Endotracheal Suctioning for Nonvigorous Neonates Born Through Meconium Stained Amniotic Fluid

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SUMMARY

This randomized controlled trial was done to assess whether endotracheal suctioning of nonvigorous infants born through meconium stained amniotic fluid (MSAF) reduces the risk and complications of meconium aspiration syndrome (MAS). Term, nonvigorous babies born through MSAF were randomized to endotracheal suction or no suction groups (n=61 in each). Risks of MAS, complications of MAS and endotracheal suction, mortality, duration of neonatal intensive care unit stay, and neurodevelopmental outcome at 9 months were assessed. In total, 39 (32%) neonates developed MAS and 18 (14.8%) of them died. There were no significant differences in MAS, its severity and complications, mortality, and neurodevelopmental outcome for the two groups. One infant had a complication of endotracheal suctioning, which was mild and transient. The authors conclude that current practice of routine endotracheal suctioning for nonvigorous neonates born through MSAF should be further evaluated.

COMMENTARY

Relevance: Fetal passage of meconium *in utero* is a worrisome event because of the risk of meconium aspiration syndrome (MAS), which carries threat of mortality to the extent of 5-40% [1]. In addition, there are several unpleasant sequelae affecting the respiratory system, and neuro-development in later life. Some of the dangerous respiratory consequences of MAS are related to airway obstruction and air-leak. However, there are also chemical effects mediated by inflammation and inactivation of surfactant. Formerly, the standard of care was nasopharyngeal and oropharyngeal suction of the infant's airway even before delivery. However, the evidence of benefit from this intervention was not demonstrated in a meta-analysis of 4 trials [2], and this has now been abandoned altogether in active vigorous babies. In contrast, current guidelines still advocate inspection of the airway and endotracheal suctioning in depressed/non-vigorous babies [3,4], probably because of absence of evidence to change practice in this group of vulnerable neonates. The general practice in such babies is to look for particulate meconium and undertake endotracheal suction if it is present [5]. However, recent reports suggest that this may not significantly reduce the risk of MAS [6]. There are emerging views that non-vigorous babies may also not require endotracheal suction. Against this backdrop, the recent trial by Chettri, *et al*. [7] is a valuable addition to literature. The trial [1] details are summarized in ***Table* I**.

Critical appraisal: The RCT was planned and executed well. ***Table* II** summarizes the methodological characteristics. Overall, the trial qualifies for medium risk-of-bias status. There are several refinements that make this trial noteworthy. First, precise definitions have been used; and where relevant, components of definitions (of various clinically used terms) have also been explicitly clarified and defined. Further, the primary outcome (incidence of MAS) has been supplemented with data on a variety of clinically important parameters that are both patient-centric as well as relevant to the managing team. The instruments used to evaluate long-term outcomes were designed for Indian infants, and hence are likely to have reliability and replicability in Indian settings. The investigators have drawn conservative conclusions from their findings, suggesting that this trial demands further evaluation of the time-honored practice, rather than immediate change in practice. This is pertinent because data from 122 babies may be insufficient to identify any subgroups of non-vigorous neonates that may benefit (or alternatively be harmed) from endotracheal suction.

Extendibility: The RCT was conducted in a teaching hospital in India itself, making it easier to replicate the procedures followed in the trial, and extend the results to other similar institutions in the country and region. The trial

TABLE I SUMMARY OF THE TRIAL DETAILS

Objective	To compare a group of non-vigorous neonates born through meconium stained amniotic fluid (Population) who do not receive endotracheal suctioning at birth (Intervention) compared to those who do (Comparison), with respect to incidence of MAS (Outcome).
Study design	Randomized controlled trial
Study setting	Tertiary care teaching hospital in Southern India.
Study duration	16 consecutive months
Sample size	Sample size was calculated *a priori* based on another study (in vigorous and non-vigorous babies). The calculation accounted for 20% attrition rate, alpha error 5% and beta error 20%. However, prior Unit data was not considered for sample size estimation.
Inclusion criteria	Live-born, term gestation, non-vigorous neonates born through MSAF. Appropriate definitions were used for term gestation, and non-vigorous state.
Exclusion criteria	Babies with antenatally diagnosed significant congenital anomalies (definitions not specified and reasons for exclusion not explained). Babies born unexpectedly were also excluded.
Intervention and Comparison groups	Intervention/Non-endotracheal suction group: Oro-pharynx was suctioned through the mouth, followed by nose. Comparison/Endotracheal suction group: Endotracheal intubation was followed by suction using a wall-mounted suction. The procedure was repeated if necessary. Thereafter babies were treated as for the Intervention group.
Outcomes	Incidence of MAS, motor function and neurodevelopmental status at 9 months of age
Statistical analysis	Investigators undertook appropriate statistical tests.
Main results (No endotracheal suction *vs* endotracheal suction)	*Immediate and short-term outcomes* • Incidence of MAS: RR 0.95 (95% CI 0.57, 1.59) • Need for resuscitation at birth: RR 0.96 (95% CI 0.85, 1.10) • Birth asphyxia: RR 0.89 (95% CI 0.52, 1.55) • Need for ventilation: 1.07 (95% CI 0.57, 2.02) • Duration of ventilation: Mean difference 0.60 days (95% CI -1.41, 2.61) • Seizures: RR 1.00 (95% CI 0.63, 1.58) • Development of shock: RR 1.25 (95% CI 0.78, 2.00) • Persistence of symptoms at 2 hours of life: RR 0.88 (95% CI 0.61, 1.26) • Duration of NICU stay: Mean difference 0.70 (95% CI -0.25, 1.65) • Mortality within 7 days: RR 1.14 (95% CI 0.44, 2.96) *Long-term outcomes (at 9 mo):* • Mortality: RR 1.20 (95% CI 0.56, 2.57) • Mortality+Lost to follow-up: RR 0.89 (95% CI 0.52, 1.55) • Abnormal neurodevelopment score (mild or severe): RR 1.34 (95% CI 0.67, 2.67) • Motor deficit (mild or severe): RR 1.10 (95% CI 0.60, 2.03)

site is a tertiary care institution, and hence better equipped in terms of manpower and resources, to deal with exigencies that arise. This may be particularly important because proper endotracheal suction itself needs considerable training, and can be associated with complications [9]. For this reason, the results of the trial may not be similar in other units caring for newborn babies.

Another issue is that the trial found similar outcomes in babies not receiving endotracheal suction and in those receiving suction; however neither was superior (or inferior) for any outcome parameter. This suggests that neonatology units and specialists can consider change in practice only after carefully collating existing local data (for a reasonable period of time), so that the impact of change (if any) can be documented and interpreted correctly. On the research front, the data from this trial would contribute to a systematic review and meta-analysis of similar trials (as and when they are reported).

Table II METHODOLOGICAL APPRAISAL OF THE TRIAL

Similarity of groups at baseline	Both groups (no endotracheal suction *vs* suction) were similar with respect to mothers' age, consistency of meconium (standard definitions), presence of fetal distress (appropriately defined), maternal anemia, frequency of pregnancy or labour-related complications (pregnancy induced hypertension, premature rupture of membranes, oligohydramnios), and type of delivery. The included babies had similar gender distribution, gestational age distribution, mean birth weight, 1 and 5 minute Apgar scores, requirement for resuscitation, and objective measures of airway obstruction (Downe score).
Randomization	Computer generated sequence was used. No other details are available.
Allocation concealment	Opaque sealed envelopes contained the randomization code. These were opened immediately prior to birth. However, as only non-vigorous babies were to be enrolled (which could be determined only after delivery of the baby occurred), a large number of opened envelopes had to be discarded. Recruitment was continued till the sample size was achieved. The impact of this, on allocation concealment, is unclear.
Blinding	Participating neonates, their families, investigators and outcome assessors were apparently not blinded. In this type of trial, since randomized participants' (short-term) outcomes are obvious to observers, there is a likelihood of observer bias creeping in as the trial progresses. If the observer, and clinical management personnel are not different, this can also indirectly impact the manner in which the interventions are delivered.
Selective outcome reporting	Almost all possible outcomes relevant to the PICO question have been presented.
Incomplete outcome reporting	There is no evidence of incomplete reporting for short-term/immediate outcomes. For the long-term outcomes at 9 months, attrition was related to mortality and loss to follow-up. The latter was nearly twice as frequent in the Comparison (endotracheal suction) arm. No reasons for this have been specified.This type of trial raises interesting challenges for intention-to-treat analysis wherein randomized participants are to be included in analysis, irrespective of whether or not they received the intervention [8]. In this trial, nearly 90% randomized participants were not eligible to be included in the trial, hence were not given the Intervention or Comparison. In such a scenario, a two-step randomization procedure could have enhanced methodological quality.
Overall assessment	Medium risk of bias

Conclusions: This well conducted randomized trial shows that in babies born through meconium stained amniotic fluid, who are non-vigorous at birth, omission of the practice of endotracheal suction, yields comparable short-term and long-term outcomes to those who receive endotracheal suction.

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REFERENCES

1. Yurdakök M. Meconium aspiration syndrome: do we know? Turk J Pediatr. 2011;53:121-9.
2. Halliday HL. Endotracheal intubation at birth for preventing morbidity and mortality in vigorous, meconium-stained infants born at term. Cochrane Database Syst Rev. 2001;1:CD000500.
3. Roehr CC, Hansmann G, Hoehn T, Bührer C. The 2010 Guidelines on Neonatal Resuscitation (AHA, ERC, ILCOR): similarities and differences – what progress has been made since 2005? Klin Pediatr. 2011;223:299-307.
4. Kattwinkel J, Perlman JM, Aziz K, Colby C, Fairchild K, Gallagher J, *et al*. Part 15: neonatal resuscitation: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010;122:S909 –19.
5. Green DA. Adaption of suction connectors for use in meconium aspiration syndrome. Trop Doct. 2010;40:33-7.
6. Michel F, Nicaise C, Camus T, Di-Marco JN, Thomachot L, Vialet R, *et al.* Management of newborns with meconium-stained amniotic fluid: prospective evaluation of practice. Ann Fr Anesth Reanim. 2010;29:605-9.
7. Chettri S, Adhisivam B, Bhat BV. Endotracheal suction for nonvigorous neonates born through meconium stained amniotic fluid: A randomized controlled trial. J Pediatr. 2015;166:1208-13.
8. No authors listed. Rationale for Concern About Bias. Available from: *http://handbook.cochrane.org/chapter_8/8_13_1_rationale_for_concern_about_bias.htm*. Accessed June 13, 2015.
9. Velaphi S, Vidyasagar D. The pros and cons of suctioning at the perineum (intrapartum) and post-delivery with and without meconium. Semin Fetal Neonatal Med. 2008; 13: 375-382.