Biomedical Research 2017; Special Issue: S473-S475 ISSN 0970-938X
www.biomedres.info

Application of ultrasound-guided transabdominal fascia block in peritoneal dialysis catheterization for patients with end-stage renal disease.

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Abstract

Background: The aim of this study was to investigate the clinical anesthesia, intraoperative circulatory fluctuation and postoperative incisional pain of patients with end stage renal disease treated with peritoneal dialysis catheterization applied of ultrasound- guided transabdominal fascia block.
Methods: 40 patients diagnosed with end-stage renal disease who selected peritoneal dialysis catheterization were randomly divided into General Anesthesia (GA) group and Transversus Abdominis Plane Block (TAPB) group with different interventions.
Results: The mean arterial blood pressure and heart rate in GA group were significantly lower than those in TAPB group, the lowest after 10 min of induction (P<0.01), the VAS score at 24 h postoperatively in the TAPB group was significantly lower than that in the GA group (t=-3.637, P=0.001).
Conclusion: In conclusion, ultrasound-guided transabdominal fascia block is convenient for peritoneal dialysis catheterization, with good anesthesia effect, and does small disturbance to the respiratory cycle of patients.

Keywords: Peritoneal dialysis, Catheterization, End-stage renal disease.

Accepted on March 27, 2017

Introduction

End-stage renal disease has the high incidence of one hundred thousandth in China. The current treatment includes blood purification (hemodialysis, peritoneal dialysis) and kidney transplantation. Due to the severe shortage of donor and many side effects of hemodialysis, peritoneal dialysis catheterization becomes an important method of blood purification for patients with end-stage renal disease. But traumatic operation of peritoneal dialysis catheter surgery requires clinical anesthesia by anesthesiologist. In current, there are three main clinical ways of anesthesia: general anesthesia, spinal anesthesia and local anaesthesia. Because patients with end-stage renal disease are complicated by multiple diseases and organ dysfunction. Both of the anesthesia ways have a greater risk and complications for them. The aim of this study was to investigate the clinical anesthesia, intraoperative circulatory fluctuation and postoperative incisional pain of patients with end stage renal disease treated with peritoneal dialysis catheterization applied of ultrasound-guided transabdominal fascia block.

Materials and Methods

General information

The participants were 40 patients. The inclusion criteria were patients diagnosed with end-stage renal disease selecting peritoneal dialysis catheterization. Exclusion criteria: local anesthetic allergy history, long-term use of non-steroidal or opioid analgesics. The participants were randomly divided into General Anesthesia (GA) group and Transversus Abdominis Plane Block (TAPB) group by randomized controlled trials. All participants were numbered from 1-20, and then divided to 2 groups according to random number.

Monitoring and drug selection

After entering into the operating room, all patients were monitored by ECG, noninvasive blood pressure, and oxygen saturation by finger. The patients in GA group were also in anesthesia depth monitoring. Before the start of anesthesia, they were given 0.5 μg/kg dexmedetomidine hydrochloride for sedation.

Anesthesia

The drug choice for TAPB group was 0.4% ropivacaine. Operation: Ultrasound probe was placed in the Petit triangle

side of the abdominal wall to make the imaging of obliquus externus abdominis, obliquus internus abdominis and abdominal transverse muscle the most obvious. After distinguishing the transabdominal fascia between obliquus internus abdominis and transverse abdominis, the needle came into the plane of transabdominal fascia. Then the use of ultrasound in-plane technology was applied to make the puncture needle along parallel to the direction of the long axis of the ultrasound probe. Ultrasound shows the needle goes from shallow to deep. When the needle into the transversus abdominis plane, no blood back to the suction, then inject 25 ml of 0.4 mg/kg. The induction regimen for GA group was 1 μg/kg etomidate, 0.4 μg/kg sufentanil, and 0.2 μg/kg cisatracurium. The laryngeal mask was set after anesthesia induction. Anesthesia maintenance program was sevoflurane 1-1.5 MAC for both two groups, to keep anesthesia between the depths of 40-60.

Observational index

1: Record the start time of anesthesia, the start time for the operation, anesthesia effect; 2: Observe and record average arterial pressure, heart rate of the patients in the two groups immediately before anesthesia and every 10 min after the start of the anesthesia; 3: Observe and record the adverse reactions of patients in the two groups, including severe circulatory fluctuations (mean arterial blood pressure decreased more than 20% of immediately before anesthesia), respiratory depression, arrhythmia, nausea, vomiting and abdominal muscle tension were recorded with and without anesthesia. 4: Pain scores were evaluated at 2, 4, 8, 12, and 24 h after operation by Visual Analogue Scale (VAS) (0 was painless and 10 was severe pain); 5, Side effect was recorded within 24 h after operation: Respiratory depression, hypotension, dizziness, nausea, vomiting and itching.

Statistical analysis

SPSS19.0 software was used for statistical analysis, measurement data was expressed as $\bar{x} \pm s$, count data was tested by χ^2 test; $P<0.05$ means statistically significant difference.

Results

There were no statistically significant differences in sex, age, height and weight between the two groups ($P>0.05$) (Table 1).

Table 1. *Comparison of general information (n=20, $\bar{x} \pm s$).*

Group	Age (Y)	Weight (Kg)	Stature (Cm)	Gender (M/F)
TAPB	58 ± 12	53 ± 10	161 ± 9	11/9
GA	60 ± 11	56 ± 9	163 ± 7	10/10

There were 11 cases of grade I anesthesia and 9 cases of grade II in TAPB group, while 18 cases of grade I anesthesia and 2 cases were of grade II in GA group. The anesthesia effect of GA group was better than that of TAPB group. The difference between the two groups was statistically significant. Sedation analgesics used in the TAPB group were applied to relieve peritoneal exploration or discomfort during peritoneal exploration or placing peritoneal dialysis catheter tube.

The change of cycle before and after anesthesia was listed in Table 2. The heart rate and mean arterial blood pressure in TAPB group had no significant change. However, the mean arterial blood pressure and heart rate in GA group were significantly lower than those in TAPB group. The lowest one was after 10 min of induction ($P<0.01$). In the GA group, 11 patients were treated with dopamine, significantly higher than those in the TAPB group.

Table 2. *Comparison of the change of mean arterial pressure and heart rate of the patients in the two groups (n=20, $\bar{x} \pm s$).*

Indicators	Group	Before	10 min	20 min	30 min	40 min	50 min	60 min
Mean arterial pressure (Mmhg)	TAPB	105.6 ± 12.6	109.3 ± 8.5	107.3 ± 11.6	101.2 ± 7.6	103.6 ± 10.2	106.4 ± 11.9	103.7 ± 10.5
	GA	108.2 ± 9.3	90.3 ± 13.3	92.6 ± 115.6	95.5 ± 17.3	99.1 ± 17.6	102.8 ± 10.6	101.9 ± 11.9
Heart rate	TPAB	83.6 ± 8.6	88.2 ± 9.6	86.3 ± 10.5	85.8 ± 8.7	84.3 ± 9.7	85.2 ± 11.2	84.3 ± 10.3
	GA	82.5 ± 9.6	75.6 ± 13.5	79.3 ± 10.8	84.3 ± 9.7	85.2 ± 8.5	84.9 ± 10.2	84.6 ± 9.8

As indicated in Table 3, the VAS score at 24 h postoperatively in the TAPB group was significantly lower than that in the GA group ($t=-3.637$, $p=0.001$). In the TPAB group, there was no lower limb motor nerve block after surgery, while the patients in the GA group were restricted in their ambulation after general anesthesia. No respiratory depression, hypotension, dizziness, nausea, vomiting and itching occurred in the two groups within 24 h after operation.

Table 3. *Comparison of postoperative Visual Analogue Scale (VAS) between the two groups (n=20, $\bar{x} \pm s$).*

Indicator	Group	2 h	4 h	8 h	12 h	24 h
VAS score	TAPB	0.78 ± 0.32	0.72 ± 0.16	0.75 ± 0.31	0.70 ± 0.42	0.69 ± 0.22
	GA	1.53 ± 0.26	1.49 ± 0.22	1.29 ± 0.30	0.68 ± 0.52	0.68 ± 0.52

Discussion

Most patients with end-stage renal disease are associated with renal hypertension and coagulation dysfunction. Preoperative hemodialysis need to be done within the control environment. Although general anesthesia has the advantages of rapid onset, high patient comfort, severe circulatory fluctuations and tracheal tube discomfort increased accident rate of perioperative cardiovascular and cerebrovascular. There are T7-L1 lateral dorsal cutaneous branch through the Petit triangle of lateral side, which is the anatomical basis of fascial blocking technique [1,2]. Ultrasound-guided transabdominal fascial block can accurately inject drugs into the nerve fascia, greatly improve the success rate of block, work quickly and greatly reduce the incidence of complications. Because the peripheral nerve is small, postoperative analgesia can also be maintained for a long time.

Recently, many studies reported the application of ultrasound-guided transabdominal fascia in the clinical abdominal surgery [3-5]. The method has been applied to intraoperative or postoperative analgesia in colorectal surgery, obstetrics and gynecology, hernia surgery, and achieved satisfactory results. Fu et al. [6] compared the transabdominal fascial block with intramedullary block, also suggesting the former superior to the latter.

In this study, transabdominal fascia block meet the surgical analgesia in the incision, at the same time has little effect on the patient's breathing and circulation. Compared with the general anesthesia group, they can postoperatively eat food faster, get out of bed earlier, and have a lower VAS score. In the surgery for the exploration of rectovaginal pouch or uterine rectum pouch, it is need to take a small amount of sedative analgesic drugs to relieve discomfort, which is the lack.

Ultrasound-guided transabdominal fascia block is convenient for peritoneal dialysis catheterization, with good anesthesia effect, and does small disturbance to the respiratory cycle of patients. Also it can reduce the hospital stay and hospitalization costs, which is a superior anesthetic option for patients with end-stage renal disease patients for peritoneal dialysis catherization.

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