

1½ to 3.0 grains (0.1 to 0.2 Gm.) gives additional analgesia. . . . In some of our cases it would seem that the first stage of labor was prolonged after continuous caudal anesthesia was instituted and in others it appeared to be shortened, but impressions in this respect have not much value because of the great variation in this stage of labor under all circumstances. The second stage is no doubt prolonged when continuous caudal anesthesia is employed. The percentage of occipital posterior positions has been greatly increased in our experience. . . . In our series, forceps delivery occurred forty-eight times in fifty-eight vertex presentations, 82 per cent. Our usual incidence of forceps deliveries is 26 per cent. . . . We have used this form of anesthesia in cases of toxemia and have demonstrated considerable lowering of blood pressure. To these patients the risk of delivery is increased and they do not tolerate pain well. . . . Significant falls in blood pressure have occurred. The response to intravenous injection of ⅓ to ⅔ grain (0.008 to 0.024 Gm.) of ephedrine, and in two cases to the injection of solution of acacia, has restored the pressure. To patients who enter labor with hypertension and toxemia, if hypertension follows the injection, we prefer to give ⅓ grain of ephedrine and repeat the dose if necessary rather than to give an initial dose of ⅔ grain.

"Because of the complete relaxation of the perineum following caudal injection, extraction of the aftercoming head in breech delivery is facilitated. Other operative procedures, such as Dührssen's incisions, repair of the perineum and repair of the cervix, are effectively accomplished. These may be rendered possible even when analgesia against the pain of uterine contraction has not occurred. . . . It has been stated that this form of anesthesia should not be used when placenta praevia is present but in two such

cases we had no untoward effect from its use. The bladder must be watched. Patients to whom continuous caudal anesthesia is administered lose the bladder reflex and may be unable to void. Catheterization is to be performed whenever necessary. . . . The progress of labor must be more carefully noted when continuous caudal anesthesia is used than when other methods are employed. The reason for this is that the patient is no longer able to judge the severity of pain or to perceive symptoms that may be significant, such as tonic contractions or changes in the character of the pain. Nothing announces the advent of the second stage except the results of rectal examination. As a result, much more time must be spent with the patient than is usual. There is no doubt that when anesthesia produced by continuous injection of 1.5 per cent metylocaine solution is completely effective, and when labor progresses normally through the first and second stages, the patient and the obstetrician are impressed with the results. When a deficient or completely unsatisfactory result obtains, however, one realizes that a panacea for relief of the pain of labor has not yet been devised."

J. C. M. C.

LULL, C. B., AND ULLERY, J. C.: *Cesarean Section under Continuous Caudal Analgesia: a Preliminary Report*. J. A. M. A. 124: 90-93 (Jan. 8) 1944.

"After observing the results of continuous caudal anesthesia in several hundred vaginal deliveries, we extend its use for immediate puerperal sterilization. Our results were satisfactory. Following this we have attempted to evaluate its use for cesarean section and herewith is a report on our observation in 50 cases. . . . Mental reassurance should be included in the usual preoperative preparation of a patient

who is going to be conscious during a surgical procedure. . . . In addition to the mental preparation of the patient, it is advisable to prepare the family for the length of time the patient is required to remain in the operating theater. It is essential that the operation not be started until the anesthesia is complete; and, in order that the family may not be unduly worried, it should be acquainted with this necessary delay. Quiet in the operating room is most important. . . . An indispensable part of the operating team is the anesthetist, who remains at the head of the table and reassures the patient while carrying on a low toned conversation with her at least until the baby is delivered. All fear usually leaves the patient immediately after she hears the baby cry, and the operation is completed in an entirely different atmosphere. The contraindications for using continuous caudal analgesia are: 1. Gross deformities of the spine, particularly of the sacrum. 2. Tumors which narrow the spinal canal. 3. Local infection around the sacral hiatus. 4. Skin infections such as boils or carbuncles anywhere on the body (a contraindication to be evaluated by the physician in charge). 5. History of sensitivity to the analgesic agent. 6. Profound anemia, unless supplemented with oxygen inhalation.

"We have hesitated to use this technique in cases of placenta previa because of the relaxation of the cervix and the possibility of bleeding. This is particularly true if the patient has had any uterine contractions. In addition, caudal analgesia is seldom satisfactory in hysterical patients, and some women do not like it because their fear of childbirth is such that they dread being conscious during the process. Adequate fluid should be administered preceding the operation, especially in hot weather. One of the barbiturates should be given the previous night and $1\frac{1}{2}$ grains (0.1 Gm.) should be given

one hour before operation. Fifty mg. of ephedrine hydrochloride should be given intramuscularly or in the initial solution if the patient's blood pressure is below 140 mm. systolic. In hypertensive cases the ephedrine should be withheld unless the blood pressure falls to 100 mm. systolic. . . . The continuous caudal needle is inserted and the apparatus adjusted as for obstetric analgesia. An initial test dose of 8 cc. is administered with careful check by aspiration to prove that the needle is not within the subarachnoid space or a blood vessel. A supplementary dose of 40 to 60 cc., depending on the size of the patient, is then administered. The patient is then placed on her back and the level of analgesia is tested in twenty minutes. If the level of analgesia has not gone above the umbilicus on both sides, a supplementary third injection of 20 to 40 cc., according to the need of the patient, is administered. When the level of analgesia is complete on both sides to the height of the eighth dorsal segment, the operation may be begun. . . .

"The enthusiasm with which those patients who have had previous sections under inhalation anesthesia accept this new method is very gratifying to us, and the family's reaction is quite different when the patient is returned to her room in a cheerful, wide awake condition. Although the average person takes this type of analgesia well, it is especially beneficial in cardiac cases, toxemias and upper respiratory infections. . . . Should there be a drop of blood pressure, it returns to normal immediately after delivery of the child; . . . perfect analgesia must be obtained before the operation is started; . . . the level of analgesia must be maintained throughout the entire procedure. Our results have been so satisfactory that we feel justified in continuing the use of continuous caudal analgesia until a larger series has been observed. . . . Of 50 patients

operated on under continuous caudal analgesia, 48 had perfect results and 2 were failures because of inability to introduce the analgesic agent. All mothers recovered. There were 2 cases of morbidity not attributable to the use of this method. Forty-nine babies were discharged from the hospital. One baby born at five and one-half months' gestation died. Two patients had a drop of blood pressure beyond the average of 26 millimeters." 2 references.

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SOUTHWORTH, J. L., AND HINGSON, R. A.: *Continuous Caudal Analgesia in Surgery*. Ann. Surg. 118: 945-970 (Dec.) 1943.

"Because continuous caudal analgesia is safe and controllable in both extent and duration of effect, we believe that it has extended the field of regional anesthesia and, thus, indirectly extended the field of surgery. . . . A knowledge of the variations of the sacral hiatus is necessary in order to introduce a needle into the sacral canal of all subjects. Lack of this knowledge is an obstacle to the beginner and is the cause of early failures. . . . With continuous caudal analgesia, as with other forms of regional anesthesia, minimal changes in vital functions occur. . . . Loss of sensation under the influence of caudal analgesia occurs much slower than under spinal anesthesia. . . . Motor roots are affected shortly after sensory roots by anesthetic solutions in the epidural space. . . . The use of continuous caudal block in surgery has demonstrated that motor nerve paralysis is unnecessary for production of muscular relaxation. . . . Because it reaches only the sympathetic supply to the gastro-intestinal tract, caudal block produces increased intestinal tonus in the absence of irritative or obstructive lesions of the bowel. In the pres-

ence of irritation or obstruction, intestinal activity and tone is similar to that noted with spinal anesthesia. In elective or interval operations, the intestines lie quietly in the abdominal cavity so that operative procedures are facilitated. Respiration is not affected by high caudal block. . . .

"The effect of caudal block on blood pressure depends on three factors, namely, rate of absorption of the drug; rapidity of extension of sympathetic nerve paralysis; and final height of effect. In the average subject in whom low caudal block is employed, as in obstetrics, blood pressure effects are minimal. . . . If large doses are employed after a bloody tap, increased amounts of solution may be absorbed, with marked fall in blood pressure and other toxic phenomena. . . . If a high level of analgesia is produced rapidly, compensating factors which help regulate arterial tension may be overcome so that a marked and precipitous fall occurs. . . . Fall in blood pressure as produced by caudal block, when absorption of drug is not a factor, does not represent the same physiologic change as a similar fall produced by spinal anesthesia. . . . Reduction of arterial tension regularly occurs in the hypertensive patient under caudal block. . . . The effect of caudal block on the pressure of patients with hypotension is not significant when absorption of the drug is not a factor. . . . The condition of the cardiovascular system has been carefully observed in patients with both normal and diseased hearts under the influence of caudal block. Neither ordinary clinical observations nor the electrocardiograph has revealed significant changes. Age has an important influence on dosage in caudal analgesia. In the aged approximately 20 per cent less drug is required than in the robust. . . . We have not employed this procedure in children. . . .