**Effect of Rubber Dam on Arterial Oxygen Saturation in Children**

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**Introduction**

The rubber dam was introduced to the dental profession by Dr. Stanford C Barnum in 1864. Since then a number of publications have appeared related to its practicality and methods of application.¹ The use of a rubber dam has significant advantages in operative procedures especially in children. It protects the patient’s oropharynx from aspiration of medicaments, instruments etc.²³ However, the use of rubber dam alters airflow in both the oral and nasal cavities depending on the method of application. This could result in a decrease in arterial oxygen saturation (SpO₂) which may cause serious problems in medically compromised patients. Any significant reduction in oxygen supply causes impairment of vital organs such as the brain, heart tissue. The pulse oximeter is a reliable, non-invasive instrument that measures hypoxia at its early stage.⁴ Good-day and Crocker evaluated the effect of rubber dam on SpO₂ in dental patients and found no change in SpO₂ before or after rubber dam isolation.⁵ Very few studies have been done assessing effect of rubber dam on SpO₂ in children.

Hence, the present study was carried out to evaluate the effect of rubber dam placement on SpO₂ while carrying out operative procedures in children of the 6-12 year age group.

**Materials and Methods**

The study consisted of 60 ASA Class I patients of the 6-12 years age group.⁶ Informed consent was taken from the parents and patients. Ethical clearance was obtained from Ethical Committee of Navodaya Medical Institution Raichur, Karnataka, India. Totally, 60 children with Class I caries lesion on second primary molars were selected and randomly allocated in two groups: Group A: 30 children had rubber dam isolation of maxillary primary second molar and Group B: 30 children had rubber dam isolation of the mandibular second primary molar. A pulse oximeter was used to detect arterial blood SpO₂ at every 30 s in both the groups. To establish a baseline, each patient’s SpO₂ was recorded every 30 s for 2 min. A rubber dam was then placed which extended over the nose. Class I cavity and glass ionomer cements restoration were performed. The rubber dam was cut to expose the nasal cavities SpO₂ were recorded every 30 s for 5 min throughout the procedure. A two-way ANOVA test was applied.

**Results:** In both groups there was no significant difference in SpO₂ after rubber dam placement with nose covered or uncovered (P > 0.05).

**Conclusion:** There was no significant change in SpO₂ after rubber dam isolation with nose covered or uncovered in children of 6-12 years age.

**Key Words:** Oxygen saturation, pulse oximeter, rubber dam

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Results
The average values of SpO₂ in both the groups are shown in Table 1. The average change in SpO₂ from pre-operative baseline till 5 min is shown in Tables 2 and 3. The baseline average SpO₂ for Group A and B was 98.20% and 97.37%, respectively. Placement of rubber dam with nose covered resulted in SpO₂ of 96.93% in Group A and 96.70% in Group B at the end of 5 min. After cutting the rubber dam, the SpO₂ resulted in 97.13% in Group A and 97% in Group B. There was the highly significant difference in means of SpO₂ in Group A (P < 0.0001) at 3.5 min (SpO₂ of 96.9%) from baseline when the nose was covered by rubber dam given by post-hoc analysis. There was significant difference in means of SpO₂ in Group B (P < 0.02) after covering the nose with rubber dam at 1.5 min (P < 0.01) and 2 min (P < 0.05) from baseline given by post-hoc analysis. The SpO₂ fell to 95.37% at 1.5 min and 95.8% at 2 min from baseline.

Discussion
In the present study, fingertip pulse oximeter was used to detect the oxygen level in blood. It is a sensitive tool in identifying low blood SpO₂, which is useful for continuous monitoring of the patient’s status. Mueller found pulse oximeter to be more sensitive to hypoxic changes than measurements of heart rate, blood pressure, respiratory rate or visual observation of cyanosis.⁷

In children, SpO₂ of 90-95% is considered as safe level for adequate oxygenation of vital organs.⁸ Hypoxia will commence when SpO₂ falls below 90%. Medically compromised children with diseases such as asthma, chronic obstructive pulmonary disease, emphysema, congestive heart failure are prone for hypoxia. The dental procedures like rubber dam application which alters airflow may induce similar situation. Bello and Darwish investigated the effect of restorative dental treatment on blood pressure, pulse rate, and SpO₂ in children and found some insignificant desaturations below the pre-operative baseline and found that the maximum decrease occurred during rubber dam application.⁹

In this regard, very few studies have been performed in children. Hence, in the present study children of the 6-12 years age group were selected. To standardize the procedure, Class I cavity preparation and GIC restoration were performed on second primary molars in both maxillary and mandibular arches. The statistical analysis showed that, after rubber dam application in the maxillary arch-Group A, the SpO₂ dropped by 1.3% i.e., to SpO₂ of 96.9% at 3.5 min (P < 0.0001) and in mandibular arch-Group B, the SpO₂ fell by 2% i.e., to SpO₂ of 95.37% at 1.5 min (P < 0.01) and recovered to SpO₂ of 96.75% at 5 min. In both the groups, the SpO₂ did not fall below 95%. Therefore, the use of rubber dam with nose covered or uncovered showed no statistically significant effect on the SpO₂ in children of the 6-12 years age group. The results of the present study are in accordance with the study done by Good-day and Crocker.⁵ Furthermore, Poiset et al. showed no significant effect on the SpO₂ and heart rate when routine dental procedures were performed under rubber dam application.¹⁰ In case of medically compromised patients who are prone for hypoxia, further studies are required to evaluate the effect of rubber dam on SpO₂ with due consideration to ethical aspects.
Conclusion

There was no significant change in arterial SpO₂ after rubber dam application with nose covered or uncovered in both maxillary and mandibular arch of healthy children of the 6-12 years age group.

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