Transcutaneous Electrical Nerve Stimulation After Cesarean Birth

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The purpose of this study was to determine if women who had Cesarean birth experiences and used transcutaneous electrical nerve stimulation as a means of pain control requested less pain medication and had shorter hospital stays than those who did not use TENS. I reviewed the medical charts of 72 women (46 using TENS, 26 not using TENS) retrospectively. Significantly less ($F = 5.77$; $df = 1,65; p < .02$) meperidine hydrochloride was administered to the women who used TENS. The length of hospital stay of women using TENS was not significantly different than those who did not use TENS. My findings suggest that the use of TENS after Cesarean birth may result in decreased usage of medication and, therefore, a reduction of the side effects of the medication both to the mother and the infant.

Key Words: Cesarean section; Electric stimulation; Pain, postoperative; Puerperium.

The use of transcutaneous electrical nerve stimulation as a new technique of pain control has increased since its prototype was developed in 1971. Although TENS was first used to screen prospective patients for surgical placement of dorsal column stimulators, its usage has expanded as a means of pain control for postsurgical patients. Hymes et al, VanderArk and McGrath, Cooperman et al, Solomon et al, Ali et al, and Schomburg and Carter-Baker have reported that TENS is effective in controlling postoperative pain. In addition to pain reduction by the use of this nonnarcotic, noninvasive technique, patients also were reported to have a reduction in the incidence of postoperative complications (atelectasis and ileus); a decrease in length of stay in intensive care; an earlier, increased mobility and activity level; an ability to cough and breathe deeply without significant pain; and a decrease in the use of narcotics for pain control. Unwanted side effects attributed to the use of narcotics for pain control (respiratory depression, nausea and vomiting, constipation, mood alteration, mental clouding, and the potential for narcotic dependency) are diminished or eliminated with the use of TENS as a postoperative analgesic.

Surgical patients who would seem to benefit from these nonnarcotic analgesic properties of TENS are mothers who are post-Cesarean birth. Like other surgical patients, they would benefit from a decreased chance of respiratory depression and atelectasis, stimulation of bowel activity and decreased ileus, increased ability to cough and breathe deeply, increased early mobility, and decreased use of narcotics. This last benefit would affect not only the mothers but also the breast-fed infants of these mothers. In addition, women whose pain is controlled by nonnarcotic means may be more alert and better able to interact with their infants in the early postpartum period.

This study was designed to determine if mothers who have given birth by Cesarean section do, in fact, take fewer narcotics to control pain when using TENS as a postoperative analgesic and to determine if the hospital stay of mothers using TENS is shorter than their non-TENS counterparts. My expectations were that narcotics use would be less and hospital stay would be shorter for the women who used TENS. I reviewed retrospectively the medical charts of 72 women who gave birth by Cesarean section at one hospital.

METHOD

I studied the medical charts of 72 women ranging in age from 17 to 45 years. Forty-six women had received TENS postoperatively as a method of pain control, and 26 had not. Charts were chosen randomly from the time periods of August 1981 to April 1982 (non-TENS patients) and March to December 1982 (TENS patients). In approximately March-April 1982, this hospital began to use TENS as a standard means of pain control after Cesarean births. All women were told that pain medication was available if needed. Preoperatively, when possible, or postoperatively, a member of the physical therapy staff instructed those who received TENS in its use according to a specific format. The women were told that they could alter the intensity of the stimulation as they felt necessary.

Stimpulse 6067* TENS units with EPC† carbon electrodes were used. The physician or nurse placed the electrodes on the patient 0.5 in to 1 in² from each side of the transverse incision while the patient was in surgery and activated the stimulator immediately. The pulse rate was set at approximately 100 pulses per second and the pulse width at 140 to 170 usec (to control acute pain according to the gate theory); the patient controlled the intensity according to her comfort. The TENS units were worn continuously until the woman felt she no longer needed it or until she took a

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*Stimtex Stimpulse Stimulator, Codman & Shurtleff, Inc, Randolph, MA 02368.
†Medtronic Neurostrip Sterile Postoperative TENS Electrodes, Medtronic, Inc, Minneapolis, MN 55440.

36 PHYSICAL THERAPY
The physical therapy staff checked the units twice daily and the nursing staff checked them once a shift to ensure proper operation.

In addition to the woman's age and the use or nonuse of the TENS unit, the following data were collected from the medical charts: 1) hospital stay in hours, 2) milligrams of meperidine hydrochloride (Demerol®) administered (injection) each postoperative day, 3) milligrams of acetaminophen and codeine (Tylenol® with codeine) taken each postoperative day, 4) whether the patient was of the Amish religious denomination, and 5) whether the hospitalization was self-paid or third-party paid.

The first three categories of data were collected to determine the correlation, if any, between each of them and the use or nonuse of TENS. The data concerning Amish religious affiliation were collected in case women of this religion tended to be more stoic and request less pain medication than did women who were not Amish. (The general population in the area of the hospital is heavily Amish.) The data concerning the type of payment for hospital stay were collected in the event that women who were self-paying tended to leave the hospital at the earliest possible time, rather than remain the optimal time if it were longer.

Data Analysis

The data were submitted to an analysis of variance (ANOVA) with a 2 x 2 x 2 factorial design and to Duncan's multiple range test. The dependent variable was hospital stay in hours; the three independent variables were use of TENS, Amish affiliation, and type of payment. In addition, a second ANOVA was computed with milligrams of meperidine hydrochloride taken and milligrams of acetaminophen and codeine taken as the dependent variables. The independent variables remained the same.

RESULTS

The difference in hospital stay in hours between those who used TENS and those who did not was not found to be statistically significant; this also was true of the correlation between hospital stay in hours and Amish religious affiliation. The difference in hospital stay in hours between those who relied on insurance for payment and those who paid themselves, however, was found to be statistically significant ($F = 4.87; df = 1.65; p < .03$) (Fig. 1). Those patients who paid themselves had a significantly shorter hospital stay (121.92 hours) than those who had third-party payment (143.15 hours). Table 1 is a summary of analysis of variance findings for length of hospital stay compared with TENS use, religious affiliation, and method of payment.

The difference in total meperidine hydrochloride taken between Amish and non-Amish affiliation was not statistically significant. The difference in total meperidine hydrochloride taken between the TENS users and the non-TENS users was statistically significant ($F = 5.77; df = 1.65; p < .02$) (Fig. 2). Those who used TENS took significantly less meperidine hydrochloride (270.65 mg) than those who did not (519.23 mg). A summary of ANOVA findings for total meperidine hydrochloride taken compared with TENS use, religious affiliation, and method of payment may be seen in Table 2.

The difference in total milligrams taken of acetaminophen and codeine compared to the usage of TENS, Amish religious affiliation, and type of payment were all found to be not statistically significant.

DISCUSSION

The results of my study concur with the findings of previous studies. The use of TENS to help control postoperative pain can decrease the amount of narcotic medication taken by the patient. My finding not only confirms those of other researchers, but also suggests a group of specific postsurgical patients who may benefit from the use of TENS rather than narcotics for pain relief. In addition to the benefits derived...
by other postsurgical patients, the post-Cesarean birth mother who uses TENS as a means of pain control has the added benefit of not transmitting the drugs to her infant through breast milk. An infant might receive a therapeutic dosage of the drugs over a 24-hour period of breast-feeding from a mother who is receiving medication to control her pain. This is an undesirable side effect. The use of TENS rather than narcotic medications to control pain possibly may allow the mother to participate more actively and with more enjoyment in the early care and interaction with her infant.

Because this study was conducted to evaluate the efficacy of a new program, neither sham TENS units nor placebo medications were used. Future studies, however, could be conducted on a prospective basis and could include these control groups. Although pain medication intake is not the only measure of pain, I used it in this study as the indicator of TENS effectiveness. Future studies might be more revealing if patients also were asked to complete a pain-intensity rating scale or a pain questionnaire. In a prospective study, patients might also be tested to determine if they are biased against the use of medication. This study did not reveal why the intake of meperidine hydrochloride was less but not the intake of acetaminophen and codeine in patients who used TENS. Perhaps, the analgesic effects of TENS could replace the more potent meperidine hydrochloride, whereas some pain medication (in this case, acetaminophen and codeine) was necessary for additional pain relief.

This study failed to support my expectation that patients who used TENS would have a significantly shorter hospital stay. Perhaps, factors other than pain have a greater influence on this variable.

Transcutaneous electrical nerve stimulation is not a panacea for postoperative pain control, but the results of this study and those of previous studies indicate that it can be an important adjunct to the use of medication for pain control. Furthermore, it can reduce the amount of medication necessary (and, therefore, the side effects) to relieve pain. This is especially important to the mother who has given birth by Cesarean section and to her infant.

CONCLUSION

The results of this retrospective study, which reviewed 72 medical charts, support the hypothesis that the use of TENS to control post-Cesarean birth pain can reduce the amount of narcotic medication taken to reduce pain. This information is important not only to potential patients but also to physical therapists who are taking increasingly greater roles in prenatal and postpartum care.

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REFERENCES