

Original Research Article

Regional versus general anesthesia for different categories of caesarean deliveries amongst Chinese women: A retrospective cohort analysis

Li Xu¹, Hao Zhang², Xiaoguang Li^{1*}

¹Department of Anesthesiology, Beijing Obstetrics and Gynecology Hospital, Capital Medical University, Beijing 100060,

²Department of Anesthesiology, Beijing Longfu Hospital, Beijing 100010, China

*For correspondence: **Email:** GracielaWisejui@yahoo.com; **Tel:** +86 10 8596 9869

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Abstract

Purpose: To study anesthetic techniques utilized in various caesarian deliveries, justification for preference of general anesthesia, and failure of regional anesthesia in pregnant Chinese women.

Methods: Clinical data for 512 Chinese women who successfully delivered through caesarian section were used in this analysis. Data comprising information on anesthetic techniques used, explanations for choice of general anesthesia, failure of regional anesthesia, and levels of supervision were collected and analyzed.

Results: Ninety-four of the enrolled women delivered through caesarian category 1, while 112 women delivered via caesarian category 2. Deliveries in caesarian categories 3 and 4 applied to 84 and 222 women, respectively. General anesthesia was used for 219 women, but this procedure was refused by 106 women, while the physician chose it for 34 women. Thirty-six women opted for general anesthesia, while regional anesthesia was used in 293 women. Ten women needed a change from regional anesthesia to general anesthesia due to inadequate regional block, accelerated delivery, and other reasons. General anesthesia was preferred in 17 % of emergency categories, 40 % of semi-emergency categories, and 43 % of elective categories.

Conclusion: Patient awareness, training of health professionals, and multi-disciplinary correspondence will be helpful to caregivers in making consensus decisions with respect to the best anesthesia technique for cesarean delivery.

Keywords: Emergency delivery, General anesthesia, Caesarean delivery, Patient awareness, Regional anesthesia

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INTRODUCTION

China has one of the highest degrees of cesarean deliveries for expectant mothers (more than 50 %) [1]. General anesthesia and/or regional anesthesia is regularly utilized in

cesarean delivery (CD) [2]. Regional anesthesia is the preferred choice for CD, considering the benefit-risk ratio for the pregnant woman and her fetus [3]. The choice of general or regional anesthesia for CD is guided by various benefits and risks, including maternal airway and

pulmonary aspiration [4]. Furthermore, retrospective studies have demonstrated probable association of neuraxial anesthesia with low incidence of adverse neonatal outcomes and learning incapacities in children [2]. Short stays in hospital after delivery are also related to neuraxial anesthesia [4]. Standard guidelines have recommended that more than 85 % of emergency deliveries must be performed under regional anesthesia, and a switch to general anesthesia ought to be under 5 % in case of emergency surgeries, and under 1 % for elective surgeries [5].

Regional anesthesia in CD is associated with quality outcomes [6]. The Royal College of Obstetricians and Gynecologists has classified CD into four categories, on the basis of urgency [7]. Category 1 applies to a situation when there is an immediate threat to the life of the pregnant woman or fetus. In category 2, there is maternal or fetal compromise which is not immediately life-threatening, while in category 3, although there is no maternal or fetal compromise, early delivery is necessary. Category 4 CD applies to delivery timed to suit the expectant mother or staff of the institute.

Although non-governmental *No Pain Labor & Delivery* approach was started in China in 2008 [1], there are no well-established protocols for choice of regional anesthesia for CD by women. In most cases, women preferred general anesthesia due to poor knowledge and misconceptions associated with regional anesthesia. This situation turns out to be more crucial when there is an immediate threat to the life of the woman or fetus (category 1 CD). In this case, most Obstetricians select general anesthesia for delivery purpose, based on customary convictions such as postponement in preparedness of women for CD and the dread of inadequate regional block during surgery.

This retrospective analysis was carried out to study the anesthetic techniques utilized in various CDs for Chinese women, and the justifications behind the selection of general anesthesia. Moreover, failure of regional anesthesia, levels of supervision, and anesthesia choices for various working hours, were investigated.

EXPERIMENTAL

Ethical consideration and consent to participate

The protocol of the original study was approved by the review board of Capital Medical University

(approval no. CMU/CL/17). Informed consent was signed by the women or their husbands regarding anesthesia, delivery, and publication of the study in all formats of publication irrespective of time and language. Patient confidentiality was strictly maintained. The study was in line with the laws of China, the 2008 Helsinki Declaration [8], and the provision of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Inclusion criteria

Chinese women who successfully delivered through CD were included in the analysis.

Exclusion criteria

Chinese women aged less than 18 years who delivered babies through vaginal birth were excluded from the analysis.

Data collection

The anesthetists involved in CD completed the data-collection forms post-consultations with obstetricians. Information was gathered regarding anesthesia techniques utilized, explanations behind general anesthesia choices, levels of supervision, and CD category. Where regional anesthesia technique failed, information regarding causes of the failure (for example, inability of anesthetists to commence regional anesthesia technique or unworkability of the technique post-commencement), levels of anesthetists, supervision levels, and work-hours were documented. The proposed indicators were CD categories 1 to 4 in the presence of regional and general anesthesia, overall incidence of failed regional anesthesia, and its percentages in various CD categories.

Statistical analysis

Values are expressed as numbers with percentages. Analysis of all data collected was done using SPSS version 21.0 (SPSS Inc, Chicago, IL, USA). Numerous bar outlines were produced for levels of supervision and duty-hours. The constant variables of anesthesia techniques utilized in various CD categories, explanations behind general anesthesia choices, and the regional anesthesia failure were assessed using rates and frequencies.

Fischer exact test was used for constant variable, while Mean Whitney *U*-test was used for continuous variables [2]. Values of $p < 0.05$ were considered significant.

RESULTS

Enrollment

Between July 3, 2016 and 11 January 2019, a total of 945 delivery cases were reported in the Beijing Obstetrics and Gynecology Hospital and the Beijing Longfu Hospital, China. One woman was less than 18 years of age, another woman was not Chinese, while 431 Chinese women had vaginal deliveries. These women were excluded from the analysis. The analysis was based on data from 512 Chinese women who qualified for inclusion. Ninety-four (94) of the women (18.36 %) delivered through CD category 1, 112 women (21.88 %) delivered through CD category 2, while 84 women (16.41 %) delivered through CD category 3. A total of 222 women (43.36 %) delivered through CD category 4. A flow diagram of the study is presented in Figure 1.

Anesthesia techniques utilized

General anesthesia was preferred in CD for 219 women (42.77 %), while regional anesthesia was chosen in CD for 293 women (57.23 %). Out of 293 women who received regional anesthesia, 266 (90.78 %) delivered through spinal anesthesia, 25 (8.53 %) delivered through extended labor epidural analgesia, while 2 (0.68 %) delivered through combination of spinal and epidural anesthesia.

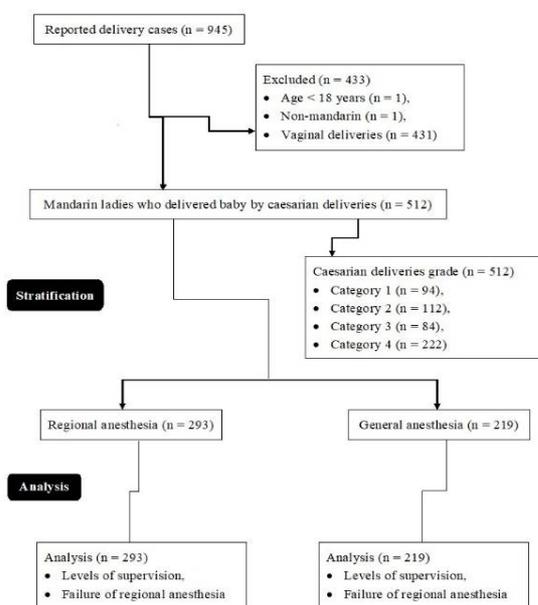


Figure 1: Flow chart of analysis

The utilization of general anesthesia and regional anesthesia for various CD categories demonstrated a relatively higher than

recommended level for category 4 or elective CD performed in presence of general anesthesia. The maternal and natal demographic characteristics were comparable between both groups ($p > 0.05$). These results are presented in Table 1.

Justification for general anesthesia

In assessing the purpose behind choice of general anesthesia, the factors responsible were refusal of regional anesthesia by women (106 cases, 48.4 %); choices by anesthetists in 36 cases (16.44 %), choices by physicians in 26 cases (11.87 %), insufficient time in 34 cases (15.53 %), and miscellaneous purposes in 17 cases (7.76 %). These data are shown Figure 2.

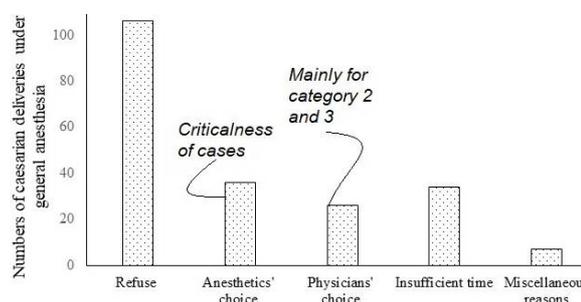


Figure 2: Reasons for caesarian deliveries under general anesthesia

Levels of supervision

A total of 352 CDs (68.75 %) were performed during morning shifts (9:00 – 18:00 h), 78 CDs (15.23 %) were done in evening shifts (18:00 – 22:00 h), while 82 CDs (16.02 %) were carried out during on-call hours (22:00 – 9:00 h). Assessment of the impact of working hours and supervision levels on anesthesia decision demonstrated that the choice of anesthesia techniques was not influenced by changes in working hours. However, the levels of supervision was altered in the various working hours, as depicted in Figure 3, with optimum supervisions during the morning shifts. A similar level of supervision was seen in cases delivered through general anesthesia and regional anesthesia ($p = 0.59$).

Failure of regional anesthesia

The regional anesthesia procedure failed in 6 women (2.05 %). Anesthetists were not able to commence regional anesthesia technique in 3 women (1.02 %). In the latter case, anesthesia was commenced for 2 of the women by resident doctors, while the other woman was anesthetized under the supervisor of an experienced physician.

Table 1: Maternal and natal demographic characteristics

Characteristic	Cohort		Comparison between groups P-value	
	Regional anesthesia	General anesthesia		
Data reviewed	293	219		
Maternal age (years)	Minimum	18	0.058	
	Maximum	45		
	Mean ± SD	27.12±3.15		
Ethnicity	Han Chinese	269(92)	0.895	
	Mongolian	20(7)		
	Tibetan	4(1)		
	Primitive	140(48)		
Maternal education	Undergraduate	108(37)	0.705	
	Higher	45(15)		
	≥37 weeks	200(69)		
Gestational age	32–36 weeks	89(30)	0.716	
	< 32 weeks	4(1)		
	1	57(19)		
	2	59(20)		
Caesarean delivery grades	3	50(17)	0.665	
	4	127(44)		
	1 min	45(15)		0.445
	5 min	27(9)		
Birth weight	≤1500 g	103(35)	0.423	
	1500–2500 g	148(51)		
	>2500 g	42(14)		
Sex of neonate	Male	132(45)	0.283	
	Female	161(55)		
Death of neonate within a week by any reason		11(4)	0.812	
Twins		5(2)	0.245	
Maternal hypertension	None	278(95)	0.838	
	Gestational hypertension	15(5)		
Maternal diabetes	None	276(94)	0.999	
	Gestational diabetes	17(6)		

APGAR: Appearance, Pulse, Grimace, Activity, Respiration. Continuous variables are presented as mean ± SD; constant variables are presented as frequency (number). The Fischer exact test was used for constant variables, while Mean Whitney U-test was used for continuous variables. Values of $p < 0.05$ were considered statistically significant

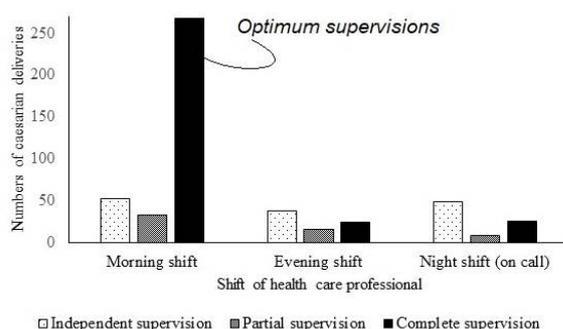


Figure 3: Comparison of levels of supervision at different working hours (morning shifts: 9:00 – 18:00 h, evening shifts: 18:00 – 22:00 h; on-call hours: 22:00 – 9:00 h)

Regional anesthesia technique did not work post-commencement in 3 women (1.02 %) either because of insufficient anesthesia or regional block. In the 3 cases, spinal anesthesia was chosen over regional anesthetic technique. The three cases were changed over to general anesthesia. In addition, 4 women preferred

general anesthesia so as to accelerate delivery in combination with labor epidural.

A total of 10 (3.41 %) women needed a change from regional anesthesia to general anesthesia. Eight out of these 10 women had CD categories 1–3, whereas two women had CD category 4. The supervision levels were completed in 9 women (Figure 4). Assessment of working hours and regional anesthesia failure demonstrated 60 % failure in morning shifts, when compared to 40 % failure in the evening and night shifts.

DISCUSSION

This study showed that 54 % of the women delivered through caesarian section. Many women deliver through CD in urban areas of PR China [9]. Indeed, PR China has the highest rate of CD in the world [10]. The high degree of CD clearly demonstrates that anesthesia techniques for various CD categories play an essential part in safer practices in obstetrics in China.

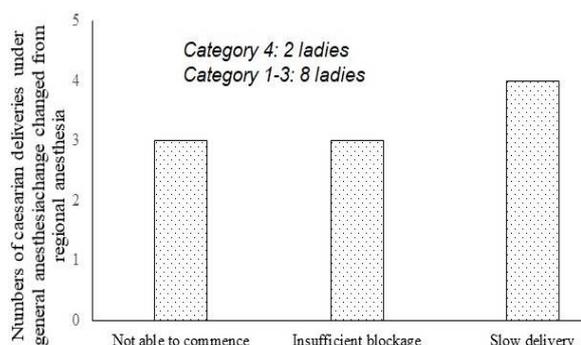


Figure 4: Reasons for change from regional to general anesthesia

This study demonstrated that 17 % of emergency (category 1), 40 % of semi-emergency (category 2 and 3), and 43 % elective (category 4) CDs were performed through general anesthesia. Results regarding category 1 CD are consistent with the findings in a survey of anesthetic management of CD in a previous study [11]. However, results obtained in semi-emergency (category 2 and 3) and elective CDs (category 4) performed through general anesthesia showed greater differences, when compared with the previous survey [11]. Globally, obstetrics anesthesia guidelines recommend regional anesthesia over general anesthesia for CD [12]. The preferential selection of regional anesthesia is triggered by various advantages and concern, including maternal airways and pulmonary aspiration risk [13]. However, CD performed through general anesthesia has turned into a quality marker for obstetrics anesthesia services [14]. The current analysis recommends CD through regional anesthesia in Chinese women.

In assessing the purpose behind choosing general anesthesia, the present study found that 106 women (48.4 %) rejected regional anesthesia. A systematic review demonstrated that more women favored general anesthesia, relative to epidural or spinal anesthesia [15]. Rejection of anesthesia is a pivotal contraindication in the utilization of regional anesthetic technique. Staying conscious during CD is a possible reason for post-treatment side effects and litigations for various medical negligence practices. A study on litigation showed that more than half of the cases were related to regional anesthesia, half of which are associated with obstetric anesthesia. A significant proportion of the claims is based on insufficient regional block and CD pain [3,16]. It has been demonstrated that Chinese women are more likely to disapprove the care given to them while they are conscious rather than when they are asleep [17]. Insufficient education and lack of awareness fuel the dread associated with

regional anesthesia, such as back pain and paralysis, resulting in low use of regional anesthesia technique in hospitals [18]. Furthermore, Chinese women totally depend on obstetricians in making choices for anesthesia techniques [1]. Thus, there is need for awareness of pregnant women as regards utilization and advantages of regional anesthesia.

In case of inclusion of women who were offered general anesthesia for accelerated delivery in combination with labor epidural anesthesia, the failure cases accounted for 3.41 %. The study had a 2.05 % failure of regional anesthesia which is slightly higher than acceptable level. Failure in emergent CD categories 1 to 3 was 1.37 %, whereas 0.68 % failure was seen in elective CD category 4 which almost met the global standard. The standard guidelines for the better practice of regional anesthesia recommends less than 5 % of regional anesthesia should be changed to general anesthesia [12].

Regional anesthesia failure is characterized in various ways. Objective results incorporate changes to general anesthesia, alteration to another variant of anesthesia, or pain amid surgery [19]. Intra-operative pain [18] and post-operative pain [10] amid regional anesthesia for CD are the most frequent causes of anesthetic litigation cases in obstetrics practice. Varied failure rates have been reported in many studies. A population-based study showed 3.9 % failure [5], whereas prospective cross-sectional study showed 3.8 % failure, and a prospective study showed 6 % failure of regional anesthesia [19]. These failures are usually caused by time constraints in development of guidelines for initiating epidural anesthesia requirements in the labor room.

The present study found that in 11.87 % of women, general anesthesia was selected. It was the physicians' decision, and was mainly for CD categories 2 and 3. Moreover, in 16.44 % of the women, general anesthesia use was due to choices by anesthetists. The purposes behind the choice of general anesthesia by anesthetist were regional anesthesia failure, and medical history of the patient such as low platelet count, coagulation anomalies, and critical conditions. Most of the Chinese obstetricians think that regional anesthesia technique requires additional time for preparation and administration [1]. Obstetricians can play a significant role in changing maternal perspectives on regional anesthesia.

The study analyzed the effect of working hours and supervision levels on choice of anesthesia. The choice of anesthesia techniques was influenced by changes in working hours. However, the level of supervision changed with working hours, with optimum supervisions during the morning shifts. These results are in line with those obtained in a prospective cross-sectional study [6]. This demonstrates that the usage of specific anesthesia technique is virtually useless, with low supervision levels at evening and night shifts.

Limitations of the study

Despite the fact that obstetricians managed to reduce CDs through general anesthesia and constantly endeavored to create awareness in patients on the benefits of regional anesthesia technique through the use of pamphlets and counseling, the current study is not up to the mark of global standards in regional anesthesia technique. Certain intrinsic limitations require consideration while interpreting the study outcomes. Since this is a two-center study with very limited number of pregnant women, one should be cautious in generalizing the results.

CONCLUSION

Patient awareness of caesarian deliveries through regional anesthesia is required. This training requires feedback from physicians as well as nurses. Multi-disciplinary correspondence is critical for the safe management of women in need of caesarian deliveries. Keeping in mind the end goal of meeting global measures for better practices, guidelines ought to be framed by consulting obstetricians and nurses for various caesarian delivery categories through regional anesthesia. This would assist caregivers in consensus decision making for the best anesthetic techniques for patients.

DECLARATIONS

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest

Authors have no competing interest regarding the results and/or discussion reported in the study.

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Authors' contributions

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. All authors had read and approved submission for publication. LX was project administrator contributed to the formal analysis, data curation, and literature review of the study. HZ contributed to the conceptualization, resources, resources, and literature review of the study. XL contributed to software, formal analysis, resources, and literature review of the study, the draft and edited the manuscript for intellectual content. The authors agree to be accountable for all aspects of work ensuring integrity and accuracy.

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