

Treatment of Renal Colic Using Intracutaneous Injection of Sterile Water

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ABSTRACT

Purpose: To evaluate the intracutaneous injection of sterile water in the treatment of renal colic.

Patients and Methods: One hundred patients with renal colic were randomly divided into two groups of 50 patients and underwent the treatment. In the first (study) group 0.5 ml of sterile water and in the control group, 0.5 ml of normal saline was intradermally injected. The severity of pain was assessed by visual analogue scale (VAS) system before and 30 and 90 minutes after the injection. Patients in whom the presence of stone was not proved were excluded from the study.

Results: Before the treatment mean pain severity in the study group was 9.86 ± 0.4 and in the control group was 9.96 ± 0.19 , so that the difference was not statistically significant ($p=0.12$). Thirty and 90 minutes after the injection, the means were 0.76 ± 2.3 and 1.02 ± 2.63 in study group and 5.94 ± 4 and 6.7 ± 4.19 in control group, respectively. The results in 30 and 90 minutes between the two groups were statistically significant ($p=0.000$ and $p=0.000$, respectively). Pain in all patients in the study group was relieved; however, only %34 of the patients in the control group reported a decrease in pain. There was no complication among the patients of both groups and only a severe and transient pain during injection was reported by the patients.

Conclusion: This study along with many other existing studies indicates the efficacy of intradermal injection of sterile water for the treatment of severe pain syndromes such as renal colic. The advantages of this method are its efficacy, availability, cost benefits, and easy application. We recommend the use of this approach for the treatment of renal colic.

KEY WORDS: sterile water, renal colic, normal saline

Introduction

Renal colic is a common urology emergency that is quite intolerable. Women who have experienced renal colic compare it to the labor pain, and this reflects the severity of pain in renal colic. The first step, according to the literature is the use of narcotic drugs, but their complications such as fatigue, drowsiness, vomiting, and nausea as well as their unavailability, especially in small medical centers and far-off clinics, illegal abuse, and administration limits in patients with asthma and pregnancy has placed a restriction on their use.⁽¹⁾

Using sterile water in the treatment of back pain especially during labor has been successful.⁽²⁾ In this study, which is a random and double-blinded clinical trial, the result of renal colic treatment by intradermal injection of sterile water is discussed.

Materials and Methods

One hundred patients with renal colic were enrolled in this random, double-blinded clinical trial. None of the patients had received analgesics before they were referred to our center. The age of the selected patients was kept in the range of

21 to 55 years, firstly, because measuring the severity of pain was more reliable on the basis of these patients' statements and secondly, because of the lower incidence of diseases and the special medical conditions of this age group. Hence, it was more possible to analyze renal colic separately. The participants were divided into two groups by random numerical table.

In the first group the treatment was done by using 0.5 ml sterile water and in the second group, which was the control group 0.5 ml normal saline was used as a placebo. In both groups injections were done using 1 ml insulin syringe in prone position. After cleansing the injection area with alcohol, 0.5 ml of sterile water or normal saline was injected in the most painful area of the flank, so that bleb was created at the injection site. Before injection, 30 and 90 minutes after the injection the severity of pain was measured using visual analog scale (VAS) on the scale of 0 to 10, in that zero indicates the painless status and 10 indicates the severest pain that the patient has ever experienced. The patients were asked to record the time immediately after the pain would be relieved.

The diagnostic criteria of renal colic were based on history, physical examination, urinalysis for the presence of hematuria, and ultrasonography from the urinary tract for the presence of stone. If necessary, IVP was also done. Patients in whom the presence of stone was not proved by imaging modalities were excluded from the study.

All the process of the study was explained for the patients and informed consents were obtained. Statistical analysis was done, using chi-square test, *t* test, and Mann-Whitney U test by SPSS 9.01 software package.

Results

Seventy-two percent of the patients were men and 28% were women. Mean age was 35.46 (range 21 to 55) years. In the study group the mean age was 35.26±9.16 years and in the control group was 33.90±9.96; the difference was not statistically significant. Pain was in the right side in 44% and 36% of the study and control group and in the left side in 56% and 64%, respectively. The difference was not statistically significant ($p=0.41$). In 92% of the patients in the study group and 88% in the control group hematuria was present in urinalysis ($p=0.79$). Twenty-four percent of the patients in the study group and 20% in the control group had a previous experience of stone pas-

sage ($p=0.62$). Mean stone size was 7.14±1.76 mm and 7.20±1.85 mm in the study and control groups, respectively. This difference was not statistically significant ($p=0.878$). The mean of VAS before treatment in the study and control groups were 9.86±3 (range 8 to 10) and 9.96±19 (range 9 to 10), respectively ($p=0.12$). Mean VAS from the point of pain severity, thirty minutes after treatment was 0.76±2.3 (range 0 to 10) in the study group and 5.94±4 (range 0 to 10) in the control group ($p=0.0000$).

Mean VAS, ninety minutes after treatment in the study group was 1.02±2.63 (range 0 to 10) and in the control group was 6.7±4.19 (range 0 to 10) and the difference was statistically significant ($p=0.000$). It is important to say that in all treated patients with sterile water, pain was relieved after injection (in 100% of cases); however, two patients, thirty minutes after injection and one patient, fifteen minutes after injection had severe pain for whom narcotics were used for pain relief (the severity of pain was recorded 10 based on VAS). However, only 17 patients (34%) in the control group had pain relief after injection ($p=0.00000$). The average time of pain relief after injection of sterile water was 1.93±0.93 (range 1 to 6) minutes in the study group and 2.4±1.23 (range 1 to 4) minutes in the control group. The difference was not statistically significant ($p=0.063$).

None of the patients in the two groups reported any special complications at the site of the injection. The only complication observed in this study was severe pain at the site of injection which lasted 20 to 30 seconds.

Discussion

After presentation of gate control theory by Melzack and Wall in 1965, a lot of physiological, pharmacological, and psychological researches were conducted in order to find new approaches to pain relief.⁽³⁾ Regarding the role of different pain stimuli in activating the anti-pain network in the CNS, using these stimuli in order to control pain has been an ultimate goal from a long time ago. Different theories such as hyperstimulation or counter-irritation, and DNIC (diffuse noxious inhibitory control) have been proposed to explain the mechanism of action of these stimuli. Some of these mechanisms are acupuncture, TENS (transcutaneous electrical nerve stimulation) and intracutaneous or subcutaneous injection of sterile water.^(1,3-6) Mechanisms of these methods are

fully understood by gate control theory.^(1,3) Some of the uses of these methods are the use of TENS for the treatment of labor pain and pain due to peripheral neuropathy, the use of acupuncture in the treatment of renal colic, and injection of sterile water for the treatment of different pain syndromes such as neck and shoulder pain in whiplash syndrome, chronic myofascial pain syndrome, and back pain as a result of labor pain.^(1,3-6)

In four studies pain relief has been reported in low back pain during labor.^(2,7-9) In Labrecque's study, 34 women with low back pain during labor were divided into three groups. One group was treated with subcutaneous injection of sterile water, another group with TENS, and the third group with the standard treatment. They reported that only patients who received sterile water had pain relief. In this group the pain rapidly decreased with the injection of sterile water.⁽⁶⁾

In a controlled randomized double blinded trial by Bengtsson and colleagues in Denmark (1981), renal colic was treated with the injection of sterile water in 4 sites. The reported response rate was 89%.⁽¹⁰⁾ Two explanatory mechanisms have been proposed for intracutaneous injection of sterile water. The first includes endorphinergic mechanisms. Short-term painful stimulation can cause opioid analgesic effects that can be restored by opioid antagonists. The second explanatory mechanism is the activation of pain regulatory mechanisms of the CNS because of painful stimulus. It has been determined that severe and long-lasting stress will result in the activation of pain control networks in CNS and exerts its non-opioid analgesic effect. The analgesic effect of painful stimuli is understood by gate control theory and DNIC.^(1,3) It is clear that the injection of sterile water can cause inflation in the skin and this inflation will activate both mechanical and pain (nociceptors) receptors. Activation of large fibers by affecting dorsal horn gate will raise the threshold of pain sensation.⁽³⁾

Intracutaneous injection of sterile water, with providing local stimulation, will cause a strong sensory stimulation in skin, at the side of injection, approximately for 30 seconds. The origin of the resultant analgesia by this stimulation might be the midbrain or on the basis of gate control theory, it may originate from spinal cord. Strong stimulation of a particular area of the skin can influence the pain sensation in the viscera and result in referred analgesia.

According to the gate control theory, when

injection is done on renal and ureteral nerve dermatomes in renal colic, the pain is relieved.⁽²⁾

As it was mentioned above, only 34% of patients in the control group reported pain relief, the same as that in other studies.^(2,10) The reason is unknown, but it might be related to the fact that the intracutaneous injection of the sterile water causes both osmotic stimulation and inflation of compact layers of the skin while the injection of normal saline can only cause the dilation in the compact layers of skin.⁽³⁾

Now, we are conducting another study in that the effect of morphine is compared with sterile water in the treatment of renal colic and it is in its final stages.

Conclusion

This study and all other available researches indicate the high efficacy of intracutaneous injection of sterile water for the treatment of severe pain syndromes such as renal colic. The advantages of this approach are effectiveness, availability, cost benefits, and easy application. It has no important complication and the only associated complication is a severe and transient pain resulting from intracutaneous injection, thus, physicians should inform the patient before the injection is done.

It might be treatment of choice for renal colic especially in remote centers, where narcotics and NSAIDs (non-steroid anti inflammatory drugs) are not available and also in pregnant and asthmatic patients.

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