A Foot Controlled Injection Device: A Step towards Enhancing Trainee Education Operator Independence during Neural Blockade

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Background and Objectives

Limitations in manpower in health care facilities both in civilian and in combat settings can severely affect patient safety as well as overall outcomes. One challenge in the acute setting is the treatment of pain caused by trauma or by surgical procedures. Regional anesthesia via neural blockade is an effective means of managing uncontrolled acute pain. Uncontrolled acute pain has been associated with cardiopulmonary, endocrine, immunologic, and hematologic derangement in addition to the development to the development of potentially life-threatening coagulopathy. Training residents and junior attendings to perform these blocks in less than optimal environments (diminished staff availabilities, severe time and ergonomic environments) is often a function of performing enough repetitions of a procedural technique to gain proficiency.[1-4] We have designed a remote-controlled injection device that may expedite the performance of regional nerve blocks in these situations.[5]

Our first objective was to evaluate a foot-controlled injection device in order to determine instructor and trainee preferences and tendencies. Some of these tendencies may provide insight into operator variability when teaching trainees block techniques. Certain operator preferences may be quantitated with the goal of arriving at a consensus of optimal, consistent teaching methods. At our institution, the remote-controlled injection device is a means of collecting several of these data.

Our second objective was to compare the times necessary to perform regional blocks using a pedal-based technique versus standard techniques for injection of local anesthetic.

This objective will examine the time it takes for completion of various components of the neural block in the ergonomic settings in which common nerve blocks are performed. Data will be recorded from the trial of each of the examinees in each blockade setting. The mean times for examinees in each discipline and at each training level will be compared.

Methods

We have designed a foot controlled injection device that may expedite the performance of regional nerve blocks in these situations.[5]

The first objective of this study was to determine the ergonomic and operational preferences that guided the development of the device. To accomplish this a focus group of 32 Anesthesiology clinicians of various practice and training levels was constructed. They completed a questionnaire created to examine trends in their procedural tendencies and preferences. The questions were
based upon the use of the foot controlled syringe pump. The respondents’ preferences were documented in the tables and graphs below.

The second objective of this work was to compare the device with more conventional or usual techniques, i.e., the two operator technique or the single operator technique using manual injection. The criteria to evaluate the device versus the usual techniques are the times to complete individual components of the nerve block.

Results

In addressing the first objective of our work we were able to determine the preferences of individuals within the focus group. These individuals had with relevant experience in technical procedures. A horizontal foot motion is preferred. There was no preference between a left or right direction of this movement. The participants reported that they believed tactile feedback is lost when a foot operated device is used. They requested addition of a monitor that indicates line injection pressure in real time.

In addressing the second objective of our work we have validated the hypothesis that the novel mechanism of performing a nerve block via the foot-controlled device is not clinically worse with regards to the specified endpoints within our experimental setup. This device may be feasible when the use of another technique (such as the classical procedure with two operators, or a single unassisted operator) proves cumbersome, unsafe or otherwise untenable.