

# Perineal Nerve Block

## *An anatomic and clinical study in the female*

EDWARD WALTER KLINK, M.D.

OF THE SEVERAL METHODS for producing obstetric anesthesia, properly performed perineal nerve block is one of the safest. The reported variations in technic—particularly those employing multiple injections of the end branches of the pudendal, ilio-inguinal, and posterior femoral cutaneous nerves—suggest that there is some confusion concerning the innervation of pelvic structures. A single injection block which satisfactorily controls the pain associated with delivery and permits the performance of simple operative procedures is reported here. In addition, the anatomy of the pudendal nerve, particularly its relationship to the ischial spine, is described.

### MATERIAL AND METHODS

Anatomic dissections were made on 25 adult female cadavers and 60 recently dead females at the time of autopsy. The initial studies were made on preserved cadavers, but it was found that fresh autopsy material gave a better and more accurate picture of the structures. Using an abdominal approach, the pelvic structures were examined and the ischial spine palpated. The rectum, bladder, and pelvic viscera were dissected from the pelvic diaphragm, and the anterior sacral nerve roots were exposed. The pudendal nerve was dissected throughout its course to the perineum, particular attention being

From the Department of Obstetrics and Gynecology, Temple University Hospital and Medical School, Philadelphia, Pennsylvania.

given to the relationship of the nerve trunk to structures in the region of the ischial spine and to the location and origin of the inferior hemorrhoidal branch.

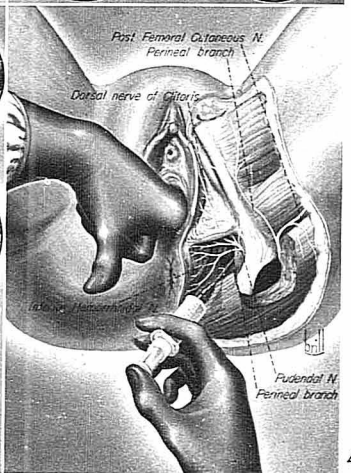
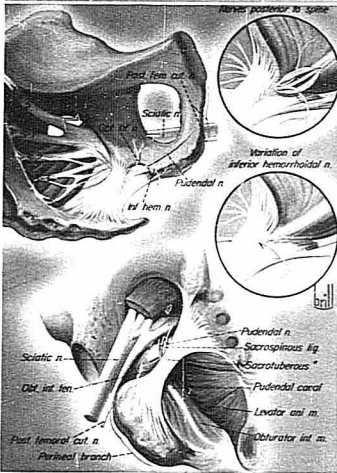
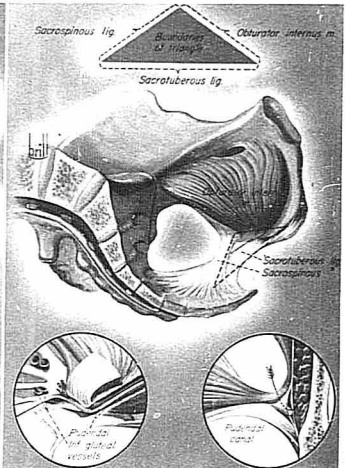
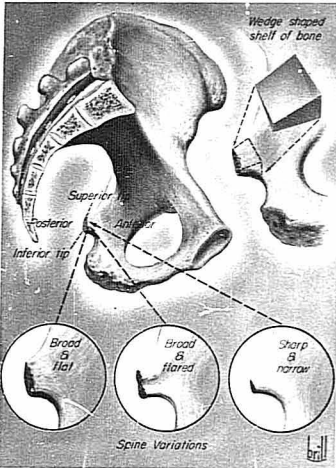
In addition to the anatomic dissections, 100 patients were studied by pin-stick and hemostat pinch to demonstrate the point of change from visceral to somatic innervation between the vagina and the perineum. Groups of 10 patients were also tested for skin anesthesia after specific peripheral nerves were blocked. To confirm the anatomic and clinical studies, more than 300 perineal nerve blocks, using the technic described here, were performed in obstetric and gynecologic patients at Temple University Hospital.

### RESULTS

The results of this study are divided into four parts: (1) The anatomic relationships of the pudendal nerve, with particular attention to its relationship to the ischial spine; (2) the innervation of the vagina; (3) the innervation of the perineum; and (4) the technic of pudendal nerve block.

#### *Anatomic Relationship of the Pudendal Nerve*

The ischial spine—a shelf of bone with a superior and an inferior tip and anterior, posterior, superior, and inferior surfaces (Fig. 1)—projects into the pelvis from the lateral midpelvic wall and separates the greater from the lesser sciatic foramen. Its



**Fig. 1.** The ischial spine: a shelf of bone with a superior and an inferior tip and anterior, posterior, superior, and inferior surfaces. **Fig. 2.** The sacrospinous ligament, sacrotuberous ligament, and obturator internus muscle forming the triangular-shaped localizing landmark shown above. **Fig. 3.** The pudendal nerve as it enters the lesser sciatic foramen and the pudendal canal. **Fig. 4.** The three main branches of the pudendal nerve trunk: (1) the inferior hemorrhoidal, (2) the perineal, and (3) the dorsal clitoral nerves.

superior surface, bordering the greater sciatic notch, is sharp; the inferior, more rounded surface borders the lesser sciatic notch. The inferior tip is the more easily palpable since it projects farther into the pelvis than does the superior tip.

The sacrospinous ligament attaches to the spine to form one side of an important triangular-shaped localizing landmark (Fig. 2). This structure runs posteriorly from the ischial spine to join the sacrotuberous ligament near the sacrum. The sacrotuberous ligament, running antero-inferiorly toward the tuberosity of the ischium, forms the inferior side of the triangle and meets the obturator internus muscle, which occupies the lesser sciatic notch, to form the third side.

The pudendal nerve is derived from branches of the second, third and fourth anterior sacral nerves which join into a single trunk 0.5 to 1.0 cm. proximal to the ischial spine. The nerve trunk courses through the greater sciatic foramen inferior to the pyriformis muscle, passing posterior to the ischial spine—between the sacrospinous ligament anteriorly and the sacrotuberous ligament posteriorly—to enter the lesser sciatic foramen (Fig. 3). As the nerve passes the inferior tip of the spine, it enters the pudendal canal, which is formed by a condensation of firm and elastic fascial layers from the sacrospinous and sacrotuberous ligaments and the obturator internus muscle. The pudendal vessels lie immediately lateral to the nerve in the pudendal canal which extends from the ischial spine inferiorly across the obturator internus muscle to the lower lateral edge of the urogenital diaphragm.

The pudendal nerve trunk divides into three main branches: (1) the inferior hemorrhoidal, (2) the perineal, and (3) the dorsal clitoral nerves (Fig. 4). Each of these is an important sensory nerve of the perineum.

**INFERIOR HEMORRHOIDAL NERVE.** The

inferior hemorrhoidal nerve usually arises from the pudendal nerve, which it accompanies in the pudendal canal; in 50 per cent of the dissections, however, it began as a separate branch from the fourth sacral nerve. In these, it arose 0.5 to 1.0 cm. inferomedial to the pudendal nerve and usually perforated the sacrospinous ligament instead of entering the canal (Fig. 3). On reaching the ischio-rectal fossa, this nerve and its accompanying vessels divide into numerous branches supplying the lower rectum, the external sphincter ani muscle, and the skin anterior and lateral to the anus.

**DORSAL NERVE.** The dorsal nerve of the clitoris courses anteriorly between the layers of the urogenital diaphragm and finally pierces the inferior layer of that structure, terminating in filaments supplying the clitoris (Fig. 4).

**PERINEAL NERVE.** The perineal nerve, largest of the three branches, arises near the base of the urogenital diaphragm approximately 3 cm. above the inferior border of the ischial tuberosity and divides almost immediately into superficial cutaneous and deep muscular branches. The former constitute the main nerve supply of the superficial structures of the vulva and perineum, and the latter are the most important supply to the deep muscle and fasciae of the perineum.

**POSTERIOR FEMORAL CUTANEOUS NERVE.** The posterior femoral cutaneous nerve, which arises from the first, second, and third sacral roots, lies lateral and posterior to the pudendal nerve, in close proximity to it, and cephalad to the superior tip of the ischial spine (Fig. 3). It leaves the pelvis through the greater sciatic foramen and plays little part in the innervation of the perineum.

From an anatomic point of view, the innervation of the perineal structures, both superficial and deep, is supplied by the pudendal nerve and its branches. These are usually contained within the pudendal canal at the inferior tip of the ischial spine. If the

inferior hemorrhoidal branch arises as a separate nerve, it lies in close proximity to the pudendal nerve trunk, medial to the ischial spine.

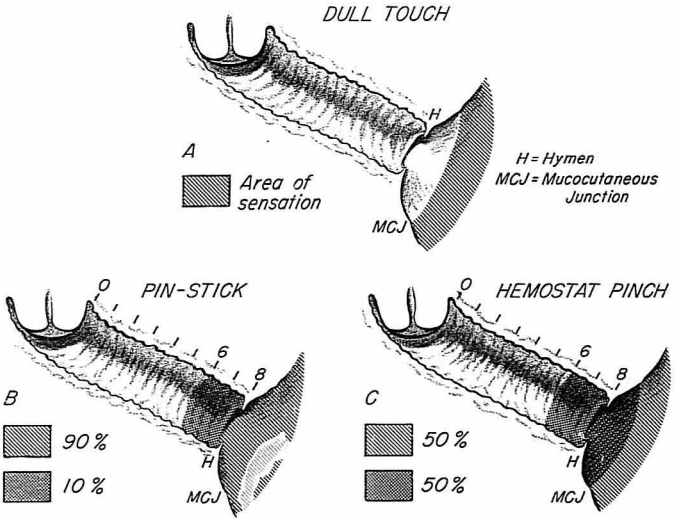
*Innervation of the Vagina*

One hundred unanesthetized patients were studied by dull touch, pin-stick, and hemostat pinch. The entire length of the vagina was exposed through a speculum, and tests were made over its surface from the vault to the introitus. The results are shown in Fig. 5.

To further show the change of innervation, the vagina was checked before and after a unilateral pudendal nerve block. Anesthesia eliminated perception of dull touch, pin-

stick, or light hemostat pinch in both the lower vagina and the skin on the blocked side, eradicating the line of demarcation. On the unblocked side, however, the changes shown in Fig. 5 prevailed.

This suggests that the pudendal (somatic) nerve overlaps the parasympathetic (visceral) nerves between the lower vagina and the mucocutaneous junction. The center of demarcation is about halfway between these two areas, at the hymenal ring. The pudendal nerve does not innervate the vagina, but only the underlying perineal musculature and fascia. Since sensation through visceral innervation of the vagina is limited, it appears that painful stimuli from the va-



**Fig. 5.** Innervation of vagina. A. Dull touch: 98 per cent first felt a touch with the head of a pin at the mucocutaneous junction. The other 2 per cent were equivocal. B. Pin-stick: 90 per cent were unable to appreciate a pin-stick in the vagina and first felt it external to the hymenal ring. Of the 10 per cent who first felt it in the lower one-sixth to one-eighth of the vagina, the full effect of the pin's sharpness was not appreciated until the mucocutaneous junction was reached. C. Hemostat pinch: 50 per cent first felt the pinch in the lower one-sixth to one-eighth of the vagina; the other 50 per cent first felt the pinch in the lower one-sixth to one-eighth of the vagina. The pain sensation varied with the amount of tissue pinched in the hemostat. If only the mucosa was pinched, no somatic pain was felt until the area external to the hymenal ring is reached. If more tissue was grasped and the levator fascia surrounding the vagina was included, somatic pain was felt.

gina are primarily from trauma to deeper structures, which are innervated through the pudendal nerve.

#### *Innervation of the Perineum*

In order to determine to what extent other nerves affect sensation in the vulva and perineum, specific isolated nerves were injected, and perineal sensation was studied. The nerves innervating the periphery of the perineum were injected to determine to what extent they overlap the distribution of the pudendal nerve. A contralateral pudendal nerve block was then done and its area of anesthesia outlined for comparison.

**ILIOINGUINAL NERVE BLOCK.** Ten cubic centimeters of 1 per cent anesthetic solution were injected into 10 women, 1 cm. medial to the anterior superior spine of the ilium, in the fascia of the internal oblique muscle where the nerve courses towards the inguinal ring. In no case of this type of block did the anesthesia extend into the labia or the clitoris (Fig. 6).

**PERINEAL BRANCH OF THE POSTERIOR FEMORAL CUTANEOUS NERVE** (external pudendal nerve). This block was accomplished by injecting 10 cc. of 1 per cent anesthetic solution lateral to the inferior surface of the ischial tuberosity, at which point the nerve runs medially across the origin of the hamstring muscles. The average area of skin anesthesia in the 10 women injected is illustrated in Fig. 7. In none did the anesthesia extend into the perineal body or labia.

**INJECTIONS AT THE TUBEROSITY.** An attempt was made to follow the technics described in the literature on pudendal block, some of which are not specific, simply stating that the needle is directed toward the ischial tuberosity or inserted until bone is reached, when 10 cc. of solution are injected. In our trial of this, no localized skin anesthesia was produced over the injection site if 10 cc. of the anesthetic agent were injected after touching the tuberosity. How-

ever, in the 10 women to whom 20 cc. of the solution were administered by multiple fanned-out injections along the ischiopubic ramus and tuberosity, some degree of perineal anesthesia resulted (Fig. 6).

**DIAMOND FIELD BLOCKS.** This type of blockage of the perineum was performed in 10 women. Continuous intracutaneous wheals were made joining four areas: the symphysis pubis, the two ischial tuberosities, and the posterior surface of the anus. Within the borders of this diamond field block, there was no skin anesthesia or perineal or levator relaxation. The extent of the skin anesthesia peripheral to the diamond field block was only 1 to 2 cm., indicating that an anesthetic effect was produced on the pudendal nerve endings and not the main trunks. It also indicated that nerves innervating the periphery of the perineum did not extend into the perineum.

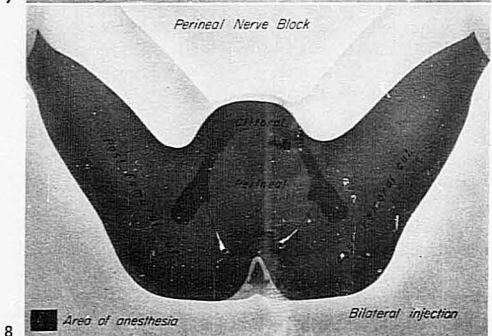
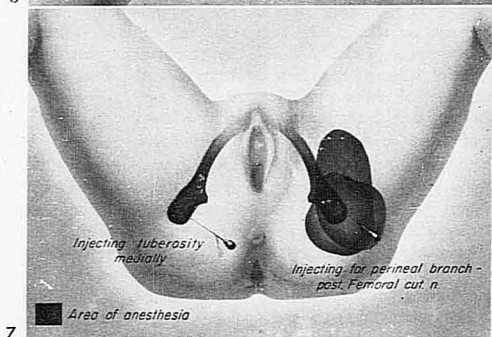
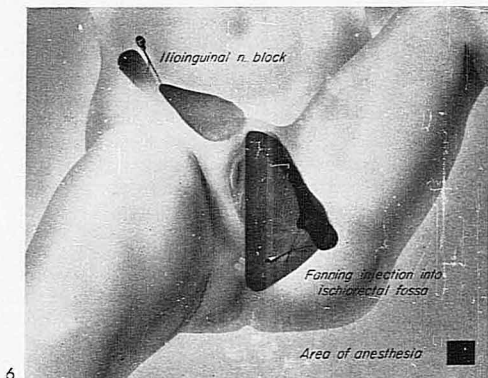
**INTERNAL PUDENDAL NERVE AND POSTERIOR FEMORAL CUTANEOUS NERVE.** These were blocked at their origins by the technic described, producing anesthesia over the areas shown in Fig. 8.

Studies of the blocking of these nerves indicates that the area supplied by the pudendal nerve and its branches covers the whole of the anatomic perineum and also that anesthesia in this area can be produced by blocking the main nerve trunk. To provide adequate anesthesia, it is unnecessary to perform supplementary nerve blocks, since this does not improve the end result.

#### *Technic of Pudendal Nerve Block*

As a result of the anatomic dissections, the following method for producing perineal anesthesia was utilized.

The anesthetic agent (1 per cent Xylocaine) is injected around the main trunk of the pudendal nerve through a 5-inch, 20-gauge needle. This is inserted through the skin of the perineum between the ischial tuberosity and the anus, somewhat nearer to the anus than to the tuberosity (Fig. 9). No prelim-



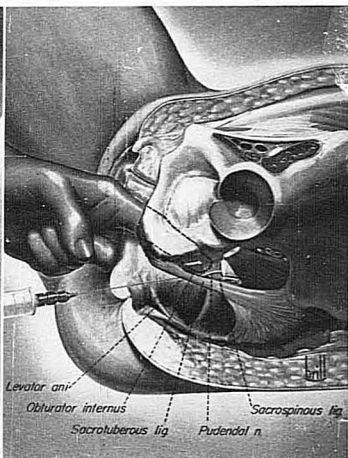
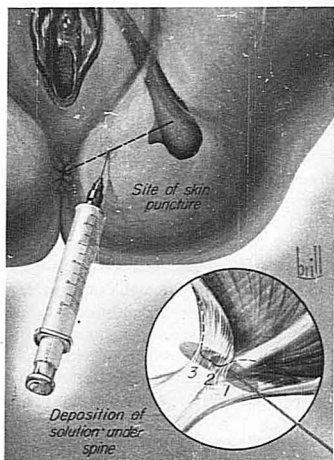
**Fig. 6.** Blocking the ilioinguinal nerve in the female does not give anesthesia into the perineum. The usual technic of multiple injections into the ischiorectal fossa and tuberosity is shown on the right. **Fig. 7.** Injecting into the tuberosity medially and depositing 10 cc. of anesthetic solution gives no skin anesthesia. Multiple injections lateral to the tuberosity give varied results. **Fig. 8.** The area of anesthesia achieved with the described technic.

## PERINEAL NERVE BLOCK

inary skin wheal is made. The needle is slowly inserted through the ischio-rectal fossa toward the posterior surface of the ischial spine, inferior to the urogenital diaphragm and the levator ani muscle. With the finger in the vagina, the tip of both the needle and spine are palpated; as the needle point approaches the ischial spine, it is pushed posterior to the inferior spine tip by the direct-

pudendal vessels, either the artery or vein, a small amount of blood being drawn back into the syringe. The needle is then withdrawn just out of the vessel and reinserted *medial to the site of aspiration*, where it lies in contact with the pudendal nerve. Again, the needle can be pulled back and forth without resistance.

Ten cc. of the anesthetic solution are then



**Fig. 9.** Injection of anesthetic solution around the main trunk of the pudendal nerve. **Fig. 10.** Insertion of the needle in the pudendal nerve block. With the finger in the vagina, both the tip of the needle and the spine are palpated.

ing finger (Figs. 10, 11). It now has gone through the apex of the triangle formed by the sacrospinous ligament, the sacrotuberous ligament, and the obturator internus muscle. If properly placed in the pudendal canal, free from muscle and ligament, the needle can be pulled back and forth slightly without resistance. If not properly placed, or if there is resistance to its further introduction, it should be withdrawn 3 to 4 cm. and reinserted.

To indicate accurate placement of the needle an attempt is made to aspirate the

deposited in approximately three equal parts posterior to the ischial spine, aspirating before each injection so as not to inject into the pudendal vessels (Fig. 9). Three cubic centimeters are deposited beneath the inferior tip of the spine, after which the needle is inserted an additional centimeter into the canal to just beneath the superior tip, and another 3 cc. injected. The needle is then inserted beyond the spine into the greater sciatic notch; there the remaining 4 cc. are injected in an effort to block the inferior hemorrhoidal branch—often arising as a

separate trunk outside the pudendal canal—and the posterior femoral cutaneous nerve. If blood is aspirated beyond the spine, it is usually from the inferior gluteal vessels; the needle tip should then be reinserted just superior to the point of aspiration, the same procedure being repeated on the opposite side.

It is important that the injection be made in the pudendal canal close to the nerve

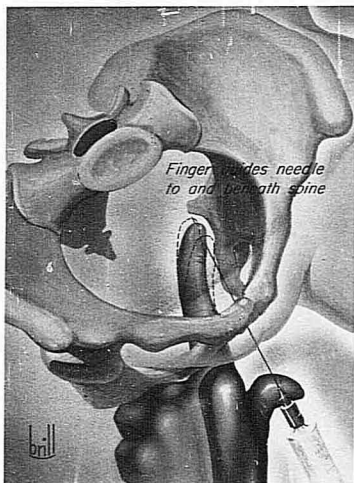


Fig. 11. Insertion of the needle in pudendal nerve block. As the needle point approaches the ischial spine, it is pushed posterior to the inferior spine tip by the directing finger.

trunk, thus concentrating the solution directly around the nerve; otherwise the result will be poor. If a wheal is felt on injection, the needle is either in muscle or ligament and should be reinserted so that a more accurate injection may be made.

The addition of vasoconstrictor drugs is unnecessary for obstetric anesthesia since 1 hour is sufficiently long to carry out any

procedures which can be performed with pudendal block anesthesia.

Hyaluronidase is completely ineffective in aiding the spread of the agent through fascia and is, therefore, of little help for improperly placed injections. The use of this material adds nothing if the injection is properly concentrated in the pudendal canal. In fact, its dispersing action reduces the duration of the anesthesia by about 40 per cent.

The anesthetic effect will usually be noted within 3 minutes; in addition to loss of sensation, muscular relaxation is evident. Tests for effectiveness are made by lightly stroking the perineal structures. Adequate anesthesia is present if the patient is unable to perceive sensation and if no reflex muscle contraction is noted. Deep pin-prick or crushing should be avoided until one is certain that effective anesthesia has been obtained. If an adequate result is not evident within 3 minutes, it is probable that the block will be a failure and the injection must be repeated.

#### CLINICAL USE

Pudendal nerve block provides sufficient anesthesia for delivery, or for minor operative procedures on the vulva and perineum, and can often replace more dangerous and complicated types of anesthesia. If properly administered, it is suitable for such procedures as Bartholinectomy, biopsy of the vulva, and simple vulvectomy. Its most important use, however, is in the obstetric patient.

The anesthetic administered for delivery is often a more hazardous and complicated part of the procedure than the delivery itself. If a skilled anesthesiologist is not available, if certain medical conditions are present, if the patient has recently eaten, inhalation technics may be contraindicated. Other forms of regional anesthesia, such as spinal, caudal, or saddleblock anesthesia, add considerable risk to an uncomplicated delivery; the substitution of pudendal nerve block, whenever possible, is desirable. With practice, the



technic can be mastered, and a good result can be anticipated in most instances.

Patients must be carefully selected and prepared for local anesthesia. Those who demand complete relief from all discomfort are usually poor candidates, as are those who are highly emotional, irrational from sedation, or overactive, for cooperation is essential. It must be clearly understood by the patient that only perineal pain will be relieved, and that the discomfort associated with uterine contractions will continue.

Pre-anesthetic sedation is not always necessary, and no more than that administered during labor should be required. Demerol or morphine are usually satisfactory. Since the reaction to scopolamine is unpredictable, and since it may make some women hyperactive and unmanageable, it is better avoided if local anesthesia is planned.

Pudendal block must be administered at a time during labor when it can be given deliberately and carefully and when there will be sufficient time for it to become effective. In the primigravida at complete dilatation, with the head at station plus two, the injection can be made easily; but if the perineum is distended by the presenting part, little can be accomplished. The rapid termination of multiparous labor makes earlier block imperative; here, the injection is made after the cervix has reached 7 to 8 cm. of dilatation. It is often expedient to perform the block and then rupture the membranes in the multipara.

Pudendal block anesthesia is satisfactory for the spontaneous or low forceps delivery of multipara and primigravida, for the performance and repair of episiotomies, and for breech deliveries. It is of particular value in delivery of premature infants or of infants whose mothers have had one of the hemorrhagic complications of pregnancy since it does not increase anoxia in the fetus. It is also indicated for complications, such as anemia, toxemia of pregnancy, pulmonary tuberculosis, and rheumatic heart disease.

Following precipitate delivery with perineal and vaginal lacerations, or if episiotomy has been performed under light inhalation anesthesia, either local infiltration or pudendal block anesthesia may be administered for the repair. *Inhalation anesthesia should almost never be re-induced solely for the repair of lacerations or episiotomy.*

#### *Drug Sensitivity*

No case of drug sensitivity was encountered in the study nor is it likely that an overdosage would be administered for obstetric anesthesia with this technic. Each patient should be carefully questioned concerning previous response to local anesthesia, and if there is a history of sensitivity, the method should be avoided.

#### SUMMARY

The anatomy of the pudendal nerve based on a study of 85 dissections, is reported and correlated with clinical studies of over 400 patients.

The relationship of the pudendal nerve trunk to the ischial spine was found to be relatively constant. However, the inferior hemorrhoidal branch, which supplies the posterior region of the perineal body, was often found to arise separately from the sacral plexus and not to enter the pudendal canal. The perineal branch of the posterior femoral cutaneous nerve arises close to and borders the distribution of the pudendal nerve.

The pudendal nerve innervates the whole of the perineum, which includes the clitoris, labia, and perineal body; thus if a block is done at the main trunk of the nerve, complete anesthesia in the area of its distribution is produced. The ilioinguinal and genital branch of the genitofemoral nerve do not extend into the perineum in the female. Innervation of the vagina is visceral in origin and completely separate from the pudendal nerve (which does, however, supply the

muscles and fascia of the perineum deep into the vagina).

A method is described for performing satisfactory perineal block anesthesia by first aspirating the pudendal vessel to accurately localize the nerve and then withdrawing and depositing the anesthetic solution at three sites posterior to the ischial spine, without the addition of hyaluronidase or vasoconstrictor drugs. By this technic, it is possible to block the pudendal nerve trunk, the inferior hemorrhoidal nerve (even though it develops as a separate nerve), and the posterior femoral cutaneous nerve. No further peripheral injection is necessary to provide

anesthesia for delivery in patients who are suitable candidates for local methods.

## REFERENCES

1. HUBER, J. F. Personal communication to author, 1951.
2. WESTON, J. Personal communication to author, 1950.
3. WILLSON, J. R. Personal communication to author, 1951.

Because of the large volume of writing on pudendal nerve block and local anesthesia no specific journal or book references are listed. The reader is referred to the *Quarterly Cumulative Index Medicus* and any of the standard text books on obstetrics or anesthesiology for listed references.