

Effect of Danhong Injection on early cognitive function of elderly patients after anesthesia

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Abstract

Objective: To investigate the effect of Danhong Injection on early cognitive function of elderly patients after anesthesia. **Methods:** 120 patients undergoing elective surgery were selected. General anesthesia and intraspinal anesthesia were received respectively. The general anesthesia group was divided into experimental group (group A) and control group (group B), with 30 cases in each group. The intraspinal anesthesia group was divided into experimental group (Group C) and control group (Group D), with 30 cases in each group. 30min before the end of the operation, 20ml of Danhong injection (added to 80ml of normal saline) was given to the experimental group and 100ml of normal saline was given to the control group on the first and second days after the operation. Serum S-100 β was measured by ELISA 15 minutes before operation and immediately, 24 hours and 48 hours after operation. One day before operation, one day after operation and the second day after operation all were tested by the same experimenter with double-blind method and simple mental state scale (MMSE). **Results:** S-100 β was compared between the experimental group and the control group. There was significant difference in protein decline. Between the two anesthesia methods, there was little difference in protein changes. There was significant difference in MMSE between the experimental group and the control group. **Conclusion:** Danhong injection can decline S-100 β Protein level in elderly patients after anesthesia, and improve early cognitive function.

Keywords

Danhong injection; Postoperative cognitive impairment; S-100 β Protein; Mini Mental State Scale; anesthesia.

1. Introduction

Postoperative cognitive dysfunction (POCD) is a common neurological complication after anesthesia surgery in the elderly [1]. The occurrence of POCD may be related to many factors, such as age, choice of anesthetics, anesthesia mode, brain function state, heredity, etc. [2]. At present, the main methods to detect POCD are mini mental state examination (MMSE) and molecular biological index S-100 β Protein, etc.

Dan Hong injection (DHI) is extracted from Chinese traditional Chinese medicine *Salvia miltiorrhiza* and safflower. It plays an important role in removing blood stasis, inhibiting cerebral thrombosis, scavenging free radicals and improving circulation. In this study, MMSE and S-100 β was measured by ELISA are to evaluate the effect of pre administration of Danhong Injection on early cognitive function of elderly patients after anesthesia.

2. Materials and methods

2.1. Case selection

120 patients, aged ≥ 60 years and ASA I ~ II, were selected for elective surgery. General anesthesia and intraspinal anesthesia were used. General anesthesia and intraspinal anesthesia were received respectively. The general anesthesia group was divided into experimental group (group A) and control group (group B), with 30 cases in each group. The intraspinal anesthesia group was divided into experimental group (Group C) and control group (Group D), with 30 cases in each group. The operation includes Gynecology, orthopedics and general surgery, and the operation time is at least 2 hours. There was no significant difference in general data among the selected cases.

2.2. Anesthesia method

After entering the room, ECG, noninvasive blood pressure (NBP) and pulse oxygen saturation (SpO₂) were monitored routinely. In the general anesthesia group, intravenous inhalation combined anesthesia was selected, and changtonin 0.5 ‰ and midazolam 2 ‰ and fentanyl 2ug were induced before anesthesia kg^{-1} 、 Propofol 2mg kg^{-1} 、 Succinylcholine chloride 1.5mg kg^{-1} Induction of endotracheal intubation, 1% - 2% isoflurane to maintain anesthesia, propofol $25\text{-}50\text{mg kg}^{-1} \cdot \text{min}^{-1}$ And remifentanyl $0.2\text{-}0.4\text{ug kg}^{-1} \cdot \text{min}^{-1}$ Continuous pumping. Intermittent intravenous injection of atracurium CIS benzenesulfonate $0.06\text{-}0.08\text{mg kg}^{-1}$ Muscle relaxation maintenance. In the spinal anesthesia group, the puncture point was L3-4 or L2-3, and 3ml of equal specific gravity 0.5% levobupivacaine was given. According to the operation time, lidocaine hydrochloride was given epidural to maintain the fluctuation range of map and HR within 20% of the basic value. 30min before the end of the operation, 20ml of Danhong injection (added to 80ml of normal saline) was given to the experimental group and 100ml of normal saline was given to the control group on the first and second days after the operation. Patients in the two groups were given patient-controlled analgesia after operation to reduce the occurrence of adverse reactions. The anesthesia time, operation time, bleeding volume and infusion volume of the two groups were recorded.

2.3. Measurement indicators

Serum S-100 β was measured by ELISA at 15 min (T₀) before operation and immediately (T₁), 24 h (T₂) and 48 h (T₃) after operation. One day before operation, one day after operation and the second day after operation all were tested by the same experimenter with double-blind method and simple mental state scale.

2.4. Statistical analysis

Statistical software SPSS 17.0 was used for analysis. The measurement data were expressed as mean \pm standard deviation T-test was used for inter group comparison, and $P < 0.05$ was used for analysis of variance of repeated measurement design for intra group comparison.

3. Results

3.1. Comparison of S-100 β protein values under two anesthesia methods

Under spinal anesthesia, at T₀, there was no significant difference in protein value ($P > 0.05$). Compared with T₀, S-100 β in the control group at T₁ ~ 2 increased and changed significantly. T₁-3 in the experimental group decreased compared with T₁-3 in the control group, and the difference was statistically significant (see Table 1)

Table 1 Comparison of serum S-100β protein values under intraspinal anesthesia

Time	Group		F value
	Experimental group	control group	
T0	0.151±0.062	0.158±0.017	0.009
T1	0.225±0.073a	0.287±0.069 a	7.468
T2	0.228±0.083 a	0.320±0.091 a	10.256
T3	0.185±0.054	0.221±0.054	4.346

Note: when T0, P > 0.05; Compared with T0, T1-2^a P < 0.01, T3^a P < 0.05

Under general anesthesia, at T0, two groups of S-100 β was no significant difference in protein value (P > 0.05). Compared with T0, S-100β in the control group at T1 ~ 2 changed significantly. T1-3 in the experimental group decreased compared with T1-3 in the control group, and the difference was statistically significant. See Table 2

Table 2 Comparison of serum S-100β protein values under general anesthesia

Time	Group		F value
	Experimental group	Control group	
T0	0.146±0.014	0.167±0.014	0.088
T1	0.221±0.045 a	0.328±0.086 a	12.589
T2	0.246±0.056 a	0.371±0.120 a	11.362
T3	0.194±0.012 a	0.245±0.077 a	12.738

Note: at T0, P > 0.05, compared with T0, T1-3^a P < 0.01

After using the experimental injection under the two anesthesia methods, the serum S-100β in the general anesthesia group and intraspinal anesthesia group was measured at t0-3. The difference was not statistically significant (P > 0.05). See Table 3

Table 3 comparison of serum S-100βprotein values after using experimental injection in two anesthesia methods

Time	Group		F value
	General anesthesia group	Intraspinal anesthesia group	
T0	0.166±0.014	0.166±0.064	0.007
T1	0.241±0.044	0.235±0.073	0.088
T2	0.246±0.056	0.238±0.083	2.63
T3	0.183±0.022	0.175±0.054	0.006

Note: compared with the control group, t0-3, P > 0.05

3.2. Comparison of Mini Mental State Scale (MMSE) under two anesthesia methods

Under spinal anesthesia, there was no significant difference between the experimental group and the control group on the first day before operation (P > 0.05). There was significant difference between the control group and the first day and 2 day after operation (P < 0.05). See Table 4

Table 4 Comparison of MMSE values under spinal anesthesia

Time	Group		F value
	Eperimental group	Control group	
One-day before operation	26.7±1.55	26.4±1.73	0.037
Postoperative day	25.7±1.34	24.4±1.83	4.988
2days after operation	25.8±1.24	24.6±1.88	4.579

Note: compared with the two groups, $P > 0.05$ on the first day before operation and $P < 0.05$ on the first day and 2 day after operation

Under general anesthesia, there was no significant difference between the experimental group and the control group one day before operation ($P > 0.05$); There was significant difference between the 1st and 2nd day after operation and the 1st day before operation ($P < 0.05$), as shown in Table 5

Table 5 Comparison of MMSE values under general anesthesia table 5

Time	Group		F value
	Experimental group	Control group	
One-day before operation	26.8±1.31	25.9±1.57	0.167
Postoperative day	26.7±1.45	24.6±2.35	4.443
2 days after operation	25.5±1.45	24.4±2.07	1.463

Note: compared with the control group, 1 day before operation, $P > 0.05$; There was significant difference between the control group on the 1st and 2nd day after operation and the 1st day before operation ($P < 0.05$).

4. Discussion

Postoperative cognitive dysfunction (POCD) is a persistent disorder of memory, abstract thinking and orientation after anesthesia surgery, accompanied by the decline of social activity. That is, the change of personality, social ability and skills, not the change of IQ. POCD is more likely to occur in the elderly, mainly those over 65 years old. It is a common neurological complication after anesthesia surgery in the elderly.

Serum S-100 β Protein is a specific protein of the brain after some operations (such as abdominal surgery and vascular surgery). There is a good correlation between the increase of serum S-100 β and POCD. It is suitable to evaluate the occurrence, development and outcome of some postoperative cognitive deficits [3]. The most commonly used neuropsychiatric function test method is the Mini Mental State Scale (MMSE), which is a screening test. By asking patients a series of questions, including 11 questions such as time judgment, place orientation, attention, computing ability, short-term review, language and organizational ability (spelling a word from back to front, writing a sentence and copying a figure), they quantitatively evaluate their cognitive function. The highest score of MMSE is 30 points, and the decline of MMSE test by more than 2 points is an indicator of cognitive decline. This method has high effectiveness and credibility, and is simple and feasible. It is suitable for the evaluation of postoperative cognitive function of elderly patients. Danhong injection (DHI) is extracted from Chinese traditional Chinese medicinal materials *Salvia miltiorrhiza* and safflower. Its main effective components are phenolic compounds and flavonoids, such as Danshensu, p-coumaric acid, tanshinic acid A,

tanshinic acid B, tanshinic acid D, tanshinic acid I, purple oxalic acid, dienoic acid, hydroxysafflower yellow A, etc. Research shows that it plays an important role in removing blood stasis, inhibiting cerebral thrombosis and improving circulation [4-5].

The results of this experiment showed that there were significant differences in MMSE scores between the experimental group and the control group on the day after operation and the second day after operation. Postoperative cognitive impairment is rare. It may indicate that POCD mainly affects memory ability and thinking response ability in most elderly patients in the short term. 20ml of experimental injection was administered intravenously 30 minutes before operation, on the day after operation and on the second day after operation. The level of S-100 β protein in the experimental group was higher than that in the experimental group. The experimental group was in T1-3 Serum S-100 β Values have decreased. It may be related to enhancing the nutritional status of brain tissue, improving brain metabolism, reducing brain oxygen consumption and protecting brain cells. It is suggested that the experimental injection can act on brain cells and reduce neuronal apoptosis. In the experiment, after the patients used the experimental injection under the two anesthesia methods, the serum S-100 β in the general anesthesia group and intraspinal anesthesia group was measured at t0-3 There was no significant difference ($P > 0.05$); Through this experiment, it is concluded that there is no significant difference in POCD after operation in elderly patients using Danhong injection under general anesthesia or intraspinal anesthesia.

After using the experimental injection under the two anesthesia methods, compared with the control group, this experiment only reduced the incidence of postoperative POCD and could not completely eliminate the occurrence of POCD. Because the causes of postoperative POCD are multifactorial, Danhong injection can protect brain cells, reduce its clinical manifestations and intervene in early postoperative cognitive impairment. Due to the limitation of the number of samples, more experimental studies need to be carried out to ensure the rational use of drugs. This study mainly discusses how to find a drug under different anesthesia methods to intervene the occurrence of early postoperative cognitive impairment. A large number of studies have proved that the experimental toxicity is small. Drugs act on brain cells through the blood cerebrospinal fluid barrier to protect brain neurons.

In conclusion, pre administration of Danhong injection can protect brain cells and serum S-100 β . It can improve the early postoperative cognitive function of the elderly.

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