

Stellate Ganglion Block: Normal Saline as Placebo

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Saline has been recommended as a placebo injection when performing diagnostic nerve blocks. One clinical testing paradigm used in the diagnosis of pain syndromes of the lower torso and lower extremities is the differential spinal.¹ This involves injection with a placebo followed by the instillation of increasing concentrations of local anesthetic into the lumbar cistern. Nerve fibers have a variable degree of sensitivity to local anesthetics based on the fiber diameter, such that the weakest concentration should interrupt only sympathetic fiber activity, the next concentration should effect somatic nerve activity, and the highest concentration should block motor activity at the anesthetic level achieved by the drug. Based on the patient's response to interview and examination during each phase of the procedure, it is presumed that one can locate which types of nerves are operant in the present pain problem, and appropriate therapeutic decisions can then be made. A strategy that is similar in content has been devised for a diagnostic differential neural blockade of the upper extremity. This involves a saline placebo injection of the stellate ganglion, a stellate ganglion block with local anesthetic, and a brachial plexus block.¹ This approach advocates the use of various psychologically oriented treatments if a response to placebo is obtained, as opposed to further somatic intervention. This rationale, of course, presumes that normal saline injected into the region of the stellate ganglion has no effect. This has never been demonstrated. The work of Urban and McKain,² however, suggested that the saline placebo injection done as part of a differential spinal may actually have some measurable effect on sympathetically mediated functions. If this is indeed the case, it would confound the interpretation of the results of the test. We were curious as to whether saline might have

some effect on the sympathetic fibers of the stellate ganglion that may similarly influence the outcome of a diagnostic placebo injection of that region.

MATERIALS AND METHODS

Twenty volunteers between the ages of 21 and 42 yr gave informed consent to participate in the study. The study was granted prior approval by our Human Research Review Committee. Subjects were excluded if they had any history or physical signs consistent with carotid or vertebral artery disease, infection of the soft tissues of the neck, coagulopathy, or any major medical problem. Subjects taking anticoagulants, antimuscarinics, or antihypertensives were not allowed to participate.

Prior to the injection, the subject had the monitoring equipment placed in the following manner: a digital plethysmography device (DataScope® Pulse Sensor) was placed on the person's left index finger; a temperature probe from a YSI 43TA Telethermometer was secured with clear adhesive tape to the plantar surface of the pad of the long fingers of both hands; and pregelled disposable silver/silver chloride electrodes (Ar-Med® Industries, Ltd.) were placed on the palmar skin of the left hand to record the skin conductance level (SCL) and the skin conductance response (SCR).³⁻⁵ A J&J® GSR/SPR Model R-71 was used to obtain the SCL and SCR. A Datascope ECG model 850A received the input from the digital plethysmography sensor. The output of all of the measuring equipment was recorded on a recorder which was run at a speed of 5 mm/min. The SCL/SCR channel was calibrated to a full scale of 50 microMhos, while the temperature channels were adjusted to read a 10° C scale over eight divisions, with the center of the scale being 30° C. The gain on the digital plethysmography tracing was adjusted to give a tracing that covered approximately one-half the scale. A sample recording from a patient receiving a local anesthetic stellate ganglion block is shown in figures 1 and 2.

The subjects were then left alone in a recumbent position to record baseline measurements for at least 5 min prior to the procedure. To decrease variability, all injections were performed on the subject's left side by the same investigator (REK), using a standard technique.⁶ A total of 10 ml of preservative-free 0.9% saline

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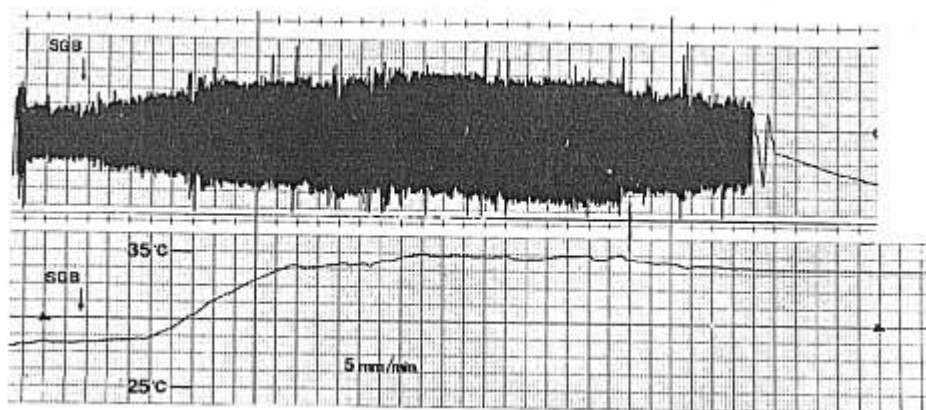
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FIG. 1. Recording after local anesthetic stellate ganglion block. Top tracing is digital plethysmography. Bottom is finger temperature. Arrow denotes stellate ganglion block.



(Elkins-Sinn, Cherry Hill, NJ) was injected through a 22-gauge, 3.81 cm B-bevel needle. After the stellate ganglion injection, the subject was allowed to rest quietly for 20 min while the variables described above were recorded.

The results were interpreted by analyzing the recordings for: 1) a unilateral temperature rise of greater than 1°C , 2) a sustained increase in the amplitude of the digital plethysmography tracing, 3) a decrease in the SCL; or 4) a diminished or absent SCR to auditory or pinprick stimuli or valsalva maneuver.

RESULTS

Changes consistent with sympathectomy to a measurable degree were not seen in any of the subjects. The only consistent change noticed was a transient bilateral decrease in skin temperature preceding the block (fig. 3). The skin temperature returned to baseline or slightly above baseline levels after the block. The SCL tended to drift upwards (higher conductance) with time which is due to the electrolyte permeating the stratum

corneum more completely with increased contact time. The SCR showed no alteration after the normal saline injection. The digital plethysmography tracing showed no increase after the procedure (fig. 4).

DISCUSSION

Differential blocks have been described as being helpful in discerning different causes of pain problems. The first step in performing differential blocks is to do a placebo injection. This presumes that the agent used is, indeed, a placebo. The work of Urban and McKain² casts doubt on whether preservative-free physiologic saline is a placebo when used intrathecally. The present study failed to show any sympatholytic effect of physio-

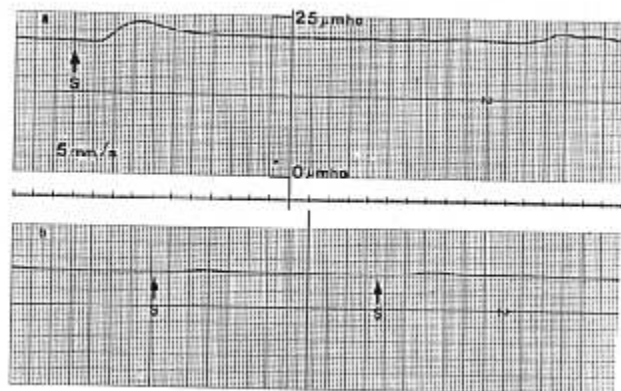


FIG. 2. Skin conductivity before (a) and after (b) local anesthetic stellate ganglion block. Auditory stimulus (S) produces attenuated response after block.

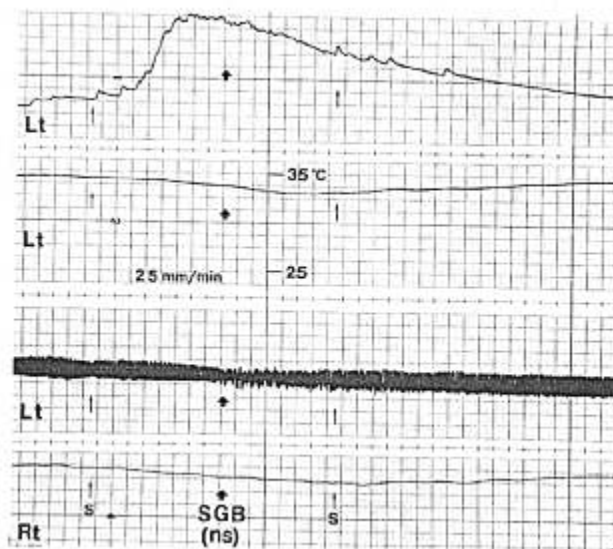


FIG. 3. Recording from study subject. Tracing 1 is skin conductance. Tracings 2 and 4 are skin temperature. Tracing 3 is digital plethysmography. Thin arrow denotes stimulus. Thick arrow denotes saline injection.

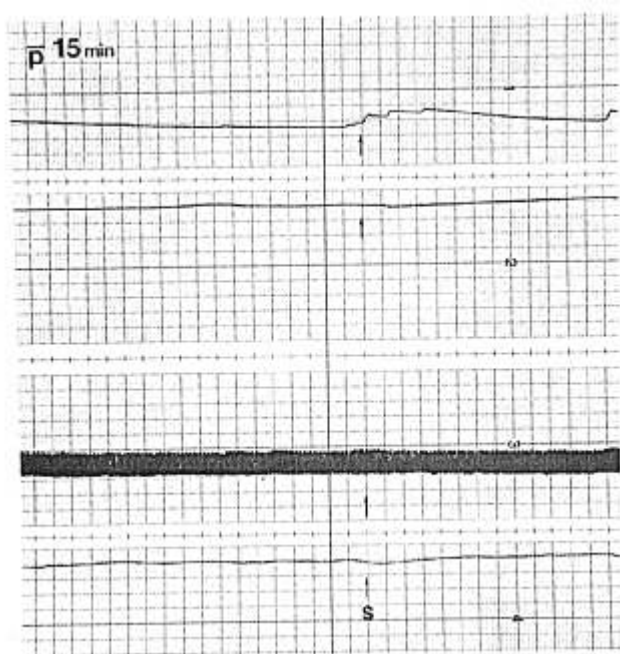


FIG. 4. Same subject as figure 3, 15 min after saline block. Thin arrow denotes stimulus. Note persistence of skin conductance response, no temperature change, and no change in amplitude of the digital plethysmography tracing.

logic saline when injected into the region of the stellate ganglion. Benzon *et al.*⁷ reported on two cases wherein Horner's syndrome, nasal stuffiness, a slight temperature increase in the affected extremity, and partial relief of nondermatomal burning pain occurred following a stellate ganglion block with preservative-free physiologic saline. The symptoms were further abated by the subsequent injection of 0.25% bupivacaine into the ganglion. One possible explanation for this would be that perhaps the stellate ganglion in patients in whom there exists an aberration of the sympathetic nervous system is more susceptible to mechanical or hydraulic forces from a saline injection than in normal subjects. This possibility is currently being investigated by the authors.

The transient decrease in bilateral finger temperature observed in all of our subjects during palpation of landmarks and needle placement is presumed to be due to a generalized increase in sympathetic activity in anticipation of having the injection. This would result in vasoconstriction and a detectable decrease in skin temperature. After the injection, the subjects relaxed and the sympathetic tone decreased allowing the skin temperature to return to baseline values.

One explanation of our results could stem from improper needle placement. Since all of the injections were done by one person, and needle position was confirmed by contact of the bevel with the anterior tubercle of the transverse process of the sixth cervical vertebra in all subjects, we feel that correct needle placement was obtained.

We believe that several forms of indicators of sympathetic function should be employed when the performance of a physiologic saline stellate ganglion block is done as part of a differential blockade procedure. We expect, based on this research and the relative lack of reports in the literature to the contrary, that any measurable degree of sympathectomy following saline stellate ganglion block would be rarely encountered in clinical practice.

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