International Journal of Surgery 12 (2014) 1484–1488

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original research

Combining interscalene brachial plexus block with intravenous-inhalation combined anesthesia for upper extremity fractures surgery: A randomized controlled trial

Lan Yuan, Wei Tang*, Guo-qiang Fu, Jian Wang, Jun Guo, Wen-ting Chen

Department of Anesthesiology, ShuGuang Hospital affiliated to Shanghai Traditional Chinese Medicine University, Shanghai 201203, PR China

HIGHLIGHTS

- Combining IBPB with IV-inhalation combined anesthesia was assessed in elderly.
- It was associated with fewer side effects such as preoperative hypotension.
- It had less consumption of general anesthetics such as propofol and lsoflurane.
- It required a less the recovery time.

ARTICLE INFO

Article history:
Received 9 July 2014
Received in revised form
24 July 2014
Accepted 16 October 2014
Available online 24 October 2014

Keywords:
Interscalene brachial plexus block
Intravenous anesthesia
Inhalational anesthetics
Side effect

ABSTRACT

Background: A parallel-group randomized controlled trial (RCT) was conducted to evaluate the effect of combining the interscalene brachial plexus block (IBPB) with Intravenous–inhalation combined anesthesia to isolated Intravenous–inhalation anesthesia in the upper extremity fractures surgery of elderly patients. **Methods**: One hundred elderly patients who underwent upper extremity surgery were randomly assigned to received isolated Intravenous–inhalation combined anesthesia (group CI, $n = 50$) and IBPB associated with Intravenous–inhalation combined anesthesia (group NB, $n = 50$). Associated side effects, recovery time after operation, as well as the dose of intraoperative vasoactive agents and auxiliary drugs were noted. **Results**: The two groups were not significantly different in gender ($P = 0.539$), ages ($P = 0.683$) and weight ($P = 0.212$). Five patients (10%) in the group NB and 17 patients (34%) in the group CI suffered from preoperative hypotension ($P = 0.004$). Besides, lower incidence of other adverse effects such as mental stress, incision pain and hypertension were also found in the group NB; however, the differences were not statistically significant ($P > 0.05$). The consumption of general anesthetics in the group NB was significantly less than that of the group CI (propofol, $P = 0.004$; lsoflurane, $P < 0.001$), and the recovery time of the group NB was significantly shorter than that of the group CI ($P = 0.020$). **Conclusion**: Combining IBPB with Intravenous–inhalation combined anesthesia in elderly patients hold a greater potential for upper extremity fractures surgery due to its improved clinical effectiveness and fewer side effects.

1. Introduction

The population of the elderly increases rapidly, and this cohort constitutes a greater proportion of medically compromised patients than younger adults. However, elderly patients would not be considered as candidates for surgical intervention due to the low survival rate caused by concomitant diseases [1]. In addition, the elderly seem to be more sensitive to adverse side effects of certain anesthetics than younger individuals. The elderly who undergo noncardiac surgery might be at risk of cardiovascular, neurologic and pulmonary complications as a result of anesthesia and surgery [2]. Therefore, the use of anesthetic on elderly patients must be managed judiciously in connection with the types of surgery required.

Interscalene block, proposed by Winnie in 1970, has gained in popularity owing to its effectiveness and the safety profile [3]. It is often chosen by skilled anesthesiologists as the major anesthetic technique for shoulder surgery [4]. Compared with general

* Corresponding author. Department of Anesthesiology, ShuGuang Hospital affiliated to Shanghai Traditional Chinese Medicine University, No. 528 Zhangheng Rd, Pudong District, Shanghai 201203, PR China.
E-mail address: tangwei241@163.com (W. Tang).

http://dx.doi.org/10.1016/j.ijsu.2014.10.011
1743-9191/

anesthesia, interscalene blocks show more significant advantages, such as improved postoperative pain, decreased the administration of postoperative opioid, and reduced recovery time. However, this technique also has disadvantages, such as location problem, and a fairly high incidence of side effects [4,5].

Intravenous–inhalation combined anesthesia is a method of general anesthesia which is used in combination with total intravenous anesthesia and inhalation anesthesia. Total intravenous anesthesia is preferable to induction of anesthesia in pediatric patients because of the low risk of respiratory irritation and short recovery time. It is simple and effective for extremity surgery and has become more popular and possible in recent time because of the pharmacokinetic and pharmacodynamic properties of propofol and the availability of short acting synthetic [6]. However, intravenous anesthesia has been limited by its inability to provide postoperative analgesia and the risk of bradycrdia and hypotension after intravenous administration [7]. Inhalational anesthesia is pervasive when used for induction or maintenance of anesthesia because it is effective, reliable, safe, easy to deliver, stable, and without major end-organ sequelae [8]. An inhalational induction is guaranteed to be painless. It might be smelly, but it will never hurt. Besides, there are a few absolute contraindications to inhalational agents for induction of general anesthesia, most notably malignant hyperthermia, probably muscular dystrophy [9].

The purpose of the present study was to evaluate whether combining interscalene brachial plexus block (IBPB) with Intravenous–inhalation combined anesthesia was more effective than isolated Intravenous–inhalation combined anesthesia in upper extremity fractures surgery of elderly patients.

2. Materials and methods

2.1. Trial design

This study was a parallel-group randomized controlled trial (RCT) using a 1:1 allocation ratio, designed to evaluate the effect of combining IBPB with Intravenous–inhalation combined anesthesia to isolated Intravenous–inhalation anesthesia in the upper extremity fractures surgery of elderly patients.

2.2. Participants

One hundred patients admitted to the Department of Anesthesiology, Baoshan District Shanghai Hospital of integrated Traditional and Western Medicine for upper extremity fractures surgery between October 2012 and December 2013 were enrolled. Ethical approval for human subjects was obtained from the Ethics Committee of our hospital, and written informed consent was obtained from each study participant. The inclusion criteria were as follow: (a) patients who were scheduled for upper extremity fractures including ulna fracture, humeral shaft fractures, humerus surgical neck fracture and humeral supracondylar fracture surgery; (b) all of them aged 70 years or older. In addition, the exclusion criteria were listed: (a) contraindications to brachial plexus block and Intravenous–inhalation anesthesia (e.g. coagulopathy, refusal of anesthesia); (b) mental diseases; (c) body mass index > 35; (d) severe congestive heart failure (New York Heart Association class IV), severe chronic obstructive pulmonary disease (Global Initiative for Chronic Obstructive Lung Disease guidelines, stage III–IV) [10]. The weight of these patients ranged from 52 to 70 kg. Among them, 69 cases (69%) were complicated by high blood pressure and cardiac insufficiency. The follow-up period was 4–6 weeks.

Table 1
Comparisons of basic characteristics between the two groups.

Groups	Age (years)	Weight (kg)	Gender (no. of males, %)	Complications (*n*, case)
CI ($n = 50$)	77.2 ± 5.9	61.2 ± 4.0	32, 64.0%	38, 76.0%
NB ($n = 50$)	76.7 ± 6.3	60.3 ± 3.1	29, 58.0%	36, 72.0%

CI, Intravenous–inhalation combined anesthesia; NB, interscalene brachial plexus block associate associated with Intravenous–inhalation combined anesthesia.

2.3. Randomization

Participants were randomly divided into two groups. The independent institution accomplished the randomization process. A computer random number generator produced the random number. The central web-site was applied to carry out the randomization program. The investigators, participants, surgeons, assistants and nurses were blinded to study treatment allocation.

2.4. Interventions

The enrolled fracture clinic patients were randomly divided into two groups. Fifty patients received isolated Intravenous–inhalation combined anesthesia (group CI), while the other 50 patients underwent IBPB with the ultrasound-guided technique associated with intravenous–inhalation combined anesthesia (group NB). These two anesthetic approaches were performed by two anesthesiologists with extensive experience in this technique. The patients in the group NB were injected with the 25 mL mixing liquid of 0.375% ropivacaine and 1% lidocaine hydrochloride after they acquired of paresthesia [4]. Trachea general anesthesia intubation was applied in Intravenous–inhalation combined anesthesia for both group CI and NB. Before induction of anasthesia, the patients were submitted to intravenous injection of 0.3 mg atropine or scopolamine, 0.02–0.04 mg kg^{-1} midazolam, and 10 min of supplying of oxygen to mask. Then began to undergo endotracheal intubation and mechanical ventilation after the patients were given 2–5 mg kg^{-1} fentanyl, 0.3 mg kg^{-1} etomidate and 0.8 mg kg^{-1} rocuronium bromide. Both CI and NB group patients were received 1–2% isoflurane inhalation and 2–4 mg (kg $h^{-1})^{-1}$ infusion of propofol following the induction [11]. All patients were successfully anesthetized. Moreover, the follow-up period was 4–6 weeks.

2.5. Outcomes

Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (Pmean), heart rate (HR) and peripheral oxygen saturation (SpO_2) were monitored before and after anesthesia at different time points (5, 10, 20, 40, 60, 80 and 120 min) by nurses using the Schiller Cardiovit AT-60 electrocardiograph (Schiller AG, Baar, Switzerland). Besides, side effects and use of intraoperative medication of the two groups were also recorded, as well as recovery time.

2.6. Statistics analyses

Categorical variables were analyzed using by $\chi 2$ test. Continuous variables, presented as mean ± SD, were compared using Student *t* test. All analyses were conducted using statistical package for the social sciences (SPSS) software (version 13.0; SPSS Inc., Chicago, IL). A P value of <0.05 was considered as statistically significant.