INTRAVENOUS PROCAINE AS AN ANALGESIC AND THERAPEUTIC PROCEDURE IN PAINFUL, CHRONIC NEUROMUSCULOSKELETAL DISORDERS

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This preliminary report is a summary of our experience with procaine solution given intravenously as an analgesic and therapeutic measure in painful, chronic, nontraumatic, neuromusculoskeletal disorders. This procedure has been reported to be an effective method of treatment for a variety of disturbances. Pain, especially, has been said to be greatly relieved or abolished in many of these acute and chronic conditions.

Our chief objective, therefore, was to observe the reported lasting control of pain provided by infusions of procaine solution. It was also our aim to determine the responsiveness of any associated symptoms and signs. Our results so far have been so different from those in a number of recent presentations on this new subject that our observations on this limited series of cases are being reported at this time.

Method

The treatment was conducted on the medical service. Our series of cases consisted of patients with painful, chronic, nontraumatic, neuromusculoskeletal disorders admitted directly for hospitalization, or referred for the purposes of this study from the out-patient department. A leading symptom, if not the only one, in all of these patients was pain. Suspected conversion syndromes were excluded. Although it was not practical to standardize our approach in all details, this study was planned to provide carefully controlled therapeutic observations. The routine followed was to employ procaine hydrochloride in a dosage of 6 mg. per kilogram, given usually through a 19 gage needle, in twenty to thirty minutes. The procaine solution was prepared by aspirating the contents of an ampule containing 5 cc. of 20 per cent "novocain" solution, then adding this material to a liter of physiologic saline solution or, in some cases, to distilled water when the administration of sodium ions was contraindicated. The resulting 0.1 per cent solution of procaine was vigorously agitated immediately prior to use.

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to assure diffusion of the drug. As a rule the solution was prepared on the day of administration.

Immediately before beginning the procaine infusion, a record was made of the status of pain and of all other relevant symptoms and signs, such as tenderness, swelling, limitation of motion, as well as the findings in such special examinations as the Lasegues sign or Patrick test, and any other helpful objective data. Tenderness was measured quantitatively by means of a calibrated pressure gage, the palpometer, and the presence of cutaneous hyperalgesia was noted. During the infusion and immediately afterwards, the same factors were evaluated. They were rechecked and recorded at regular intervals.

When a patient failed to obtain relief following one infusion, a second was administered, usually two days later. If this one, too, failed to produce any therapeutic response, no further infusions were given. When improvement was noted definitely an infusion of an equal amount of saline solution or distilled water was carried out after one or more days following the last procaine treatment, when the complaints returned to their original severity or when incomplete relief persisted. The same number of saline infusions was given in an effort to distinguish whether the effect of the procaine solution represented the patient's suggestibility or a specific therapeutic response.

To avoid altering the subjective reactions to the intravenous therapy, premedication was not used. After our first few experiences, the patients were kept under close observation during the procaine infusions, with intravenous barbiturate and epinephrine at hand to counteract any severe toxicity. Preliminary intradermal testing for procaine sensitivity was carried out initially. In order not to prejudice the patients, favorably or otherwise, we avoided any leading questions, comments or bedside discussion. The nature of any of the medication was not revealed. If the patient sought information, he was told that what he was getting might or might not benefit him.

Criteria for Evaluating Results

In evaluating the therapeutic action of intravenous procaine we were guided by two considerations: (1) does this procedure provide lasting analgesia, at least superior to that of simple parenteral administration of available analgesics, and (2) does it produce adequate cumulative effects on the pain? To answer these questions the results were classified as complete or major improvement, moderate lasting or transient improvement, and minor transient or nonimprovement, according to the influence on pain chiefly, and also on the other symptoms and signs.

In complete or major improvement, "complete" refers to total relief of pain for twenty-four hours or more. "Major" means considerable but not entire relief of pain for twenty-four hours or longer. "Moderate and lasting" or "marked but transient" improvement
signifies slight effects on pain that were prolonged but unimpressive, or definite for the duration of the treatment only. "Minor and transient relief" indicates a slight but so insignificant an effect as to be classed with no improvement.

RESULTS

As listed in table 1, of the 6 patients with low-back pain, one could not be tested by a control owing to his subjective and objective improvement, which was complete and lasting. One of the patients experienced equivocal relief, but he also responded to saline infusions, although not as well. The symptoms were unaffected, or relief fleeting, in 4 cases.

**TABLE 1**

<table>
<thead>
<tr>
<th>Type</th>
<th>No. of Cases</th>
<th>Complete or Major Improvement</th>
<th>Moderate and Lasting, or Marked but Transient Improvement</th>
<th>Minor and Transient or No Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low-back pain</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2. Rheumatoid arthritis</td>
<td>8*</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>3. Osteoarthritis</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4. Shoulder-hand syndrome (reflex dystrophy of upper extremity)</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5. Miscellaneous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Painful amputation of stump</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Undiagnosed arthropathy</td>
<td>1†</td>
<td>0</td>
<td>1</td>
<td>(?(?))</td>
</tr>
<tr>
<td>Periarthritis nodosa</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Painful hallux</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Coecalgynia</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Painful shoulder</td>
<td>1†</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sciatica</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Multiple reflex dystrophy</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Facial neuralgia</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Focal arthritis</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Posttraumatic atrophy</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>1</strong></td>
<td><strong>4</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

* One patient treated by intramuscular administration.
† Died, probably as a result of procaine toxicity.
‡ Treatment was discontinued after 50 cc. was administered owing to muscular twitching. This patient was uremic and probably had increased neuromuscular irritability.

The 8 patients with active rheumatoid arthritis showed only an evanescent response or none at all. Two of them were given an additional procaine infusion of 1000 cc., a total of 1 Gm. of procaine, without relief of symptoms.

Of 4 patients with osteoarthritis, one who responded fairly well was an elderly suggestive woman who reported far less subjective response to saline solution. Objectively, her condition remained unchanged.
One patient with shoulder-hand syndrome showed some increased range of motion only at the shoulder during the treatment, but the hand signs were uninfluenced.

The patient with coccygodynia who responded favorably did not have associated tenderness or other objective signs at the coccyx. The patient's complaints were complicated by "burned-out" tabes dorsalis, with a marked syphilophobia. His pain improved almost as well after saline infusions. Later he obtained some relief from intramuscular placebo injections at our clinic.

The fatal case was that of a 69-year-old woman with painful, poly-articular involvement of uncertain nature, suggestive of rheumatoid arthritis. Shortly after the infusion began, the patient experienced a chill, with cold perspiration and generalized tremor. The infusion was discontinued. There was no fever. Barbiturate was given, but she became dyspneic, cyanotic and unconscious. She died seven hours after the beginning of the infusion. An electrocardiogram had previously shown signs of left ventricular strain. A repeated tracing during this episode was not different, except for sinus tachycardia (170). The patient had been on maintenance doses of digitalis, and quinidine was started. Necropsy was not obtained. It may be assumed that this death probably was caused by toxicity from, or hypersensitivity to, procaine. This was the second patient treated and the close observation adopted later was not carried out in this case.

In 1 patient treated by intramuscular administration the characteristic dizziness developed shortly after the injection was discontinued, and it was concluded absorption by this route apparently is rapid, at least in some individuals.

The toxic manifestations observed, except those already described, were: dizziness, headache, metallic taste, drowsiness, nausea, a feeling of tremor in the extremities without externally discernible trembling, numbness of fingertips, hoarseness, and filminess before the eyes. Of these side-effects, dizziness was by far the most common. It usually developed shortly after the infusion was started and it subsided soon after it ended.

The previously described ability (1) of intravenous procaine to produce vasodilation was manifested by the feeling of warmth often noted, and the tendency in some cases toward a rise in the skin temperature of 1 to 2 degrees. An effort was made to ascertain whether the pain threshold was elevated by means of a pressure gage permitting application of quantitative stimulation to the same site before, during and after treatment. Although the series was too small to permit final conclusions, and sometimes no change was noted, in the majority of cases a temporary elevation in the pain threshold to this type of stimulus was reflected during the treatment, and for a short while afterward in a few patients.

Owing to the distinctive dizziness usually produced by intravenous
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procaine and the other occasional toxic effects, patients often have the feeling that they are receiving something new and powerful.

SUMMARY

Intravenous procaine solution, in larger quantities or doses at each treatment than those reported to be effective in relieving pain and producing other clinical improvement, was given to 33 patients who had a variety of painful, chronic, nontraumatic, neuromusculoskeletal disorders.

The evaluation of results and of their duration was based on relief of pain as the chief subjective criterion; also on the response of other symptoms and of the physical signs to the procaine therapy and to intravenous saline infusions as controls.

In this series the analgesic action of intravenous procaine solution was usually slight and transient when it occurred. Objective, controlled evidence of lasting improvement followed repeated infusions of procaine occurred in only 1 case. Four of the patients showed moderate, prolonged response or marked improvement for the duration of the infusion or slightly longer.

In this small group of cases with a variety of painful, chronic conditions, the therapeutic effects following the intravenous administration of procaine solution were too infrequent and transient to constitute this method as a reliable and general form of treatment for relief of pain and associated features.

REFERENCES