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Intra and postoperative maternal and fetal complications in pregnant ladies undergoing cesarean section using spinal or general anesthesia

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Abstract
Objective: To evaluate maternal and fetal outcome in cesarean section using spinal or general anesthesia.
Study design and setting: Observational descriptive study at AL -Elwiya Maternity Teaching Hospital from the beginning of October 2013 to the beginning of October 2014.
Materials and Methods: Pregnant ladies undergoing cesarean section (C/S) were enrolled in this study. Sample collection was on Sunday and Wednesday each week throughout this period, the selection of cases was done after decision of C/S. Full history, examination, investigations, indications of c/s, type of anesthesia, intra and post-operative events for both mother and fetus were recorded and all patients were followed for one week after doing the operation, total number of patients was 110 cases of these sixty patients received spinal anesthesia (SA) and fifty received general anesthesia (GA). Informations obtained on admission plotted on special informations form.
Results: Chest infections and preeclampsia were significantly (P<0.05), the more frequent medical diseases, in SA group. In the current study blood loss in SA group was significantly less than that in GA group (<0001). It had been significantly found that women of SA group started bowel motion earlier than those in GA group (P<0.001), women in SA group needed shorter hospital stay (P<0.05). Regarding wound infection it was significantly more frequent in SA group than GA group (P<0.05), study reported difficult intubation and aspiration pneumonia in one woman represented 2% of GA group. In SA group 25/60 women developed post spinal headache (41.66%). Neonates of SA group had higher Apgar score at 1 min (P=0.036), and at 5 min (P=0.028) than those with GA, and less likely to be admitted to neonatal care unit (P=0.022).
Conclusion: Spinal anesthesia is a safe type of anesthesia in C/S, as pregnant ladies received spinal anesthesia during C/S they had less intraoperative blood loss, better neonatal outcome and the complications were not highly morbid as complications of general anesthesia.

Keywords: spinal and general anesthesia for cesarean section, maternal and fetal complications

1. Introduction

A caesarean section is often performed when a vaginal delivery would put the baby's or mother's life or health at risk. Many are also performed upon request [1]. The rate has risen to 46% in China and to levels of 25% and above in many Asian, European and Latin American countries [2]. The rate has increased in the United States, to 33% of all births in 2012, up from 21% in 1996 [3]. Across Europe, there are differences between countries: in Italy the caesarean section rate is 40%, while in the Nordic countries it is 14% [4].

In England the caesarean rate has increased by 0.5 per cent to 25.5 per cent in 2012-13. There has been a rise in the number of elective caesareans (0.5 per cent) while emergency caesarean rates have remained stable. This continues the trend of increasing elective caesarean rates and stable emergency caesarean rates [5, 6]. Two types of anesthesia are used in cesarean section: general anesthesia and regional anesthesia (spinal type). Obstetric anesthesia is generally considered to be one of the high-risk areas of anesthetic practice. Changes in maternal physiology during pregnancy and the care of both mother and fetus present unique challenges to the obstetric anesthetists. The modern-day obstetric anesthetist has to also grapple with issues related to charging population characteristics including maternal obesity, advanced maternal age and an increased complexity of medical diseases (including cardiac diseases), which may affect women with a reproductive potential. Various factors like improved maternal and fetal safety with regional, spinal anesthesia and confidential enquiry into maternal deaths due to general anesthesia have been responsible for increased use of regional anesthesia. Although serious complications are uncommon with regional and spinal anesthesia, they must be considered and should be discussed with the patient. One study from UK has shown that the rate of regional anesthesia for elective cesarean section rose from 69.4% in 1992 to 94.9% used in 2002, where spinal anesthesia was used for 86.6% of cases [7].

The increased safety of regional analgesia has increased the relative risk of general anesthesia. In Michigan Mortality Surveillance report by Mhyre *et al*. 4 of 8 anesthesia related maternal deaths were associated with the use of general anesthesia. One common cause of death cited for GA is failed intubation [8]. Difficult and even failed intubation in obstetric anesthesia has been ascribed to anatomic & physiological changes of pregnancy (airway oedema, weight gain, increased risk of hypoxia due to upward displacement

of the diaphragm by the gravid uterus, increased risk of regurgitation and aspiration of gastric contents, emergent nature of c/s), situational stress and the relative inexperience caused by decreased numbers of general anesthetics for c/s [9]. The American College of Obstetricians and Gynecologists has concluded that this relative increase in morbidity and mortality rates suggests that regional analgesia is the preferred method of pain control and should be used unless it is contraindicated [8].

2. Patients and Methods

Objective: evaluation of maternal and fetal outcome in cesarean section using spinal or general anesthesia.

Observational descriptive study at AL-Elwiya Maternity Teaching Hospital from the beginning of October 2013 to the beginning of October 2014, pregnant ladies undergoing cesarean section (C/S) were enrolled in this study. Consent of all patients was taken. Total number of cesarean sections in this period was (7579 cases). Sample collection was on Sunday and Wednesday each week throughout this period, the selection of cases was done after decision of cesarean section was made. 140 cases were included in the study in the beginning. Full history, examination, investigations, indications of C/S, type of anesthesia, intra and post-operative events for both mother and fetus were recorded and all patients were followed for one week after doing the operation, of the total number of patients 110 cases only remained in the study the other 30 patients were lost during the follow up period, of these 110, sixty patients received spinal anesthesia (SA) and fifty received general anesthesia (GA).

Inclusion criteria

Thirty six weeks and more pregnant ladies.

Exclusion criteria

Pregnants before 36 weeks gestation

After a decision of C/S is made; we recorded the indications and type of c/s whether it is elective or emergency. Type of anesthesia is also decided. A Quicken Type needle for spinal anesthesia was used in our hospital (figure 1). Any anesthetic complications of SA are recorded which include: hypotension after SA and need to any medication, history of dyspnea intraoperative, nausea and vomiting, loss of consciousness or seizure, collapse, and complications of GA are also recorded which include: aspiration pneumonia, difficult or failure of intubation, apnea. Amount of blood loss is also visualized and the number of packs used in c/s is calculated to estimate blood loos and if there is any need for intraoperative blood transfusions.

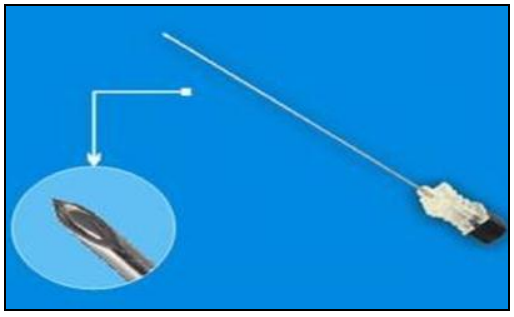

Fig 1: 22-gaguge Quincke type needle used in spinal anesthesia (in AL-Elwiya Maternity Teaching Hospital)

About Neonatal Outcome we recorded: The need for resuscitation or not, Apgar score at 1 and 5 min, gestational age, weight of neonate and admission to N.C.U. or not.

Maternal Outcome (post-operative) was recorded: vital signs are measured every 15min in the first hour then ½ hourly for the 2nd hour, and hourly for 3 hours, amount of blood loss, the need for blood transfusion or not, analgesia needed, usually we gave ordinary analgesia (opioids, non-opioids and NSAID every 12 hours), but if there was need for additional analgesia we gave injection every 8 hours., all patients were given third generation cephalosporin and metronidazole. Type and amount of fluid post-operatively intravenous or oral; all patients were given I.V. fluid 120 ml/ hour until bowel sound was positive. All cases in the SA group were advised to drink one liter of cola and 3 cups of strong coffee 750 ml (this is about 400mg of caffeine). Any respiratory, cardiac, neurological, specific complications related to SA (headache, pruritus, weakness, shivering, urinary retention) were recorded. Time of movement after SA and GA (every patient after spinal anesthesia was advised to stay in supine position after c/s for 8 hours and for those with GA as soon as they can move). Time of Foley catheter removal, time of bowel motion and days of stay in hospital are recorded.

We followed the cases for one week (during their stay in hospital and after discharge by phone) to know the evidence of: wound infection, post spinal headache, other complications include: chest infection or U.T.I., neonatal problems (time of stay in N.C.U.) and pain at the site of puncture. All ladies discharged on antibiotics.

Statistical analysis

Data of the patients were managed and analyzed by using the statistical package for social sciences version 21, IBM, US. Findings were presented as mean, standard deviation, frequencies (numbers) and proportions (%) according to the type of the variable under study. Student's t test (statistical) was used to compare means of a variable between both studied group (SA and GA), Chi square test was used to compare frequencies of a variable/s between the studied groups. Fisher's exact test was used as an alternative statistical test when the Chi square couldn't be applied, level of significance was set at 0.05 as cutoff point for significant difference, $P \leq 0.05$, considered as significant.

3. Results

The use of SA at AL-Elwiya Maternity Teaching Hospital (Baghdad-Iraq) from August 2013 to the end of July 2014 was changed, as seen in figure (2) in first 4 months (August-November) the rate was 1439 c/s under effect of GA vs. 733 C/S under effect of SA. In second 4 months (December-March) there is a slight dropping in rate of SA use due to unavailability of bupivacaine in our hospital. But there is increase in use of SA compared with dropping in use of GA in last 4 months(April- July) 423 c/s were carried out with GA vs. 1100 with SA (Fig. 2).

Number of C/S from the beginning of October 2013 till the beginning of October 2014 (7579 cases).One hundred and ten pregnant lady were enrolled in this study, they were classified into two groups, 60 pregnant lady were exposed to Spinal Anesthesia (SA group I) and 50 pregnant lady were exposed to General Anesthesia (GA group II).

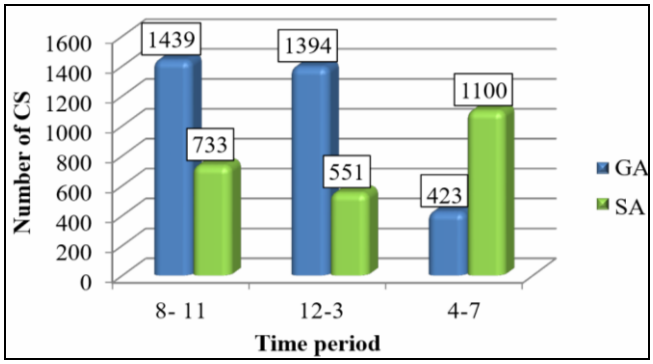

Fig 2: Distribution of GA and SA from the beginning of August 2013 to the end of July 2014 in AL-Elwiya Maternity Teaching Hospital

3.1 History of medical diseases

Chest infections and preeclampsia were significantly ($p<0.05$) the more frequent medical diseases in SA group (table 1).

Table 1: History of medical diseases of women in the studied groups

Medical diseases	SA group (N=60)		GA (N=50)		P. value
	No.	%	No.	%	
Chest infection	22	36.7	0	0.0	< 0.001
PET	10	16.7	2	4.0	0.031
D.M.	2	3.3	3	6.0	0.82
Anemia	2	3.3	3	6.0	0.82
Thyroid diseases	1	1.7	0	0.0	0.70

3.2 Estimation of intra operative blood loss

No significant difference had been found between both groups regarding the blood transfusion, neither intra operatively nor postoperatively, ($P>0.05$) (table 2).

Table 2: Estimation of blood loss during SA and GA

	SA group (N=60)		GA (N=50)		P. value
	No.	%	No.	%	
Number of packs					
5 packs	49	81.6	10	20.0	**<0.001**
10 packs	9	15.0	30	30.0	
15 packs	1	1.7	6	12.0	
20 packs	1	1.7	4	8.0	
Blood transfusion					
Intraoperative	1	1.7	3	6.0	0.48
Postoperative	2	3.3	6	12.0	0.16

3.3 Post-operative use of analgesics

No significant difference had been found between SA and GA groups regarding the use of analgesics (table 3).

Table 3: Comparison of analgesics used in both groups

Analgesia	SA group (N=60)		GA (N=50)	
	No.	%	No.	%
ordinary analgesia	28	46.7	20	40.0
Additional anesthesia	32	53.3	30	60.0

P. value = 0.61

3.4 Time of starting bowel motion

It had been significantly found that women of SA group had been started bowel motion earlier than those in GA group (table 4).

Table 4: Comparison of time of starting bowel motion by women in both groups

Bowel motion at	SA group (N=60)		GA (N=50)	
	No.	%	No.	%
First day	45	75.0	15	30.0
Second day	15	25.0	33	66.0
Paralytic ileus	0	0.0	2	4.0

P. value< 0.001

3.5 Hospital stay

It had been significantly found that women in SA group needed shorter time to stay in hospital (table 5).

3.6 Wound infection

Was significantly more frequent in SA group than GA group (table 5).

Table 5: Comparison of days of stay in Hospital and wound infection between the studied groups

Variable	SA (N=60)		GA (N=50)		P. value
	No.	%	No.	%	
Stay in hospital					
1 day	40	66.7	17	34.0	0.003
2 day	17	28.3	28	56.0	
3 day	3	5.0	5	10.0	
Wound infection	20	33.3	8	16.0	0.030

3.7 Intraoperative complications (table 6)

Table 6: Sequel and complication related to use of both types of anesthesia

Variable	No.	%
Spinal anesthesia		
Failure of SA (converted to GA)	10	16.7
Intraoperative hypotension (needed ephedrine)	14	23.3
Shivering after SA	35	58.3
General anesthesia		
Difficult intubation and aspiration pneumonia	1	2.0

3.8 Post spinal headache

The incidence of post spinal headache (PSH) was significantly increased with number of trials of SA ($p=0.01$).

Table 7: Distribution of Post spinal headache developed after trials of SA.

Number of trials of SA	No. of women developed (PSH)	%
Once (n=15)	10	67.0
Twice (n=35)	12	34.3
Three times or more (n=10) *n= number of women received SA*	3	30.0

From other point of view, among the 25 women who developed post spinal headache, the duration of headache was for less than one week in 18 women (72%), for one week in 3 women (12%) and for two weeks in 4women (16%) is shown in Figure 3.

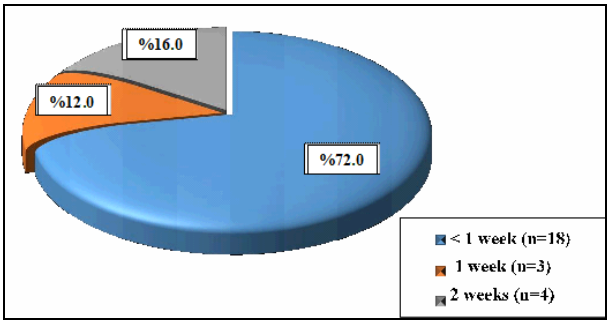

Fig 3: analyses of the 25 women who developed post spinal headache according to the duration of headache

3.9 Neonatal outcome

The following (table 8) summarizes the findings related to the neonatal outcome:

SA group neonates had significantly high Apgar score at 1 min, 5 min, less likely need to be admitted to the neonatal care unit (N.C.U.) than GA group neonates and perinatal deaths was non in SA group (p=0.039).

Table 8: Comparison Neonatal outcome in both studied group

Variable	SA group (N=60)		GA (N=50)		P. value
	No.	%	No.	%	
Gestational age					
36 – 36 $^{+6}$	8	13.3	9	18.0	0.79
37 – 39	42	70.0	33	66.0	
≥ 40	10	16.7	8	16.0	
mean ± SD	37^{+3}± 0.4	-	37^{+4}± 0.6	-	0.91
Birth weight (kg)		0.0			
2.5 – 3	14	23.3	16	32.0	0.37
3.1 – 3.5	38	63.3	25	50.0	
> 3.5	8	13.3	9	18.0	
Mean ± SD	3.2 ± 0.3	-	3.3 ± 0.2	-	0.89
Apgar score at 1 min.					
≥ 7	49	81.7	31	62.0	0.036
< 7	11	18.3	19	38.0	
Apgar score at 5 min.					
≥ 7	54	90.0	36	72.0	0.028
< 7	6	10.0	14	28.0	
Need admission to N.C.U.	14	23.3	22	44.0	0.022
Duration of admission					
Few hours	9	15	6	12.0	0.12
2 days	3	5	8	16.0	
> 2 days – 3	2	3.3	4	8.0	
mean ± SD (day)	1.2 ± 0.2		1.7 ± 0.8		
Perinatal death	0	0.0	4	8.0	0.039

4. Discussion

Regional anesthesia was a vague concept in our society because they do not accept the idea of inserting a needle or any drug in their back or spinal cord, but nowadays when it became a popular method and proved to be safe; many patients are requesting this type of anesthesia, however, both general and spinal anesthesia have been used successfully for performing C/S at AL-Elwiya Maternity Teaching Hospital (Baghdad-Iraq). Differences in terms of outcomes and complications between the two interventions often guide decisions on which method is the preferred one and in which setting. The current study which was conducted during a period of one year is to compare the two techniques in terms of complications, maternal and neonatal outcomes in a prospective manner.

In a last study in this subject severe pre-eclamptic mothers receiving GA and their babies required more critical care support. Maternal as well as neonatal mortality was significantly higher with GA. SA is a safer alternative to GA in severe pre- eclampsia with less postoperative morbidity and mortality [10]**.** In the present study**,** chest infections and preeclampsia were significantly (p<0.05) the more frequent medical diseases in SA group. In the current study also blood loss in SA group was significantly less than in the GA group (<0001). This finding is consistent with that reported by Páez *et al*. in Colombia in 2012 [11]. Regarding wound infection it was significantly more frequent in SA group than GA group, 33.3% vs. 16%, respectively, P<0.05. Studies have also shown a higher incidence of post-operative wound infection for SA when compared to GA (20% vs.8.7% versus p<0.0001) this could be due to lower perfusion of the wound site due to venous pooling [12, 13].

In the present study SA failed in 16.7% of mothers in SA group and they were converted to GA, however, failed spinal anesthesia is loosely defined and not addressed in the general literature, this finding was higher than the standards of the Royal College of Anesthetists that suggest, in keeping with the best practice, the conversion rate from neuraxial anesthesia to general anesthesia should be less than 1% for elective C/S and less than 3% for non-elective C/S[14], additionally the reported failure rate in the current study was much higher than that reported by Sng *et al*.[15]who showed

failure rate of 0.5% (4/800) requiring conversion from SA to GA. Furthermore, Pokharel found a failure rate of 1.5% after the first attempt and 5.5% after the second attempt which is also higher than the standards of the Royal College of Anesthetists/United Kingdom [16].This high failure rate in the present study was due to a less experienced anesthetists in doing SA, however, we notice the wider introduction of SA in our hospital just after 2013 and all our anesthetists started to get familiar with it and they are now more experienced.

Intraoperative hypotension was reported in 23.3% of the SA group of the current study and they needed Ephidrin, this is close to that found by Pokharel A. who reported hypotension in 22.2% of the cases, on the other hand the finding of the current study was lower than that shown by Brenck *et al*. [17]. who reported hypotension after SA for C/S in 56% of the cases, however, studies referred that the incidence of hypotension can be as high as 80% and the severity depends on the height of the block, the position of the parturient, and whether prophylactic measures were taken to prevent the hypotension [18].

Shivering after SA; the etiology of this symptom is unknown, and there is no definite treatment, a recent study showed that warm bupivacaine injected into the subarachnoid space decreased the incidence and intensity of shivering with no effect on modifying the efficacy of the sensory and motor block or its maximum spread [19]. In another study carried in 2011, Sadegh A *et al*. [20], believed that intrathecal bupivacaine combined with fentanyl 25mcg is associated with a lower incidence and severity of shivering than a combination of bupivacaine and normal saline.

The current study reported difficulty of intubation and aspiration pneumonia in women represented 2% of GA group, In retrospective audit over an 8 year period from 2000 - 2007, in the United Kingdom, Djabetey and Barclay[21] reported an incidence of difficult intubation of 1:149 with failed intubation in 0 out of 3430 cases. A more recent UK report of the Confidential Enquiries into Maternal and Child Health (CEMACH), looking at the 2006- 2008 triennium, found an overall maternal mortality rate of 11.39 per 100,000 maternities. Anaesthetic related deaths were the 7th leading cause of direct maternal death. Of the 261 maternal deaths, 7 were direct anaesthetic related deaths and in 3 of these, significant sub-standard care was implicated. In 1 of the 2 deaths due to failure to ventilate, there were repeated attempts at intubation despite adequate oxygenation with the use of an iLMA, and a surgical airway was not attempted. Another death was due to possible aspiration of gastric contents at emergence from GA in a patient with ante-partum haemorrhage [9]. The literature indicates that the incidence of difficult intubation is one per 30. The impossible intubation is one per 280 in obstetrics, eight times greater than in the general population [22].

Some of the women participated in the current study developed post spinal headache, in total 25/60(41.66%) and it had been observed that incidence of post spinal headache was significantly increased with number of trials of SA, P=0.01. All of the patients were advised to lie supine for 8 hours after C/S and were given oral caffeine as cola and coffee but we noted that 18 patients had postoperative cough due to preoperative chest infection that give us a clue that cough had a relationship with this rate of post spinal headache. From other point of view, the duration of headache was for less than one week in 72%, and continued for 2-3 weeks in 28%, of those who developed headache. In a study conducted in Egypt in 2011, Alia *et al*. found that overall post spinal headache incidence range from 32.6% - 32.8% depending on the size of the needle used for that they recommend the usage of the pencil point needle or a smaller needle to decrease post spinal headache. There is a relation between the incidence of the PDPH (post dural puncture headache) and the needle size and type, it is 75% with 16–18 G needles, 30% with 22 G Quinke needles and decreased to 0.37% with the 27 G pencil point needles which is widely used now [23]. In our hospital, we used spinal needle 22-gauge Quincketype point needle with cutting end.

In our study it had been significantly found that neonates of SA group were more likely to have a higher Apgar score at 1 min (P=0.036), and at 5 min (P=0.028). and less likely need to be admitted to N.C.U. (P=0.022), than neonates of mothers in GA group, on the other hand, neonates in SA group who needed to be admitted to N.C.U. had shorter duration of stay. Additionally, perinatal death only reported in neonates of mothers of GA group, 8% vs. none in SA group,(P=0.039), these findings indicated that spinal anesthesia is associated with better neonatal outcome as compared to general anesthesia in C/S and agreed with findings of previous studies and literatures, which stated that SA is the better form of anesthesia in C/S than GA, as it is associated with better outcome in terms of shorter length of hospital stay, greater maternal satisfaction and better fetal APGAR scores and lower mortality [24, 25, 26].

The limitations of this study should be noted. Both the investigators and the patients were aware of group assignment, simply because it would be impossible to hide the type of anesthesia from either the investigators or the patients. However, all our findings were objective and thus intrinsically resistant to bias.

5. Conclusion

Spinal anesthesia is a safe type of anesthesia in C/S, as pregnant ladies received spinal anesthesia during C/S had less intraoperative blood loss, better neonatal outcome and the complications were not highly morbid as complications of general anesthesia.

6. Recommendation

We recommend the generous use of spinal anesthesia for C/S if there is no special contraindication to spinal anesthesia. Further researches are needed about post spinal headache and preventive measures. We recommend the introduction of 27 Gauge pencil point needles for performing spinal anesthesia in Iraq.

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