3. *An infusion set.* A bottle of intravenous fluids and the equipment necessary for administration should be readily available. This should be started as soon as adequate ventilation is assured.
4. *An intravenous barbiturate.* There should always be available a solution of a short or ultra-short acting barbiturate as well as a syringe and needle. Should convulsions occur, very small increments of a barbiturate (i.e., thiopental, I.V. 30–50 mg./min.) or a muscle relaxant should be injected. Only the dose necessary to stop convulsions should be used, since local anesthetics cause medullary depression with overdosage and the barbiturate will potentiate this action.
5. *A vasopressor.* A vasopressor drug should be available for adding to the infusion whenever circulatory collapse occurs. Levarterenol bitartrate and phenylephrine hydrochloride are the more commonly employed drugs. However, if the collapse is mild, such drugs as ephedrine sulfate, methoxamine hydrochloride, methamphetamine hydrochloride, etc., may be used in small increments to support the circulation.

J. *Discard solutions containing aspirated blood.*

Clinical Application of Local Anesthetics

The properties of Xylocaine as previously described indicate that this drug very closely approaches the desired qualities of an ideal local anesthetic drug. The generalized acceptance of Xylocaine by both the medical and dental professions is directly attributable to its widespread clinical utility. Its ability to withstand prolonged storage and autoclaving without loss of potency permits the anesthesiologist to be confident that the agent has maintained its effectiveness. Xylocaine may be used either topically or by injection methods. It is capable of producing regional anesthesia by abolishing conduction of afferent and efferent impulses at any point along their nerve pathways. Its property of tissue penetration, wide margin of safety, and unusually low tissue irritancy makes Xylocaine a local anesthetic of choice for conduction anesthesia.

Surface Anesthesia

Xylocaine produces rapid and effective anesthesia of the mucous membranes of the respiratory, upper gastrointestinal, and lower genito-urinary tract, the eye and ear, and the ano-rectal area. It is also effective when topically applied to the broken skin for pain or burns and abrasions, for open wounds and pruritis. It is non-irritating and well tolerated.

Four preparations of Xylocaine are available for surface use: (1)

Xylocaine HCl 0.5%, 1%, 2%, or 4%, a sterile aqueous solution without epinephrine. (2) Xylocaine Jelly, a water soluble, non-staining preparation with a high viscosity and a low surface tension that permits prolonged contact with mucous membranes. This preparation contains a sterile aqueous solution of Xylocaine HCl 2% thickened to suitable consistency with carboxymethylcellulose and is effective for as long as two hours. (3) Xylocaine Ointment 2.5% or 5% xylocaine base in water soluble carbowaxes. (4) Xylocaine Viscous, a solution of Xylocaine HCl 2% the viscous nature of which is due to a carboxymethylcellulose vehicle.

Urology

Aqueous solutions have previously been used for providing topical anesthesia of the lower genito-urinary tract. However, by their physical nature they are incapable of producing the best possible results. Their low viscosity allows the solutions to pass through the posterior urethra too quickly for good contact with the mucous membrane. A special high viscosity jelly has been prepared with carboxymethylcellulose which permits prolonged contact, and this vehicle combined with the excellent penetrating property of Xylocaine has made available to the urologist a preparation that furnishes ideal anesthesia for painful minor operative procedures. This deep and dependable quality of anesthesia furnished by Xylocaine Jelly has heretofore been unobtainable. Postoperative or manipulative pain does not appear for two to three hours following the application of Xylocaine Jelly.

For surface anesthesia of the male urethra: The outer orifice is washed and disinfected. The plastic cone provided with Xylocaine Jelly is sterilized for five minutes in boiling water, introduced into the orifice, where it is firmly held in position. The jelly is instilled by turning the tube key until the patient has a feeling of tension or until

almost half of the tube is emptied. A penile clamp is then applied for some minutes at the corona and then the injection of the contents of the tube is completed. To save time, the injection is performed against the resistance of the sphincter, possibly assisted by asking the patient to strain as for defecation or to press as in voiding. The jelly will then pass into the posterior urethra.

Prior to sounding or cystoscopy, a penile clamp should be applied for five to ten minutes. If the instrument is introduced immediately, a lubricant is unnecessary. Otherwise, the remaining jelly can be expressed from the tube and applied to the instrument tip. One tube of Xylocaine Jelly is required to fill and dilate the male urethra and to obtain satisfactory anesthesia.

When it is desired to anesthetize only the anterior male urethra, as prior to catheterization, considerably smaller volumes (5 to 10 cc., or from one-sixth to one-third of the contents of one tube) are usually adequately effective and anesthesia is obtained immediately.

For surface anesthesia of the female urethra: Three to 5 cc. are instilled in a similar manner. In addition, a wire loop is dipped into the jelly and introduced into the urethra. If desirable, some jelly is deposited on the urethral orifice and covered with a cotton swab.

Ophthalmology

Two to three drops of a 2% or 4% aqueous solution of Xylocaine HCl will establish intense corneal analgesia, without evidence of irritation. Xylocaine, unlike cocaine, does not cause mydriasis or rise in intraocular pressure.

Otorhinolaryngology

Xylocaine is ideally suited for laryngoscopy and bronchoscopy because of its intense surface activity, rapid onset and brief duration of

action. Its abbreviated surface action is important following bronchoscopy, as it permits the patient to resume control of the mechanisms that protect the respiratory tree and evacuate foreign material from it.

For laryngoscopy, the oral cavity and pharynx are sprayed with a 2% or 4% Xylocaine HCl solution. When the mouth and pharynx are completely anesthetized, the glottis and larynx are sprayed under direct vision. A 5 cc. volume of 2% or 3 cc. volume of 4% is adequate for this procedure.

For bronchoscopy, the same technique may be used as for laryngoscopy, with an additional 3 to 5 cc. of 2% Xylocaine HCl sprayed down the trachea through the vocal cords under direct vision. It should take from five to seven minutes to obtain good analgesia. An alternate method is the transtracheal technic. With the patient sitting up and the head extended, a small gauge needle is inserted through the crico-thyroid membrane or between the cricoid cartilage and the first tracheal ring until the needle lies within the trachea. Air is aspirated to assure the administrator of proper placement of the bevel. One to two cc. of a 4% solution or two to four cc. of a 2% solution of Xylocaine is rapidly injected and the needle withdrawn. Reflex coughing immediately follows injection and the Xylocaine is sprayed over the vocal cords, larynx, and pharynx. A second and similar injection must follow the first as soon as the patient has begun to ventilate normally again. The patient is asked to refrain from coughing during the second injection in order that the solution will fall downwards over the trachea and bronchi. A very intense analgesia follows.

For intranasal analgesia, a 2% or 4% Xylocaine HCl solution with epinephrine 1:100,000 should be sprayed, instilled, or applied by soaking cotton applicators or packs with the solution.

Endotracheal, nasal or pharyngeal airways may be covered with a film of Xylocaine Ointment 2.5% or 5%. This permits the patient to tolerate these airways in light planes of anesthesia, thus eliminating coughing or bucking on the endotracheal tubes and gagging on pharyngeal airways.

Dentistry

Xylocaine has many useful topical applications in dentistry. Xylocaine Ointment 5% may be used to anesthetize the mucous membranes of the area which is to receive the injection needle, thus eliminating the pain associated with this portion of intraoral injections. The ointment is also used on the drill tip to produce dentin analgesia. Xylocaine Viscous may be used to prevent gagging associated with the taking of X-rays and impressions. From 10 to 15 cc. of Xylocaine Viscous may be swallowed after swishing around in the mouth for a few seconds, or a 2% Xylocaine HCl solution may be sprayed on painful or sensitive areas.

Upper Gastrointestinal Tract

Xylocaine Viscous is the preparation of choice for this anesthesia. Its high viscosity and low surface tension enables it to spread evenly over and remain in prolonged contact with the mucous membrane. It may be used effectively as follows:

Dumping Syndrome: From 10 to 15 cc. of Xylocaine Viscous are swallowed quickly preceeding each meal and washed down with one half glass of water.

Pyloric Spasm: 15 cc. of Xylocaine Viscous should be swallowed quickly, followed by one half glass of water. For infants, reduce the dose to 3 to 5 cc.

Hiccup: 10 cc. of Xylocaine Viscous should be swallowed quickly. To pre-

vent hiccup induced by manipulation of the stomach in upper abdominal surgery, 15 cc. should be given one-half hour before surgery. It may also be instilled in the stomach through the Levine tube which is usually inserted and left in place during gastric resections.

For esophagoscopy, gastric intubation, pharyngitis, stomatitis, and in dentistry, 10 to 15 cc. of Xylocaine Viscous should be carefully retained in the mouth and then slowly swallowed. No water should follow. Xylocaine Viscous is also used for spasmodic vomiting, and hyperemesis gravidarum.

Proctology

The irritation and pain of pruritis ani, hemorrhoids, and anal fissures is quickly relieved by Xylocaine Ointment and Jelly. Also, Xylocaine Jelly can be used to render rectal instrumentation relatively pain-free.

Dermatology

Painful cutaneous X-ray burns, acute herpes zoster, sore nipples, and pruritis of varied etiology are relieved with Xylocaine Ointment or Jelly.

Skin Injury

Lacerations and abrasions are made relatively painless within a few minutes after application of a gauze pack soaked in aqueous 2% Xylocaine HCl without epinephrine. Xylocaine Ointment or Jelly is also effectively utilized for obtaining anesthesia of these lesions.

Injection Methods

Regional anesthesia may be obtained by the deposition of a local anesthetic solution at any point along the pathway of somatic nerves from their origin to their termination. These blocks may be per-

formed upon individual nerves, groups of individual nerves, plexuses, or upon terminal nerve endings. The volume and concentration of Xylocaine HCl is individualized and epinephrine should be used in all instances unless specifically contraindicated.

Infiltration Anesthesia

This is probably the most common use of local anesthetics, and is accomplished by the injection of the anesthetic solution in and around the operative site, beginning with a skin wheal and progressively blocking the deeper structures (dermal, subcutaneous, fascial, and intramuscular). A 0.25% Xylocaine HCl solution with epinephrine 1:300,000 will produce excellent analgesia and will permit the use of 150 to 200 cc. of solution with an effective duration of from four to six hours. If less than a 75 cc. volume is to be administered, a 0.5% solution may be used.

Field Block

This method of producing surgical anesthesia involves the deposition of the local anesthetic in the area of the larger terminal branches of somatic nerves innervating the operative site. When the nerve supply to the operative field is from more than one direction, the block encircles the operative site; whereas if the nerve supply is from one direction, the block is performed proximal to the operative site only. In both instances it is necessary to infiltrate the local anesthetic into each layer, as in infiltration technics. This form of regional anesthesia is used when it is believed inadvisable to inject the anesthetic drug directly into the operative area, i.e., biopsies of tissues, incision and drainage of infected areas, tonsillectomy, enucleation of an eye, highly vascular lesions, etc. The dosage, volume and concentration of Xylocaine HCl solution is the same as that used for infiltration techniques.

Nerve Blocks

The deposition of a local anesthetic either intraneurally or extraneurally for the purpose of providing anesthesia to a region innervated by either a specific nerve or a group of nerves is commonly referred to as a nerve block. When a large area of the body is to be anesthetized, it is advisable to employ a technique that will block multiple nerves with a single injection, such as spinal, peridural, or plexus block; whereas if only one or more unilateral dermatomes are involved, individual nerve blocks may be preferred. *The volume and concentration of Xylocaine HCl varies with the type of block selected, and necessitates individual consideration.*

Multiple Nerve Blockade

Peridural (Epidural, Extradural) Anesthesia: Peridural anesthesia is a method of regional anesthesia in which obtundation of nerve impulse is obtained by the injection of a local anesthetic into the space surrounding the dura mater. This space serves as a dispersal center for the local anesthetic solution; the actual site of action remaining somewhat controversial. The peridural space may be approached at any interspinous space of the cervical, thoracic, and lumbar interspaces, or at the sacrococcygeal hiatus. The block may be segmental or complete for all of the spinal nerves. It is effective for surgical anesthesia, pain control, and as a diagnostic and therapeutic block.

Peridural anesthesia has supplied the opportunity for Xylocaine to demonstrate its superiority as a local anesthetic agent. For some four decades, this method of anesthesia knew sporadic acceptance and ultimate rejection by the anesthesiologist because of the spotty and incomplete anesthesia that accompanied its use. However, with the advent of Xylocaine, peridural anesthesia has become more widely

accepted. This is directly attributable to the consistently effective anesthesia obtained from the spreading and penetrating qualities of Xylocaine, as well as its short latency period. Previously, the administrator had to wait 20 to 30 minutes for the onset of anesthesia, and with the high incidence of incomplete blocks that resulted, an equally long period was often needed for repeating the block or administering a supplementary anesthetic.

The duration of the nerve blockade resulting from the peridural use of Xylocaine HCl is related to the concentration used. A 0.5% Xylocaine HCl solution with epinephrine 1:100,000 will last approximately one hour, and a 2% concentration will exceed two hours. The duration of anesthesia may be controlled by the use of an indwelling catheter that will permit subsequent increments of Xylocaine HCl as indicated. This same catheter may be left in place for control of pain postoperatively.

It is possible with Xylocaine HCl to obtain the intensity of blockade required for each problem by varying the concentration. In the cervical and thoracic areas, the motor fibers must be left intact to assure adequate respiratory activity; whereas in other segments, the concentration may be increased to a strength adequate to effect motor fiber blockade. Sympathetic blockade is obtained with concentrations of Xylocaine HCl from 0.25% to 0.5%. Sensory analgesia is obtained with concentrations of 0.5% to 1% Xylocaine HCl with 0.5% being preferred. The concentration necessary for motor fiber blockade is difficult to assess. However, between 1.5% and 2% Xylocaine HCl is recommended. Xylocaine HCl produces sensory analgesia in at least 8 to 10 minutes with 0.8% solution. This interval is even briefer with 2% solutions.

The anterior flexion that is possible in the lower cervical and upper thoracic region (C5–T3) and in the lumbar area (T10-L4) sepa-

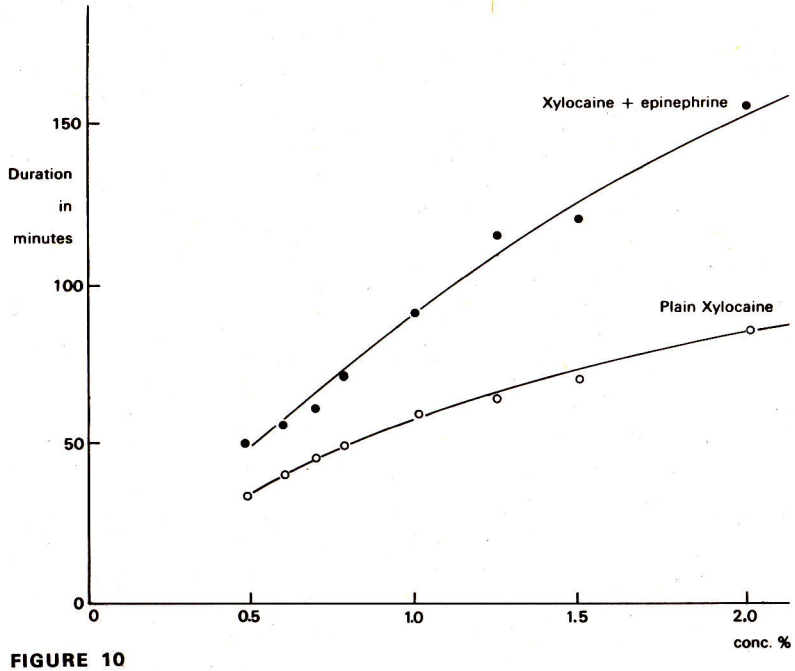

FIGURE 10

Duration of epidural blockade *in relation to concentration of Xylocaine used, with and without the addition of 1:100,000 epinephrine. Reprinted from data by Crawford, O. B.: Comparative qualities of three new local anesthetic drugs: Xylocaine, Cyclaine and Pravocaine. Anesthesiology 14, 278 (1953).*

rates the spinous processes and widens the interspace, thus facilitating approach in these areas. The other interspinal areas are accessible, but require increased skill for successful needle placement. The needle, and catheter if used, should be placed in the middle of the spinal segments to be blocked in order to restrict the anesthesia to the desired level. The quantity of solution required to block a given number of segments is related to the age and height of the patient. The tall patient with a large bony structure requires more solution

Concentration of Drug per cent	Average Duration, minutes		Resulting Anesthesia in		
	With Epinephrine	Without Epinephrine	Thoracic Surgery	Abdominal Surgery	Perineal Surgery
2.0	155	85	Unable to use Concentration too high	Excellent	Excellent
1.5	120	70	Too concentrated	Good to excellent	Excellent
1.25	115	65	Too concentrated	Good	Excellent
1.0	90	60	Usable, but concentration too high	Fair	Excellent
0.8	70	50	Excellent	Inadequate	Excellent
0.7	60	45	Good to excellent	Inadequate	Excellent
0.6	55	40	Good	Inadequate	Excellent
0.5	50	35	Fair to good	Inadequate	Good
0.4	Unable to measure	Unable to measure	Inadequate	Inadequate	Poor to fair
0.25	Unable to measure	Unable to measure	Inadequate	Inadequate	Inadequate

TABLE 7

Results of the use of Xylocaine in Peridural Anesthesia *Reprinted from data by Crawford, O. B.: Comparative qualities of three new local anesthetic drugs: Xylocaine, Cyclaine and Pravocaine. Anesthesiology 14, 278 (1953).*

to fill his peridural space than the short patient with a small bony structure.

Table 8 describes the recommended volumes and concentrations of Xylocaine HCl that should be employed in the various approach sites, and operative procedures where peridural anesthesia is utilized.

Subarachnoid (Spinal) Anesthesia

This is a multiple nerve block that is effected at the spinal nerve roots. This method of regional anesthesia is interesting and different

Applications	Xylocaine HC1 Solution		Puncture Site (Approx.)	Minimum Dermatome Segs. to be Blocked
	Av. Vol.	Av. Conc.		
CERVICO-THORACIC APPROACH *Surgical*				
Neck Surgery (i.e., thyroidectomy)	10 cc.	0.8%	C5	C2-C4
Upper Extremity Surgery (i.e., tendon repair)	14 cc.	0.8%	C6	C5-T1
Extra-Thoracic (i.e., mammectomy)	20 cc.	0.8%	T2	C3-T7
Intra-Thoracic (i.e., pulmonary resection)	30 cc.	0.8%	T1	C2-T10
Laminectomy (i.e., cervical and thoracic)	INDIVIDUALIZED			
Therapeutic and Diagnostic				
Sensory Blockade (i.e., postop. pain, intractable pain)	2 cc. per seg.	0.5%	central interspace	as indicated
Sympathetic Blockade (i.e., Reynaud's Disease)	10 cc.	0.5%	C6	C5-T1
LOWER THORACIC APPROACH *Surgical*				
Upper Abdominal Laparotomy (i.e., gastrectomy)	16 cc.	2.0%	T8	T5-T11
Abdominal Wall (i.e., umbilical hernia)	10 cc.	2.0%	T10	T9-T11
Laminectomy (i.e., spinal fusion)	INDIVIDUALIZED			
Retro-peritoneal (i.e., nephrectomy)	18 cc.	1.5%	T10	T7-L1
Therapeutic and Diagnostic				
Sensory Blockade (i.e., herpes zoster)	2 cc. per seg.	0.5%	central interspace	as indicated
Sympathetic Blockade (Greater Splanchnic) (i.e., pancreatitis, mesenteric thrombosis)	12 cc.	0.5%	T8	T5-T11
Lesser Splanchnic (i.e., renal shutdown)	10 cc.	0.5%	T12	T10-L2

TABLE 8 Peridural Volumes and Concentrations

Applications	Xylocaine HC1 Solution		Puncture Site (Approx.)	Minimum Dermatome Segs. to be Blocked
	Av. Vol.	Av. Conc.		
LUMBAR APPROACH *Surgical*				
Laparotomy (i.e., abdominal-perineal resection)	20 cc.	2.0%	L3	T9-S5
Pelvic Laparotomy (i.e., Caesarean section, hysterectomy)	16 cc.	2.0%	L2	T9-S3
Perineal (i.e., vaginal hysterectomy)	16 cc.	1.5%	L4	T10-S5
Lower Extremity (i.e., mid-thigh amputation)	14 cc.	1.0%	L4	L1-S5
Therapeutic and Diagnostic				
Sensory Blockade (i.e., postop. or post-traumatic pain)	2 cc. per seg.	0.5%	central interspace	as indicated
Sympathetic Blockade (i.e., thromboembolic disease)	10 cc.	0.5%	L1	T12-L3
CAUDAL APPROACH *Surgical*				
Back (i.e., coccygectomy)	20 cc.	1.0%	Sacral Hiatus	L2-S5
Perineal (i.e., transurethral resection)	30 cc.	1.0%	"	T10-S5
Rectal (i.e., hemorrhoidectomy)	18 cc.	1.0%	"	L3-S5
Obstetrical				
Cesarean Section	34 cc.	1.0%	"	T9-S5
Vaginal Delivery	30 cc.	0.8%	"	T10-S5
Conduct of Labor	30 cc.	0.8%	"	T10-S5
Therapeutic and Diagnostic				
Sensory Blockade (i.e., sciatica)	20 cc.	0.5%	"	S1-S5
Sympathetic Blockade (i.e., thrombophlebitis)	30 cc.	0.5%	"	L2-S5

TABLE 8 Peridural Volumes and Concentrations *Continued*

in that the local anesthetic is injected into a medium (cerebro-spinal fluid) which normally bathes the spinal roots. The anesthetic solution then becomes a part of this medium, thereby diluting the concentration of anesthetic solution in a manner that varies with the technique used. In all other nerve blocks the agent is placed or maneuvered into the nerve or its immediate environment where dilution is minimal and the solution not freely movable. The diluting effect and mobility of the local anesthetic in a fluid medium allows the administrator to control the intensity of blockade and the number of dermatome segments to be included in each instance.

The technics that are utilized for administering a spinal anesthetic are almost innumerable. However, they are primarily based on mechanical control (baricity of solution, approach site, rate of injection, etc.) and selection of the dosage of local anesthetic which, when diluted with the cerebro-spinal fluid and dispersed, will produce a desired degree of blockade in a specific group of spinal nerves.

Xylocaine HCl has proven an effective drug for subarachnoid block. Its action in this instance is characterized by rapid onset of blockade, a moderate duration of action, high safety margin and an excellent quality of anesthesia. The duration of anesthesia furnished by Xylocaine HCl in spinal techniques is less than that experienced in any other clinical application. The 2% concentration of Xylocaine HCl is almost isobaric and has a specific gravity of 1.0067 at 37° C. A special preparation suitable for hyperbaric spinal anesthesia has therefore been developed; namely, Xylocaine HCl 5%. This contains, besides Xylocaine HCl 5%, 7.5% glucose which gives the preparation a specific gravity of 1.030–1.035. The reaction of the solution is practically neutral (pH 6.5). It is completely stable in the presence of spinal fluid and its low binding affinity minimizes potential nerve injury. See figures 7 and 11.

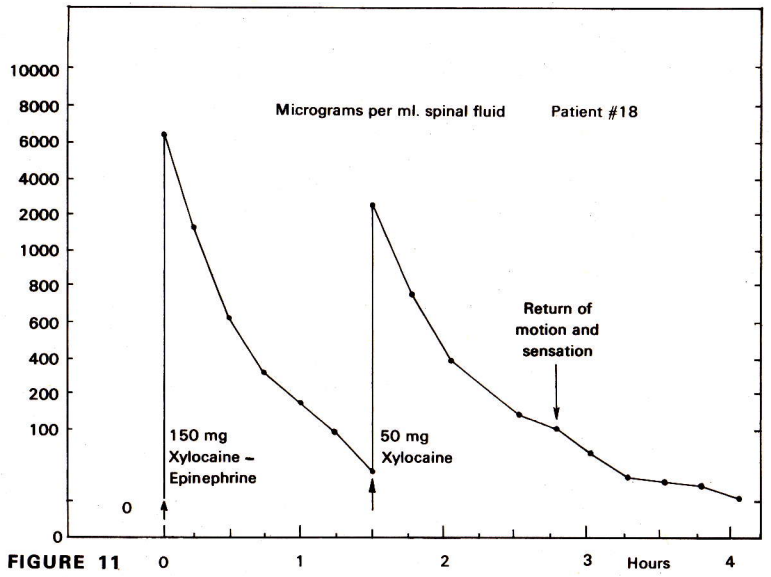

FIGURE 11 Spinal fluid levels of Xylocaine. *The concentration of lidocaine in the spinal fluid following an initial dose of 150 mg. lidocaine with 0.3 mg epinephrine and another dose of 50 mg lidocaine subarachnoidally. Reprinted from Trier-Morch, E., Rosenberg, K. and Truant, A. P., "Lidocaine for Spinal Anesthesia, A Study of the Concentration in the Spinal Fluid," Acta anaesth. Scandinav., 1:105-115, 1957.*

The dosage of this hyperbaric Xylocaine HCl solution for surgical procedures is 1–2 cc. or 50–100 mg. The duration of anesthesia thus provided is 60–90 minutes with analgesia continuing for an additional 40 minutes. Selective sensory saddle block anesthesia can adequately be achieved with even lower doses of this agent.

Xylocaine HCl is, according to von Euler, non-irritant in intradural injections even when it is given in high concentrations. This has been confirmed in reports made by Björn (1947), Goldberg (1947), and Wiedling (1948). For the sake of comparison, we would mention here that, according to Dietrich and Beutner (1946), the highest

Nerve Block	Xylocaine Solution	
	Vol.	Conc.
Paravertebral	3-5 cc. per segment	1%
Intercostal	3 cc. per segment	1%
Lumbar Sympathetic	5-10 cc.	1%
Pudendal	10 cc. Each side	1%
Median	3-5 cc.	1%
Ulnar	3-5 cc.	1%
Radial	3-5 cc.	1%
Digital	2-4 cc. Each side	1%
Stellate	5-10 cc.	1%
Dental Blocks		
Mental	1-2 cc.	2%
Infraorbital	1-2 cc.	2%
Mandibular	1-5 cc.	2%

TABLE 9 Nerve Block Volumes and Concentrations

non-irritant concentrations in respect to the two most commonly used preparations for spinal anesthesia; namely, tetracaine and cinchocaine (dibucaine), are 0.1% and 0.02–0.05% respectively.

The toxicity of Xylocaine HCl is only about 1/10 that of tetracaine and about 1/20 that of cinchocaine. Therefore, the safety margin of Xylocaine HCl is higher.

Phillips, *et al*, (1958, 1959) have found hyperbaric 5% Xylocaine to be their agent of choice in normal vaginal deliveries in both the dibucaine comparative series and an extended series exceeding 2,000 cases. The dosage used was 50 mg. (1 cc.). Thus it can be seen that Xylocaine HCl 5% with 7.5% glucose is suitable for obstetrical,

gynecological and urological procedures, and for surgery of the lower abdomen.

Brachial Plexus Block

This type of block furnishes excellent anesthesia for upper extremity surgery and may be used when general anesthesia would be inadvisable, i.e., full stomach, pulmonary pathology, debilitated patient, and in shock states when immediate or definitive surgery is necessary. There are three approaches to the plexus: Axillary, infraclavicular, and supraclavicular. The latter is the most commonly used and the preferable technique for the novice. One percent Xylocaine HCl solutions are adequate when analgesia alone is desired, but 1.5% to 2% solutions with epinephrine 1:100,000 are necessary for complete anesthesia and offer an effective duration of three to five hours. The volume of Xylocaine used is 20 to 30 cc. of 1% solution, and 15 to 20 cc. of 2% solution.

Sciatic Block

The sciatic nerve is blocked as it leaves the pelvis. This technique is useful for operations of the foot, neuralgias and sympathetic blockade. The sciatic block is not commonly employed, and the reason is probably related to the comparative ease with which a low spinal anesthesia can be administered. Ten cubic centimeters of a 2% solution of Xylocaine with epinephrine is used, and an anesthetic duration of two to three hours may be expected.

Coeliac Plexus (Splanchnic) Block

Blockade of the sympathetic innervation of abdominal viscera may be accomplished with a coeliac plexus injection, however, continuous peridural anesthesia is the preferred technique. Mesenteric thrombosis, acute pancreatitis and acute anemia from vascular spasm are

examples of the clinical application of this block. A volume of 25 to 35 cc. of 0.2% Xylocaine HCl is deposited on the anterior lateral aspect of the first lumbar vertebral body. Xylocaine freely spreads through the retroperitoneal tissue and bathes the coeliac plexus.

Individual Nerve Block

Individual nerve block is accomplished by the deposition of a local anesthetic drug either extraneurally or intraneurally at any point along a nerve proximal to its distribution. Although there is really no substitute for accurate needle placement and anatomical deposition of the minimal effective concentration of the drug, it is possible to achieve equally good results using larger volumes of lower concentrations. The latter technique has some advantages in that larger volumes of dilute solutions are less apt to result in high blood levels than small volumes of more concentrated solutions. It furnishes more consistent results with less accuracy demanded of the administrator, and the larger volumes form a depot, thereby giving more prolonged anesthesia and postoperative analgesia. However, accurate needle placement and minimal effective concentrations are, as a rule, desirable, and mandatory in blocks that are to be followed by the deposition of neurolytic drugs.

Table 9 outlines the recommended volumes and concentrations of Xylocaine for the blocks listed.

Xylocaine in Clinical Medicine

DENTISTRY

Xylocaine HCl is rapidly replacing procaine HCl and is today well established as a preferred local anesthetic agent in dentistry. Comfort and safety is afforded the patient, while the dentist is rewarded with conservation of time accrued from the rapid onset of anesthesia and the reliable quality of each block.

Bremer *et al* (1948) state that the intense penetrating and spreading powers of Xylocaine are invaluable in dentistry; after infiltrating at the base of a single tooth, adjacent teeth are often anesthetized also. These same workers emphasize the absence of side effects with Xylocaine. They report that Xylocaine produced excellent analgesia and no systemic effects in 87 patients with histories of repeated severe reactions to procaine. Xylocaine may be used by infiltration, to provide anesthesia of even the anterior mandibular structures.

The termination of dental analgesia is characteristically sudden, like "releasing a blind". Paraesthesiae and uncomfortable disturbances of sensation sometimes arise at the conclusion of a block with procaine, but this did not occur with Xylocaine (Björn and Huldt, 1947).

For routine use, Xylocaine HCl 2% with epinephrine is usually employed. The dosage is as follows:

Terminal analgesia 1 cc. Block analgesia 1.5-2 cc. Surgical treatment 3-5 cc.

The duration of analgesia is largely determined by the content of epinephrine. If epinephrine is not added to the solution, analgesia is short, but the duration increases rapidly in proportion to the strength of epinephrine. Where a particularly powerful and long lasting effect is required, 2% Xylocaine with 1:50,000 epinephrine may be employed.