ORIGINAL RESEARCH ARTICLE

Comparison of General Anaesthesia (GA) or Sequential Combined Spinal EpiduralAnaesthesia (SCSEA) for Caesarean Delivery in Severe Preeclampsia Patients without HELLP Syndrome in Terms of Haemodynamic Stability & Faetomaternal Outcomes in Tertiary Care Hospital

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A B S T R A C T

Introduction: Pre - eclampsia is a potentially fatal disorder and a major cause of morbidity and mortality in developing countries. Anaesthetic management in these patients is challenging. General anaesthesia in these patients has advantages of good oxygenation, maintenance of uteroplacental blood flow but has disadvantages of stress response due to Intubation which can worsen patient. Sequential CSEA is new concept in which low dose intrathecal & epidural drugs can be given simantaneouly to achieve good sensorimotor effect to conduct surgery & having less haemodynamic changes & better faetomaternal outcomes. Present study aimed at studying the hemodynamic stability & faeto Maternal outcomes of severe preeclamptics posted for caesarean under GA/ SCSEA were studied and analysed.

Material and methods: Present randomised retrospective comparative observation study was done at VS General hospital & NHLM Medical college Ahmedabad, Gujarat, India. Parturient with severe pre-eclampsia posted for caesarean section under general anaesthesia (GA)or Sequential combined spinal epidural anaesthesia (SCSEA) were randomised into two groups of 30 each. Randomisation done with odd& even no in opaque sealed envelopes. Execution of Randomisation at time of giving Anaestheaia. Demographic data including age, weight, gravida, gestational age were recorded. Blood pressure and Heart rate were monitored in the ward before induction, after intubation and at 5 min intervals till completion of the operation and after spinal anaesthesia at 5 min intervals. The incidence of maternal morbidity, mortality and admissions in ICU were analysed.

Results: Sequential CSEA for caesarean delivery has better outcome in terms of hemodynamic stability and postoperative recovery,less mean hospital stay, complications when compared to general anesthesia.

Conclusion: Sequential CSEA is a safe alternative to general anaesthesia in severe preeclampsia patients.

Keywords*:* Caesarean, General Anaesthesia, Severe Preeclampsia, Sequential Combined Spinal Epidural anaesthesia (SCSEA)

INTRODUCTION

Pre-eclampsia can complicate 5-8% of obstrettic patients worldwide.[1,2] It is defined as hypertensive diseases of pregnancy characterized by hypertension after 20 weeks gestation with proteinuria.It is classified as BP is ≥160 mmHg Systolic and/or ≥110 mmHg Diastolic; Proteinuria is 300 mg/24 hours; or ≥1+ (on 2 random urine samples, collected at 4 hrs apart); or protein:creatinine ratio is ≥0.3 mg/dl. ii. BP is ≥160 mmHg systolic and/or ≥110 mmHg diastolic,without proteinuria, any one of following is present: Thrombocytopenia, platelets count <100,000/uL, Serum creatinine ≥1.1 mg/L or a doubling of serumcreatinine concentration in absence of other renal disease. Impaired liver function, elevated blood concentrations of liver transaminases to twice normal concentration. Pulmonary oedema, Cerebral or Visual Disturbances. (Blood pressures are recorded at 2 occasions 6 hrs apart with patient at bed rest).

HELLP syndrome is a subtype of severe pre-eclampsia characterised by Hemolysis (H), elevated liver enzymes (EL), and low platelets (LP).[1-5]

Preeclampsia referred as "disease of theories", pathophysiology is complex[1] with multiple of pathophysiologic effects resulting in compromised uteroplacental circulation.[6] It's multi organ involvement making its prevention andmanagement an ongoing challenge.

Platelet dysfunction also has been implicated in pre-eclampsia, with surface-mediated platelet activation, decreased sensitivity to prostacyclin, and increased release of thromboxane and serotonin, leading to further platelet aggregation and upregulation of uteroplacental renin-angiotensin aldosterone system. Triad of physiological derangements in preeclampsia include: Vasospasm, Plasmavolume contraction & Local or disseminatedntravascularcoagulation.cardiovascular changes in severe untreated preeclampsia (Cotton and colleagues[7-9]) are:

1. Hyperdynamic circulation,high cardiac output with N to ↑SVR, N or slightly↓ blood volume and filling pressures.
2. Normal cardiac output and lower filling pressures, but ↑ SVR.
3. Highly elevated SVR, but reduced blood volume and ↓ LV function.

Management of pre - eclampsia involves a multi-disciplinary approach with the anesthesiologist playing a significant role for a positive outcome. Women with a first-degree relatives are more likely to develop preeclampsia. Familial patterns of pre - eclampsia are associated with more severe disease.

Pre-eclampsia may be classified as mild or severe. Severe pre-eclampsia can occur in preterm, term and postpartum periods. Onset of pre-eclampsia at ≥ 34 weeks" gestation is associated with a less severe form of the disease while onset before that time is associated with more severe disease and greater maternal and fetal morbidity. It is misleading to assume a smooth progression from mild disease to severe preeclampsia to eclampsia, because 25% - 40% of patients will have normal blood pressure at the time of their first eclamptic seizure.[10]

Other forms of severe hepatic dysfunction in pregnancy need to be differentiated from pre- eclampsia for peri-operative management. General anaesthesia can be safe in severe preeclampsia, currently, safety of Regional anaesthesia is well established with better maternal outcomes.[3]

Present study aimed at studying the hemodynamic stability & faeto Maternal outcomes of severe preeclamptics posted for caesarean under GA/ SCSEA were studied and analysed.

MATERIAL AND METHODS

After taking informed consent of patient & her relatives in randomised retrospective observation study was done in severe pre-eclampsia candidated for elective / emergency caesarean section during February 2016 to February 2017 at VS General hospital,NHLM Medical college Ahmedabad.

All the patients were in the age group of 18 yrs to 40 yrs,& gestation age of 35-36 weeks and randomised into two groups Group A and Group B. An informed written consent was taken from all the patients.

Inclusion criteria

Parturients at term with severe preeclampsia for elective LSCS.

Exclusion criteria

Cardio vascular and pulmonary disease, Diabetes, HELLP syndrome, Gestational age <34 weeks, Fetal bradycardia and any contraindications of regional anaesthesia including patients refusal, severe hemorrrhage, coagulopathy and sepsis.

After proper preoperative preparation & All drugs & instrument kept ready for cardiopulmonaryresuscitation, patients were taken in operation theatre.

All patients received magnesium sulphate as anti-seizure prophylaxis and in operation theatre after securing an i.v.cannula, patients received 7-8 ml / kg of crystalloid Ringer"s lactate before anaesthesia and baseline vitals (NIBP and HR) were recorded. Monitoring included ECG, HR, NIBP,SpO_2.

Group A - General Anesthesia (n= 30)

Rapid sequence Intubation with cricoid pressure after preoxygenation of Parturients with 100% O2 for3minswith. inj thiopentone5mg/kg & succinylcholine 1.5 mg/kg, with inj lignocaine to attenuate pressure response to laryngoscopy, Intubation was done with appropriate endotracheal tube, maintenance of Anaestheaia with O2& sevoflurane1MAC & after divery of baby inj fentanyl 1 mcg/ kg & sevoflurane upto 3 MAC.Neuromuscular block was achieved by inn. Atracurium 0.5 mg/kg bolus IV& then subsequently 0.01 mg/ kg for maintenance. At the end of surgery patients were reversed by inj glycopyrollate&neostigmine.patients were extubated after All extubation criterias fulfilled.if any delay or complications occur,they were treated & notification of it was done.

Group B- Sequential Combined spinal Epidural Anesthesia (SCSEA) (n=30)

After all prerequisites for Cardiopulmonary resuscitation, patient were given SCSEA in lateral position with combined CSEA needle (needle through needle) of no 18 with full aseptic & antiseptic precautions Epidural space was located in L2-3 space with LOR (loss of resistance) technique, then spinal needle through epidural needle was introduced,& after free flow of CSF inj bupivacaine heavy 5 mg (1 cc) was given, spinal needle withdrawn,& epidural catheter was introduced upto 3-4 cm in epidural space,it was secure aseptically on skin of patient. Cathetre was checked for any knot,leak & free flow through it from its end before introducing it in space. After introducing, free flow was checked with 1 ml NS. Patient then made supine with 15 degree left lateral position to prevent aorto-caval compression.

After giving position,inj bupivacaine isobaric 0.25% 5 cc was given through epidural catheter. Sensory blockage was assessed by Pin prick method &Motor blockage was by modified Bromage scale. Surgery was allowed to perform when sensory T4 & Bromage 3. Score achieved. All the patients in whom satisfactory sensorimotor blockage achieved were enrolled in study. In both groups Apgar score was accessed at 1&5 min after delivery of baby.

Demographic data including age, weight, gravida, gestational age were recorded. Blood pressure (systolic,

mean, diastolic), Heart rate, Oxygen saturation were recorded immediately after SCSEA every minute for first 10mins, then every 5mins till completion of operation. Vitals were monitored post-operatively for the first 24hrs. After SCSEA, BP & HR were monitored at 5 min interval till end of operation. A change of ± 20%in Blood Pressure & HR from baseline, is considered as hypertension or hypotension and tachycardia or bradycardia respectively.
Parturients were also observed for incidence of morbidity, mortality and ICU admissions.
Morbidity parameters observed were incidence of peri-operative hypertension and hypotension, changes in heart rate, post operative complications like convulsions, pulmonary edema, acute renal failure, aspiration pneumonitis and delayed recovery. Hypertension was treated IV lobetalol, hypotension was treated with inj. ephedrine 6 mg IV in repeated alliquotes.

STATISTICAL ANALYSIS

Data were collected & saved in MS Excel spreadsheet & analysed by suitable SPSS software.
An unpaired Student's t-test was used to test the significance of means of all qualitative parameters.
Categorical parameters analysed by chi- square tests.

RESULTS

(I) Demographic Data: In both study groups demographic data was comparable (table-1).

Hemodynamic Parameters: Hemodynamic monitoring included Systolic, Diastolic, Mean arterial Blood Pressure and Heart rate. The highest and lowest systolic, diastolic and mean arterial blood pressure are compared between both groups from the time of induction till end of the surgery. The difference between two groups were extremely significant statistically ($p < 0.0001$) with better control of blood pressure in the group B (table-2).

Morbidity and mortality: Incidence of morbidity and mortality in both groups were analysed statistically most common cause of morbidity is intra-operative hypertension with higher incidence in Group GA, between both the groups is extremely significant statistically (p value 0.000006), other causes of morbidity are tachycardia followed by postoperative complications.
Table IV shows that neonatal apgar score in Group A was less at 1 min which is statistically significant ($p<0.05$),at 5 min it was good in both groups ($P>0.05$). No neonate in our group require airway intervention (table-4).
Total complications in group A in 15(50%)& in Group B using 4(13.2%) patients (pis 0.068). ICU admissions in the postoperative period are more common in general anaesthesia group and statistically significant (p value 0.000006) cause of ICU admission was post-operative hypertension. Delayed recovery is another indication with

Parameters	Group A	Group B	P value (Inference)
Age(years)	22.5+/-8.5	23.3+/-7.8	>0.05(NS)
Weight(kg)	54.2+/-6.0	53.4+/-7.2	>0.05(NS)
Height (cms)	154+/-5.0	152!+/-6.0	>0.0&(NS)
Duration of surgery (mins)	45+/-8	50+/-2	>0.05(NS

Table-1: Demographic Data

Parameters	Gr A	Gr B	Pvalue	Inference
Highest SBP	162.05+/-7.55	137.9+/-6.0	<0.0001	
Lowest SBP	128.05+/-7.93	112.80+/-12.60	<0.0001	
Mean SBP	131.27+/-8.84	99.85+/-4.89	<0.0001	
Highest DBP	99.83+/-5.85	96.24+/-6.23	<0.0001	
Lowest DBP	78.93+/-7.21	64.23+/-9.12	<0.0001	
Mean DBP	78.23+/-6.24	69.1+/-8.12	<0.0001	
Mean. MAP	93.57+/-7.22	84.58+/-5.3	<0.0001	
HR change(+/-)	26.57+/-7.23(+)	6.34+/-4.21(-)	<0.0001	

Table-2: Hemodynamic Parameters

Parameters	Gr A	He B	Pvalue	Inference
Intraoperative hypertension	22(73.3%)	2(6.6%)	0.000006	HS
Tachycardia	22(73.3%)	10(33.3%)	0.0022	HS
Postoperative hypertension	5(16.6%)	Nil	0.030	S
Intraoperative hypotension	5(16.6%)	10(33.3%)	0.1521	S
Bradycardia	5(16.6%)	5(16.6%)	0.638	NS
Postoperative hypotension	2(6.6%)	4(13.2%)	0.0336	S
Mean hospital stay	12(7-15)	6(4-10)	0.045	S

Table-3: Morbidity and mortality

APGAR score	Group A	Group B	P value
1 min	6.3+/-0.2	7.5+/-0.4	<0.05 (S)
5 min	7.8+/-0.5	8.0+/-0.3	> O.05(NS)

Table-4: APGAR score

Indications	Gr A	Gr B	Pvalue	Inference
Postoperative hypertension	5(16.6%)	Nil	0.000006	
Postoperative hypotension	2(6.6%)	3(10%)	0.3326	
Convulsions	2(6.6%)	Nil	0.999	
Pulmonary oedema	1(3.3%)	Nil	0.999	
Acute Renal failure	2(6.6%)	1(3.3%)	0.999	
Delayed recovery	3(10%)	Nil	0.2373	

Table-5: Indications for admission in ICU

an incidence of 10% (table-5).

DISCUSSION

Women with severe pre-eclampsia have an increased rate of cesarean section consequent upon high incidence of IUGR, fetal distress and prematurity (1,2) and anesthesia remains a challenge as parturients may present to labor and delivery unit with or without a prior diagnosis of preeclampsia.

Cesarean section in these patients is increasingly emergency in nature with high risk of cardiopulmonary morbidity.[3,4] In severe preeclampsia,there is a significant chronic placental hypoperfusion, further decreases in perfusion is poorly tolerated by the fetus.[12] It is essential to understand the various medical and surgical conditions, which mimic pre eclampsia.

Goals of anaesthesia in pre-eclamptic parturient are optimization of maternal blood pressure, cardiac output, uteroplacental perfusion, prevention of seizures and stroke. The advantages and disadvantages of General / sequential CSEA will have to be carefully considered for each patient.[13-16] Neuraxial anesthetic techniques are preferable to GA for cesarean delivery in the absence of HELLP syndrome.[17]

Anaesthetic management of pre eclamptic patients for Emergency Caesarean Delivery depends on severity of preeclampsia and maternal/fetal status. Parturients are classified into four categories depending on urgency of delivery, maternal and fetal status during delivery.[18]

There are pros & cones of each method used in present study. SCSEA has Advantages like it is relatively simple, rapid onset and superior quality of anaesthesia, No effect on Apgar scores and umbilical artery pH.[10] Low doses of local anaesthetic will reduce the risks of systemic toxicity, Early breast feeding can be initiated,Shorter duration of hospital stay.

Sequential CSEA precludes the risk of aspiration, difficult and failed intubations, laryngoscopic response of Intubation. Advantages of GA are it is with rapid sequence intubation is considered over RA when there is an immediate threat to the mother or fetus.

Whereas risks of GA are in it there is potentially difficult ventilation and endotracheal intubation, exaggerated hemodynamic responses to laryngoscopy, intubation and extubation, risk of acid aspiration as gastric. emptying is delayed, potentiation of effects of neuromuscular blocking drugs due to $MgSO_4$., uterine atony and coagulopathy cause considerable intrapartum blood loss, Impaired villous blood supply.[19-21] Patients are Prone for rapid desaturation during Induction of anaesthesia, Post operative Airway management can be difficult due to laryngeal edema, Babies born to mothers receiving general anesthesia required advanced resuscitation in the form of supplemental oxygen and bag mask ventilation.[16]

Wallace et al[18] have also done rapid sequence intubation with cricoid pressure as we have done.

SCSEA is a modified CSEA in which low dose spinal Local anaesthesia agent is given for early onset& less haemodynamic changes & sequentially epidural LA is given to potentiate sensorimotor characteristics of blockage.

In this method less dose of LA given by both spinal & epidural route & desire level of Anaestheaia achieved as epidural catheter is already in situ& postoperative analgesia can be also given. Machanism of epidural volume extension in SCSEA is it compresses drug injected in intrathecal space. so early level with less dose& early motor regression & less haemodynamic changes occur.(4,5)

SCSEA is preferred over general anaesthesia for caesarean section in severe preeclampsia without coagulation abnormalities. There is always a chance that a preeclamptic patient may suddenly have a convulsion and anticonvulsant drugs (midazolam or thiopentone sodium) must be immediately available. On the other hand, CSEA conveys significant advantage and is now considered the method of choice for Caesarean section.[4]

MC Naught AF & Stokes GM(4) have suggested that with low dose SCSEA less dose of spinal LA can be used.

So less haemodynamic changes which are advantageous in preeclampsia. In our study we used 5 mg hyperbaric bupivacaine for intrthecal usage& 0.25% of 5 ml isobaric bupivacaine for EVE. Kumari Indra et al[5] have used SCSEA for LSCS with cardiomyopathy. They have also used 5 mg hyperbaric bupivacaine for intrthecal & 5 ml 2% Xylocaine for EVE.

Tyagi Asha et al shown that minimum effective volume for

epidural volume. Extension is 7.4 ml if normal saline is used for EVE.[6] They have also done EVE in LSCS. They used 1.2 ml hyperbaric bupivacaine for intrthecal usage & then NS for EVE.

Benale N, Stokes GM[8] have shown that with epidural volume extension (EVE) ED 50 dose of bupivacaine is 5.1 mg, so we have used 5 mg hyperbaric bupivacaine intrathecally.

Benedetti[13], Cook[14] have analysed patients undergoing LSCS having severe preeclampsia with PA catheter. monitoring of CVP, PCWP. They concluded that maximum haemodynamic changes can occur in severe preeclamptic patient. To cut short that, & for better faetomaternal outcomes we have used low dose SCSEA using minimum ED 50 dose of bupivacaine with epidural volume extension (EVE).

Incidence of complications following GA (66.67%) were significantly (P <0.05) higher than SCSEA (16.67%). Commonest complication following GA was intra-operative hypertension (73.3%), patients showed exaggerated cardiovascular responses to laryngoscopy. Blood pressure (73.3%) as well as Heart rate (73.3%) were significantly high after intubation, administration of IV lignocaine hydrochloride did not effectively reduce the response in pre-eclamptic parturients. While intraoperative hypotension following SCSEA was 33.3% in our study and difference among GA versus SCSEA group, was significant (p<0.05).

Incidence of Bradycardia in both groups were comparable,under SCSEA bradycardia was followed by hypotension (16.6%) which was responded to glycopyrollate and IV fluid therapy. Under general anaesthesia bradycardia episodes were relatively less (16.6%). Hypotension was treated with conventional treatment using ephedrine and IV fluid therapy and hypertension was controlled with labetolol and nitroglycerine infusion.

We observed that 50% patients from GA group, were admitted in ICU as compared to 13.2% from SCSEA group. Indications for ICU admission were (in order of frequency) post operative hypertension, delayed recovery, postoperative hypotension,convulsions, acute renal failure and pulmonary edema.

Mean hospital stay in GA group was more (12 days) as compared to SCSEA group (6 days). Difference in both the parameters between two groups is staesticaly significant (p<0.05).

Regional anaesthetic techniques are equally acceptable for caesarean delivery in pregnancies complicated by severe preeclampsia if steps are taken to ensure a careful approach as postoperative morbidity and mortality is more after general anaesthesia. The shorter duration of mean hospital stay is an added advantage for the mother and newborn in SCSEA group.

Safety of low dose sequential CSEA has been studied in parturients with high risk& cardiac comorbidities (6,7,8) who concluded that SCSEA is safer than GA for LSCS in patients with cardiovascular comorbidities. A thorough evaluation to detect underlying coagulopathy or thrombocytopenia is essential prior regional anaesthesia. Stable Hemodynamics, post operative morbidity, admissions in ICU and mortality are more common after general anaesthesia.

Ajuzieogu et al.[9,14] found significant birth asphyxia in babies of severe pre-eclamptic mothers who received general anesthesia.

In our study apgar score at 1 min was low in GA group but at 5 min score was comparable& normal

Ahsan-ul-Haq[16] also found lower 1-minute Apgar score with general anaesthesia same as our study.

Dasgupta et al.[15] in his study concluded that neonatal umbilical artery base deficit was significantly higher in GA group and neonates required more resuscitative efforts

Limitations

we have not done neonatal blood gas analysis.

CONCLUSION

In nutshell Sequential Combined spinal epidural anaesthesia is a better & safe choice for Caesarean delivery compared to general anaesthesia in severe preeclampsia as It provides better haemodynamic stability, faetomaternal outcome and fewer perioperative complications,& less mean hospital stay.

REFERENCES

1. Saftlas A. F., Olson D. R., Franks A. L., Atrash H. K., Pokras R. Epidemiology of preeclampsia and eclampsia in the United States, 1979-1986. Am. J. Obstet. Gynecol. 1990;163(2):460-465
2. Gogarten W. Preeclampsia and anaesthesia. Curr Opin Anaesthesiology 2009;22(4):347-51
3. Duer RA, Piercy JL, Reed AR. The role of the anaesthetist in the management of the pre-eclamptic patient. Curr Opin Anaesthesiol 2007;20(6):168-74.
4. AFMcNaught, GM Stokes, Epidural volume extension & low dose sequential combined spinal epidural blockage,2 ways to reduce spinal dose requirements for Caserean section. International ljournal of obstetrics Anaestheaia 2007;16(4):346-353
5. Kumari Indra, Kumar Sanjeev, Gupta Sunanda. Sequential CSEA for patientsfor caeserean section in patients with postpartum cardiomyopathy. Indian journal of Anaestheaia 2007;51(2):137-139
6. Tyagi Asha, Kumarsurendra, Salhotra, Rash ietalminimum effective volume for epidural volume extension. journal ofanaesthesiology & clinical pharmacology 2014;30,(2):228-232.
7. Lucas DN, Yentis SM, Kinsella SM, Holdcroft A, May AE, Wee M, et al. Urgency of caesarean section: A new classification. J R Soc Med 2000;93(6):346-50.
8. Benale N, Columnb MO, GM Stokes. et al. Effect of epidural volume extension on dose required of intrthecal bupivacaine at caeserean section British journal of Anaestheaia 2005;95(4):500-503.
9. Ajuzieogu OV, Ezike HA, Amucheazi AO, Enwereji J. A retrospective study of the outcome of cesarean section for women withsevere pre- eclampsia in a third world setting. Saudi J Anaesth 2011;5(1):15-8

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10. Dasgupta S, Chakraborty B, Saha D, Ghosh D. Comparison of neonatal outcome in women with severe pre-eclampsia undergoing caesarean section under spinal or general anaesthesia. J Indian Med Assoc 2011;109(4):166-70.
11. M. Ahsan-ul-Haq, Analysis of outcome of general versus spinal anaesthesia for caesarean delivery in severe preeclampsia with.foetal compromise. Biomedica 2004;20(3):23-29.
12. Sibai BM. Imitators of eclampsia. Clin Perinatol. 2004;31(6):835-52.
13. Benedetti TJ, Cotton DB, Read JC, et al. Hemodynamic observations in severe preeclampsia with a flow directed pulmonary artery catheter. Am J Obstet Gynecol 1980,136(4):465-470.
14. Cotton DB, Gonik B Dorman K, et al Cardiovascular alterations in severe pregnancy induced hypertension. Relaationship of central venous pressure to pulmonary capillary wedge pressure Am J Obstet Gynecol 1985;151(5):762-764
15. Martin JN Jr, Blake PG, Perry KG Jr, McCaul JF, Hess LW, Martin RW. The natural history of HELLP syndrome: patterns ofdisease progression and regression. Am J Obstet Gynecol 1991;164(6):1500-9.
16. Jouppila P, Kuikka J, Jouppila R, Hollmén A. Effect of induction of general anesthesia for cesarean section on intervillous blood flow. Acta Obstet Gynecol Scand. 1979;58(1):249-53.
17. Comparision of spinal versus general anaesthesia for caesarean delivery in patients with severe pre-eclampsia. F.MOSLEMI and S. Rasooli J. Med Sci, 7(6):1044-1048. 60.
18. Wallace DH, Levino KJ, Cunningham FG, et al: Randomized comparison of general and regional anesthesia for cesarean delivery in pregnancies complicated by severe preeclampsia. Obstet Gynecol 1995; 86(1):193-199.
19. Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000; 183(5):S1-S22.
20. Obinna V. Ajuzieogu,Humphrey Azubuike Ezike, Adaobi Obianuju Amucheazi, and Jamike Enwereji. etal A retrospective study of the outcome of cesarean section for women with severe preeclampsia in a third world setting. Saudi J Anaesth. 2011; 5(1): 15-18.
21. Observational study of choice of anaesthesia and outcome in patients with severe pre-eclampsia who present for emergency caesarean section. South Afr J Anaesth Analg 2012;18(4):206-212.
22. Martin JN Jr, Blake PGPerry KG Jr, McCaul JF, Hess LW, Martin RW.The natural history of HELLP syndrome: patterns of disease progression and regression. Am J Obstet Gynecol 1991;164(1):1500-9.
23. Barton JR, Sibai BM: HELLP and the liver diseases of preeclampsia. Clin Liver Dis 1999; 3(6):31-48.

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