

## EFFECT OF DEMEROL ON THE CEREBROSPINAL FLUID PRESSURE\*

EDITH ROTH KEPES, M.D. †

*Denver, Colorado*

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SINCE Eisleb and Schauman (1) introduced the synthetic compound methyl-4-phenylpiperidine-4-carboxylate (demerol, dolantin, mepidine, D-140, and so forth) in 1938, the drug has become popular and widely used for its analgesic, spasmolytic and sedative properties. Rovenstine and Batterman (2) used demerol in 1942 as a substitute for morphine in the preoperative medication of patients, and Brotman and Cullen (3) suggested that it be employed as a supplement to nitrous oxide anesthesia.

The purpose of this investigation was to find out the suitability of demerol as a preoperative and supplemental agent in anesthesia for cranial operations or for traumatic surgical procedures on patients who have cranial injuries, and for patients in whom a change in intracranial pressure is undesirable. Morphine and barbiturates (amytal and luminal) have been investigated by Finesinger and Cobb (4). The results showed that in 25 cats given morphine intravenously, the cerebrospinal fluid pressure increased from 4 to 34 per cent of the initial figure; in 15 cats given amytal, the pressure increased from 9 to 52 per cent, and in 14 cats given luminal, the elevation ranged from 4 to 33 per cent. Guttman (5) administered demerol to 20 patients with intracranial lesions of various kinds. In 7 of the 20 patients the respiratory rate fell to 12 or less per minute. He pointed out that the drug should be administered with caution, if at all. No measurements of intracranial pressure, however, were mentioned.

### METHOD OF INVESTIGATION

Thirty-two unselected consecutive patients, who had various surgical disorders and who were scheduled for spinal anesthesia, received medication on the day of operation. There were 5 women and 27 men. The ages ranged from 32 to 82 years. A spinal puncture was performed in the third or fourth lumbar intervertebral space with a 20-gauge needle, the patient lying in the lateral recumbent position with

\* From the Denver General Hospital, Denver, Colorado.

† Assistant Professor, Division of Anesthesiology, Department of Surgery, University of Colorado School of Medicine, Denver, Colorado. Present address, 240 Cabrini Boulevard, New York 33, New York.

the head at the same level as the lumbar spine. A spinal water manometer was attached. When the fluid reached a constant level, the initial control reading was made. Systolic and diastolic blood pressure readings were taken throughout. Morphine sulfate, 6.4, 10.6 or 16 mg., was given to 5 patients. Demerol 50, 75 or 100 mg. was given to 27 patients. Each drug was slowly injected intravenously. The dose was selected according to the age of the patients. Cerebrospinal fluid pressure and blood pressure readings were made every two or three minutes for ten to twenty minutes, depending on the time available in a busy operating

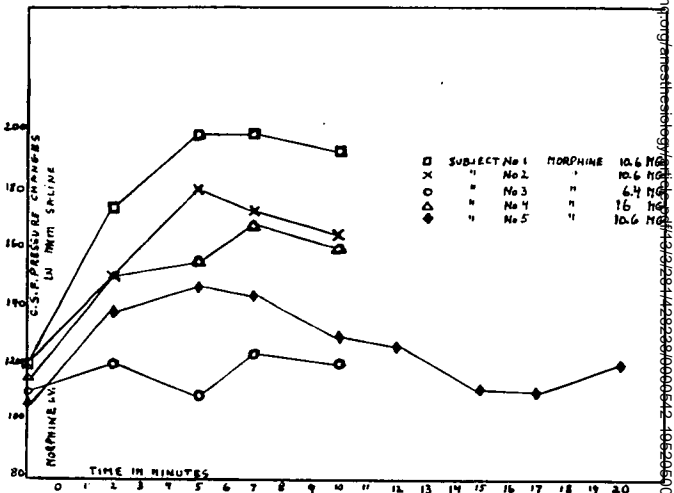


FIG. 1. Changes in cerebrospinal fluid pressure after intravenous administration of morphine.

room. Patients were cooperative and relaxed, especially after the morphine or demerol had taken effect.

### RESULTS

Figure 1 shows the results obtained in the 5 patients given intravenous injections of morphine sulfate. Case 3, a 77 year old man, received 6.4 mg. of morphine. The rise of cerebrospinal fluid pressure was only 12 mm. of water. In the other 4 cases, in which 10.6 to 16 mg. was given, a rise of 40 to 82 mm. of water occurred.

In table 1 the data on the 27 patients who were given demerol are summarized.

TABLE 1  
CEREBROSPINAL FLUID PRESSURE AND BLOOD PRESSURE AFTER INJECTION OF DEMEROL

Expt. No.	Sex	Age	Demerol, mg.	Control Values		After 2 Min.		After 5 Min.		After 7 Min.		After 10 Min.		Percentage Elevation, Per Cent
				CSF, mm. H <sub>2</sub> O	BP, mm. Hg	CSF, mm. H <sub>2</sub> O	BP, mm. Hg	CSF, mm. H <sub>2</sub> O	BP, mm. Hg	CSF, mm. H <sub>2</sub> O	BP, mm. Hg	CSF, mm. H <sub>2</sub> O	BP, mm. Hg	
1	M	71	50	64	70	200	82	200	90	200	86	200	40.6	
2	M	77	50	82	104	160	102	160	94	144	94	144	20.8	
3	M	75	50	96	96	160	86	150	106	150	118	140	23.9	
4	M	66	50	120	170	100	110	190	118	—	120	170	0.0	
5	M	77	75	76	68	160	66	105	78	155	87	140	14.4	
6	M	66	75	160	120	164	162	150	162	150	168	150	5.0	
7	M	71	75	105	130	100	106	120	110	—	106	130	4.7	
8	M	62	75	204	140	228	216	130	220	—	226	120	23.0	
9	F	76	75	176	150	220	154	170	200	170	250	175	64.2	
10	F	66	75	158	135	144	170	130	180	120	200	125	26.5	
11	M	65	75	146	150	150	202	150	240	144	230	138	64.3	
12	M	75	75	152	240	166	196	240	158	220	172	220	28.9	
13	M	82	75	40	120	33	64	105	68	105	64	120	70.0	
14	M	77	75	62	175	52	56	168	56	170	53	170	Decrease	
15*	M	76	75	140	170	178	190	160	220	145	208	150	57.0	
16*	M	77	75	145	120	140	120	120	180	120	182	130	28.9	
17	M	49	100	152	130	150	230	150	290	160	290	155	90.7	
18	M	46	100	206	190	218	242	185	240	170	244	160	20.8	
19	M	66	100	120	140	126	134	136	168	140	166	138	40.0	
20	F	33	100	140	115	164	112	220	260	108	258	110	85.7	
21	M	33	100	218	140	238	266	136	264	130	262	130	22.0	
22	M	74	100	134	130	190	125	214	158	125	138	125	59.7	
23	M	60	100	68	110	52	66	120	90	—	82	105	32.3	
24	F	40	100	185	180	220	200	180	235	185	236	175	27.5	
25**	M	63	100	108	120	162	164	120	194	120	192	120	70.6	
26**	F	47	100	90	100	110	140	120	142	120	130	120	57.7	
27**	M	40	100	130	110	136	154	110	170	110	170	110	30.7	

\* In Cases 15 and 16, twenty minutes after injection of 75 mg. of demerol, the cerebrospinal fluid pressure had decreased to 148 mm. and 174 mm. of water and the blood pressure to 140 mm. and 120 mm. of mercury, respectively.  
 \*\* In Cases 25, 26, and 27, twenty minutes after injection of 100 mg. of demerol, the cerebrospinal fluid pressure was 110 mm. of water and the blood pressure reading was 120 mm., 120 mm., and 110 mm. of mercury, respectively.

Four patients were given 50 mg. of demerol. In 3 cases, the cerebrospinal fluid pressure increased from 22 to 26 mm. of water, with an average of 25.3 per cent.

Twelve patients were given 75 mg. of demerol. In one case the cerebrospinal fluid pressure decreased 10 mm. of water. In the other 11 cases the pressure rose from 1 to 114 mm. of water. In 3 cases the rise was over 80 mm. of water. The average rise was 31.4 per cent.

Eleven patients were given 100 mg. of demerol. In all 11 cases, the cerebrospinal fluid pressure rose from 22 to 120 mm. of water. In 4 cases the rise was over 80 mm. of water. The average rise was 49.8 per cent.

Figure 2 demonstrates that the average pressure rise of the cerebrospinal fluid is directly related to the dose administered.

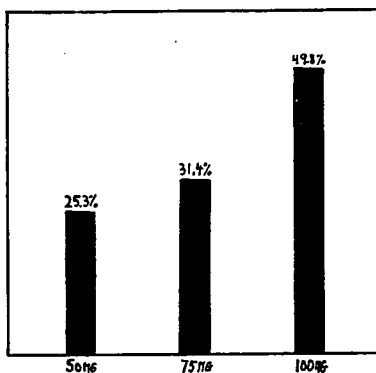


FIG. 2. Average changes of cerebrospinal fluid pressure after injection of demerol.

Figure 3 shows measurements of cerebrospinal fluid pressure up to twenty minutes after the administration of demerol. The peak of the rise occurred five to seven minutes after its administration. After this time an adjustment took place and, although the pressure did not return to its original level after twenty minutes, a tendency to return to the original level was observed.

Another observation of interest is that there was no correlation between the blood pressure readings and changes in the cerebrospinal fluid pressure. In the doses of demerol and morphine employed in this investigation, the systemic blood pressure remained unchanged, rose or fell slightly. This supports the view of Browder and Meyers (6), who have shown clinically and experimentally that there is no relationship between the cerebrospinal fluid pressure and systemic blood pressure unless the level of the former reaches the diastolic or mean blood pres-



and during the time investigated. The amount of demerol injected was directly related to the rise of cerebrospinal fluid pressure.

Morphine used in a like manner gave results similar to those with demerol.

This property of demerol of raising the cerebrospinal fluid pressure should be considered and the drug used with caution or avoided altogether in patients who have intracranial diseases which are accompanied by elevation of intracranial pressure or in which a rise in cerebrospinal fluid pressure is undesirable.

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### ANNUAL MEETING OF THE AMERICAN MEDICAL ASSOCIATION

CHICAGO, ILLINOIS—JUNE 9-13, 1952

#### SCIENTIFIC EXHIBITS

The Scientific Exhibits on anesthesiological subjects which will be presented at the Annual Meeting of the AMA in Chicago are listed below:

#### Continuous Measurement of CO<sub>2</sub> Concentrations During Anesthesia.

James O. Elam, Raymond H. Ten Pas, Elwyn S. Brown, and Douglas W. Eastwood, Washington University School of Medicine and Barnes Hospital, St. Louis.

#### Mobile Anesthesia Unit for Field Use.

Lieut. Col. Fred C. Dye, USAF (MC), Sampson Air Force Base, Geneva, N. Y.

#### Accidents and Complications of Local Anesthesia.

John Adriani and John Parmley, Louisiana State University Medical School and Charity Hospital, New Orleans, La.

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