REVIEW

Anesthetic management of urgent cesarean section

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The validity of the 30-minute cesarean section (CS) rule has been questioned. A new classification of the urgency of CS was introduced by the NICE in the United Kingdom and has received considerable attention in recent years. In the guideline, categories 1 and 2 are defined as “immediate threat to the life of the woman or fetus” and “maternal or fetal compromise which is not immediately life-threatening”, respectively, and the recommendation is to “perform category 1 and 2 CS as quickly as possible after making the decision, particularly for category 1” and to “perform category 2 CS in most situations within 75 minutes of making the decision”. In consideration of these suggestions, the anesthetic method should be chosen from among general anesthesia following rapid sequence induction, rapid sequence spinal anesthesia, and epidural anesthesia converted from epidural labor analgesia.

Introduction

When emergency cesarean section is indicated, anesthesiologists must prepare the drugs and the equipments for general anesthesia as quickly as possible. Consequently, there is not enough time to perform sufficient preoperative assessments before inducing anesthesia. However, given that truly urgent cases are uncommon, it should be noted that inducing general anesthesia, in haste, without performing sufficient preoperative assessments in patients not really in need of urgent surgery may put both mother and fetus at unnecessary risk. Here, we discuss applications of the 30-minute rule for emergency cesarean section, and introduce a classification based on the urgency of emergency cesarean section, as proposed by the National Institute for Health and Clinical Excellence (NICE). We also discuss the choice of anesthetic management for emergency cesarean section.

1. The 30-minute rule for emergency cesarean section

a) The 30-minute rule as applied overseas

Since the 1980s, several organizations have developed

guidelines for the decision-to-delivery interval for cesarean section, but the ‘Organizational Standards for Maternity Service’ published by the Royal College of Obstetricians and Gynecologists in 1995 is regarded as the first guideline stating that the decision-to-delivery interval for cesarean section should be less than 30 minutes (30-minute rule). Although the validity of this rule has been questioned,^{1–3)} the idea was followed by the ‘Guidelines for Perinatal Care’ published by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists in 2002, which state that “To date, no studies have demonstrated the correlations between the decision-to-delivery interval and the outcome, and this situation of lack of evidence will remain unchanged in the future. Despite this, there is a consensus that obstetric hospitals should be equipped to start cesarean section within 30 minutes after the decision has been made that an operation is necessary. Although there are cases in which cesarean section can be safely performed well over 30 minutes after this decision, clinicians should be aware that some cases might have accompanying hemorrhage from placenta previa, premature abruption of a normally implanted placenta, umbilical cord prolapse, or uterine rupture, etc., and these

conditions necessitate early delivery”.

Because of these guidelines from the UK and the USA, obstetric hospitals have been under pressure to perform cesarean section within 30 minutes when an emergency cesarean section is indicated. It should be noted, however, that this rule does not require that all emergency cesarean sections be performed within 30 minutes after making the decision to operate.

b) The 30-minute rule as applied in Japan

The Yamato Municipal Hospital lawsuit is a frequently cited example when discussing the appropriateness of the 30-minute rule in Japan. In this lawsuit, a male child and his parents claimed compensation for damage from Yamato City on the grounds that “the child was born apparently dead and had severe disabilities including paralysis of the extremities because cesarean section had not been performed at the appropriate time”. In the first trial at the Yokohama District Court in 2007, Yamato City was ordered to compensate the plaintiffs in the amount of 142.5 million yen on the grounds that “it took about one hour and 16 minutes from the decision to perform cesarean section until delivery, which was too long”. In the second trial at the Tokyo High Court in 2008, the amount of compensation was reduced to 84 million yen on the grounds that “the delay in surgery alone was not the cause of the sequelae”. However, it was added that “the decision-to-delivery interval of about one hour and 16 minutes did not meet the standard of medical practice at the time”. This was the final decision because Yamato City did not appeal the ruling. Although the ‘30-minute rule’ was not mentioned specifically in the verdict, its importance was clearly implied. This view led to the misunderstanding by many individuals that medical practitioners would not be exempt from liability when the newborn has an abnormality, if the decision-to-delivery interval exceeded 30 minutes.

As yet, in Japan, there are no laws or guidelines stipulating that the 30-minute rule should be applied individually. The first public statement regarding the 30-minute rule appeared in a public notice entitled ‘Provision of Perinatal Care’, which was issued by a chief of the Equal Employment, Children and Families Bureau of the Ministry of Health, Labour and Welfare to prefectural governors on 21 April 2003. According to this notice, the regional perinatal care center recommendations can be described as follows: “Obstetric facilities are recommended to maintain staffing so as to enable cesarean section to be performed within 30 minutes after the decision to operate”. The statement was repeated in the public notice from the Ministry of Health, Labour and Welfare, entitled ‘Effective Medical Systems for Treatment of Diseases and Clarification of the Role of Institutions’ (2007). However, the notice only

mentioned the accreditation criteria of the institutions with non-binding targets. In addition, the recent notice entitled ‘Accreditation criteria for basic clinical practice costs and their notification requirements’ (2008) provided the following statement: “Obstetric facilities should have an adequate number of physicians and other healthcare professionals as accreditation criteria for maternal-fetal intensive care units where cesarean section can be performed within 30 minutes after the decision to operate”. Although this was a requirement rather than a recommendation, the statement was made only to define accreditation criteria for maternal-fetal intensive care units. To date, no sound legal basis for the 30-minute rule in clinical practice has been provided.

c) Problems in applying the 30-minute rule

In the UK and USA, there have been major advances in obstetric services in recent decades. In many hospitals, obstetric anesthesiologists can now offer painless delivery and are prepared for emergency cesarean sections. Therefore, complying with the 30-minute rule is not difficult for these hospitals. Attention is now moving to the possibility that performing cesarean sections in haste, i.e. within 30 minutes, may put both the mother and the fetus at unnecessary risks, especially when there is no definite need to carry out surgery under such hurried conditions. How to perform cesarean section in well under 30 minutes, when the mother and/or the fetus are in a critical state, should be discussed more seriously.

On the other hand, many perinatal care centers in Japan do not meet the non-binding goals or the facility criteria. According to a survey of general and regional perinatal care centers (130 centers in total) conducted by the study group of the Ministry of Health, Labour and Welfare, those responding that they were ‘always able’ to initiate a cesarean delivery within 30 minutes after the decision accounted for only 47% of general centers and 28% of regional centers. As mentioned above, there are no clear regulations or judicial precedents addressing the issue of emergency cesarean delivery necessarily being carried out within 30 minutes. However, we should improve the environment keeping in mind that there are cases requiring emergency surgery in well under 30 minutes.

2. A classification of the urgency of cesarean section according to the NICE guidelines

a) NICE guidelines

A new classification of the urgency of cesarean section was introduced by the NICE in the United Kingdom and has received considerable attention in recent years. The NICE, established in 1999, is part of the National Health Service and aims at improving the quality and

safety of medical care through standardization of medical treatment by providing guidelines based on scientific evidence and economic evaluation. The first edition of the cesarean section guidelines was published in 2004, and proposed a new classification based on the urgency of cesarean section.⁴⁾ In the 2011 edition of the guidelines, in-depth recommendations on the decision-to-deliver interval were made based on the classification system proposed in the 2004 edition of the guidelines.⁵⁾

b) Classification of urgency of cesarean section

In the United Kingdom, cesarean section was formerly categorized as elective or emergency. The problem with this classification was that all non-elective cases were categorized as emergencies, regardless of their actual urgency. Then, a classification of the urgency of cesarean section was developed based on the four-category classification of urgency (emergency, urgent, scheduled, and elective) used for surgical procedures by the National Confidential Enquiry into Perioperative Deaths.⁶⁾ This new classification was introduced in the 2004 edition of the NICE guidelines (Table 1).

According to the NICE guidelines, category-1 includes acute and severe bradycardia of the fetus, umbilical cord prolapse, uterine rupture, and pH of 7.2 or lower on fetal scalp blood sampling. Category-2 includes cases in which emergency cesarean section is needed to prevent further deterioration of maternal and/or fetal health. For example, antepartum bleeding and obstructed labor with poor maternal and/or fetal health conditions are included in this category. Category-3 includes those cases in which early delivery is recommended despite the health conditions of the mother and fetus being stable: For example, cases in which the membrane ruptures before labor starts in a pregnant woman scheduled for cesarean section or labor is obstructed but the mother and fetus are in good condition. Category-4 includes all pregnant women scheduled for cesarean section. There are no absolute restrictions regarding the timing of surgery. The schedule can be adjusted according to the convenience of clients and medical staff members.

c) Decision-to-delivery interval for cesarean section

To date, there have been many studies using the new classification. One of the most important studies using this classification system was conducted in England and Wales. The authors investigated the decision-to-delivery interval and its effects on the health conditions of the mother and fetus in 17,780 cases of single pregnancy undergoing emergency cesarean section between 1 May and 31 July 2000. The decision-to-delivery interval was classified into six groups according to 15-minute intervals: 15 minutes or shorter, 16 to 30 minutes, 31 to 45 minutes, 46 to 60 minutes, 61 to 75 minutes, and

Table 1. Classification of Urgency

category	definition
1	immediate threat to the life of the woman or fetus
2	maternal or fetal compromise which is not immediately life-threatening
3	no maternal or fetal compromise but needs early delivery
4	delivery timed to suit woman or staff

Table 2. Decision-to-delivery interval for unplanned CS

1	Perform category 1 and 2 CS [2] as quickly as possible after making the decision, particularly for category 1.
2	Perform category 2 CS [2] in most situations within 75 minutes of making the decision.
3	Take into account the condition of the woman and the unborn baby when making decisions about rapid delivery. Remember that rapid delivery may be harmful in certain circumstances.
4	Use the following decision-to-delivery intervals to measure the overall performance of an obstetric unit: 30 minutes for category 1 CS both 30 and 75 minutes for category 2 CS.

CS, cesarean section.

76 minutes or longer. The results showed, as predicted, that urgent delivery cases had poorer maternal and fetal outcomes. The analysis adjusted by other variables, including urgency, indications for surgery, anesthesia method, and cardiotocogram results, showed that cases with an interval of 76 minutes or longer had significantly poorer maternal and fetal outcomes.

Based on the findings from the above study, the recommendations regarding decision-to-delivery intervals were proposed in the 2011 edition of the NICE guidelines (Table 2). It is noteworthy that, in these guidelines, delivery in well under 30 minutes was recommended for category-1 patients. This recommendation represented a more rigorous application than the traditional 30-minute rule. On the other hand, delivery within 75 minutes was recommended for the category-2 patients, still less rigorous than the traditional 30-minute rule. Given that emergency cesarean section for category-1 cases accounts for only about 10% of total cesarean sections, the distinction between the category-1 and -2 cases in these guidelines is anticipated to aid medical professionals in relieving the stress associated with this surgery.

Table 3. Cesarean section (CS) rate and types of anesthesia by unit size in consultant-led maternity units in the UK

Annual deliveries	≤ 2,500	2,501–3,500	3,501–4,500	> 4,500	Total
Number of units	52	52	37	30	171
Overall CS rate; %	23	23	25	25	24
Category 1 as % of total CS	10	10	13	10	10
Rate of general anesthesia; %					
All CS	10	8	10	8	9
Category 1	55	68	50	34	51
Categories 2, 3	14	12	13	11	12
Category 4	4	4	2	3	4

3. Choice of anesthesia for emergency cesarean section

a) Findings from a survey in the United Kingdom

In 2006, a questionnaire survey was conducted to ascertain the current management of category-1 emergency cesarean sections based on the NICE classification for anesthesiologists working in obstetric facilities in the United Kingdom.⁷⁾ The results showed that an emergency cesarean section for category-1 patients accounted for about 10% of total cesarean sections, regardless of facility size (Table 3). With regard to the anesthesia method, 51% of emergency cesarean section in category-1 were managed by general anesthesia. However, there was a trend towards a lower rate of general anesthesia in larger facilities. There were two reasons for this.⁸⁾ First, many large hospitals were able to provide labor epidural analgesia, which can be used for anesthetic management of cesarean section. Second, many large hospitals had a sufficient number of obstetric anesthesiologists and were able to perform rapid sequence spinal anesthesia, as described below.

b) Rapid sequence spinal anesthesia

Traditionally, emergency cesarean section has been performed under general anesthesia in order to minimize delays. Recently, Kinsella et al. reported that the modified spinal anesthesia (rapid sequence spinal) can reduce the decision-to-delivery interval to an acceptable level even in category-1 patients.⁹⁾ Rapid sequence spinal anesthesia is thought to be a possible alternative to general anesthesia induced by rapid sequence intubation. Considering that more than 50% of cesarean sections are managed by obstetricians in Japan, this notion would appear to be readily applicable to clinical practice.

c) Application of epidural anesthesia for painless delivery

As epidural labor analgesia is not popular in Japan, the idea of an epidural catheter being useful for urgent cesarean section has not been well accepted. However, it

is expected that the demand for this practice will increase in the future, if the usefulness of epidural anesthesia for emergency cesarean sections is recognized and gains greater acceptance.

d) General anesthesia

Hawkins et al. recently reported that the relative risks of mortality for general anesthesia in cesarean section cases as compared with local anesthesia were 16.7 for 1985–1990 (95% confidence interval, 12.9–21.8) and 1.7 for 1997–2002 (95% confidence interval, 0.4–4.6). When the data for 1997–2002 were analyzed, there was no significant difference in mortality rates between the two anesthesia methods.¹⁰⁾ However, it should be noted that general anesthesia is never risk-free. A recent study in the United States found that, among a total of 8,543 deliveries in 2005, cesarean section was performed in 2,962 cases (31.5%), among which only 22 (0.8%) underwent cesarean section under general anesthesia.¹¹⁾ Even when emergency cesarean sections are necessary, general anesthesia should be avoided whenever possible.

e) Recommendations for Japanese obstetricians

In some hospitals where anesthesiologists are not available for urgent cesarean section, obstetricians are expected to anesthetize the parturient. In such cases, the authors strongly recommend that the treating obstetrician choose spinal rather than general anesthesia.

Although spinal anesthesia is associated with several potential complications, most of them are not life-threatening. Hypotension can be prevented or managed by uterine left displacement, fluid loading, and vasopressors. Effects of hypotension on the fetus can be minimized by shortening the induction-to-delivery interval. Spinal hematoma is a possible risk for parturients with coagulopathy, but permanent damage can be avoided by rapid diagnosis and treatment. On the other hand, complications related to general anesthesia such as failed intubation and aspiration pneumonia are life-threatening. Therefore, obstetricians should avoid general anesthesia if they are not accustomed to the procedure.

Regarding the decision-to-delivery interval, it should be noted that the 30-minute rule is not strictly applied, and general anesthesia should not be attempted simply to meet this time limit. According to the NICE classification, category 1 requires the shortest decision-to-delivery interval, though this rarely happens, and most category 2 cases can undergo surgery within 75 minutes. Therefore, rapid sequence spinal anesthesia is a reasonable alternative to general anesthesia for urgent cesarean section cases.

Closing comments

We have described a classification based on the urgency of cesarean section and the choice of anesthesia. Obstetricians and anesthesiologists should have a common understanding of operative urgency and choose the optimal anesthesia method for each patient.

Conflict of interest

None.

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