

# Newborn Resuscitation: Meconium Aspiration Syndrome

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The World Health Organization has produced guidelines for the management of common illnesses in hospitals with limited resources. This series reviews the scientific evidence behind WHO's recommendations. The WHO guidelines, and more reviews are available at: [http://www.who.int/child-adolescent-health/publications/CHILD\\_HEALTH/PB.htm](http://www.who.int/child-adolescent-health/publications/CHILD_HEALTH/PB.htm)

This review addresses the question: *What is the value of routine immediate perineal suction to prevent meconium aspiration syndrome (MAS)?* and *What is the value of routine endotracheal suction to prevent MAS in vigorous babies born through MSAF?*

The **WHO Pocketbook of Hospital Care for Children** recommends suctioning the airway if there is meconium stained fluid and the baby is not crying and moving limbs: suck the mouth, nose and oropharynx, do not suck right down the throat as this can cause apnoea/bradycardia. (Pocketbook chapter 4.2, page 44).

## Introduction:

At present time, delivery room management of babies born through Meconium stained amniotic fluid (MSAF) often includes suctioning of the mouth and nose before the delivery of the shoulders. This addresses the concern that babies will inhale meconium present in the upper airway with their first breath putting them at risk of MAS. The rationale of routine perineal suctioning of all babies born through MSAF has recently been questioned. Likewise, tracheal suctioning of meconium in babies born through MSAF is an established intervention in many delivery rooms. However, disagreements exist concerning the value of perineal and routine endotracheal suction of the airway in the delivery room management of vigorous meconium-stained infants.

## Methods

Articles were identified through MEDLINE searches by use of Pubmed clinical queries. Using the search terms (meconium OR suction) AND resuscitation and searching under systematic reviews, 36 articles were found 3 of which were relevant.

Using the terms (meconium aspiration OR meconium OR meconium aspiration syndrome) AND (suction OR suctioning) AND resuscitation under therapy, broad, sensitive filter, 21 articles were found 5 of which were relevant.

The titles and abstracts of the identified articles were read by two independent reviewers and those with primary data on the value of routine, immediate suction (perineal or endotracheal) in meconium stained neonates selected. The methodological quality of the selected articles were assessed using the Oxford CEBM LOE, which ranks the validity of evidence in a hierarchy of levels with systematic reviews as level 1 (strong evidence) and expert opinions as level 5 (weak evidence) [1]. Likewise, the grades of recommendations were based on the SIGN grading system, which places weight on the quality and body of the evidence [2].

Overall, 1 SR, 4 RCTs, 1 CT and 2 Guidelines were found. Three of the studies [3,4,5] were analysed by one SR [6]. One study had a LOE of 1a, 4 were level 1b evidence while 1 had a LOE of 2b.

## Results

### Perineal Suction

One large study [7] which assessed the effectiveness of intrapartum suctioning in term gestation infants born through MSAF, found no significant difference between groups in the incidence of MAS (52 [4%] suction vs 47 [4%] no suction; RR 0.9, 95% CI 0.6 - 1.3), need for mechanical ventilation for MAS (24 [2%] vs 18

[1%]; 0.8, 0.4-1.4), mortality (9 [1%] vs 4 [0.3%]; 0.4, 0.1-1.5), or in the duration of ventilation, oxygen treatment, and hospital care.

### Endotracheal Suction

Two studies [3,5] which assessed the incidence of MAS reported no significant difference between treatment groups; all the 95% CIs crossed one. One SR [6] which analysed 4 studies, found no evidence that endotracheal intubation reduced this outcome (RR 1.29, 95% CI 0.80, 2.08), although the total number of observed cases was relatively low.

Mortality as an outcome was measured by 4 studies [3,4,5,6]; one SR [6] found no evidence that endotracheal intubation at birth had an effect on mortality (RR 1.73, 95% CI 0.37, 8.1). However, the number of deaths reported was very low. Two studies [3,4] found no significant difference between treatment groups in this outcome. One small study [5] reported no deaths in either group.

Pneumothorax was reported by 3 studies [4,5,6]; A meta-analysis of the results of two studies [4,5] by an included SR [6] showed no evidence of an effect of intubation on this outcome (RR 0.87, 95% CI 0.16, 4.92), but only four cases of pneumothorax occurred.

There were no significant differences between treatment groups in the occurrence of respiratory disorders, HIE, convulsions and stridor [6]. Similarly, no significant differences were reported in the occurrence of complications [3] and air leaks [4]. One SR [6] reported that there was no significant difference between treatment groups in need for oxygen treatment.

One non-randomised trial [8] reported that MAS was significantly more common in suctioned infants as compared to those not suctioned, those with light meconium and those with clear fluid (11 vs 3 vs 0 vs 0;  $p < 0.01$ ). The same study also reported that, compared to infants with moderate to thick meconium selectively not suctioned, suctioned infants had significantly greater rates of pulmonary diagnoses, abnormal FHR patterns, fetal acidosis, low Apgar scores, need for resuscitation and NICU admissions.

### **Discussion**

The findings of the current review demonstrate first that routine perineal suction in babies born through MSAF appears to be of no value. Available data indicates further that other important effects (mortality, HIE, pneumothorax,

respiratory disorders, etc) are unaffected by this procedure. Therefore, there is no basis for its continued practice.

Similarly, routine endotracheal intubation and suction was also shown to confer no benefits to vigorous babies delivered through MSAF. In contrast, the procedure has potential risks; it can stimulate the vagus nerve resulting in apnoea and bradycardia. The strengths of these findings are, however, limited by the small number of studies identified.

### **Summary**

Based on the above findings, perineal suction is of no value and has potential risks (grade A evidence) and should not be practiced. Similarly, routine endotracheal suction of vigorous term babies born through MSAF is of no benefit and may be harmful even if there is thick meconium (grade A evidence); oropharyngeal suction is only of value in cases of airway obstruction. Thus, even if there is thick meconium routine intubation in the vigorous infant should not be encouraged; intubation should be in response to the need for respiratory support in 'depressed' infants - with apnea and poor tone. Nonetheless, there is need for future trials to define a subgroup of infants with meconium staining who might benefit from intubation and airway suction.

### **Abbreviations:**

CEBM LOE: Centre for Evidence Based Medicine Levels of Evidence  
SR: Systematic Review  
RCT: Randomised Controlled Trial  
CT: Clinical Trial  
MAS: Meconium Aspiration Syndrome  
MSAF: Meconium Stained Amniotic Fluid  
HIE: Hypoxic-Ischaemic Encephalopathy  
FHR: Fetal Heart Rate

### **References**

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- study. Journal of Tropical Pediatrics 1994; 40(4): 198-200.
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  7. Vain N, Szyld EG, Prudent LM, et al. Oropharyngeal and nasopharyngeal suctioning of meconium-stained neonates before delivery of their shoulders: multicentre, randomised controlled trial. The Lancet 2004; 364: 597-602.
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**Table 1. Airway**

| <b>Citation Design</b>                           | <b>Country Setting</b>   | <b>Inclusion Criteria</b>                                                                       | <b>Sample Size</b> | <b>Intervention</b>                                                                                                                                               | <b>LOE</b>    |
|--------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Meconium Aspiration: Perineal Suction</b>     |                          |                                                                                                 |                    |                                                                                                                                                                   |               |
| Vain et al<br>Double blinded<br>RCT              | Multicentre<br>Hospitals | Birth through MSAF<br>of any consistency<br>Gestational age $\geq$ 37 weeks<br>No abnormalities | 2514               | Suctioning of the oropharynx and<br>nasopharynx before delivery of<br>the shoulders (n=1251) or no suctioning<br>before delivery (n=1251)                         | <b>1b</b>     |
| <b>Meconium Aspiration: Endotracheal Suction</b> |                          |                                                                                                 |                    |                                                                                                                                                                   |               |
| Wiswell<br>et al<br>RCT                          | Multicentre<br>Hospitals | Birth through MSAF<br>of any consistency<br>'Vigour' immediately after birth                    | 2094               | Subjects were randomised to be intubated<br>and suctioned (INT, n=1051) or to<br>expectant management (EXP, n=1043)                                               | <b>1b</b>     |
| Linder<br>et al<br>RCT                           | Israel<br>Hospital       | MSAF<br>Gestational Age >37 weeks<br>Birth weight >2500g<br>Breathing spontaneously             | 572                | Group I (n=308) suctioning of the<br>trachea under direct vision.<br>Group II (n=264) no suctioning                                                               | <b>1b</b>     |
| Daga<br>et al<br>RCT                             | India<br>Hospital        | Babies born with thick<br>meconium staining of<br>amniotic fluid                                | 49                 | Control group (n=26) received only<br>oropharyngeal suction (OR) while the<br>Intervention group (n=23), under went OR<br>suctioning followed by tracheal suction | <b>1b "L"</b> |
| Yoder<br>et al<br>Prospective<br>Clinical trial  | USA<br>Hospital          | All live births >36 weeks<br>gestation occurring between<br>1990 and 1992                       | 4938               | 799 (16%) had MSAF<br>Suctioned, n=196<br>Not suctioned, n= 211                                                                                                   | <b>2b</b>     |

**MSAF: Meconium Stained Amniotic Fluid**