

Retrospective evaluation of anaesthesia methods in pregnant women with neurological and neuromuscular syndromes who underwent caesarean section

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Summary

Purpose: The purpose of this study was to investigate the anaesthesia methods used in pregnant women with neurological or neuromuscular disease who underwent caesarean section. **Materials and Methods:** Demographics; pregnancy weeks, urgent or elective caesarean section, accompanying neurological or neuromuscular diseases, and anaesthesia type. **Results:** Of the pregnant women operated on, 72% (16), 14% (three) and 14% (three) were diagnosed with epilepsy, multiple sclerosis (MS), and myasthenia gravis (MG), respectively. General anaesthesia was administered in 45%, 40%, and 25% of epileptic pregnant women, patients with MS, and those diagnosed with MG, respectively. Spinal anaesthesia was administered in 55%, 20%, and 75% of epileptic pregnant women, those with MS, and those diagnosed with MG, respectively. **Conclusion:** Regional anaesthesia may be an appropriate option in pregnant women with neurological or neuromuscular diseases. Epidural anaesthesia may be a safer method in terms of ensuring the control of block level.

Key words: Epilepsy; Myasthenia gravis; Multiple sclerosis; Obstetrical anaesthesia.

Introduction

Pregnant women with neurological or neuromuscular disease have become more frequently observed due to an increase in treatment options. Patients in this pregnancy group are at a high risk of maternal mortality and morbidity [1, 2]. Generally, neurological diseases are observed more commonly in women and during childbearing years. In addition, teratogenic complications associated with treatment, along with the maternal risks, complicate cases. Therefore, a multidisciplinary management approach is required.

Neurological and neuromuscular diseases cause some structural and functional changes. Therefore, in order to make an accurate decision and manage the anaesthesia method competently, obstetric anaesthesiologists should be aware of the pathophysiology of these diseases. The present authors aimed to evaluate the methods of anaesthesia performed in pregnant women diagnosed with epilepsy, multiple sclerosis (MS), and myasthenia gravis (MG) over a ten-year period, and their effect on the mother and new-born in the early postoperative period.

Materials and Methods

Following the approval of the present hospital's ethics committee, the records of pregnant women with neurological or neuromuscular disease (epilepsy, MS, and MG), who had undergone caesarean section from 2004–2014, were examined retrospectively.

Out of 53 cases, 13 were excluded from the evaluation because of vaginal delivery. For the included 40 patients, the following information was extracted: demographics (age and weight), pregnancy number, week, and parity, urgent or elective caesarean section, accompanying neurological or neuromuscular diseases, administered treatment, disease history, anaesthesia type, new-born Apgar scores, and the intensive care requirements of the mother and new-born.

Results

Of the 53 pregnant women with neurological or neuromuscular disease, 13 (25%) had undergone vaginal delivery and 40 (75%) caesarean section. Of these pregnant women, 31, five, and four were diagnosed with epilepsy, MS, and MG, respectively (Figure 1, Table 1). Caesarean section was performed urgently in 55% (n=22) of cases and electively in 45% (n=18). Of the urgent cases, 16 (72%), three (14%), and three (14%) patients were diagnosed with epilepsy, MS, and MG, respectively.

When the time of diagnosis in pregnant women with epilepsy was evaluated, in 14 patients, diagnosis was made in \leq two years, 12 were diagnosed between ten to 20 years, and five had a history of epilepsy for $>$ 20 years. Six of the 31 pregnant women diagnosed with epilepsy had a history of seizure in the previous month. Seventeen (55%) patients had spinal anaesthesia while 14 (45%) received general anaesthesia (Figure 2).

When the pregnancy stage was considered, three patients

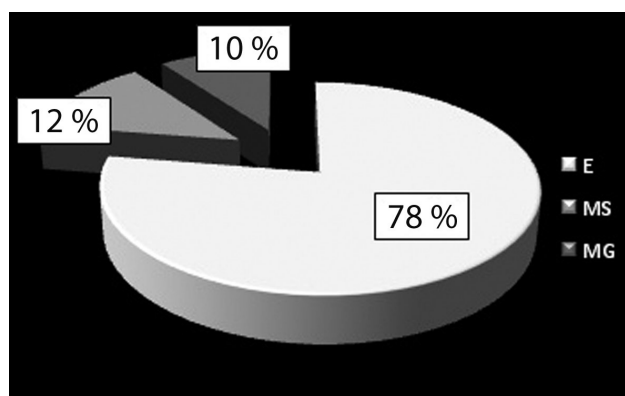


Figure 1. — Proportion (%) of patient diagnoses. E: epilepsy, MS: multiple sclerosis, MG: myasthenia gravis.

were ≤ 24 weeks pregnant. A total of seven patients were at 25–36 weeks of pregnancy (Table 2). Only one woman was 25 weeks pregnant and was transferred to the intensive care unit due to neonatal respiratory distress. The Apgar scores of new-borns of the remaining pregnant women were 9–10 at one and five minutes. Intensive care was not required for any of the patients in the post-partum period.

MS was diagnosed in four patients in the previous five-year period. One of the pregnant women with a clinical symptom had visual impairment, while another had numbness in the hands (Table 2). Only one patient received corticosteroid treatment. The anaesthesia types of the pregnant women are shown in Figure 2. Only one patient was less than 36 weeks pregnant. The Apgar scores of the new-borns of the pregnant women were 9–10 at one and five minutes. Intensive care was not required in any of the patients in the post-operative period.

Four patients with MG were recorded. One patient was diagnosed two years previously. One patient had no clinical symptoms and one patient was paraplegic. Two of the preg-

Table 1. — History of pregnant women with neurological disease.

Diagnosis (n)	Time of diagnosis (years)	Treatments during pregnancy	Clinical symptoms
E (31)	1–10 (14)	No (10)	No (25)
	11–20 (12)	AED (21)	Yes (6)
	≥ 21 (5)		
MS (5)	1–5 (5)	No (4)	No (3)
		CS(1)	Yes (2)
MG (4)	1–5 (1)	No (3)	No (1)
	5–10 (3)	Mestinson (1)	Yes (3)

AED: antiepileptic drug; CS: corticosteroid; E: epilepsy; MS: multiple sclerosis; MG: myasthenia gravis.

Table 2. — Pregnancy period in patients diagnosed with neurological disease.

Diagnosis (n)	Pregnancy weeks (n)	Neurological finding in pregnancy (n)	Caesarean type (n)
E (31)	≤ 24 (3)	No (25)	Urgent (16)
	25–35 (7)	Yes (6)	Elective (15)
	≥ 36 (21)		
MS (5)	≤ 24 (0)	No (1)	Urgent (3)
	25–35 (1)	Yes (4)	Elective (2)
	≥ 36 (4)		
MG (4)	≤ 24 (0)	No (1)	Urgent (3)
	25–35 (4)	Yes (3)	Elective (1)
	≥ 36 (0)		

E: epilepsy; MS: multiple sclerosis; MG: myasthenia gravis.

nant women had visual impairment, myopathy, and numbness in the hands (Table 2). While general anaesthesia was administered in one pregnant woman, spinal anaesthesia was performed in the remaining three (Figure 2). The only patient who received drug treatment was the patient with myopathy. When the pregnancy stage was considered, all patients were between 29–33 weeks; however, new-born Apgar scores were 9–10 at one and five minutes. Intensive

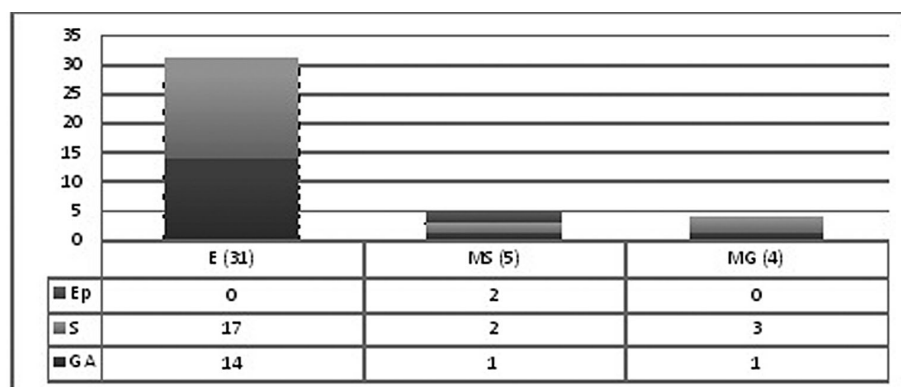


Figure 2. — Pregnant women with neurological disease and the type of anaesthesia selected. E: epilepsy, MS: multiple sclerosis, MG: myasthenia gravis, Ep: epidural anaesthesia, S: spinal anaesthesia, GA: general anaesthesia.

care was not required in any of the mothers or new-borns.

Discussion

Epilepsy is the most commonly observed neurological disorder; it is associated with recurring seizures [1]. Pregnant women diagnosed with epilepsy are at a high risk of sudden death. In addition, in order to be protected from the teratogenic effect of anticonvulsant drugs, discontinuation of treatment or reducing the dose and switching to other drugs, can aggravate the disease. Hormonal changes can also affect outcomes. Elevation of estrogen levels in the early period of pregnancy triggers seizures and an increase in progesterone levels causes an antiepileptic effect [2]. Previous studies on epileptic pregnant women have found no difference in seizure frequency in 25–50% of the patients, whereas a reduction was observed in 13–14% [3, 4]. In approximately 17–32% of patients, an increase in the frequency of seizures has been observed [3, 4]. In the present study, 19% of patients had a history of seizure in the previous month.

When selecting general or regional anaesthesia in epileptic pregnant women, both adverse-effects of antiepileptic drugs and their interaction with anaesthetic agents should be known. For instance, haematological (including agranulocytosis and aplastic anaemia) and neurological adverse-effects (peripheral neuropathy) of anticonvulsant drugs, such as phenytoin, barbiturates, and carbamazepine, are associated with regional anaesthesia. Due to the elevation of anticonvulsant drugs in the liver, microsomal enzyme sensitivity to opioids, neuromuscular blockers, and inhalation agents increase. In addition, agents such as etomidate and ketamine are known to be epileptogenic. It should be considered that, although the amide group of local anaesthetics are also anticonvulsants during regional anaesthesia, the high serum concentrations also cause convulsions [5]. All maternal, fetal, and obstetric factors should be well-evaluated and appropriate actions taken.

MS is a chronic, immune-mediated, inflammatory disease characterised by neuroinflammation and neurodegeneration in the central nervous system. The disease has an episodic course. Some studies have demonstrated that MS remits in the third trimester, in particular, during the pregnancy period; however, in the first three months post-partum, it shows a 70% increase compared with the pre-pregnancy period [6–9]. This can be attributed to the suppression and stimulation of cellular and humoral immunity that develop during pregnancy. It has been suggested that cytokines secreted from fetoplacental structures cause an increase in cellular immunity and sex steroids in humoral immunity [4]. In a study conducted by the National Multiple Sclerosis Society, no statistically significant difference was found between epidural and general anaesthesia in groups of pregnant women. In the same study, spinal anaesthesia caused an increase in episode frequency due to an increase in the neu-

rotoxic effects of local anaesthetics [10]. Currently, this subject is still controversial, as some authors have failed to report a difference with spinal anaesthesia [11].

It is essential to sufficiently evaluate the motor functions of some patients, while determining the anaesthesia method. The localisation of the demyelinating region in the central nervous system and its effects on respiratory function should be carefully controlled. It should be known that autonomic dysfunction in the lesions of the upper thoracic region, in particular, may cause haemodynamic instability, and hypotension that develops after regional anaesthesia may have very serious consequences. In patients with poor respiratory function, pre-oxygenation is vital during general anaesthesia [5]. The choice between intravenous or inhalation anaesthesia has not yet been clarified. Drugs administered in the treatment MS are important for the choice of anaesthesia method since baclofen causes sensitivity to muscle relaxants and steroid use leads to hypotension as a result of adrenal insufficiency [12, 13].

MG is a neuromuscular disease that manifests as weakness and loss of tone in muscles. Autoantibodies developing against postsynaptic acetylcholine receptors are responsible for its pathology. It is two-fold more common in women and tends to emerge during childbearing years. Hopkins *et al.* reported an improvement in symptoms in 30–40% of pregnant women with MS, no change in 30–40%, and a clinical deterioration in approximately 20–30% of patients. This study stated that symptoms worsened particularly in the first trimester and post-partum period [5]. Some studies have demonstrated that the risk of preterm labour increases [14], as similarly observed in all patients in the present study.

Currently, anaesthesia evaluation in pregnant women is recommended in the antenatal period. Pulmonary and myocardial functions of patients and the treatment administered are of major importance in the choice of anaesthesia. In pregnant women with MG, epidural anaesthesia or combined epidural-spinal anaesthesia is more widely accepted [5]. In order to prevent episodes in patients with MG, it is beneficial to ensure the control of postoperative pain. In the choice of local anaesthetic agents, the amide group of anaesthetics should be selected due to the degradation of the ester group of agents by anticholinesterases. If general anaesthesia is used, the sensitivity to neuromuscular agents is high. Therefore, many studies and case presentations have reported that an adequate muscle relaxation can only be achieved by inhalation agents. However, upon the availability of sugammadex, results indicate safe use of rocuronium in this group of patients [15, 16].

Conclusion

The authors conclude that general anaesthesia can be administered in the presence of neurological deficit, and regional anaesthesia may be an appropriate option in pregnant

women with neurological or neuromuscular diseases. They propose that epidural or combined epidural-spinal anaesthesia may be a safer method with regards to allowing block level control.

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