

The effect of dexmedetomidine compound nicardipine in transnasal endoscopic pituitary tumor resection

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Abstract. Objective: To compare the effect of dexmedetomidine and nicardipine alone in transnasal endoscopic pituitary tumor resection, and to find a more suitable controlled antihypertensive regimen. Methods: 40 patients under elective general anesthesia (ASA grade I to II) were randomly divided into nicardipine group (N group) and dexmedetomidine + nicardipine group (DN group), 2 N group). It was the same, before anesthesia initiation (T0), 10min after pumping nicardipine (T1), 20min after (T2), 30min later (T3), 10min after stopping pumping (T4), 20min after (T5), heart rate. Surgical field quality score, bleeding volume, propofol, remifentanyl, and nicardipine dosage, respiratory recovery time, extubation time, and adverse effects were recorded. Results: At the 20min time (T4) time, the MAP value of DN group was significantly lower than that of N group, and the difference was statistically significant ($P < 0.05$). At the three moments of 30min (T2), stop pumping (T3) and 20min (T4), the HR value of DN group was lower than group N, and the difference was statistically significant ($P < 0.05$). Both DN and N achieved good surgical field, with no significant differences in anesthesia depth, operation time and bleeding time ($P > 0.05$); respiratory recovery time in DN was shorter than group N ($P < 0.05$). The incidence of adverse reactions of chills and agitation was higher in the group N than in the DN group, and the difference was statistically significant ($P < 0.05$). Conclusion: separate application of nicardipine in transnasal endoscopic pituitary resection antihypertensive effect is positive, but dexmedetomidine compound nicardipine application in this operation, can reduce propofol, remifentanyl anesthetic dosage, heart rate is more stable, also can reduce the incidence of postoperative chills, agitation, than separate application of nicardipine usual effect is better.

Key words: Dexmedetomidine; nicardipine; controlled blood pressure; nasal endoscopy; pituitary tumor.

1. Introduction

Pituitary adenoma is a group of tumors arising from the posterior pituitary and anterior lobe and craniopharyngeal duct epithelium, which is a common disease in neurosurgery, and surgery is the main treatment method. Transnasal endoscopic pituitary tumor resection is preferred because of its advantages of small trauma, low surgical risk, no scarring, large exposure range, and quick recovery.[1], the operating space in the nasal cavity is small and the blood transport is rich. Intraoperative bleeding is easy to lead to unclear surgical field, affecting the operation, and increasing the occurrence of complications. Therefore, it is very important to implement control antihypertensive technology during surgery. Nicardipine (nicardipine) is a calcium ion channel blocker, dilating small arteries, coronary arteries, the antihypertensive effect is rapid and stable, is a commonly used controlled antihypertensive drug.[3] Dexmedetomidine (Dex) is a highly selective 2 adrenergic receptor agonist, mainly manifested as sympathetic block, sedative and hypnotic effects in

clinical applications.[4] The controlled antihypertensive effect of dexmedetomidine and nicardipine in nasal endoscopic pituitary tumor resection is reported as follows.

1.1 General Data

The First Affiliated Hospital of Kunming Medical University was 20~60 years old under general anesthesia of Kunming Medical University from October 2021 to April 2022, 155~175cm, 45~70kg, American Association of Anesthesiologists ASA grade I ~II, unintentional, hepatic and renal abnormalities, endocrine system diseases and cardiovascular system diseases, no coagulation dysfunction, no routine blood abnormalities. There were 20 cases in the nicardipine group (N group) and dexmedetomidine + nicardipine group (DN group), respectively. General data between the two groups were compared with no significant difference ($P > 0.05$), which was comparable.

Table 1 Comparison of general data between the two groups ($\bar{x} \pm s$)

group	Example number	age	weight	height	Gender (male / female)
N group	20	43.90±6.53	58.50±7.03	162.80±5.09	11/9
DN group	20	44.45±6.86	58.40±5.64	163.75±6.66	10/10
P values		0.797	0.961	0.615	

1.2 Anesthesia and antihypertensive methods

The patient opened the peripheral vein channel and was given compound electrolyte injection at 10ml / (kg.h) Intravenous infusion, connected monitor to continuously monitor oxygen saturation (SpO₂), heart rate (HR), electrocardiogram (ECG), radial artery puncture and catheterization under local anesthesia to monitor invasive mean arterial pressure (MAP).Anesthesia induction: intravenous fentanyl 3 g / kg, etomidate 0.4~0.6mg / kg, vecuronium 0.1mg / kg, mechanical ventilation, tidal volume (VT) 8 ~ 10 ml/kg, respiratory rate (RR) 10~12 times / minutes, maintain the end-expiratory carbon dioxide pressure (PETCO₂) 35~45 mmHg, breath ratio 1:2.Anesthesia maintenance: propofol at 5~7mg / kg · h, remifentanyl at 10~15 g / kg · h continuous pump injection to maintain the depth of anesthesia.During the operation, the pumping rate was adjusted according to the EEG double frequency index monitoring, and the EEG double frequency index was maintained at 40~60.

Group N had pumped nicardipine at the beginning of the procedure at a rate of 0.3 to 3 g · (kg · min).The DN group continuously pumped dexmedetomidine at a rate of 0.4 g / (kg · h) at the beginning of the operation and simultaneously injected nicardipine at a rate of 0.3 to 3 g · (kg · min).Intraoperative pumping rate was adjusted to maintain the mean arterial pressure (MAP) at 60-70 m m H g, and the pumping of dexmedetomidine and nicardipine was stopped after the completion of hemostasis.Disoxin 0.12~0.15mg / kg analgesia was given half an hour before the procedure, dexmedetomidine was stopped 20 minutes before the operation, propofol was stopped 10 minutes before the procedure, and remifentanyl was stopped at the end of the procedure.

1.3 Observation indicators

Before the start of anesthesia (T₀), After 10min (T₁), After pumping nicardipine for 30min (T₂), Stop pumping nicardia normally (T₃), Average arterial pressure (MAP), heart rate (HR) after 20min (T₄), The operative time of the two surgical groups were recorded, amount of bleeding, Propofol, remifentanyl, and nicardipine dosage, And by the same surgeon according to the Fromme surgical field quality score scale (Fromme score method: 0 is divided into no bleeding; 1 Divided into mild bleeding, No need to attract; 2 Divided into mild bleeding, Attract them occasionally; 3. Divided into mild bleeding, Need for frequent attraction, Stop attracting for a few seconds before hinder the field; 4. Divided into moderate bleeding, Need for frequent attraction, Stop the attraction immediately after obstructing the surgical field; 5 Divided

into severe bleeding, Need for continuous attraction, Bleeding is faster than the attraction rate, Seriously hinder the surgical field.) A Surgical field score was performed and BIS values during control antihypertensive were recorded.The time of respiratory recovery, extubation time, and adverse reactions were recorded.

1.4 Statistical Methods

Statistical method: Through SPSS21.0 statistical software, the measurement data were analyzed by ANOVA, and the count data were tested. When P <0.05, the difference was statistically significant. χ^2

2. Results

2.1 Hemodynamic index during antihypertensive in both groups

Both DN and N were able to maintain MAP within the target range during controlled antihypertensive.It shows that both groups achieved the effect of controlled blood pressure.At the time of 20min after stopping the pumping injection (T₄), the MAP value of DN group was significantly lower than that of N group, and the difference was statistically significant (P <0.05).At the three moments of 30min (T₂), stop pumping (T₃) and 20min (T₄), the HR value of DN group was lower than group T, and the difference was statistically significant (P <0.05).

Table 2 Comparison of the hemodynamic indexes between the two patient groups

	DN group	N group	F values	P values
	MAP			
T ₀	84.50±6.19	87.60±5.01	0.382	0.54
T ₁	74.30±4.12	75.50±5.98	3.887	0.056
T ₂	65.25±2.63	66.85±2.28	4.224	0.072
T ₃	64.85±2.43	63.75±2.31	2.146	0.151
T ₄	86.05±5.11	90.30±3.01	10.257	0.031*
	HR			
T ₀	79.40±5.54	80.90±4.78	1.032	0.324
T ₁	74.25±6.60	75.65±5.30	0.547	0.464
T ₂	61.30±4.50	73.25±7.11	40.317	0.000**
T ₃	58.40±3.45	71.95±5.29	92.074	0.000**
T ₄	79.30±4.54	86.50±4.15	27.39	0.000**

* p<0.05 ** p<0.01

2.2 Comparison of the depth of anesthesia, surgical field score quality, operation time, bleeding volume, respiratory recovery time, and extubation time between the two groups

Both DN and N achieved good surgical field, with no significant differences in anesthesia depth, operation time and bleeding time (P> 0.05); respiratory recovery time in DN was shorter than group N (P <0.05).

Table 3 Comparison of depth of anesthesia, quality of operative field score, operation time, bleeding volume, respiratory recovery time, and extubation time between the two groups

group	Depth of anesthesia (BIS)	Fromme grade	Operation time (min)	amount of bleeding, (ml)	Respiratory recovery time (min)	Extubation time, (min)
DN group	50.50±4.72	2.30±0.66	93.15±16.95	97.65±10.17	9.45±1.64	19.55±1.05
N group	51.50±4.90	2.35±0.75	95.60±17.92	103.05±17.70	11.35±2.81	20.70±3.61
F values	0.023	0.051	1.081	1.399	6.808	1.867
P values	0.952	0.823	0.305	0.244	0.000**	0.18

* p<0.05 ** p<0.01

2.3 Comparison of propofol dosage, remifentanyl dosage and nicardipine dosage in the two groups

The amount of propofol, remifentanyl and nicardipine in DN group was less than group N, which was statistically significant (P> 0.05).

Table 4 Comparison of propofol dosage, remifentanyl dosage, and nicardipine dosage in the two groups

group	Propofol dosage	The dosage of remifentanyl	Nicardipine dosage
DN	368.20±48.54	1.05±0.13	4.91±0.71
N	426.95±54.60	1.32±0.27	6.51±1.01
P	<0.05	<0.05	<0.05

2.4 Comparison of postoperative adverse effects between the two groups

The incidence of adverse reactions to chills and agitation was higher in the group N than in the DN group, and the difference was statistical significant (P <0.05).

Table 5 Comparison of postoperative adverse effects between the two groups

group	Example number	N and V	shivering	move restlessly	dry
DN	20	1	0	1	2
N	20	2	3	5	2
P		>0.05	<0.05	<0.05	>0.05

3. Discussion

Transnasal endoscopic pituitary tumor resection is small, fine operation, often requires a more clear surgical vision. Intraoperative, surgeons often apply drugs that contract the nasal mucosa, such as adrenaline, which can cause adverse effects such as hypertension, tachycardia and arrhythmia. Controlled antihypertensive technology can reduce intraoperative bleeding and reduce the adverse reactions caused by adrenaline.[2] Therefore, it is necessary to choose a more appropriate controlled antihypertensive regimen during nasal endoscopic surgery.

In this study, both the DN and N groups were able to maintain the mean arterial pressure within a certain range with a good surgical field, which affirmed the antihypertensive effect of nicardipine. Its mechanism of action is direct action on the vascular smooth muscle cells to prevent calcium ions from entering the vascular smooth muscle cells. In addition, it can also partially inhibit the cyclic adenosine phosphate phosphodiesterase, thus promoting the uptake of calcium ions in the myosocyte body. Nicardipine has a weak effect on the timing and force of the myocardium, and does not affect the conduction system of the heart, so it can be used in patients with conduction abnormalities and poor heart function.[5]

In this study, the HR values of DN group at moments T2, T3 and T4 were smaller than those of group N, which was statistically significant (P> 0.05), mainly because the 2 receptor in the postsynaptic membrane of dexmedetomidine inhibited the sympathetic nerve cells of the anterior spinal cord, increased the vagal activity, and slowed the heart rate.[4] It has been suggested that the amount of anesthetic drug sedation and analgesic drugs can be reduced in general anesthesia in combination with other anesthetic drugs.[4] In this study, propofol and remifentanyl were used in DN group and less than in N group, which was statistically significant (P> 0.05), which once again verified this view. The respiratory recovery time in the DN group was shorter than in the N group, probably because the less propofol was used in the DN group, which indirectly indicated that there had no significant effect on the respiratory system. The operation site of nasal surgery is special, and agitation can cause bleeding, reflux aspiration and even asphyxia. Through the appropriate sedation of dexmedetomidine, the comfort and safety of surgery can be increased. Studies have also shown that dexmedetomidine is also protective against the heart and brain.[7]

Chiller is a common perioperative complication, and dexmedetomidine can significantly reduce the incidence of chills in surgical patients. The mechanism is mainly through the nucleus locus coeruleus, that is, it can act on the 2-receptor of the spinal cord segment, and then inhibit serotonin and norepinephrine reabsorption, and improve the shivering response threshold.[8] Due to its own pharmacological effects, although nicardipine can maintain the target average arterial pressure as dexmedetomidine compound nicardipine, nicardipine itself does not have a sedative and analgesic effect. If there is no EEG double-frequency index monitoring, it is easy to cause the anesthesia depth is too shallow. Some studies believe that the combination of nicardipine and dexmedetomidine hydrochloride can effectively reduce the incidence of adverse reactions to each other, maintain the heart rate stability, and reduce postoperative complications.[9]

To sum up: separate application of nicardipine in transnasal endoscopic resection of pituitary tumor antihypertensive effect is positive, but dexmedetomidine compound nicardipine used in this operation, can reduce the medicinal amount of propofol, remifentanyl anesthetic dosage, heart rate is more stable, also can reduce the

incidence of postoperative chills, agitation, than separate application of nicardipine effect is better.

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