachment on the lumen of the shunts or the outflow veins by deposits in the wall of the vessels (amyloidosis) may lead to priapism (i.e. abnormal persistent erection). In amyloidosis the priapism may be the presenting symptom/sign of the disease.

## Ejaculation

The following anatomical structures are involved in the process of ejaculation: 1) the internal urethral sphincter - a smooth muscle, therefore a low energy consuming,

involuntary structure under autonomic N.S. control, located in the bladder neck; It constricts under adrenergic flux preventing passage of the ejaculate into the bladder and relaxes in a prevalent cholinergic flux, as it should since the detrusor muscle of the bladder constricts under parasympathetic influence during urination, 2) the prostatic urethra, into which the seminal canaliculi and prostatic glands drain their contents - that form the ejaculate, and 3) the external urethral sphincter in the deep transverse perineal muscle, a striated muscle, therefore a high energy-consuming, voluntary structure, that - as any other sphincteric structure - responds to increased intraluminal pressure proximally to it by dilatation.

The process of ejaculation consists of two phases:

The first phase is under adrenergic control. The internal urethral sphincter constricts closing the bladder outflow, the seminal canaliculi (and possibly the seminal vesicles) constrict, the prostatic glands are stimulated to secrete and the ejaculate (content of seminal canaliculi and of the prostatic glands) is discharged into the prostatic urethra.

**“In this, as in other, true or perceived sexual abnormalities, the truism of “Whoever thinks he or she has a sexual problem, has one!” is correct.”**

The second phase is a reflex relaxation of the external urethral sphincter and a massive, reflex, contraction of the perineal musculature propelling the ejaculate toward the meatus.

The preponderant adrenergic flux opens the A-V shunts and constricts the vessels in the erectile tissues of the penis/clitoris and detumescence follows. This “refractory” phase continues as long as adrenergic flux predominates.

The increased sensitivity to touch of the glans penis or clitoris during the height of adrenergic flux, subsides with the normalisation of the adrenergic stimulation.

In the female the reflex relaxation of the external urethral sphincter is extended to the anal sphincter and,

since the internal urethral sphincter cannot close reliably, passage of urine and/or flatus during the height of contractions of the perineal muscles (see above) may occur.

### CLINICAL IMPLICATIONS

Since the ejaculation process is under the adrenergic control exclusively, it is possible to have ejaculation without erection, or even in case of damaged pelvic splanchnic nerves (parasympathetic). It is, therefore, possible to inseminate a partner after the surgical procedures or injuries damaging the pelvic splanchnic or in state of paralysis due to cord injuries (adrenergic nerves follow in a prevertebral chain).

During transurethral prostatectomy the internal urethral sphincter may be damaged by resection close to the bladder neck, and cannot close the bladder outflow in the first phase of ejaculation. The ejaculate, then escapes from the prostatic urethra into the bladder, the increase of the intraluminal pressure in the prostatic urethra is inadequate to generate the reflex relaxing the external urethral sphincter, and ejaculation through the meatus does not occur. This “retrograde ejaculation” is noticeable to the sexual partners and the “loss of erections” may have a devastating psychological effect on either partner.

In this, as in other, true or perceived sexual abnormalities, the truism of “Whoever thinks he/she has a sexual problem, has one!” is correct.

The sympathomimetic effect of anxiety in relation to the problem of premature ejaculation is well established and has a firm anatomicophysiological explanation.

The knowledge of the anatomical basis of the sexual function permits a sensible evaluation of the patient’s “sexual” problems and selection of an appropriate modality of care, and increases the impact of the physician’s discussion of patient’s problems, alleviating the patient’s fears and warding off a potential tragedy.

**Notes:** *References are available from the author on request.* □

**“ We did not inherit the earth from our forefathers, we borrowed it from our children. ”**