

. . . 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.

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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

not have any desire to bear down because of the anesthesia of the perineum. For this reason the head may be left on the perineum for hours if the attending doctor is not watchful. Multiparas were able to push the baby out rather easily when instructed to do so. Primigravidas were unable to do this even after prolonged pushing. . . . It is our belief that more than two hours pounding on the perineum is dangerous to the welfare of the infant. For this reason it was necessary to perform episiotomy on all primiparas, and for 70 per cent of our primiparas forceps also were necessary for delivery. Posterior positions were much more common when caudal anesthesia was employed than in our previous cases. . . . This change was attributed to the relaxation of the levator muscles with the resultant failure of a large number of fetuses to rotate spontaneously. This was compensated for by the ease with which rotation could be effected. . . .

"The third stage of labor should be managed carefully. Oxytoxics should not be given prior to separation of the placenta, nor should the uterus be manipulated before separation takes place. If oxytoxics are given or the uterus is manipulated earlier, tetany of the uterus is likely to occur and a retained placenta results. One should leave the uterus entirely alone until separation of the placenta takes place; then gentle traction may be made on the cord and, placing the other hand on the abdomen, one pushes the uterus gently upward with the thumb; thus the uterus is pushed away from the placenta. When this maneuver is completed, the placenta will be in the vagina and a gentle push on the uterus in order to make it act like a piston will deliver the placenta. . . . Delivery by Credé's method should never be attempted. The over-all length of labor was slightly increased in cases of continuous caudal anesthesia. . . . In the 300 cases no maternal mortality oc-

curred. No effect was noticed on the baby; all cried spontaneously on delivery. Three babies were lost, but the causes were entirely unrelated to the anesthesia. . . .

"We have learned that certain conditions should be fulfilled before continuous caudal anesthesia should be started. These hold true only for primigravidas, as the caudal anesthesia may be started for multigravidas as soon as definite labor is established. These conditions are as follows: (1) The head should be engaged, (2) contractions should be occurring at five minute intervals or less, (3) there should not be any disproportion between the presenting part and the pelvis and (4) dilatation of the cervix of 1 cm. or more should have occurred. . . . The dangers of this type of anesthesia may be grouped under three headings: (1) infection, (2) injection into the cerebrospinal space and (3) circulatory collapse. . . . In the first 50 cases in our series one epidural abscess occurred. The patient was seriously ill for three weeks but responded to large doses of sulfonamide compounds and completely recovered. . . . It must be stressed that strict asepsis is absolutely essential during the entire technic. Injection into the dura is obviously dangerous. . . . This complication did not occur in any of our 300 cases. The most serious danger is that of circulatory collapse. This occurred in 3 of our 300 cases. . . . Epinephrine was given intravenously, and both mother and baby recovered without any apparent ill effects. To prevent such collapse, 2 minims (0.12 cc.) of epinephrine was placed in the first 25 cc. of the anesthetic solution injected. This was repeated in subsequent injections only when the systolic blood pressure fell to less than 100 mm. of mercury. . . .

"Continuous caudal anesthesia was used in the treatment of 3 patients who had eclampsia in this hospital. . . .

More work is being done on this phase of continuous caudal anesthesia. It should be pointed out, however, that these patients should be watched for circulatory collapse, as too great a drop in blood pressure might be disastrous. . . . The patient is placed on her right side in a modified Sims position and close to the side of the bed. The lumbosacral region is scrubbed with soap and water, followed by alcohol and ether. Tincture of mercuric iodine then is applied to the region and sterile drapes are put in place. A skin wheal is raised over the sacrococcygeal ligament. A 13 gage needle is passed through the skin wheal and is advanced through the sacrococcygeal ligament. After the tip of the needle comes into contact with bone on the anterior border of the caudal canal, the needle is rotated 90 degrees to bring its bevel against bone. The needle is then advanced about 1 inch (2.5 cm.). A glass syringe containing 25 cc. of the anesthetic solution is attached to the needle and 1 or 2 cc. of the anesthetic solution is injected to clear the needle of any obstruction. The plunger is withdrawn gently in order

to make sure that the tip of the needle is not lying within the lumen of a blood vessel or within the subarachnoid space. Twenty-five cc. of the anesthetic solution is injected slowly into the caudal canal. As soon as the initial dose has been injected the syringe is detached from the needle and a No. 5 French nylon ureteral catheter which has been sterilized in an autoclave is passed through the needle and is advanced until the tip of the catheter is approximately $1\frac{1}{2}$ inches (3.8 cm.) above the sacral hiatus. The catheter is now supported in place while the needle is removed. The catheter is taped to the skin and the region is sealed with adhesive tape to prevent soiling from the perineum. The patient may now be turned on her back and made comfortable. It is important to refrain from advancing the tip of the catheter more than $1\frac{1}{2}$ inches (3.8 cm.) into the caudal canal. If the catheter is placed high in the canal, unilateral anesthesia may result. Additional injections of 25 cc. of the anesthetic solution are given whenever the patient begins complaining of discomfort." 3 references.

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