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SADDLE BLOCK SPINAL ANESTHESIA IN OBSTETRICS, WITH SPECIAL REFERENCE TO THE USE OF METYCAINE *†

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OBSTETRICIANS and anesthesiologists are constantly seeking safe methods for the relief of pain in the parturient woman. Within the past few years technics for regional anesthesia have become widely accepted as valuable procedures in obstetrics, and their definite advantages to mother, fetus, obstetrician and anesthesiologist recognized.

The modified "saddle block" spinal technic of Adriani (1), an improvement of the "controllable" spinal anesthesia introduced by Pitkin (2) in 1928, has become the most popular of the regional methods in obstetrics during the past two years. Since January 1, 1947, approximately 3000 women have been delivered at The Chicago Lying-in Hospital under this form of pain relief. No maternal mortality and no significant morbidity attributable to the anesthetic procedure has resulted. The results in our first 719 cases have been reported elsewhere (3) in detail.

In a combined experience of over 1000 cases of continuous caudal analgesia and in our early work with saddle block spinal anesthesia, we were impressed clinically by the apparent profound anesthetic effect of metycaine. Patients anesthetized with this agent experienced no pain or discomfort on deep pressure during forceps traction or intrapelvic manipulations incident to major operative delivery procedures, if the anesthesia was not at the waning point and the anesthetic level was not below the tenth thoracic segment. This has not been a constant finding when other drugs were used.

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† "Metycaine" (Gamma-[2-methyl-piperidino]-propyl Benzoate Hydrochloride, Lilly) used in this study was supplied by Eli Lilly and Company, Indianapolis.

With this factor in mind we have sought to evaluate more completely the safety and efficiency of metycaine as a drug suitable for routine use in saddle block spinal anesthesia in obstetrics, and to find a means of prolonging the duration of its analgesic effect.

MATERIAL

This is a study of 182 consecutive patients anesthetized with metycaine, selected only in that they presented none of the usual contraindications to spinal anesthesia and in that, in addition, delivery was anticipated in from one to two hours from the time the spinal block was instituted. Some data on 20 additional cases in which a special anesthetic solution (to be described) was used will be included. There were 95 primiparas and 87 multiparas in the basic series. One hundred thirty-nine patients were at term, 20 were between thirty-six and thirty-eight weeks gestation, and 13 less than thirty-six weeks.

Complications to pregnancy existed in 44 patients. Upper respiratory infection was present in 15 cases and cardiac disease in 8. Ten patients had preeclampsia and 4 had hypertensive toxemia. A miscellaneous group of 7 patients had syphilis, bronchitis, inactive tuberculosis, contracted pelvic outlet and other unrelated conditions.

TECHNIC

All of the anesthetics were administered by physicians who have had extensive experience with spinal or caudal anesthesia or both in obstetrics. The majority of the injections were carried out with the patient in the labor bed, under the mattress of which had been inserted board supports to prevent sagging. The patient was placed in a sitting position over the side of the bed, bending forward and supported by an assistant. The lower back was prepared with alcohol and a mercurial tincture. Local infiltration of skin and deeper tissues with the anesthetic agent was not carried out.

Spinal puncture was made at the level of the fourth lumbar interspace. In case of difficulty at this point the third space was utilized. A short-beveled 22-gauge needle, 3 inches in length, was used in the majority of cases.

When a free flow of clear spinal fluid was obtained, a Luer-Lok syringe containing 1 cc. of 3 per cent metycaine in 5 per cent dextrose (30 mg. of the drug) was attached to the spinal needle, aspiration of 0.1 cc. of spinal fluid carried out, and the solution injected rapidly (three seconds). At the end of ten seconds the needle was removed, and at the end of thirty seconds the patient was placed flat on her back with a pillow under the head to keep the neck sharply flexed. The procedure was timed to be carried out in its entirety between contractions of the uterus, to prevent any abnormally high level or aberration of anesthesia which might result from change in spinal fluid pressure coincident with straining.

As soon as the patient was in the supine position, the following observations were made and recorded on the specially prepared form. The blood pressure was taken at least every five minutes for the first thirty minutes following the injection of the drug, and every fifteen minutes thereafter. Basal blood pressure was determined by regular observations throughout labor preceding the block, including one reading immediately before the induction of anesthesia. Observations of the maternal pulse rate and fetal heart rate were made between blood pressure readings. Oxygen and emergency drugs including ephedrine, methedrine, coramine and (soluble) sodium amytal were kept immediately available.

The patient was not moved or allowed to change position for twenty minutes after injection. If more rapid delivery was imperative, however, this was permitted by elevating the patient's trunk and head into 10 to 15 degree reverse Trendelenburg position within five minutes after the injection and immediately placing the legs in stirrups. This maneuver prevented ascent of the hyperbaric solution within the spinal canal to undesirably high levels. Anesthetic effect adequate for delivery invariably was obtained in five minutes or less.

By this procedure we believe that we can obtain safely for fetus and mother the advantages of regional anesthesia in cases in which rapid delivery by operative means is indicated by preexisting fetal distress or other extenuating circumstances.

The plain 3 per cent metycaine in 5 per cent dextrose was administered in 1 cc. dosage to 132 patients. In 50 cases 0.4 cc. of 1:1000 epinephrine solution was added to the above solution. This resulted in a significant prolongation of the anesthetic effect in these cases. Comparison of results will be noted below.

In addition to the cases reported in detail here, we have lately administered to 20 patients a commercially premixed solution of 3 per cent metycaine in 5 per cent dextrose containing 0.36 mg. of epinephrine per 1 cc. of the anesthetic mixture. Complete analysis of these cases is not included in this discussion, but certain data of significance will be presented.

ANALYSIS OF RESULTS

The predetermined policy of the hospital staff in using only single blocks late in labor has been mentioned. Six patients received the benefits of two successful injections. (There was no failure to obtain successful anesthesia in any case.) In our experience with all drugs, repetition of the spinal block has been carried out in approximately 200 cases. No untoward effects have resulted in these cases of repeated injections.

On the other hand, we feel strongly that the inexperienced obstetrician should use saddle block only as a semiterminal procedure. Labor should be well established, cervical dilatation must be proceeding progressively, and the presenting part should be fixed in the pelvis.

The tendency to delay the block until late in labor is reflected in the analysis of the series on the basis of cervical dilatation at the time of spinal injection, table 1. In this group of cases we preferred to anesthetize primiparas at or near the beginning of the second stage of labor and multiparas at from 6 to 8 cm. of cervical dilatation.

The anesthetic block should not as a rule be administered if the presenting part has already descended so low in the pelvis as to have caused bulging of the perineum. The theoretical possibility of injury to the fetal head as the patient is placed in a sitting position under such circumstances must be kept in mind. No such fetal injury has occurred in our experience.

With the use of regional anesthesia restricted to a semiterminal procedure, earlier sedation to produce some analgesia-amnesia obviously is necessary in most cases. It is routine practice on our clinic service to administer morphine sulfate, 0.01 Gm., and hyoscine, 0.0005 Gm., when labor is well established and the patient is in definite pain. Morphine is given only once, but the hyoscine in doses of 0.0003 Gm. may be repeated at intervals of sixty to ninety minutes.

TABLE 1
CERVICAL DILATATION AT TIME OF SADDLE BLOCK

Cervical dilatation in cm.	-4	4-5	6-7	8	9	Complete
Percentage of patients	0	3	13.2	13.2	20	50.5

It is our distinct clinical impression that patients who have received morphine and hyoscine before saddle block experience less restlessness during the process of delivery and repair if a barbiturate has been administered early in labor. We prefer to use 0.2 Gm. of seconal or sodium amytal.

The relatively short duration of anesthesia obtained with metycaine and procaine has served, in the past, to restrict the usefulness of these drugs in any single injection type of regional technic. In obstetrics this implies anesthesia for little more than delivery and episiotomy repair in primiparas.

Of the 132 patients who received 30 mg. of metycaine without epinephrine, duration of complete relief from pain of uterine contraction ranged from forty-five to 110 minutes, with a mean of seventy-five minutes. Duration of analgesia was observed directly in patients who experienced return of pain before delivery. For patients delivering before return of uterine pain, potential duration of analgesia was determined by noting the length of time after injection through which the skin level of sensory anesthesia remained *above* the eleventh thoracic segment. Perineal anesthesia outlasted uterine analgesia by fifteen to forty minutes.

Significant prolongation of the duration of pain relief was obtained by adding 0.4 cc. of 1:1000 epinephrine solution to 1 cc. of the 3 per cent metycaine in 5 per cent glucose (30 mg. of anesthetic agent). In the 50 patients who received this mixture, absolute and potential uterine analgesia ranged in duration from ninety to one hundred and thirty-five minutes, with a mean of one hundred and nineteen minutes. The latter represents an increase of forty-four minutes (60 per cent) in relief from uterine contraction pain.

Similar results were produced in the 20 patients given the premixed solution containing 30 mg. of metycaine and 0.36 mg. of epinephrine in 1 cc. of 5 per cent dextrose. Uterine analgesia ranged from ninety to one hundred and fifty-five minutes, with a mean duration of 120.5 minutes (fig. 1). Perineal anesthesia, when observed directly, outlasted uterine analgesia by twenty-five to forty-five minutes.

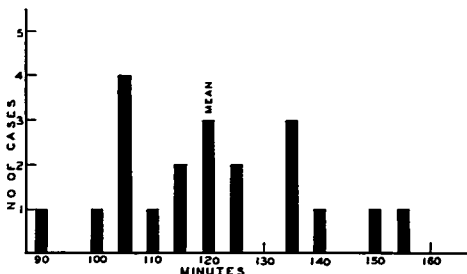


FIG. 1. Duration of uterine analgesia in 20 patients receiving the prepared solution containing 30 mg. of metycaine and 0.36 mg. of epinephrine in 1 cc. of 5 per cent dextrose.

The subarachnoid use of vasoconstrictor agents has been discussed recently by Whitacre and Potter (4). These workers found that the duration of effect of pontocaine in dextrose was not altered by the addition of epinephrine to the solution. On the other hand, the use of ephedrine reduced by 30 per cent the dose requirement of pontocaine with dextrose for any given extent and duration of anesthesia. Ruben (5) has reported increased duration of anesthesia with pontocaine-dextrose when ephedrine was added. Lund and Rumball (15) found that the addition of epinephrine prolonged by 30 per cent to 50 per cent the anesthetic effect of a hypobaric solution of pontocaine. Using hypobaric nupercaine as the active agent, Whitacre and Potter found epinephrine to be much more effective than ephedrine.

Pitkin (6) and, more recently, Prickett, Gross and Cullen (7) noted that the intrathecal use of epinephrine prolonged significantly the action of novocaine (procaine). Romberger (8) reported similar results with ephedrine.

Turner (9), using ephedrine and methedrine with metycaine in saddle block spinal anesthesia for delivery, has noted less significant prolongation of anesthesia than we have found with epinephrine. Methedrine appeared to be the most effective of the two vasoconstrictors.

Spinal anesthetic effects of ephedrine have been described by Ruben, Kamsler and Howell (10). In some cases, anesthesia produced by 50 mg. of ephedrine mixed with 1 cc. of spinal fluid was "adequate for operation without the addition of a standard agent." Willson (11) has used 50 mg. of ephedrine diluted to 2 cc. with 10 per cent dextrose as total anesthetic for delivery and repair in normal obstetric cases.

We have administered intrathecally to 5 patients in active labor 0.4 cc. of 1:1000 epinephrine mixed with 0.6 cc. of 10 per cent dextrose. Technic of administration was identical to that described as our usual procedure for saddle block. Complete analgesia from uterine contraction pain was obtained in each case, as well as anesthesia of varying intensity distributed in the identical pattern we see with the use of metycaine and other standard anesthetic agents. Motor paralysis of the rectal sphincter was minimal and variable. Duration of effect varied from ninety to one hundred and fifty minutes. One patient, coming to delivery under the effect of the epinephrine block, had outlet forceps extraction plus episiotomy and repair without requiring any supplemental anesthesia. There was no elevation or depression of blood pressure or pulse rate in any case. No unusual or untoward neurologic effects were noted.

These results would tend to indicate that the prolongation of anesthetic effects noted when epinephrine is added to standard agents in spinal anesthesia is due, in part at least, to the anesthetic potentialities of the vasopressor drug itself. This effect may be the result of ischemia of nervous tissue. Heretofore the prolongation of anesthesia has been attributed to delay in absorption of the standard anesthetic agent resulting from vasoconstriction produced by the epinephrine. It must be pointed out, however, that the concentration of epinephrine used by us (1:2500) is four times greater than that reported by anyone in the past. Work with greater dilutions is progressing and will be reported elsewhere.

If the effects noted with epinephrine and glucose alone are the result of ischemia in nervous tissue, the use of similar concentrations of epinephrine in combination with metycaine and other anesthetic agents may be criticized as potentially injurious. Any untoward neurologic effects might be expected to become obvious immediately. To date we have administered epinephrine in concentrations of 1:2800 and 1:3500 in combination with metycaine, nupercaine and pontocaine to approximately 100 patients. Aside from prolongation of anesthesia beyond that expected from use of these agents alone, no unusual or pathologic neurologic effects have been noted.

Delivery data for 168 cephalic presentations in our basic series of patients who actually delivered under saddle block anesthesia are presented in table 2, compared with a control series of 2,946 patients delivered during 1944, when very little regional anesthesia was used. The only change of significance noted is an increase of outlet forceps and a decrease in spontaneous deliveries. Major operative interference was not increased. At the present time on our service all primiparas and many multiparas are delivered by outlet or "prophylactic" forceps with an adequate episiotomy made before the perineum has been greatly distended by the presenting part, regardless of the type of anesthesia used.

TABLE 2
DELIVERY IN CEPHALIC PRESENTATIONS

Type of Delivery	Control, per cent	Saddle Block, per cent
Spontaneous	36.2	8.3
Outlet forceps	37.6	69.6
Low forceps	14.1	10.7
Manual rotation and low forceps	7.0	8.9
Low forceps rotation	4.1	0.6
Mid forceps	2.0	1.8

Physicians undertaking to deliver their patients under spinal anesthesia must anticipate a decrease in spontaneous expulsion of the fetus by the parturient. With the loss of the "bearing down" reflex, voluntary efforts are diminished in power and efficiency. Undue prolongation of the second stage of labor for convenience or from neglect must be avoided. Simply because the patient is comfortable and is not straining with each contraction does not remove the possibility of direct or anoxic damage to the fetus as a result of pressure from powerful second-stage uterine activity. The patient should be delivered promptly by outlet forceps as soon as the fetal head is brought to the perineum by uterine force alone or by the directed "pushing" efforts of the parturient when indicated. Apparent delay in completion of cervical dilatation and in descent of the fetal head often can be eliminated by artificial rupture of the membranes, particularly when there is a bulging forebag.

Saddle block with metycaine was selected as the anesthetic procedure of choice in several of the rotation cases and in the three mid-forceps deliveries (two with Dührssen's incisions), as well as in four extractions in single breech presentations and in three cases of twin pregnancy.

Physicians who have used low spinal anesthesia in obstetrics have been impressed by the extreme relaxation of pelvic musculature and lower uterine segment, comparable to deep surgical anesthesia produced by the open-drop ether technic and lacking the narcosis to mother and fetus created by general anesthesia. The relaxation obtained with

spinal anesthesia is ideal for rotations and mid-forceps deliveries. Irritability of the musculature of the upper uterine segment under spinal contraindicates version in the single fetus, although we have done version and extraction on the second of twins, as well as breech extractions, under unsupplemented saddle block anesthesia.

Preservation of contractility in the upper uterine segment under spinal anesthesia tends to decrease blood loss during the third stage of labor. In 77 per cent of the cases in this series third stage blood loss was estimated to be less than 100 cc., and there were no postpartum hemorrhages. Two patients lost between 200 and 300 cc. of blood. Dieckmann (12) has pointed out that slow delivery of the fetus (three to four minutes) is the most important factor in causing prompt separation of the placenta. Along with slow delivery of the fetus our management of the third stage includes intravenous administration of an oxytocic drug during the second stage. We have given one unit of posterior pituitary extract at the delivery of the posterior shoulder or 0.2 mg. of ergotrate after delivery of the head. A "trapped" placenta requiring manual extraction occurred in one case. Manual removal of the placenta is done routinely on our service if simple expression is not possible within fifteen minutes.

TABLE 3
SKIN LEVELS OF ANESTHESIA

Anesthetic Level	3 Per Cent Metycaine, per cent	3 Per Cent Metycaine with Epinephrine Added, per cent	Combined Solution of Metycaine and Epinephrine, per cent
T 10	23.9	18	40
T 9	58.0	60	50
T 8	8.7	14	10
T 7	2.9	4	
T 6	2.9	2	
T 5	3.6	2	
T 4		2	

T = thoracic.

To obtain complete analgesia from uterine contraction pain regional nerve block must be carried above the eleventh thoracic dermatome segment. (We have not found it necessary to carry the skin level of anesthesia to between the umbilicus and xiphoid, as reported recently by Brown (13).) If anesthesia is carried above the eighth thoracic segment, a significant percentage of patients will demonstrate decrease in frequency and duration of uterine contractions. The great majority of our patients developed sensory anesthesia to the ninth or tenth thoracic segments (table 3). Circulatory disturbances are minimized with these levels of anesthesia. In the third group of patients there was less experimental variation in the rate of injection of the anesthetic mixture, all injections being made at a rapid rate (3 seconds).

The effect of the nerve block on systolic blood pressure is shown in table 4. There appeared to be less drop in blood pressure among the patients receiving the combined solution containing 30 mg. of metycaine and 0.36 mg. of epinephrine in 1 cc. of 5 per cent glucose, although the series of 20 patients is admittedly small. We purposely omitted using a prophylactic vasoconstrictor in any case, to observe more accurately the effect of the anesthetic solution on blood pressure. In routine practice we would advise intramuscular injection of 50 mg. of ephedrine sulfate before spinal tap in any patient whose basal systolic blood pressure is below 110 mm. of mercury.

In patients who are asymptomatic and who exhibit no drop in fetal heart tones to below 100 beats per minute, we do not treat blood pressure falls until the systolic tension goes below 80 mm. of mercury. Deep breathing, oxygen inhalation, or elevation of the patient's legs to a right angle with the trunk usually suffices to correct hypotension. A single intravenous injection of 25 mg. of ephedrine sulfate is given when the simpler means do not suffice. In the series of 20 patients receiving the combined metycaine-epinephrine solution, one was treated for transient fall in fetal heart rate.

TABLE 4
BLOOD PRESSURE CHANGES

Fall in mm. of Hg	3 Per Cent Metycaine, per cent	3 Per Cent Metycaine with Epinephrine Added, per cent	Combined Solution of Metycaine and Epinephrine, per cent
0-9	36.0	27.0	45.0
10-19	22.5	36.6	30.0
20-29	16.0	23.0	10.0
30-39	11.6	7.7	10.0
40-49	8.7	1.9	5.0
50-59	5.2	3.8	0.0

No immediate neurologic phenomena of a pathologic nature were noted in any of the patients included in this series, and no remote sequelae have been reported to date. This is also the case for our entire series of approximately 3000 patients for whom saddle block anesthesia was employed.

Postpartum urinary retention has not been a problem. In table 5 we have compared catheterizations in this series with those in a control group of 100 patients delivered under gas anesthesia and managed under similar conditions of early postpartum ambulation. An increase in the number of patients requiring one catheterization is noted in the series having saddle block anesthesia, but otherwise the comparison is favorable to the group having spinal anesthesia. Postpartum urinary retention will not be a major problem if bladder distention is avoided during labor and in the first twenty-four hours following delivery by

means of repeated, regular catheterizations as necessary. Close attention must be given to the bladder during these periods by physicians and nurses.

Headache during the postpartum period has proved to be an annoyance in our experience with saddle block anesthesia, but has not caused us to doubt the utility of the procedure or to consider its abandonment. In the present series 20.3 per cent of patients complained of some headache postpartum. In 14.8 per cent of all cases a "mild" headache was noted, which did not interfere in any way with the patient's activity and required only acetylsalicylic acid for relief or no medication at all. A "moderate" headache was present in 5.4 per cent of all cases, requiring caffeine sodium benzoate intramuscularly or codeine for relief and limiting in part the patient's ability to be up and about freely. One patient (0.5 per cent) had a "severe" headache which caused nausea and confined her to bed for three days.

TABLE 5
POSTPARTUM CATHETERIZATION

Number of Catheterizations	Control, per cent	Saddle Block, per cent
1	13	22
2	14	9
3 or more	11	7

The typical time of onset of these headaches was thirty-six to seventy-two hours postpartum, and the duration was one to three days. No patient in this series left the hospital with a headache. Cullen and Griffith (14), in comparing postpartum results in 200 patients delivered under spinal with an equal number receiving general anesthesia, found the incidence of headache to be the same in both (20 per cent), although a greater number of "distressing" headaches occurred in the spinal group. We have noted a significant number of headaches in patients delivered under gas anesthesia, but we believe the incidence is definitely higher when spinal is used. In the cases in which saddle block anesthesia is employed we make no effort to keep the patients flat in bed immediately after delivery, nor to interfere with the general hospital program of early ambulation, which routinely begins with sitting up in a chair twenty-four hours after delivery.

Maternal morbidity in this series was not above the general hospital average, and there was no maternal mortality from any cause. Among the 3000 women who have received saddle block spinal anesthesia for delivery in this hospital, there has been one death—from pulmonary embolism during the postpartum period. There have been no alarming experiences or "near deaths" from anesthetic causes.

Any physician who observes deliveries carried out under one of the regional methods of anesthesia cannot help being impressed by the benefits derived by the fetus, particularly the premature one. Respira-

tory depression that is the result of general anesthetic agents is entirely lacking. The fetus is born undrugged unless preanesthetic sedation has been excessive or injudiciously timed. In this series 91 per cent of the infants breathed and cried in less than one minute after birth, and an additional 8.5 per cent spontaneously in three minutes. Only one infant required any form of resuscitation. The majority of infants breathed and cried before completion of delivery of the body. Infant mortality in this series was limited to the neonatal death of 2 infants, a set of twins born prematurely at thirty-one weeks of gestation.

COMMENT

The advantages of regional anesthesia in obstetrics have been emphasized frequently and need little reiteration. The fetus is unaffected so long as intelligent obstetric management does not increase the incidence of major operative delivery, and proper anesthesiologic technics prevent occurrence or persistence of falls of blood pressure below 80 mm. of mercury systolic. The mother is protected from the unique obstetric hazard of pulmonary aspiration of food particles and receives the psychologic benefits of an unrushed terminal period of labor and of a delivery in full consciousness.

The modified "saddle block" technic of Adriani has been used by us in approximately 3,000 cases with no anesthetic death or "near death" and with no increase in maternal morbidity. By comparison with other regional or spinal technics, the saddle block procedure is a simple one. To the qualified anesthesiologist it will present no problems in administration or management. Our experiences with a large resident staff have shown that this minimal dosage technic can be used safely by any physician who can do a good spinal tap, provided he avoids carelessness, adheres strictly to the technical principles of timing the injection and positioning the patient, and observes the patient closely after anesthesia has been induced.

Good results with saddle block anesthesia are much more dependent upon judicious obstetric management of cases than upon anesthesiologic technic. The proper time in labor at which the block will be administered is determined by multiple factors, among which are: character and frequency of the uterine contractions, station and position of the presenting part, effacement or rigidity, or both, of the cervix, presence or absence of any degree of cephalopelvic disproportions and so forth. A small percentage of patients may be anesthetized when the cervix is dilated as little as 3 or 4 cm. In some cases the block should be delayed until the descent phase of the second stage of labor is nearly complete.

The physician having little experience with regional anesthesia should at first use saddle block only as a semiterminal procedure in normal cases. As experience is gained and knowledge of the alterations in the mechanism of labor created by regional anesthesia is increased, patients may be anesthetized earlier in labor and selected cases

may be given two successive blocks. Other factors in success include proper selection of cases to eliminate grossly unstable individuals, preparation of the patient psychologically before labor begins, and astute administration of premedication.

SUMMARY

Obstetric and anesthesiologic management of labor and delivery under saddle block spinal anesthesia has been described, and data on 202 patients given metycaine in 30 mg. dosage have been presented. The duration of uterine analgesia produced by this amount of metycaine has been increased 60 per cent by the addition of epinephrine. Primary spinal anesthetic potentialities of epinephrine have been noted.

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