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Original article

Spinal 1% 2-Chloroprocaine versus general anesthesia for ultra-short outpatient procedures: a retrospective analysis

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Summary. *Introduction:* 2-Chloroprocaine is a local anesthetic with a very short half-life and a favorable evolution of spinal block for ultra-short outpatient procedures. The aim of this retrospective study is to evaluate the clinical impact of the introduction of spinal 1% 2-chloroprocaine compared to general anesthesia at the ARS Medica Clinic (Switzerland). *Material and Method:* We retrospectively evaluated the charts of all patients who underwent knee arthroscopy under general anesthesia (group GA) or spinal 2-chloroprocaine (group SA) between June 2012, when chloroprocaine was available for the first time, and December 2012. We collected the anesthesia time and the number of patients able to bypass the PACU. Moreover, we looked at hospital discharge time and we performed a pharmaco-economic analysis. *Results:* 61 charts were evaluated, 5 patients were excluded for insufficient data. The anesthesia time was comparable between the two groups. All patients in group SA were able to bypass the PACU versus only 18% in group GA. We observed a clinically significant reduction in terms of discharge time (203 vs 326 minutes) and cost of materials and employers involved patients' care (53 vs 78 swiss franks) when spinal 1% 2-chloroprocaine was used. *Conclusion:* The right selection of the local anesthetic makes spinal anesthesia a suitable anesthetic technique for ultra-short outpatient procedures. If short acting local anesthetics are involved, spinal anesthesia could be competitive versus general anesthesia. (www.actabiomedica.it)

Key words: 2-Chloroprocaine, general anesthesia, spinal anesthesia

Introduction

Spinal anesthesia is one of the most commonly used anesthetic techniques: in fact, it is easy to perform and shows a reliable anesthetic profile (1). In the past, two local anesthetics were mainly used for intrathecal injection: bupivacaine for inpatient surgery and lidocaine for outpatient surgery.

In 1991, the first case report of cauda equina syndrome was published after continuous spinal anesthesia with lidocaine (2). This report was followed by publication of cases of transient neurologic symptoms after single dose spinal anesthesia with lidocaine (3-5). These collective publications resulted in a significant decrease in the use of lidocaine for spinal anesthesia.

In the last two decades, different Authors have searched for alternatives to lidocaine for spinal anesthesia for outpatients, such as low-dose bupivacaine and more recently prilocaine and articaine (6-8). In the past, the lack of the ideal spinal local anesthetic and the availability of on/off drugs as remifentanil and propofol have made general anesthesia the anesthetic technique of choice for short procedures around 30 minutes (9). In fact, compared with spinal bupivacaine or with peripheral nerve blocks, general anesthesia is characterized by a reduction in terms of discharge time in this clinical setting (10).

Recently, 1% 2-chloroprocaine was approved by the European Medicine Agency (EMA) as spinal local anesthetic for surgical procedures lasting up to

40 minutes. In this setting, spinal 2-chloroprocaine showed a fast onset, a reliable anesthetic effect, a low incidence of residual motor block and postoperative urinary retention (POUR). When compared to lidocaine, bupivacaine and articaine, 1% 2-chloroprocaine showed a better anesthetic profile for ultra-short procedures (11-13). Based on these results, it seems that 1% 2-chloroprocaine could be competitive with general anesthesia in this setting.

The aim of this study is to retrospectively evaluate the discharge time associated with the care of consecutive outpatients treated with spinal 1% 2-chloroprocaine or general anesthesia who underwent knee arthroscopy at the ARS Medica clinic.

Materials and Methods

We received approval from the Institutional Review Board at the ARS Medica Clinic (Gravedona, Switzerland) to examine the database containing day-of-surgery processes for all patients who underwent knee arthroscopy between June and December 2012 at the outpatient surgery unit.

For each patient, we collected data regarding the following parameters: age, sex, preoperative physical status (American Society of Anesthesiologist (ASA) physical status), duration of both surgery and anesthesia, defined as the time between the induction of anesthesia and the discharge from the operating room, type of perioperative care received (including anesthetic, analgesic, and antiemetic agents) and information about postoperative anesthesia care unit (PACU) use and hospital discharge. Patients were categorized as having received general anesthesia (group GA) if the airway was secured with laryngeal mask (LMA) and intravenous propofol and fentanyl were administered or spinal anesthesia (group SA) if 1% 2-chloroprocaine was the local anesthetic of choice for intrathecal use. We recorded whether the patient received parenteral interventions by a nurse after surgery for the management of pain or PONV. Moreover, we collected pain at the discharge time and the worst pain referred during the hospitalization using the numerical rating score (NRS 0-10). Patients who experienced a rapid emergence from anesthesia, showed hemodynamic and respiratory stability and were free from pain, PONV and other symptoms, were transferred to a step-down recovery unit, rather than being sent to the PACU. To determine recovery room bypass eligibility we routinely used the score described by Aldrete (Aldrete's score > 8 for PACU bypass). In addition we recorded when patients were discharged home from the hospital (PADDS score > 10).

Costs, included both direct (anesthesia supplies and drugs) and indirect costs (PACU and ambulatory surgery unit nurse), were defined as the Swiss franc amount of resources utilized to provide all the anesthesia aspects of patient care.

Unpaired t-test was used for parametric data null hypothesis testing, while Mann-Whitney U-test was applied to non-parametric data. A p value < 0.05 was considered statistically significant (95% confidence interval).

Results are given as mean (m) ± standard deviation (SD) for normally distributed parameters or median (M) and interquartile range (IQR) for non-normally distributed parameters. Statistical analysis was performed using SPSS (IBM, USA) and Numbers '09 2.1 version (Apple Inc., USA) softwares.

Results

During the study period, 61 patients underwent knee arthroscopy performed either under general anesthesia with LMA, propofol and fentanyl (Group GA) or spinal anesthesia with 1% 2-chloroprocaine (Group SA). Five patients were excluded due to insufficient data in the analyzed database. Twenty-eight patients for each group were considered in the analysis. Table 1 shows the characteristics of the population included in the retrospective analysis.

Table 1. Study population characteristics. Data are expressed as mean ± SD

	GA Group	SA Group
Age (years)	50 ± 3	50 ± 5
Height (cm)	167 ± 2	172 ± 5
Weight (Kg)	77 ± 9	79 ± 18
Sex (M/F)	12/16	19/9
ASA (I/II)	10/18	18/10

Table 2. Cost of materials and employers involved in the anesthesia care of patients. Data are expressed as mean ± SD

	GA Group	SA Group
Anesthesia Cost (swiss franks)*	78 ± 18	53 ± 11
PACU Cost (swiss franks)*	8 ± 1	0
ASU Cost (swiss franks)*	41 ± 16	24 ± 11

* $p<0.005$

The anesthesia time (64±16 minutes GA vs 62±14 minutes SA) was comparable between the two groups while the surgical time (22±12 minutes GA vs 14±14 minutes SA) was shorter in patients who received spinal anesthesia (p=0.003). In group SA, 32% (9/28) of patients required pain medication after surgery versus 64% (18/28) in GA group. There was no difference in terms of worst pain referred during the hospitalization between the two groups (NRS 3 versus 4, respectively in the group SA and GA). One patient required antiemetic drugs in the postoperative period in group SA compared to 4 patients in group GA.

All patients in group SA matched PACU by-pass criteria vs 18% in group GA and were successfully discharged to the ambulatory surgery unit (ASU). A reduction in terms of discharge time if chloroprocaine was used (203 ± 14 minutes vs 326 ± 67 minutes; p=0.0001) was observed. The cost of anesthesia supplies and employers involved in the anesthesia care of patients are reported in Table 2.

Discussion

In this retrospective study we evaluated the impact of the anesthetic technique on the recovery profile and the cost associated with the care of consecutive outpatients who underwent knee arthroscopy in the outpatient surgical unit. The availability of 1% 2-chloroprocaine as a short acting local anesthetic for spinal use gave us the possibility to bypass the PACU and to discharge patients home earlier with an economical advantage over general anesthesia.

In the meta-analysis published by Liu et al, the Authors compared general anesthesia versus regional anesthesia for ambulatory surgeries (10). Spinal anesthesia was not associated with a decrease in PACU time and it showed an increased discharge time by 35 minutes related to a delay in achievement of several common discharge criteria. This may be due to the type and dose of the spinal local anesthetic used. In fact the commonly used long-acting local anesthetics for spinal anesthesia such as bupivacaine have the disadvantage of a potential delay in hospital discharge. Reducing the dose may improve the recovery profile of the spinal block but it may increase the failure rate (13-14). The studies included into the meta-analysis of Liu et al used low dose of long acting or intermediate acting local anesthetics (10).

2-Chloroprocaine is an amino-ester local anesthetic with a very short half-life and a favorable evolution of spinal block for ultra-short outpatient procedures. Casati et al tested the hypothesis that 50 mg of 1% preservative-free 2-chloroprocaine would provide a faster resolution of sensory and motor blocks if compared to the same dose of 1% plain lidocaine (11). The median onset time of spinal block was shorter in patients of group chloroprocaine than in patients of group lidocaine (8 vs 12). Recovery of sensory and motor functions and unassisted ambulation was faster in patients receiving chloroprocaine than for those receiving lidocaine. When voiding was not included among discharge criteria, the faster resolution of spinal block obtained with chloroprocaine resulted in quicker fulfillment of home discharge criteria.

In the last decade other local anesthetics have been evaluated as spinal agents in the ambulatory setting. Foster et al have recently compared 40mg of chloroprocaine with the same dosage of articaine (12). The equivalent doses of 40 mg of articaine and chloroprocaine produced mainly adequate spinal anesthesia for knee arthroscopy. While onset and spread of anesthesia were similar, block regression was faster with chloroprocaine. There were trends toward a longer time to the first spontaneous voiding in the articaine group as compared with the patient treated with chloroprocaine.

A possible complication after spinal anesthesia is the potential development of postoperative urinary retention (15). In literature, there are no reports of urinary retention after spinal anesthesia with 2-chloroprocaine. In fact, low-risk patients treated with short acting local anesthetics are at no greater risk of urinary retention than after general anesthesia and may be dis-

charged home with similar instructions regarding hospital return if unable to void (16).

In the meta-analysis of Liu et al spinal anesthesia was associated with lower NRS and less analgesic consumption in the post anesthesia care unit (10), due to the small number of patients and the retrospective nature of the study, data related to the incidence of PONV and the worst pain reported in our analysis are not significant.

The constant search for increased healthcare efficiency has led us to compare under the economical point of view two different anesthetic techniques. In our retrospective analysis, patients treated with spinal anesthesia were able to bypass the PACU systematically and they were characterized by a faster discharge time compared with patients treated with general anesthesia. The associated cost reductions per patient associated with spinal anesthesia for knee arthroscopy, were due to the lower incidence of pain and PONV in the ambulatory surgery unit with a faster discharge at home.

The study presents a major limitation due to its retrospective design. Future data from prospective randomized double-blinded studies are needed to confirm our results.

In conclusion, the selection of the right local anesthetic makes spinal anesthesia a suitable anesthetic technique for ultra-short outpatient procedures. If short acting local anesthetics are involved, spinal anesthesia can be competitive versus general anesthesia for ultrashort procedures.

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