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A Study on Pain Improvement Using Compound Diclofenac Sodium with Pethidine and Scopolamine in the Treatment of Acute Renal Colic

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Abstract: *Objective:* To analyze the improvement effect of compound diclofenac sodium with pethidine and scopolamine on patients' pain in the treatment of acute renal colic. *Methods:* 360 patients with acute renal colic admitted from January 2022 to December 2023 were selected and divided into the control group and the observation group by double-blind method. The control group applied pethidine with scopolamine treatment and the observation group adopted the same treatment combined with compound diclofenac sodium. Comparison between the two groups was made in terms of pain improvement, the disappearance time of each symptom, as well as the treatment effect and adverse drug reactions. *Results:* The pain score of the observation group after treatment was lower than that of the control group, the disappearance time of each symptom was shorter than that of the control group, the total treatment effectiveness was higher than that of the control group ($P < 0.05$), and the difference in the incidence of adverse reactions between the two groups was not significant ($P > 0.05$). *Conclusion:* In the treatment of acute renal colic, the combined application of compound diclofenac sodium with pethidine and scopolamine can actively improve the pain symptoms and promote the disappearance of each symptom as early as possible, which is effective and has few adverse reactions.

Keywords: Acute renal colic; Compound diclofenac sodium; Pethidine; Scopolamine; Pain

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1. Introduction

Renal colic is a kind of acute abdominal disease with high morbidity, which is usually caused by spasm of ureteral smooth muscle or partial lumen obstruction due to certain diseases, and ureteral colic is the most common, i.e., it is probable that renal colic is triggered by ureteral stones [1]. Clinical treatment of acute renal colic commonly uses antispasmodic drugs, such as scopolamine, but a single drug is usually slower to take effect, and the side effects are more obvious. Thus, it is often combined with other drugs, such as scopolamine combined with pethidine. Pethidine belongs to the phenylpiperidine class of opioid analgesic drugs, a special

class of drugs that may cause drug dependence [2]. In order to maximize the drug efficacy, reduce the dosage, and control adverse effects, better treatment options need to be explored. Compound diclofenac sodium has antipyretic and analgesic effects, commonly used in the treatment of various febrile fevers, as well as acute gout, renal colic, and other painful diseases. In order to analyze the effect of the combination of compound diclofenac sodium with pethidine and scopolamine on the improvement of pain in patients with acute renal colic, a total of 360 cases were selected for evaluation.

2. General information and methods

2.1. General information

360 patients with acute renal colic admitted from January 2022 to December 2023 were selected and grouped into two groups of 180 cases by double-blind method. In the control group, there were 126 males and 54 females, aged 22–63 (48.24 ± 6.17) years old; onset to treatment time was 0.5–4 (1.91 ± 0.36) hours. In the observation group, there were 128 males and 52 females, aged 24–61 (48.45 ± 6.10) years old; onset to treatment time was 0.6–4 (1.89 ± 0.31) hours. The data of the two groups were compared and found no significant difference ($P > 0.05$).

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) patients diagnosed with acute renal colic by imaging and other examinations, and it is the first-time onset; (2) patients with a stone of 1.2 cm or less in long diameter and 1.0 cm or less in short diameter; (3) patients meeting the indications for medication and having good medication adherence; (4) patients who cooperate to complete the assessment of the relevant scales; and (5) patients with complete general information.

Exclusion criteria: (1) patients with a combination of other serious somatic diseases, such as malignant tumors, liver and kidney failure, etc.; (2) patients with acute obstructive ureteral problems; (3) patients with a combination of psychiatric disorders, or presence of cognitive disorders; (4) patients who were in pregnancy or breastfeeding; and (5) patients with serious allergic reactions to the drug.

2.3. Methods

On the basis of conventional anti-infection and other treatments, the control group adopted the combined program of pethidine + scopolamine. It included an intramuscular injection of 100 mg of pethidine hydrochloride and an intramuscular injection of 5–10 mg of scopolamine hydrochloride.

Based on the treatment program of the control group, the observation group received an additional compound diclofenac sodium treatment, which was an intramuscular injection of 2 ml of compound diclofenac sodium.

2.4. Observation indicators

The below indicators were observed and compared between the groups:

(1) Improvement of pain symptoms: This was assessed by using the visual analog scale (VAS) [3], with 0–10 points, indicating no pain to most pain.

(2) Disappearance time of symptoms including fever, nausea, and vomiting.

(3) Treatment effect [4]: The symptoms of nausea and vomiting disappeared within one hour after the administration of the drug indicating that the treatment was “effective”; the symptoms were significantly improved within one hour after the administration of the drug, and the pain relief was more than 30%, indicating that the treatment was “highly effective”; the symptoms were improved but

did not completely disappear, and the pain relief was less than 30%, indicating that the treatment was "ineffective." The treatment is "ineffective" if the degree of pain relief is less than 30%. Total effective rate = 100% – Ineffective

(4) Adverse drug reactions including flushing, blurred vision, and so on.

2.5. Statistical methods

SPSS25.0 statistical software was used to analyze the data; measurement data in line with normal distribution used mean ± standard deviation (SD) and *t*-test; [n (%)] indicated the count data, χ^2 test; $P < 0.05$ indicated the data were statistically significant.

3. Results

3.1. Pain improvement

As shown in **Table 1**, the pain scores of the two groups of patients were higher before treatment, $P > 0.05$; and the pain scores of the observation group were lower than those of the control group when comparing the pain scores at 10 minutes, 30 minutes, and 60 minutes after treatment, $P < 0.05$.

Table 1. Pain score (mean ± SD, points)

Group	Cases (n)	Before treatment	10 minutes after treatment	30 minutes after treatment	60 minutes after treatment
Control group	180	7.96 ± 1.10	6.06 ± 1.23	4.15 ± 0.64	3.10 ± 0.26
Observation group	180	7.89 ± 1.17	4.18 ± 1.10	2.23 ± 0.56	1.19 ± 0.29
t	-	0.585	15.285	30.291	65.793
P	-	0.559	0.000	0.000	0.000

3.2. Disappearance time of each symptom

As presented in **Table 2**, the disappearance time of fever, nausea, and vomiting symptoms in the observation group was shorter than that in the control group, $P < 0.05$.

Table 2. The disappearance time of each symptom (mean ± SD, minutes)

Group	Cases (n)	Fever	Nausea	Vomiting
Control group	180	37.15 ± 6.26	21.05 ± 4.19	16.23 ± 3.35
Observation group	180	21.17 ± 5.20	13.34 ± 2.28	10.15 ± 2.27
t	-	26.345	21.685	20.158
P	-	0.000	0.000	0.000

3.3. Treatment effectiveness

As demonstrated in **Table 3**, the total treatment effectiveness of the observation group was higher compared to the control group, $P < 0.05$.

Table 3. Treatment effect [n (%)]

Group	Cases (n)	Ineffective	Effective	Highly effective	Total effective rate
Control group	180	41 (22.78)	43 (23.89)	96 (53.33)	139 (77.22)
Observation group	180	9 (5.00)	43 (23.89)	128 (71.11)	171 (95.00)
χ^2	-	-	-	-	23.783
P	-	-	-	-	0.000

3.4. Adverse reactions

As displayed in **Table 4**, the difference in the incidence of adverse reactions between the two groups was not significant compared to the incidence of adverse reactions in the two groups, $P > 0.05$.

Table 4. Adverse reactions [n (%)]

Group	Cases (n)	Flushing	Blurred vision	Drowsiness	Dry mouth	Total
Control group	180	2 (1.11)	1 (0.56)	2 (1.11)	1 (0.56)	6 (3.33)
Observation group	180	2 (1.11)	1 (0.56)	2 (1.11)	2 (1.11)	7 (3.89)
χ^2	-	-	-	-	-	0.080
P	-	-	-	-	-	0.778

4. Discussion

Acute renal colic is the onset of urinary tract obstruction due to urinary stones. Due to acute urinary tract obstruction, the pressure of the renal pelvis and ureter rises, leading to spasms of ureteral smooth muscle and then renal colic. The condition involves an increase in the amount of synthesis and release of prostaglandins in the kidneys, a decrease in renal vascular resistance, a decrease in the secretion of antidiuretic hormone, and a change in the volume of urine, which aggravates the degree of renal colic, and the renal pelvis and the ureter are compressed by the stones. Edema of the renal pelvis or ureter wall may occur, as well as smooth muscle ischemia problems, elevating inflammatory mediators and gradually increasing pain [5]. Acute renal colic requires prompt treatment to control pain symptoms, reduce smooth muscle spasms, and improve disease symptoms.

There are several methods in the clinical treatment of acute renal colic, such as intramuscular injection of pethidine hydrochloride, belonging to the opioid receptor agonist and categorized as a narcotic analgesic, which can activate the opioid system of the central nervous system, and then exert the analgesic effect. However, there is a risk of drug dependence, and due to the special type of drug, the actual use of the drug is more inconvenient. Intramuscular injection of scopolamine hydrochloride is also a common method of treating acute renal colic, the drug is more convenient to use, with a lower price and high clinical application rate [6], but the onset of its effect is slower and the effect of single-use is poor. Morphine offers a better analgesic effect and a rapid onset of action, but easily leads to respiratory depression, dizziness, and other adverse reactions. Additionally, because of its effect on sphincter contraction [7], it may lead to aggravated tubal or renal pelvic spasm, and urine and stone discharge is thus impeded, limiting its clinical application. Compound diclofenac sodium injection includes 25 mg diclofenac sodium and 0.15 g acetaminophen, of which diclofenac sodium belongs to a kind of phenylacetic acid derivatives, which is antipyretic and analgesic, with a more ideal anti-

inflammatory effect [8]. Compared with aspirin, the analgesic effect of diclofenac sodium is 26–50 times higher [9], with strong efficacy, fewer side effects, smaller individual variability, and no addiction. This component can competitively inhibit the cyclooxygenase in the metabolic pathway of arachidonic acid and control the conversion of arachidonic acid to prostaglandins, which decreases the body's nociceptive receptor sensitivity to inflammatory stimuli and increases the threshold of nociception [10], exerting the analgesic effect; and the other component, acetaminophen, also has a better analgesic effect. The result data in the article showed that the pain score of the observation group after treatment was lower than that of the control group, and the disappearance time of each symptom was shorter than that of the control group, indicating that the combined medication has a faster and better effect in improving the symptoms; and the observation group had a higher total treatment effective rate (95.00%) than the control group (77.22%), but there was not much difference in the adverse reactions of the two groups, which further proves that the combined treatment program has better effectiveness without affecting the safety of the medication.

5. Conclusion

In conclusion, the treatment of acute renal colic using compound diclofenac sodium with pethidine and scopolamine can positively improve pain symptoms with precise effects and few adverse effects.

Disclosure statement

The author declares no conflict of interest.

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