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Assessment of Airway Changes in Pregnant Women at Onset of Labour, Following Delivery and after 48 Hrs

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Abstract

Introduction /Context: High incidence of difficult or failed intubation in pregnant patients is still a major challenge for anaesthesiologists. To evaluate airway changes in pregnant patients we used mallampatti grade and image J software at various intervals. *Aims*: To assess the upper airway changes in pregnant women at the onset of labour, following delivery and after 48 hours and to identify any predictive factors. *Settings and Design: Methods and Material*: 77 ASA II parturients admitted to the labour and delivery suite (early active labour, cervical dilatation 2-3 cm) were included in the study. Initial airway examination was graded according to the Samsoon modiûcation of the Mallampatti classiûcation(T1).Airway photographs were taken. The images were studied under Image J software and the area of opening of the oropharynx were calculated. *Statistical analysis used*: Mc Nemar Bowkar test, Wilcoxan signed ranks test and chi-square test. Results: Significant differences were seen in percentage of parturients in whom mallampatti grading changed more than 1, equal to 1 or more grade at T1-T2 (24.6%, P<0.05) T2-T3 (37.6%, P=0.036) T1-T3 (55.8%, P=0.00008). Mean area of opening of oropharynx with MPG grade 3 or less than 3 at T1 (59.38%) T2 (64.5%) T3 (80%). Significant changes were also seen in mean area change in parturients with MPG 3 or less than 3 at T2-T3 (29.5%) T3-T2 (37.75%) T3-T1 (54.04%). *Conclusions*: There is significant change in the airway of pregnant women undergoing labour and delivery and these changes are fully reversed by 48 hours after delivery. Our study conûrms the absolute necessity of examining the airway before anaesthetic management in obstetric patients

Keywords: Airway Changes; Pregnancy; Difficult Intubation; Obstetric Anaesthesia.

Introduction

Regional anaesthesia has now become more popular choice of anaesthesia compared to general anaesthesia as it has many advantages such as induction of excellent analgesia and anaesthesia, lesser incidence of maternal side effects [1-4]. Still, in few pregnant women, the need of general anaesthetia may arise. Airway management is challenging in pregnant woman because of Anatomical changes in the upper airway in the form of swelling and friability of the nasopharyngeal and oropharyngeal tissue which occurs secondary to capillary engorgement.

The incidence of failed intubation in the parturients has been estimated between 1.3 to 3 per thousand and difficult endotracheal intubation of 64 per thousand [5,6]. Difficult or failed intubation after induction of general anesthesia for cesarean delivery remains the major contributing factor to anesthesia-related maternal complications [7,8]. As the seventh major cause for the death of parturients, 33% of anesthetic accidents arise from difficult airway [9]. During intubation in a parturient, it is difficult to view oropharyngeal area and the risk of trauma to the oropharynx is high due to upper airway oedema, which is contributed by an increase in the level of oestrogen and increase in the volume of blood. There is also an increase in fat deposition

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in the body which leads to increased fat around the neck. The Mallampati classification is a valuable estimate of the tongue size relative to the oral cavity [10]. When performed properly, Mallampati classification is a simple, reproducible, and reliable pre-anaesthetic airway assessment. In obstetric patients, Mallampati classes 3 and 4 are strongly associated with difficult laryngoscopy, with an increased relative risk of 7.6 and 11.3, respectively [11]. In this study, we aimed to assess the upper airway changes in pregnant women at the onset of labour, following delivery and after 48 hours and to identify any predictive factors for the airway changes by using samsoon modification of mallampati classification [12].

Materials and Methods

Study design of this study was Hospital Based Observational Study. The Place of the study was KLE'S Dr Prabhakar Kore Hospital and Medical Research Centre, Jawaharlal Nehru Medical College, Belagavi. Approval of the ethical committee was taken. The study was explained to the participants and their informed written consent was received.

Seventy seven pregnant women with age more than 18 years and with a gestation age of more than 37 completed weeks were included in this study. Other inclusion criteria were ASA II parturients admitted to the labour and delivery suite (early active labour, cervical dilatation 2-3 cm). Exclusion criteria were ASA III-IV group parturients, those who did not give consent and those who were uncooperative. Our patients were given no obstetric (e.g., spinal or epidural) analgesic management. Each patient was asked for weight before pregnancy. Each patient's current weight and height were measured and recorded in standing position. Anaesthesiologist evaluated each patient's on Samsoon modification of Mallampati scores and mouth opening in the delivery room at three different points of time eg.T1 (At The Onset of Labour), T2 (After delivery), T3 (After 48 Hrs of delivery). All patients were evaluated for Mallampati class by the same anaesthetist. At the same different points of time at which Mallampati scores were recorded, the airway photographs were taken using a standard digital camera and parturients in the sitting position with measuring scale held vertically next to oral cavity. In each patient, the area of the oropharyngeal opening was recorded by using ImageJ software. Image J is a public domain, Java-based image processing program developed at the National Institutes of Health [13]. Image J can acquire, display, edit, enhance, analyse and animate images. Image J can be used to measure area, mean, centroid, perimeter, etc. of user-defined regions of interest. Results were analysed using Mc Nemar Bowkar test, Wilcoxan signed ranks test and chi-square test. Data are mean (standard deviation) unless otherwise specified. Level of significance was taken as p-value < 0.05.

Results

Significant differences were seen in the percentage of parturients in whom mallampatti grading changed more than 1, equal to 1 or more grade at T1-T2 (24.6%, $P<0.05$) T2-T3(37.6%, $P=0.036$) T1-T3(55.8%, $P=0.00008$). Mean area of the opening of oropharynx with MPG grade 3 or less than 3 at T1 was 59.38%, T2 was 64.5%, and T3 was 80%. Significant changes were also seen in mean area change in parturients with MPG 3 or less than 3 at T2-T3 (29.5%), T3-T2 (37.75%), and T3-T1 (54.04%). (Table 1-6).

Table 1: Each participant's age, height, weight and BMI

Parameters	Result
The mean age group of parturient	23.7 ± 2.85 y
The mean weight of parturient	57.5 ± 6.12 kg
The mean height of parturient	148.5 ± 5.79 cms
The mean BMI	26.15±3.10kg/m2

Table 2: Associated conditions in studied pregnant women

Condition	Percentage
Pregnancy-induced hypertension	19.48%
Gestational diabetes	12.9%
Hypothyroidism	6.4%
Anaemia	5.1%
Others	56.12%

Table 3: Percentage of parturients in whom mallampati grading changed more than 1, equal to 1 or more grade (Test used – wilcoxan signed rank's)

Various Interval	Z value	P value
T1 – T2	4.359	< 0.001
T2 – T3	4.972	< 0.001
T1 – T3	6.099	< 0.001

Table 4: Mean area of opening of oropharynx with MPG grade 3 or less than 3

Various intervals	Percentage
T1	59.38
T2	64.57
T3	80

Table 5: Mean area change in parturients with MPG 3 or less than 3 (Test used – wilcoxan signed rank's test)

Various intervals	Z value	P value
T2 – T1	4.531	< 0.001
T3 – T2	5.586	< 0.001
T3 – T1	5.842	< 0.001

Table 6: Pregnancy outcome and change in MPG (Test used- Mann Whitney U)

T1 – T2	T2 – T3	T1 – T3
Z = 0.986 P = 0.324	Z = 0.776 P = 0.437	Z = 0.079 P = 0.937

Discussion

As demonstrated in this study, there is a significant change in the airway of pregnant women undergoing labour and delivery and these changes are fully reversed by 48 hours after delivery. This study highlights the importance of airway examination before anaesthetic management of obstetric patients.

As reported by Kodali and colleagues in their study, there was a significant and rapid change during labour in Mallampati classification and it was identified that in the post labour vs pre-labour evaluation there has been a 1.7-fold increase in classes 3 and 4 as per Mallampati classification [14]. In a previous study, Pilkington and colleagues demonstrated a significant increase in the Mallampati class between 12 and 38 weeks of pregnancy [15]. The study done us also showed that labour and delivery are associated with changes in airways as similar to previous observation in the study done by Farcon EL et al. [16].

Rocke et al studied the relation difficult intubation and between increasing Mallampati classification in term parturients undergoing general anesthesia during caesarean delivery [17]. As compared to parturients with a Mallampati class 1, the relative risk of difficult intubation during general anesthesia in parturients with Mallampati class 3 as shown in the above study. There is further increase in relative risk to 11.3 in parturients with a class 4 in Mallampati classification. As suggested by these findings, the change in Mallampati class from class 2 to class 4 in term parturient is associated with increased relative risk to encounter difficult intubation from 3.23 to 11.3. As a result, there is an increased risk of difficult intubation in term parturient during labour, particularly if there are changes in Mallmapati classification.

Therefore it is important to evaluate and re-evaluate the parturient on the basis of Mallampati classification during labour, especially in caesarean deliveries. Though nowadays most of the caesarean deliveries are performed under regional anaesthesia, the possibility of general aneasthesia cannot be ruled out. General anaesthesia may be required in critical situations such as inadequate regional anaesthesia. Even an increase in Mallampati class by one grade can increase the

cumulative risk of difficulty in intubation, especially if there is an association of coexisting factors such as morbid obesity, receding mandible, short neck, protruding maxillary incisors [18]. In these situations, airway management strategies backup may need to be implemented. Limitation of this study was small sample size.

Conclusion

There is a significant change in the airway of pregnant women undergoing labour and delivery and these changes are fully reversed by 48 hours after delivery. Therefore, this study highlights the absolute necessity of examining the airway before anaesthetic management in obstetric patients.

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