Oronasopharyngeal suction versus no suction in normal, term and vaginally born infants: A prospective randomised controlled trial

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Abstract
This prospective randomised controlled trial aimed to compare the effects of oronasopharyngeal suction with those of no suction in normal, term and vaginally born infants and was performed at a Turkish tertiary hospital from June 2003 to January 2004. A total of 140 newborns were enrolled in the trial (n = 70 per group). The no suction group showed lower mean heart rates through the 3rd and 6th minutes and higher SaO2 values through the first 6 mins of life (P < 0.001). The maximum time to reach SaO2 of ≥ 92% (6 vs. 11 min) and ≥ 86% (5 vs. 8 min) were shorter in the no suction group (P < 0.001).

Key words: newborn, pulse oximetry, suction, vaginal delivery.

Introduction
Oronasopharyngeal suction (ONPS) has been a routine practice in the initial management of normal term newborns delivered vaginally or by Caesarean section. Some practitioners believe that oronasopharyngeal suction helps pulmonary fluid expulsion from the trachea, facilitates the entrance of air, prevents aspiration of mucus and blood, and provides tactile stimulation to assist in the initiation of respirations. Others have concerns about possible harmful effects of oronasopharyngeal suction including vagal-induced bradycardia or apnea, irritation to mucus membranes, and increased risk for iatrogenic infection.

Interestingly, in the English literature, few studies have questioned the role of oronasopharyngeal suction at birth and have recommended that the routine use of oronasopharyngeal catheter suctioning did not show a benefit in oxygenation of the infants. In studies investigating the oxygen saturation (SaO2) levels, study groups were heterogeneous for potential factors (gestational length, birth method, medication, and maternal or fetal/neonatal health status, etc.) that could effect on the neonatal respiratory physiology and almost all neonates received supplemental oxygen after birth. Low power due to the small sample sizes in these studies prompted us to examine the effects of the oronasopharyngeal suction procedure on healthy, term and vaginally born newborns and to compare the outcomes with those of no suctioning in a larger scale study.

Materials and methods
Patients
After obtaining Ethics Committee approval at Gülhane Military Medical Academy Hospital in Ankara, Turkey, this study was carried out at Perinatology Unit, from June 2003 through January 2004. Eligibility criteria for case inclusion were: nulliparity, term labour with a single fetus, no maternal or fetal pathologic changes during gestation and delivery, no intrapartum medication except epidural analgesia, no evidence of fetal distress, clear amniotic fluid, and spontaneous vaginal delivery in the cephalic presentation. Written informed consent was obtained from the parents prior to delivery. Newborns of the patients were randomised to suction and no suction groups according to computer-generated random numbers. Group selection was determined by assignments from sealed envelopes opened in the delivery room. All investigators, as well as residents and nurses who subsequently cared for the infant outside the delivery room, were unaware of individual treatment group assignments.

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Procedures

In the suction group, oronasopharyngeal suction was performed immediately after birth by using a sterile polyethylene tube (8 Ch - 2, 67 mm, closed end, double hole, Bicakcil A.S. Istanbul/Turkey) and negative pressure did not exceed 30 cm H2O. The only intervention in the no suction group was to wipe away any visible matter. pH, pCO2, and pO2 were determined in umbilical arterial samples by using the analyser Critical Care Laboratory Synthesis 35, Type-17350-16 A (Lexington, MA, 02421, USA). Following this, the newborn was dried thoroughly under radiant heat in the next room receiving standard care. In order to monitor oxygen saturation and heart rate, a reusable neonatal saturation sensor (System VI Infant Monitor, Air-Shields Vickers Hatboro, PA, 19040, USA) was attached to the middle finger of the right hand. Saturation measurements were evaluated only when the difference in heart rate was less than five beats from that obtained by the pulse oximeter. Measurements were documented minute-by-minute starting from the first minute of life until a SaO2 level of ≥ 92% was reached. Apgar scores were reported at the first and fifth minute. At least one author participated in all procedures and examinations of the newborns.

The primary outcome of the study was time to reach 92% SaO2, which represents the lower limit of the normal range, the mean pH and pO2 value were lower in the normal range, the mean pH and pO2 value were lower in the no suction group, while the mean pCO2 value was higher (P < 0.001).

Secondary outcome variables were Apgar scores, heart rate, and time to reach 86% SaO2. Additionally, any type of intervention that may be relevant to suctioning or no suctioning procedure such as oxygen requirement, re-evaluation for respiratory distress and neonatal intensive care unit admission was monitored until the discharge of the newborns.

Statistical analysis

According to our previous observations, we presumed that median survival time to reach 92% SaO2 was 5 min in no suction group and 9 min in suction group. PS Power and Sample Size Calculations Version 2.1.30 statistical package revealed that a minimum of 67 infants were needed in each group to demonstrate such a difference, at Alpha=0.05, Beta=0.10, and power 80%. Categoric variables were analysed with Chi-square or Fisher’s exact tests. Continuous variables were analysed with independent samples t-test or Mann–Whitney U-test. Due to differences between data collection periods of the two groups, only those measurements recorded at the first 6 min of life were used in the comparison. Differences were considered significant when P < 0.05 for the two tails. Statistical analysis was performed with SSPS 10 software (SSPS, Inc, Chicago, III). Data were expressed as mean ± standard deviation median, frequency, and proportions, where appropriate.

Results

One hundred and forty patients meeting the inclusion criteria were enrolled in the study, and complete data were available for all of them. All mothers received epidural analgesia. All newborns were in good clinical condition and did not require any supplemental oxygen. The two groups were similar in regard to maternal and fetal characteristics (Table 1). Although the values of all neonates in both groups were in normal range, the mean pH and pO2 value were lower in the no suction group, while the mean pCO2 value was higher (P < 0.001).

During the first six minutes of life, infants in the suction group had a lower mean SaO2 value compared to the no suction group (P < 0.001). Through the 3rd and 6th mins, the mean heart rates were consistently and significantly lower in the no suction group (P < 0.001) (Table 2).

While the slowest newborn in the no suction group achieved a SaO2 of 92% at the 6th minute of life, it took 11 min for the slowest one in the suction group (P < 0.001) (Table 3). None of the neonates in suction group achieved 92% oxygen saturation before the eighth minute of life.
The maximum time to reach 86% saturation was significantly shorter in the no suction group than the suction group (5 vs. 8 min, respectively, \( P < 0.001 \)). None of the neonates in suction group achieved 86% before the 6th min of life.

All neonates had an Apgar score of eight or nine at the 1st minute of life and there was no difference between the two groups. At the 5th min, all the neonates in the no suction group had a score of 10, while only 32 of 70 infants in the suction group showed the same score (\( P < 0.001 \)).

**Discussion**

Pulse oximetry values have been reported to change over time in healthy term newborns.\(^9\) In accordance with the earlier studies, our study indicate that newborns are oxygen desaturated immediately after birth\(^4–16\) and that the increase of \( \text{SaO}_2 \) levels occurs gradually in the first minutes of life\(^4,8,9,11,16\) regardless of suctioning. Persistence of the right-to-left shunt could be an explanatory factor for the delay in reaching a high \( \text{SaO}_2 \) level in all infants. \( \text{SaO}_2 \) levels remaining less than 85%, even briefly, was reported to possibly cause or prolong pulmonary vasoconstriction and could trigger pulmonary arterial hypertension.\(^7\) Despite the significant difference in reaching a level of \( \geq 86\% \) \( \text{SaO}_2 \) between the two groups, none of the babies had respiratory distress of any kind in the present study, as previously reported by Carrasco\( et al.\)\(^4\).

In the literature, there are four human studies for the evaluation of \( \text{SaO}_2 \) with respect to the oronasopharyngeal suction immediately after birth. Estol\( et al.\)\(^6\) reported that the volume of fluid eliminated by the suction procedure was only a minimal fraction of that contained in the respiratory system at birth and all this fluid was totally and rapidly eliminated by physiological mechanisms.

Carrasco\( et al.\)\(^4\) found that the average \( \text{SaO}_2 \) value was significantly lower in the suctioned group between the first and sixth minutes of life and the time elapsed to reach 86% and 92% saturation was significantly shorter in the no suction group. Although proportions of newborns to reach 86%
SaO₂ and 92% SaO₂ values were not demonstrated in their study, similar results may indicate that the lower and slower SaO₂ values may be relevant to suctioning procedure.

Recently, Waltman et al. reported that the bulb suctioning was not beneficial. In their pilot study, the suction group initially had lower SaO₂ levels and took longer to reach 92% SaO₂. In contrast to our results, they found that the newborn group with suctioning had a slightly lower, although non-significant, SaO₂ level at 5th minutes of age. However, by 10 min of life, the suction group demonstrated a higher SaO₂ level, which persisted through first 20 min of life.

Although anecdotal data are conflicting, the suctioning procedure in various forms has also been widely used in infants with meconium-stained amniotic fluid. Recently, in a multicentre prospective randomised controlled study, no significant difference was observed between treatment groups in the incidence of Meconium Aspiration Syndrome, need for mechanical ventilation, mortality, or in the duration of ventilation, oxygen treatment, and hospital care. Interestingly, in contrast to previous studies, this study found that newborns in the no suction group had significantly lower heart rates. Since all values remained within normal range throughout the observation period, the clinical importance of this finding was not clear.

Evidence from numerous animal studies shows that the mechanisms that are responsible for lung liquid clearance during the neonatal period develop gradually during the last part of the third trimester of pregnancy, together with an acceleration of clearance once labour is established. If during the neonatal period develop gradually during the latter part of the third trimester of pregnancy, together with an acceleration of clearance once labour is established. If rapid removal of liquid from potential airspaces is a key step in establishing the timely transition from placental to lung respiration in the first minutes of life, suction of oronasopharyngeal region should be expected to have positive impact on optimal oxygen delivery to the important organs of newborns. Our study demonstrated that no suctioning was superior to routine suctioning in reaching ≥ 92% SaO₂ in term-gestation, vaginally born, healthy infants. Crucial outcomes including Apgar score during 5th min, heart rate, and time to reach SaO₂ of ≥ 86% were similarly affected by this procedure.

In conclusion, clinicians performing oronasopharyngeal suction should review their policies since there is no statistical or physiological basis for oronasopharyngeal suction as a systematic procedure in healthy, term, and vaginally born infants.

References
