

## AN EVALUATION OF MONOCAINE FORMATE IN THE PRODUCTION OF LOW SPINAL ANESTHESIA \*

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RECENT pharmacologic studies have indicated a higher therapeutic ratio for the drug, monocaine formate (formic salt of isobutyl amino-ethyl para-amino benzoate), compared with procaine hydrochloride as a spinal anesthetic agent (1). The present study is concerned with the effects of monocaine when used for low spinal anesthesia. Ninety-seven patients were studied in whom monocaine was used and a control series of 120 patients in whom procaine was used (table 1). Ninety and 100 cases, respectively were transurethral prostatic resections; the remaining surgical procedures involved suprapubic cystostomies, removal of neoplasms of the bladder, litholapaxies, and operations on the genitalia or perineum. Three surgeons, the chief of the service and two senior residents, performed all of the operations. Vasopressor drugs were not administered routinely as a preanesthetic measure, and their use was limited as much as possible. Neosynephrin, 1 per cent aqueous solution, in doses of 0.25 to 0.5 cc. was administered subcutaneously for hypotension during the period of anesthesia to 24 patients who received procaine and to 19 patients who received monocaine.

The technic of administration was as follows. Approximately thirty minutes prior to the spinal puncture, the patient was given morphine sulfate, 0.008 to 0.01 Gm., and scopolamine, 0.0002 Gm., subcutaneously. The spinal puncture was performed with the patient lying horizontally on the side, using a 22 gauge needle with a 45 degree bevel. The interspace between the third and fourth lumbar vertebrae was utilized when possible and 2 cc. of spinal fluid allowed to flow into the ampule containing the crystalline drug. This solution was immediately injected slowly without barbotage and the patient placed in the supine position. Draping was then performed and the operation started.

Following several years of clinical experience in the University of Michigan Hospital, 100 mg. of procaine hydrochloride has been accepted as the standard dosage necessary to give sufficient anesthesia

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for a transurethral prostatic resection lasting a period of one hour. The dosage occasionally is increased for procedures of greater magnitude, such as resections of large glands, litholapaxy combined with transurethral resection, and suprapubic cystostomies.

The blood losses during transurethral prostatic resection were determined (2). It is interesting to note that in general greater losses occurred in the hypertensive group of patient with both anesthetic agents (table 1 and 2). The marked divergence in the average blood loss occurring in the two groups is owing to the fact that 4 patients in the monocaïne group had losses of 450 cc. to 500 cc., and probably has no significance. The exact relation to the blood pressure drop during anesthesia is difficult to determine.

TABLE 1

	Procaine HCl	Monocaïne Formate
Number of cases	120	97
Average age, years	67.6	66.6
Average hemoglobin, per cent	89.4	92
Average blood loss, cc.	145.2	138.5
Average operating time in minutes	48.9	46.3

TABLE 2

	Procaine HCl	Monocaïne Formate
Percentage with systolic drops over 20 mm. Hg.	44.2	57.7
Number of hypertensives	27	22
Number of hypertensives with drops over 20 mm. Hg. systolic	17	16
Percentage of hypertensives with drops over 20 mm. Hg. systolic	71	72.6
Number of nonhypertensives with drops over 20 mm. Hg.	36	40
Percentage of nonhypertensives with drops over 20 mm. Hg.	39.2	53.4
Average systolic drop over 20 mm. Hg. in hypertensives, mm.	55.7	47.9
Average systolic drop over 20 mm. Hg. in the nonhypertensives, mm.	39.5	33.9
Average diastolic drop in the hypertensives with systolic drops over 20 mm. Hg., mm.	29	19.9
Average diastolic drop in the nonhypertensives with systolic drops over 20 mm. Hg., mm.	16.2	13.7
Average blood loss in cases with systolic drops over 20 mm. Hg., cc.	152	256
Average blood loss in hypertensive cases with systolic drops over 20 mm. Hg., cc.	173	326

A dosage of 75 mg. of monocaïne formate was arrived at in the following manner. Eight patients who received 50 mg. demonstrated levels of sensory anesthesia about the symphysis pubis, but this dosage was insufficient for a one hour procedure and the anesthetic level is unsatisfactory for transurethral prostatic resections. In 8 patients who received 100 mg. sufficient anesthesia developed, but the level tended to rise to the eighth or ninth dorsal segment and was considered to be excessive. This tendency of the drug to diffuse readily in

the spinal fluid has been reported elsewhere (3). Therefore, 75 mg. was decided upon as the most satisfactory dosage, producing adequate sensory anesthesia for sixty to ninety minutes at a level between the pubis and umbilicus. This was carried out in 80 patients. One patient who had suprapubic cystostomy and fulguration of a papilloma received 150 mg.

For purposes of this study, considering the age group, a systolic blood pressure of over 170 mm. of mercury or a diastolic blood pressure of over 90 mm. of mercury was classified as hypertensive. A drop in systolic blood pressure of over 20 mm. during anesthesia was considered to be clinically significant. Analysis discloses that 72.6 per cent of the hypertensive patients in the monacaine group experienced systolic drops of over 20 mm. of mercury as compared to 71 per cent in the procaine group. In the nonhypertensive patients 53.4 per cent and 39.2 per cent, respectively, had drops of over 20 mm. of mercury. The average systolic and diastolic drop was consistently slightly lower in the monacaine group in both classes. Separate study of the transurethral resections, 90 in the monacaine group and 100 in the procaine group, disclosed no significant differences in the values (tables 2 and 3).

TABLE 3  
TRANSURETHRAL PROSTATIC RESECTIONS

	Procaine HCl	Monocaine Formate
Number of cases	100	90
Number of hypertensives	23	21
Number of hypertensives with a systolic drop over 20 mm. Hg.	14	15
Percentage of hypertensives with a systolic drop over 20 mm.	61	71.3
Average systolic drop in hypertensives over 20 mm. Hg., mm.	49.5	44.5
Average diastolic drop in hypertensives of the above group, mm.	25.2	20
Number of nonhypertensives with a systolic drop over 20 mm. Hg.	31	37
Percentage of nonhypertensives with a systolic drop over 20 mm. Hg.	40.3	53.6
Average systolic drop in nonhypertensives over 20 mm. Hg., mm.	39.5	31.8
Average diastolic drop in the above group, mm.	16.4	13.6

Aqueous sodium pentothal, 2.5 per cent, was used intravenously as a supplemental anesthetic agent in 10.3 per cent of the monacaine group and in 12.5 per cent of the procaine group, with an average dosage employed of 28.2 cc. and 23.5 cc. respectively. Inhalation nitrous oxide was used to supplement anesthesia in 1 patient in the monacaine and in 2 patients in the procaine group. Oxygen alone was administered to 15 patients of the procaine group.

Nausea and vomiting was noted in 3 patients of the monacaine and in 4 patients of the procaine group (7 in the latter group had nausea

alone). Postoperative nausea occurred in one patient with monocaine and in 9 patients with procaine. Postoperative hypotension of over eight hours' duration was experienced in 10 patients with monocaine and in 11 patients with procaine anesthesia.

No deaths resulted from anesthesia.

From this study it is concluded that 75 mg. of monocaine formate is as effective as 100 mg. of procaine hydrochloride for low spinal anesthesia in the types of surgical procedures studied. The untoward reactions are about equal with both drugs.

REFERENCES

1. Co Tui; Preiss, A. L.; Burstein, C. L., and Ruggiero, W. F.: Animal Standards for Acute Toxicity of Spinal Anesthetic Agents, *J. Pharmacol. & Exper. Therap.* **75**: 137-144 (June) 1942.
2. Nesbit, R. M.: *Transurethral Prostatectomy*, Springfield, Thomas, 1946, p. 91.
3. Burdick, D. L., and Rovenstine, E. A.: Monocaine Formate, Its Application in Spinal Anesthesia, *Anesthesiology* **3**: 514-521 (Sept.) 1942.

JOINT MEETING OF THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS, INC., AND THE OHIO SOCIETY OF ANESTHESIOLOGISTS

HOTEL COMMODORE-PERRY, TOLEDO, OHIO

October 1 and 2, 1948

PROGRAM

FRIDAY, OCTOBER 1, 1948

9:00 a.m. (Papers will be limited to 20 minutes unless otherwise specified. General discussion after each paper 10 minutes if necessary, with call for discussion from various members from the floor.)

1. Anesthesia for Children, Earl P. Kniseley, M.D., Columbus, Ohio.
2. The Care and Sterilization of Anesthetic Equipment, Donald F. Hale, M.D., Cleveland, Ohio.
3. Segmental Spinal Anesthesia, A. L. Schwartz, M.D., Cincinnati, Ohio.
4. Postoperative Blocks for Control of Pain, J. J. Jacoby, M.D., Columbus, Ohio.
5. Hypospray, Robert A. Hingson, M.D., Baltimore, Maryland.

2:00 p.m.

1. Business Meeting—American Society of Anesthesiologists, Inc.
2. Anesthesia for Brain Surgery, A. J. Kuehn, M.D., Toledo, Ohio.

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