

the blood pressure drops during the period of anesthesia, but this reaction seldom has been acute or alarming. . . . Such conditions as placenta previa, inertia uteri, hysterical or psychotic states and disproportion between size of the child and pelvis are definite contraindications to the use of the method. . . . Greedy and Hessel-tine said that the method is contraindicated for difficult rotation and versions, since complete uterine relaxation is desirable for these procedures. Other contraindications include a history of hypersensitivity to local anesthetic agents, infective processes over the sacrum and sacral hiatus, and congenital or traumatic malpositions of the vertebral column, especially of the sacral segment. . . . We have not found the use of epinephrine to be disadvantageous; it is omitted, however, from the local anesthetic solution if the patient has any type of hypertension or if there is a history of idiosyncrasy to the drug. There is possibly less fall in blood pressure as a result of the caudal anesthesia in cases in which epinephrine is employed. If there is no contraindication to the use of epinephrine we employ it in the following amounts: One cc. of a 1:2,600 solution or 6 minims (0.4 cc.) of a 1:1,000 solution is added to 66.6 cc. of a 1.5 per cent solution of mety-caine. If total doses larger than 66.6 cc. of the 1.5 per cent solution of mety-caine are required the epinephrine may be omitted from the subsequent doses, particularly if the patient's blood pressure becomes elevated above normal. One advantageous feature of this method of anesthesia is that if complete anesthesia is not obtained there does not appear to be any contraindication to the supplementary use of suitable anesthetic agents by inhalation. If the cardiovascular system is normal or nearly normal, injection may be administered while the patient is in the knee-chest or the modified Sims

position, but if a cardiovascular lesion such as severe cardiac decompensation is present the knee-chest or the knee-elbow position should not be used. If orthopnea is present, the patient cannot be placed in this position with safety and the modified Sims position will be indicated. . . .

"We have used both of these methods of continuous caudal anesthesia. Our results will be published subsequently, in addition to the results obtained in a series of cases in which operations were performed on the anus and lower part of the rectum, perineum, vagina, uterus, urogenital tract and adjacent parts. . . . Since most of the dangers, draw-backs and untoward effects have been associated with certain technical difficulties which could not be foreseen in the early phases of the work by even experienced physicians, it is suggested that for the present, at least, the use of the method be confined to institutional practice by persons trained and experienced in caudal anesthesia." 16 references.

J. C. M. C.

IRVING, F. R.; LIPPINCOTT, C. A., AND MEYER, F. C.: *Continuous Caudal Anesthesia in Obstetrics. Demonstration of Catheter Technic for Administration*. New York State J. Med. 43: 1023-1029 (June) 1943.

"Since October, 1942, we have used continuous caudal anesthesia in over 200 obstetric cases, employing the catheter instead of the malleable needle. There have been no major complications from its use. . . . Continuous caudal anesthesia cannot be used in every case of childbirth. There are certain contrindications, such as pilonidal cyst, infection near the site of injection, cases of hypotension, and patients who are known to be sensitive to the drug. We believe that placenta praevia, ablatio placentae, and dis-

proportion contraindicate its use. Although in our study we have used it more or less on unselected cases, we did not transgress to the extent of forgetting the mother's safety. In 5 cases of inlet disproportion, in 'border-line' pelves, and 3 outlet contractions, continuous caudal was used successfully, the patients being finally delivered vaginally after a prolonged but comfortable labor. Version can be accomplished but the anesthetic is not ideal since the uterus is not relaxed. Cardiac cases apparently do exceptionally well. . . .

"Aside from the contraindications mentioned, it must be remembered that the method is time-consuming. . . . For our present method, we employ a 5-inch, No. 18 gage needle without hub, and a 2½-inch, No. 15 gage needle which has been reamed out so that it will pass over the No. 18 gage needle readily and also permit the introduction of a No. 4 ureteral catheter. The No. 15 gage needle has no point, but its tip is sharpened throughout its circumference and bevelled at 45 degrees. . . .

"In analyzing our first 100 cases, we found that we had 10 failures, 7 of which were due to technical errors of the operator. . . . Of the 7 technical errors, 4 occurred because analgesia wore off following the first injection, which had been made through the spinal needle and could not be renewed because the catheter had been incorrectly placed. . . . A review of the series disclosed 17 cases in which the fetal heart rate fell below 100 and did not recover between the uterine contractions; and one case in which, immediately upon turning the patient on her back, following the first injection, the fetal heart could not be heard; it had been heard thirty minutes before. Seventeen per cent fetal distress was alarming and required explanation. We considered several possible causes. At first, we thought that placing the

patient in the knee-elbow position might predispose to pressure on the cord. Second, the drug employed might, after absorption, pass the placenta in sufficient concentration to have some direct effect on the fetus. Third, the fact that dilatation of the cervix took place so rapidly suggested the possibility that uterine tone and contractions might be greatly increased. And fourth, the observation of an almost bloodless uterus at cesarean section in a patient whose condition resembled shock suggested fetal anoxemia from ischemia of the uterus as a cause of fetal distress. This might be due either to maternal hypotension or to direct action of the anesthetic on the arteriolar bed in the uterus.

"We have now compiled and present . . . [an] analysis of 118 additional cases, in which we have tried to determine which factors are significant in the causation of this unusually high percentage of fetal distress. Our first step was to put the patients in the knee-elbow position for ten minutes at approximately the stage of labor where caudal block is usually started. This was done in 16 patients, and in no case was fetal distress observed. At the same time, we began our inductions in the lateral position, to see if the incidence in the two positions was comparable. We found that the ratios were not significantly different. We attempted to study the toxicity of the anesthetic agent, but found that we were unable, with the tests available, to determine the concentrations in maternal and fetal blood. We then approached the problem by employing three other local anesthetics: novocain. . . . monocain . . . [and] pontocaine. . . . Up to the present time 0.25 per cent pontocaine has given us the most satisfactory results. At this time we are unable to present any evidence that increased tonicity of the uterus or prolonged contractions exist or play any role in the production of fetal distress.

. . . That anoxemia of the fetus is a factor in the mechanism of production of fetal distress in certain of our cases of continuous caudal analgesia seems fairly well founded by the observation that the administration of oxygen to the mother has uniformly resulted in prompt recovery of the fetal heart rate. . . .

"In 8 cases we administered 1 cc. of adrenalin, 1:2,600 per 100 cc. of anesthetic solution, and observed fetal distress in 3. . . . We have found that, including the above 3, 9 of 12 of our cases of fetal distress in the last 118 were associated with a sustained fall in blood pressure. By a sustained fall we mean a systolic pressure of less than 90 which remained so for at least one hour. We feel that the correlation between the sustained low blood pressure and fetal distress is significant. . . . In this series of 218 cases, we have had no maternal mortalities; there were 2 stillbirths, and 3 neonatal deaths. One of the stillbirths was a case in which a prolapsed cord and fetal death occurred twelve hours before caudal anesthesia was given. The other is the case discussed above, in which the fetal heart disappeared during the administration of caudal. The neonatal deaths were all in very small babies; one weighed 2 pounds 13 ounces; the other two were 2-pound twins. . . . Of the 12 cases of fetal distress in the last 118 cases, 9, or 75 per cent, occurred in patients manifesting a sustained low blood pressure. In each of the remaining 3 cases there was a clear obstetric explanation for the fetal distress. One stillbirth . . . was . . . a result of the caudal anesthesia." 11 references.

J. C. M. C.

SIEVER, J. M., AND MOUSEL, L. H.: *Continuous Caudal Anesthesia in Three Hundred Unselected Obstetric Cases*. J. A. M. A. 122: 424-426 (June 12) 1943.

"This paper is an analysis of 300 obstetric cases at the Brooke General

Hospital in which continuous caudal anesthesia was employed. In 288 anesthesia was satisfactory; in 12 it was not and supplementary anesthesia was necessary. This type of anesthesia was used for all patients admitted to the hospital for delivery with a few exceptions. . . . The only obstetric patients for whom this type of anesthesia was not used were those who presented definite obstetric contraindications, such as placenta previa, contracted pelvis or some abnormality of the sacrum or coccyx. This series included anterior, posterior and breech presentations, one face presentation and one set of twins. . . . The type of solution used was a 1.5 per cent solution of procaine hydrochloride. The amount given varied considerably. . . . The largest quantity used was 1,000 cc. and the least was 30 cc. The longest administration was twenty-four hours and the shortest thirty minutes. . . . The first stage of labor was conducted along natural lines. If its progress was to be normal, it was necessary to watch the level of anesthesia. In our cases we found it expedient to keep the level of anesthesia halfway between the symphysis and the umbilicus. If it was allowed to become lower anesthesia was not complete, and if it extended higher progress of labor was impaired. It was noted early in our series that in many cases labor progressed rapidly until the cervix was dilated 7 or 8 cm. and then would make no progress for several hours until the membranes ruptured, whereupon rapid completion of dilatation would ensue. For this reason we artificially ruptured membranes at this stage and thereby considerably shortened labor in these cases. This absence of progress should be watched carefully, otherwise prolonged labor may result.

"The second stage of labor was altered greatly by continuous caudal anesthesia. This was particularly true among primiparas. The patient did