

Comparative Study between Three Analgesic Agents for the Pain Management during Extracorporeal Shock Wave Lithotripsy

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Purpose: To compare the clinical efficacy between locally applied diclofenac diethylamine gel, EMLA cream and systemically given diclofenac sodium for the pain relief during extracorporeal shock wave lithotripsy (SWL) using Dornier Delta Compact Lithotripter.

Material and Methods: One hundred five patients with renal stones were randomly divided into 3 groups. Group A was given intramuscular diclofenac sodium (1 mg/kg), 45 minutes before the procedure. In group B, 10 gm of eutectic mixture of local anesthetic (EMLA) cream and in group C, 15 gm of diclofenac diethylamine gel was applied locally 45 minutes before the procedure. Ten-score linear and visual analogue scale (VAS) was used to assess the severity of pain during the procedure. Analysis of variance (ANOVA) test was used to compare various parameters and analyzed statistically.

Results: All the three groups were not statistically different with respect to age, weight, stone size, number of shock wave delivered and maximum voltage used ($P > .05$). The mean pain score in group A was 4.48, in group B was 3.60 and in group C was 3.95, which were not significantly different ($P = 1.34$). Complication like skin lesion was found only in injection diclofenac sodium group whereas cold sensation at the local site was typically found in diclofenac diethylamine gel group.

Conclusion: Although not statistically significant, the mean pain score in locally applied analgesic agents (EMLA and diclofenac diethylamine gel) is lower as compared to intramuscularly given diclofenac sodium. Among these two locally acting drugs, diclofenac diethylamine gel is an equally effective alternative to EMLA.

INTRODUCTION

Extracorporeal shock wave lithotripsy (SWL) is well known for its noninvasiveness, effectiveness and minimal morbidity for the management of renal and ureteric stones.^(1,2) Older lithotripter were associated with more pain as compared to modern day lithotripter and it was impossible to carry out stone fragmentation without the need of anesthesia, now with the advent of modern lithotripters we can break the stones even on outpatient basis. Although the pain intensity and severity has been decreased from original HM3 lithotripter to present day modern lithotripter, still most of the patients require some form of analgesic agents to decrease their pain during SWL. Various analgesics and anesthetics agent has been tried to decrease pain, still we don't have any guidelines for the pain management.^(3,4)

The present study aimed to compare the clinical efficacy between the three drugs, two of which are applied locally at the site of the entry of shock wave like Eutectic mixture of local anesthetic agents (EMLA) cream and diclofenac diethylamine gel, third drug is diclofenac sodium which is given intramuscularly. This study is using locally applied diclofenac diethylamine gel for the first time and compared its clinical efficacy with that of EMLA and injection diclofenac sodium.

MATERIALS AND METHODS

This was a prospective and randomized study conducted in our institute from January 2011 to August 2011 after obtaining ethical clearance from the institute and written consent from the patients. These patients were recruited from the urology department outpatient clinic. Our institute being a secondary referral center, we get frequent cases of renal stones and so more cases of those undergoing an intervention for this disorder.

Following inclusion criteria were used: renal stone of size less than 2cm, no previous surgery and no previous exposure of SWL. Exclusion criteria used in the study were: stone size more than 2cm, pregnancy, bleeding disorders, active urinary tract infection, age less than 18 years and allergy to one of the study medications.

We recruited 105 patients out of 156 patients with renal

stones fulfilling the inclusion and exclusion criteria. Enrolled patients were evaluated in detailed with clinical examination, family history, baseline biological and hematological tests, urine microscopy with culture and sensitivity. An intravenous urogram (IVU) was done in all the cases to assess the anatomical and functional aspects of the urinary system along with stone characteristics like stone size and position.

Recruited 105 outpatients of renal stones were randomly divided in to three groups. Right sided renal stone was found in 54 patients and 51 patient had stone on the left side. Randomization was done by simple randomization using the random number generator. Procedure was conducted using third generation lithotripter (Dornier delta compact, Germany). Group A (n=35) were given diclofenac sodium at the dose of 1 mg/kg, intramuscularly 45 minutes before the procedure. In group B (n=34), 10 gm of eutectic mixture of local anaesthetic (EMLA) cream (2.5% lignocaine and 2.5% prilocaine) was applied locally at the site of the entry of shock wave, 60 minutes before the procedure. In group C (n=36), 15 gm of diclofenac diethylamine gel was applied locally at the site of the entry of shock wave, 45 minutes before the procedure. Pain assessment was done with the 10-score linear visual analogue pain scale and was compared between the three groups. Age, sex, weight, stone size, total shock waves given and voltage used for each patient were recorded. Statistical analysis was done using one way ANOVA and results were compared between the three groups. A *P* value of less than .05 was considered to be statistically significant.

RESULTS

The patients mean age, sex distribution in each group, weight (kg), stone size (mm), number of shock wave delivered and voltage level used in each group was recorded and presented in Table 1. Mean VAS score in group A was 4.48 ± 2.01 , in group B was 3.60 ± 2.21 and in group C was 3.95 ± 2.5 , and the *P*-value was 1.34 (Table 2). Thus the difference was insignificant and each drug was equally effective in decreasing the pain during SWL. If we see complication then cold sensation at the site of the entry of shock wave was the most common complication associated with

Table 1. Demographic characteristics

Variables	Group A (Diclofenac injection)	Group B (EMLA)	Group C (Diclofenac gel)	P value
Age	38.5±12.0	37.5±13.5	37.5±14.5	5.5
Sex (M:F)	21:14	18:16	21:15	.99
Weight	61.0±8.2	58.6±9.4	58.3±9.9	.8
Stone size	10.3±3.3	10.4±2.8	10.9±2.3	.4
No. of shock waves	1580±408	1682±301	1800±322	3.5
Used voltage	1-2	1-2	1-2	.07

diclofenac diethylamine gel. It was present in 20 out of 36 patients. Whereas skin lesion was present only in 2 out of 35 patient's injection diclofenac sodium group, it was not seen in other two locally applied agents.

DISCUSSION

Extracorporeal shock wave lithotripsy (SWL) is a non-invasive and effective mode of treatment for the urinary stones. As it is associated with minimum morbidity, it can be performed in an outpatient setting. Earlier first generation lithotripter were associated with severe pain during the procedure so general or regional anesthesia was considered essential, but with the advent of modern third generation lithotripter now it is possible to complete the procedure without the need of anesthesia. This general or regional anesthesia has been replaced by opioids, sedatives, non-steroidal anti-inflammatory drugs (NSAIDs) and topical anesthetics.

Various analgesic agents that have been tried are opioids (morphine, fentanyl, and pethidine), NSAIDs (diclofenac, ketorolac and piroxicam), local anesthetic agents like EMLA (eutectic mixture of lignocaine 2.5% and prilocaine 2.5%) and Dimethyl sulfoxide (DMSO) in combination with lignocaine and various other combination drugs. Still we don't have any guidelines regarding the use of analgesic agents during SWL. Opioids like fentanyl, morphine and pethidine are well established for the management of pain during SWL but they are associated with dose related profound decrease in breathing rate, tidal volume, nausea, vomiting, bronchospasm and respiratory depression.⁽⁵⁾ So to prevent these side effects various centers started using other

Table 1. Demographic characteristics

Variables	Group A (Diclofenac injection)	Group B (EMLA)	Group C (Diclofenac gel)	P value
VAS SCORE	4.48	3.60	3.90	1.34

alternatives like NSAID and topical anesthetic agents.

Non steroidal anti inflammatory drugs like diclofenac sodium and ketorolac have been proven as effective analgesics for the pain relief during the SWL.⁽⁶⁾ Its main action is by anti inflammatory effect secondary to prostaglandin synthesis inhibition. Various routes have been tried for diclofenac like oral, intramuscular and rectal, but in this study it was used as a locally applied gel for the first time.⁽⁷⁾ In our study we used diclofenac as intramuscular injection as well as locally applied gel and comparison was made among them as well as with topical EMLA cream. Kumar et al used Oral diclofenac in their study to compare it with EMLA and combination of oral diclofenac sodium and EMLA. They suggested combination of oral diclofenac and occlusive dressing of EMLA provides adequate analgesia for SWL.⁽⁸⁾ Erydilium et al. compared the efficacy of EMLA cream, diclofenac sodium and EMLA+ diclofenac sodium for the pain management during SWL. Their study showed that diclofenac sodium was more effective than EMLA cream, but in our study we find both are equally effective in reducing the pain of SWL.⁽⁹⁾

EMLA cream is a eutectic mixture of lignocaine (2.5%) and prilocaine (2.5%), and has been used as topical anesthetic agent for venous catheterization, condyloma acuminatum excision, phimosis and preparation of skin grafts in various studies.^(10,11) To achieve its maximum anesthetic effect, it should be applied 45-60 minutes before the procedure,⁽⁸⁾ and this property of EMLA cream made it, an effective agent for pain reduction during SWL in various studies. Bierkens and associates reported reduced opioid requirement when EMLA was used as a supplement during SWL.⁽¹²⁾ Tritrakarn and associates also reported in their study that EMLA is a safe, effective and economical method to reduce pain during SWL.⁽¹³⁾ McDonald and Berry found EMLA cream as an ineffective agent for the pain management dur-

ing SWL as compared to placebo.⁽¹⁴⁾ In our study we found EMLA cream equally effective to intramuscular diclofenac sodium and locally applied diclofenac diethylamine gel in controlling pain of the intervention

CONCLUSION

The EMLA cream, diclofenac gel and intramuscular diclofenac sodium produce similar results for pain scores during SWL. Further studies with larger sample sizes are needed to extrapolate these results.

CONFLICT OF INTEREST

None declared.

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