

## Anaesthesia for caesarean section in patients with preterm HELLP syndrome: literature review, personal experience and possible guidelines

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### Introduction

HELLP syndrome is considered a severe form of preeclampsia. The acronym HELLP was first suggested by Weinstein in 1982 and describes Haemolysis (H), Elevated Liver enzymes (EL) and Low platelets (LP)(1).

Both regional and general anaesthesia are potentially associated with complications in HELLP syndrome. As low platelet count and liver dysfunction are a risk factor for the development of lumbar epidural haematoma, and even cerebral subdural haematoma formation in case of neuraxial anaesthesia, spinal and epidural anaesthesia have been considered for a long time as a contra-indication (2-6). Although in the early nineties general anaesthesia was recommended as the technique of choice, impaired liver function and an altered metabolism of anaesthetic agents (such as slow degradation of choline-ester drugs due to lower concentrations of pseudo-choline-esterase) may complicate general anaesthesia (7), besides the risk of enhanced hepatotoxicity following the use of volatile substances, difficult intubation and haemodynamic perturbations during induction and incision (2,3,7-9).

The minimum platelet count above which it is safe to perform spinal or epidural anaesthesia is still unknown, but several studies suggest that this may be safely done at thrombocyte counts less than 100.000 mm<sup>3</sup> (9-14). None of these studies contains data specific for patients with HELLP syndrome.

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Not many studies have reported on anaesthetic techniques in patients with HELLP syndrome. In the majority of reports the number of patients varies from 20 to 40 collected during 4–6 year periods (2–5,15) while some have mainly described and recommended intensive care treatment for these patients while strongly dissuading regional anaesthesia without strong supportive evidence (3,4).

In a landmark study by Sibai (16) 16 of 112 patients with HELLP syndrome received epidural anaesthesia. The mean platelet count in this group was  $83 \pm 8 \cdot 10^3/\text{mm}^3$ . There was one maternal bleeding in the epidural space in a patient with a platelet count of  $93.000/\text{mm}^3$ . The catheter was kept in place for 24 hours and the bleeding stopped spontaneously. In their discussion they wrote that "the use of epidural anaesthesia in such patients is potentially dangerous".

Crosby (2) reported 33 patients with HELLP syndrome of whom 32 received general anaesthesia and 8 patients had uneventful epidural anaesthesia, but at the time of catheter insertion the diagnosis of HELLP syndrome had not been made in 6 of these 8 patients. They had much evidence of abnormal haemostasis while 36% of patients received blood transfusion.

Miyamoto et al. (17) reported on 11 caesarean sections for HELLP syndrome, 6 under general anaesthesia, 1 epidural and 4 spinal blocks. No complications were noted.

In a report by Osmanagaoglu (15) et al., 27 caesarean sections in a group of 37 HELLP syndrome patients were performed. General anaesthesia was used in 12 and single dose spinal anaesthesia in 25 patients. In this study no distinction can be made for the anaesthetic used in the vaginal delivery or the caesarean section group. There were no complications of regional anaesthesia, but these were also not explicitly looked for. In this study, maternal mortality was as high as 30 % but it is unclear whether the risk was higher for vaginal than for abdominal delivery. In our hospital, vaginal delivery was performed in only one non-included case during the study period evaluated.

The largest published series to date reported on 85 caesarean sections (18), of whom 14 with post caesarean and 71 with pre-operative diagnosis of HELLP syndrome. In this series 58 (81.7 %) had epidural anaesthesia, 9 (12.7 %) had general anaesthesia and 4 (5.6 %) had spinal anaesthesia. Neurological complications or epidural haematoma were not diagnosed.

### **Experience in the Antwerp University Hospital**

Our technique of choice for C-section is Combined Spinal-Epidural anaesthesia since almost 15 years. Epidural anaesthesia is only selected in case

a catheter was already placed during (trial of) labour. Rarely patients with severe pre-eclampsia or HELLP syndrome are allowed to deliver vaginally. With respect to platelet count, the following 'rude' local guidelines have been recommended: any technique is possible with counts above 90000/mm<sup>3</sup>, general anaesthesia with counts inferior to 60000/mm<sup>3</sup>, while with intermediate values the technique used is at the discretion of the managing anaesthesiologist with some preference for a less traumatising single dose spinal.

To our knowledge, there is a lack of reports using combined spinal-epidural anaesthesia for caesarean section in HELLP syndrome. Although, simply a combination of spinal and epidural anaesthesia signifies a double risk of a spinal haematoma formation, as two needles are introduced in two vascularised spaces. Theoretically, this risk may be even greater when a double-interspace technique is used. Contrary to earlier publications on plain epidural, we have chosen to use the catheter for patient controlled anaesthesia and leave it in place until the platelet count has risen over 100.000/mm<sup>3</sup>, also because meanwhile LMWH had been started.

In our hospital, the charts of 102 patients presenting with HELLP during a six year period were reviewed (19). As we are a tertiary care centre the incidence of HELLP in our obstetrical population is 2.8%. Mean gestational age of the patients was 30.6 weeks (SD 2.7, range 23-36 weeks). There were 7 (6.9 %) patients with postpartum HELLP and 95 with ante-partum HELLP. In case of ante-partum HELLP in 37 (36.3 %) general anaesthesia was selected; in 53 (52.0 %) combined spinal epidural anaesthesia (CSEA) was performed and 12 (11,8 %) women received single dose spinal anaesthesia. Preoperative thrombocyte count was significantly higher ( $p < 0.01$ ) in the combined spinal epidural group (113.000/mm<sup>3</sup>) while there was no difference ( $p = 0.6$ ) when general (88.000/mm<sup>3</sup>) and spinal anaesthesia alone (95.000/mm<sup>3</sup>) were compared. In patients with a platelet count below 80.000/mm<sup>3</sup> the anaesthesiologists in our centre have preferred general or spinal anaesthesia three times more frequently than CSE anaesthesia.

Epidural catheters stayed in site for 48 hours and were removed when the thrombocyte count was  $> 100.000/mm^3$ . There were no cases of epidural haematoma. One bloody tap necessitated conversion from planned spinal to general anaesthesia. No major peri-operative bleeding was noticed but one patient needed to be re-operated within 24 hours because of intra-abdominal bleeding. Two patients received a combined spinal epidural although their immediate preoperative thrombocyte count was  $< 50.000/mm^3$ . In patients with a platelet count lower than 80.000/mm<sup>3</sup> general or spinal anaesthesia was the choice 3 times more frequently than combined spi-

nal epidural anaesthesia. Transfusion of thrombocytes was performed in 13 (12.7 %) patients.

### Discussion

In another Belgian University Hospital of Leuven, the charts of HELLP patients were also reviewed and covered a six year period as well (20). Their incidence was 0.8%, while totally 107 charts were reviewed. Single dose spinal anaesthesia was never an option, but vaginal delivery was allowed in 45 patients and failed in 22 (i.e. 26% receiving an epidural top-up). Thrombocyte count was ranging between 9 and 124.000/mm<sup>3</sup>. General anaesthesia was selected in 28% and de-novo CSEA in 46%.

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These results, as those from Virgil-De Grana et al. (18) question the often cited advice that a platelet count below an arbitrary limit (be it 100.000 or 80.000/ mm<sup>3</sup>) precludes the placement of an epidural catheter in case of HELLP syndrome. From the point of view of maternal safety, no data on anaesthesia related maternal death in HELLP syndrome are available, but control of blood pressure is more difficult with general anaesthesia.

In a survey of severe neurological complications after central neuraxial blockade (21) it was found that 33 spinal haematomas on a total of 127 complications were present, 2 of these were in patients with HELLP syndrome, one with spinal block and one with an epidural catheter being removed with apparent signs of coagulopathy. In this study the highest risk for developing spinal haematoma was in female orthopaedic patients subject to knee arthroplasty, clearly not in obstetric patients.

Other studies on thrombocytopenic parturients have failed to demonstrate the feared complication of spinal haematoma (22-25).

In a recent letter to the editor, Frenk et al. reported their experience with regional anaesthesia in parturients with thrombocytopenia (26). No neurological complications or spinal hematoma were reported, but this series did not include patients with HELLP syndrome (26), neither did the series reported by Bernstein et al. (24).

It is evident that there is more than just the platelet count alone, as altered platelet function has since long and repeatedly been suggested, but has not yet been clearly demonstrated in HELLP syndrome (27).

Thrombocyte function is difficult to evaluate. Studies on the use of thromboelastography in HELLP syndrome found that in cases with preeclampsia women with a platelet count less than 100.000/ mm<sup>3</sup> are significantly hypo-coagulable when compared to pre-eclamptic women with platelet counts 100.000/ mm<sup>3</sup>, but the level of thrombo-elastographic parameters that would allow safe epidural anaesthesia to be performed in these women is

not known (28).

Thrombo-elasticography has been reported in a case report to reveal accompanying fibrinolysis in case of HELLP syndrome (29). No reports are available on the use of the Platelet Function Analyse (PFA-100) in HELLP syndrome, but in patients with preeclampsia false positives (suggesting disturbed clotting in normal patients) have been described (30). On the other hand it was demonstrated that in patients with pregnancy induced thrombocytopenia, platelet function is not disturbed with counts as low as 60.000/ dl. Conflicting results have been obtained demonstrating impairment of haemostatic function in severe pre-eclampsia with the PFA-100 even with a normal thrombocyte count, but not when testing with thrombo-elasticography (31).

### Conclusion

Based upon the actual literature and a small local series, our experience demonstrates that regional anaesthesia, including combined spinal/epidural anaesthesia for primary caesarean section in HELLP syndrome is feasible and safe. Despite local guidelines do exist, regional techniques were used more frequently, which may indicate that there is more than platelet count alone in the decision making of an anaesthetic technique, such a the speed of platelet loss, the time during the week, technical aspects, degree of emergency, anticipated intubation difficulty and personal preferences.

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