

Analysis on the effect of intravenous anesthesia with dexmedetomidine and propofol combined with seaweed polysaccharides on hemodynamics and analgesia in pregnant females undergoing painless induced abortion

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Abstract: This study attempted to investigate the effect of intravenous anesthesia with dexmedetomidine and propofol combined with seaweed polysaccharides on painless induced abortion. A total of 82 pregnant females were divided into study group and reference group. The subjects in the study group took seaweed polysaccharides orally before surgery and received intravenous anesthesia with dexmedetomidine and propofol, while the subjects in the reference group received intravenous anesthesia with sufentanil combined with propofol. The onset time of anesthesia in the reference group was significantly shorter than that in the study group ($P<0.001$) and both recovery time and the dosage of propofol in the study group were significantly lower than those in the reference group ($P<0.001$). The values of MAP and HR at T3 and T4, clinical analgesia effective rate, Ramsay sedation scores and incidence of adverse reactions of the subjects in study group was significantly better than those indexes of the subjects in reference group ($P<0.05$). The intravenous anesthesia with dexmedetomidine and propofol combined with seaweed polysaccharides is a promising strategy for painless induced abortion, which is worthy of application and popularization in clinical practice.

Keywords: Dexmedetomidine, propofol, intravenous anesthesia, seaweed polysaccharides, painless induced abortion, hemodynamics.

INTRODUCTION

Painless induced abortion is a common means to terminate pregnancy with safety, convenience and little pain. Despite the simple operation, any carelessness during surgery can lead to uterine bleeding due to the abundant blood vessels in the uterus of pregnant females, thus adding to the surgical difficulty (Liu *et al.*, 2019; Yang *et al.*, 2019). The surgery is performed when pregnant females fall into a deep sleep after they receive intravenous administration of anesthetics. Propofol is a short-acting intravenous anesthetic which can rapidly spread throughout the body and enable people to sleep quickly. Though it is often used with sufentanil clinically with a good analgesic effect, the combination increases the incidence of postoperative adverse reactions such as dizziness and vomiting in people after surgery (Hernando *et al.*, 2019). Dexmedetomidine is an adrenoceptor agonist widely applied in the clinical sedation of patients starting intubation and ventilators during intensive care and treatment. After injection, it is rapidly absorbed and excreted in urine after extensive metabolism, with a short biological half-life period and little effect on human body (Schacherer *et al.*, 2019; Niggemann *et al.*, 2019; Jia *et al.*, 2019). Seaweed polysaccharides are mixed substances

that can directly or indirectly affect the body's metabolic substance after absorption, thus controlling cell division and maintaining normal organic metabolism (Hemphill *et al.*, 2019; Ullman *et al.*, 2019; Ki *et al.*, 2019). There are few studies at home and abroad on the effect of dexmedetomidine and propofol combined with seaweed polysaccharides on painless induced abortion. Based on this, to investigate the effect of the above three drugs on hemodynamics and analgesia in pregnant females undergoing painless induced abortion, 82 pregnant females in the department of obstetrics and gynecology of our hospital from March 2019 to March 2020 were selected as the study subjects, summarized and reported as below.

MATERIALS AND METHODS

General information

A total of 82 pregnant females who had been undergoing painless induced abortion in the department of obstetrics and gynecology of our hospital from March 2019 to March 2020 were selected as the study subjects and they were divided into study group ($n=41$) and reference group ($n=41$), according to the order of admission. In the study group, the average age of the pregnant females was (24.65

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± 2.05) years old and the average gestational weeks were (6.35 ± 2.43) weeks, while in the reference group, the average age of the pregnant females was (24.62 ± 2.03) years old and the average gestational weeks were (6.33 ± 2.39) weeks. There were no significant differences in clinical data between the two groups, with comparability ($P > 0.05$).

Inclusion criteria

(1) The pregnant females had gestational weeks of less than or equal to 10 weeks. (2) The pregnant females had uterine pregnancy. (3) This study was approved by the Hospital Ethics Committee, and the pregnant females or their families signed the informed consent.

Exclusion criteria

(1) The pregnant females had severe organic lesions. (2) The pregnant females had systemic coagulation dysfunction. (3) The pregnant females were allergic to the drugs used in this study. (4) The pregnant females had surgical contraindications or had mental or cognitive disorders.

Methods

In the study group, the pregnant females took carrageenan vacant capsules (State Food and Drug Administration approval number: F20050002; Manufacturer: Qinhuangdao Yaoyong Jiaonang Co., Ltd.; Specification: 1g * 12 capsules) orally at 8 h before surgery, with 1 g a time. The pregnant females in both groups conducted fasting and water deprivation at 6 h before surgery, and they could not take any analgesic and sedative drugs. Before surgery, the monitoring of vital signs such as electrocardiogram and oxygen saturation was performed, and venous channels were opened.

In the reference group, the pregnant females were injected with sufentanil citrate (State Food and Drug Administration approval number: H20054172; Manufacturer: Yichang Humanwell Pharmaceutical Co., Ltd.; Specification: 2ml: 100 μ g). The 1 μ g/kg of injection was diluted to 2ml, and pumping injection was controlled within 6-8min.

In the study group, the pregnant females were injected with 200 μ g of dexmedetomidine hydrochloride injection (State Food and Drug Administration approval number: H20110085; Manufacturer: Cisen Pharmaceutical Co., Ltd.; Specification: 2ml: 200 μ g) combined with 50ml of sodium chloride solution (concentration: 4 μ g/ml), and pumping injection was conducted at 0.2-0.6 μ g/kg·h for sedation.

The pregnant females in both groups were intravenously injected with propofol (State Food and Drug Administration approval number: H20030114; Manufacturer: Sichuan Guorui Pharmaceutical Co., Ltd.; Specification: 50ml: 0.5g) at the rate of 1ml/6s, and the

surgery was carried out after pregnant females' eyelash reflex completely disappeared. During surgery, the dosages of sufentanil, propofol and dexmedetomidine were adjusted according to pregnant females' vital signs, and the pregnant females were sent to the recovery room after surgery (Israel *et al.*, 2019).

Evaluation indexes

The onset time of anesthesia, recovery time and the dosage of propofol in both groups were analyzed and compared between the two groups. The mean arterial pressure (MAP) and heart rate (HR) in both groups were measured at different time points by a heart function detector (Manufacturer: Hefei Jianqiao Medical Electronic Co., Ltd.) Rate, HR). Before surgery, the time of anesthesia injection, at 10 min after injection and awakening time were set as T1, T2, T3 and T4, respectively.

Analgesic effect: (1) Markedly effective: The pregnant females kept quiet and had no signs showing pains during surgery. (2) Effective: The pregnant females had partial limb movement during surgery but had good compliance. (3) Ineffective: The pregnant females had severe pains in lower abdomen during surgery and could not cooperate with the surgery. The total analgesia effective rate = markedly effective rate + effective rate.

Clinical sedation before and after surgery in both groups was evaluated with reference to the *Ramsay Sedation Score Scale* (Deol *et al.*, 2019), with the total score of 6 points, and higher scores indicated better sedation. The incidence of adverse reactions was recorded and compared between the two groups.

STATISTICAL ANALYSIS

The data in this study were statistically processed and analyzed by SPSS21.0 software, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was used to draw the pictures of data. Measurement data were expressed by ($\bar{x} \pm s$) and tested by t-test. Enumeration data were expressed as [n (%)] and tested by χ^2 test. The differences had statistical significance when $P < 0.05$.

RESULTS

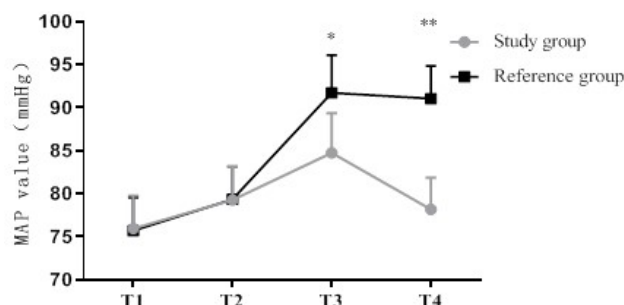
Comparison of the onset time of anesthesia, recovery time and the dosage of propofol between the two groups

The onset time of anesthesia in the study group was significantly longer than that in the reference group ($P < 0.05$), and both recovery time and the dosage of propofol were significantly lower than those in the reference group ($P < 0.05$), as shown in table 1.

Comparison of MAP values at different time points between the two groups

There were not significant differences in MAP values at T1 and T2 between the two groups ($P > 0.05$), and the

MAP values at T3 and T4 in the study group were significantly lower than those in the reference group ($P < 0.05$), as shown in fig. 1.



Note: The abscissa represented the T1, T2, T3 and T4, respectively, while the ordinate represented MAP value (mmHg).

Fig. 1: Comparison of MAP values at different time points between the two groups ($\bar{x} \pm s$)

In the study group, the Map values at T1, T2, T3 and T4 were (73.26±5.36) mmHg, (76.52±5.47) mmHg, (81.48±6.52) mmHg and (75.53±5.24) mmHg, respectively.

In the reference group, the MAP values at T1, T2, T3 and T4 were (72.96±5.45) mmHg, (76.61±5.43) mmHg, (88.64±6.15) mmHg and (83.37±5.35) mmHg, respectively.

*indicated that there were significant differences in MAP values at T3 between the two groups ($t = 5.115$, $P = 0.000$).

**indicated that there were significant differences in MAP values at T4 between the two groups ($t = 6.704$, $P = 0.000$).

Comparison of HR values at different time points between the two groups

There were no significant differences in HR values at T1 and T2 between the two groups ($P > 0.05$), and the HR values at T3 and T4 in the study group were significantly lower than those in the reference group ($P < 0.05$), as shown in table 2.

Comparison of analgesia effective rate between the two groups

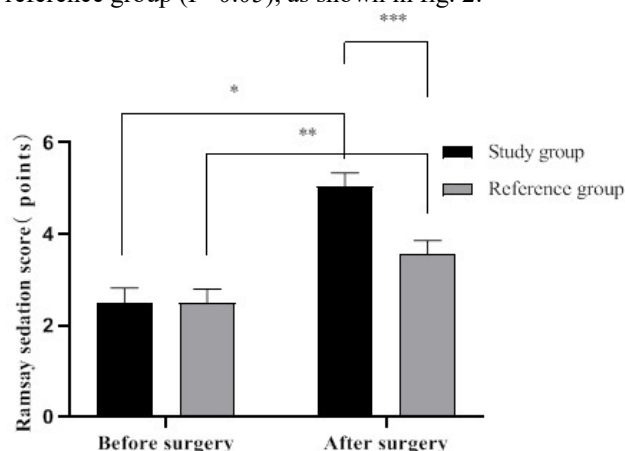
The clinical analgesia effective rate in the study group was significantly higher than that in the reference group ($P < 0.05$), as shown in table 3.

Table 1: Comparison of the onset time of anesthesia, recovery time and the dosage of propofol between the two groups ($\bar{x} \pm s$)

Group	n	Onset time of anesthesia (s)	Recovery time (min)	Dosage of propofol (mg)
Study group	41	39.73±5.62	7.02±1.21	104.27±25.68
Reference group	41	19.27±5.38	8.35±1.16	182.41±28.34
t		16.839	5.081	13.083
P		0.000	0.000	0.000

Comparison of Ramsay sedation scores between the two groups before and after surgery

The Ramsay sedation scores in both groups after surgery were significantly higher than those before surgery ($P < 0.05$), and after surgery, the Ramsay sedation scores in the study group were significantly higher than those in the reference group ($P < 0.05$), as shown in fig. 2.



Note: The abscissa represented before surgery and after surgery, while the ordinate represented Ramsay sedation score (points).

Fig. 2: Comparison of Ramsay sedation scores between the two groups before and after surgery

In the study group, the Ramsay sedation scores before and after surgery were (2.25±0.47) points and (4.82±0.43) points, respectively; in the reference group, the Ramsay sedation scores before and after surgery were (2.28±0.43) points and (3.36±0.41) points, respectively.

*indicated that there were significant differences in Ramsay sedation scores before and after surgery in the study group ($t = 28.833$, $P = 0.000$).

**indicated that there were significant differences in Ramsay sedation scores before and after surgery in the reference group ($t = 11.639$, $P = 0.000$).

***indicated that there were significant differences in Ramsay sedation scores between the two groups after surgery ($t = 15.735$, $P = 0.000$).

Comparison of postoperative adverse reactions between the two groups

The incidence of postoperative adverse reactions in the study group was significantly lower than that in the reference group ($P < 0.05$), as shown in table 4.

Table 2: Comparison of HR values at different time points between the two groups ($\bar{x}\pm s$, beats / min)

Group	n	T1	T2	T3	T4
Study group	41	82.43±10.25	85.68±9.36	93.26±8.49	85.48±8.51
Reference group	41	82.48±10.21	85.72±9.41	101.63±8.73	93.47±8.61
t		0.022	0.019	4.401	4.226
P		0.982	0.985	0.000	0.000

Table 3: Comparison of analgesia effective rate between the two groups [n (%)]

Group	n	Markedly effective	Effective	Ineffective	Total effective rate
Study group	41	25 (60.98%)	14 (34.15%)	2 (4.88%)	95.12% (39/41)
Reference group	41	21 (51.22%)	12 (29.27%)	8 (19.51%)	80.49% (33/41)
X ²					4.100
P					0.043

Table 4: Comparison of postoperative adverse reactions between the two groups [n (%)]

Group	n	Vomiting	Nausea	Dizziness	Dysphoria	Total incidence
Study group	41	0 (0.00%)	1 (2.44%)	0 (0.00%)	1 (2.44%)	4.88% (2/41)
Reference group	41	3 (7.32%)	2 (4.88%)	2 (4.88%)	1 (2.44%)	19.51% (8/41)
X ²						4.100
P						0.043

DISCUSSION

With the continuous advancement of medical technology, painless induced abortion has been widely applied for termination of pregnancy; however, this surgery is an aggressive treatment, and its operation can cause pregnant females' extreme pains especially in curettage and aspiration of endometrium as well as expansion of the uterus, and cause abnormal fluctuation of hemodynamic parameters, thus leading to multiple complications (Yuzkat *et al.*, 2020; Jamil *et al.*, 2020; Hackenberg *et al.*, 2020). The painless induced abortion is performed through the injection of anesthetics into pregnant females who will then fall into a deep sleep, which greatly reduces the incidence of adverse events caused by pregnant females' fear and tension during surgery. Therefore, the selected anesthetics play an important role in reducing pregnant females' surgical pains and postoperative adverse reactions, as well as ensuring the smooth implementation of the surgery (Krauze *et al.*, 2020; Burkett *et al.*, 2020). In the past, only propofol has been adopted during painless induced abortion, but the analgesic effect of propofol alone is weak and the incidence of postoperative pain is still very high, thus there should be another anaesthetic used to combine with propofol during surgery. Sufentanil, a kind of commonly used analgesic for surgery, mainly acts on μ opioid receptor, and some pregnant females will suffer from respiratory depression, sphincter spasm, tachycardia and arrhythmia after intravenous injection of it, which cannot meet the surgical needs, thus there is a critical need for an efficient anesthesia method for painless induced abortion (Lai *et al.*, 2020; Verbrugge *et al.*, 2020; Schauer *et al.*,

2019). Foreign scholars have pointed out that the combination of dexmedetomidine and interventional embolization has significant efficacy in controlling postoperative pains and reducing adverse reactions. Dexmedetomidine can be quickly absorbed by the body after injection to exert sedative and analgesic effects, and because of its short metabolic half-life period, it can be excreted with the urine after surgery, with less side effects (McMillan *et al.*, 2019). In addition, this drug can effectively inhibit the excitability of the sympathetic nervous system to keep the body in deep sleep and block the transmission of pain signals in the nerves, playing an analgesic effect. Seaweed polysaccharides are rich in a large number of sulfate groups, which play the role of inhibiting the replication and transmission of viruses in host cells, so as to improve body's defense capability against diseased cells and antioxidant capacity, and serve the function of antibiosis and anti-inflammation (Lin *et al.*, 2019; Zhao *et al.*, 2019).

In this study, we found that the values of MAP and HR at T3 and T4 in the study group were significantly lower than those in the reference group ($P < 0.001$), suggesting that intravenous anesthesia with dexmedetomidine and propofol combined with seaweed polysaccharides can effectively reduce the levels of hemodynamic parameters and the incidence of adverse reactions during surgery, and improve surgical safety. Besides, our study also revealed that the pregnant females in the study group had shorter recovery time, suggesting that dexmedetomidine combined with propofol not only exerts significant clinical analgesic effects but also shortens patient recovery time after surgery, which is presumed to be

related to the higher clearance of dexmedetomidine than sufentanil in human body. Benato *et al* (2019) have pointed out in the study that after the implementation of intravenous anesthesia with dexmedetomidine and propofol in pregnant females with ventilation injury in lungs during thoracoscopic pneumonectomy, the recovery time of (7.24±2.13) min is significantly lower than (9.31±2.07) min of the pregnant females undergoing sufentanil combined with propofol, revealing that intravenous anesthesia with dexmedetomidine and propofol can effectively shorten pregnant females' recovery time after surgery.

CONCLUSION

In conclusion, intravenous anesthesia with dexmedetomidine and propofol combined with seaweed polysaccharides can effectively reduce the levels of hemodynamic parameters during painless induced abortion, take better analgesic effect and reduce the incidence of adverse reactions after surgery, which is beneficial to pregnant females' postoperative recovery, thus it is worthy of application and promotion in surgery.

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