Holding the baby: head downwards positioning for physiotherapy does not cause gastro-oesophageal reflux


ABSTRACT: The head-downwards tipped position for physiotherapy has been claimed to exacerbate gastro-oesophageal reflux (GOR) in infants with cystic fibrosis (CF). This was investigated using lower oesophageal pH monitoring during physiotherapy.

Twenty-one infants (age range 1–27 months) with respiratory disorders (CF=11), undergoing lower oesophageal pH monitoring were recruited. Subjects received two physiotherapy episodes in random order, A/B or B/A, 12 h apart. A began the gravity-assisted positioning head downward tip for: right lower lobe, middle lobe, left lower lobe and lingula; then supine with no tip for anterior segments of the upper lobes followed by apical segments of upper lobes in a sitting position. B was in the reverse order. Intermittent chest clapping was carried out for 4 min in each position by a physiotherapist blinded to the pH data.

During episode A, the median change in pH from baseline was -0.32 (range -2.07 to +1.0) in non-CF subjects (n) and -0.52 (range -2.7 to +0.52) in CF subjects (p<0.02). During episode B, the median change in non-CF subjects was -0.1 (n; range -1.7 to -0.15) and in CF subjects was -0.05 (n; range -0.67 to +0.5). There was no order effect for positioning. In the CF subjects the sitting position was twice as likely to have the lowest pH measurement during physiotherapy than the other positions (p<0.04).

In conclusion, the head-downward tipped positioning for physiotherapy treatment neither induces nor aggravates gastro-oesophageal reflux. There is no justification for routinely changing the way in which infant physiotherapy is carried out.


In infants with respiratory disorders complicated by excess bronchopulmonary secretions and sputum retention, chest physiotherapy to enhance airway clearance is an essential part of management. Established clinical practice consists of gravity-assisted positioning combined with periods of chest clapping. It is possible that gastro-oesophageal reflux (GOR) may cause or complicate recurrent respiratory problems [1], but whether or not head-downwards positioning aggravates GOR has not been determined. A recent study claimed that modified head-up positioning for physiotherapy caused less reflux than treatment in tipped positions [2] but this has been disputed [3]. In three previous studies reporting GOR as a consequence of chest physiotherapy, it is unclear whether the head-downward tipped positions were investigated, but the physiotherapy described would not be considered orthodox since it also consisted of the use of abdominal thrusts, routine tracheal rubs and nasopharyngeal suction [4–6]. This study was, therefore, designed to determine whether established current physiotherapy practice for infants causes or exacerbates GOR.

Methods

Subjects

Twenty-one infants (six male) were recruited, with a median age of 8 months (range 1–27 months), undergoing 20 h of lower oesophageal pH (LOpH) monitoring to evaluate possible GOR. Eleven infants had cystic fibrosis (CF). The remainder were being investigated for either or both of recurrent wheeze and recurrent lower respiratory tract infection. Infants <2.5 yrs of age, requiring chest physiotherapy, were eligible for entry into the study. Exclusion criteria were: a nasogastric tube in situ, receiving systemically administered β-agonists [1] or a coexisting medical condition which contra-indicated being placed in a head-downwards tipped position, e.g. congenital heart disease. The study protocol was approved by the Ethics Committee and informed, written consent was obtained from all parents or carers.

pH measurements

LOpH measurements were made using Synectics pH monitoring equipment (Digitrapper Mark III ambulatory system; Synectics Medical, Stockholm, Sweden). A two-point calibration was performed on each antimony electrode before use. The location of the electrode was determined in accordance with the protocol of the European Society of Pediatric Gastroenterology and Nutrition [7]. Food-thickening agents were not used for feeds and subjects were not receiving antireflux medication.
Physiotherapy

Each subject received two physiotherapy treatment sessions from an experienced physiotherapist during their LOPH monitoring. Chest clapping with pauses was carried out for 4 min in six gravity-assisted positions. These positions were: left side lying with 20° head-downward tip for the right lower lobe; left side lying with a quarter turn to supine and 15° downward tip for the middle lobe; right side lying and 20° tip for the left lower lobe; right side lying with a quarter turn to supine and 15° tip for the lingula; and supine lying, no tip for the anterior segments of the upper lobes and upright sitting for the apical segments of the upper lobes. These positions constituted treatment order A, with treatment order B the reverse. From an envelope, subjects were randomized to receive physiotherapy A/B or B/A. Treatments were carried out at least 2 h postprandial and 12 h apart, one in the evening and one in the morning. pH recordings were made at one-minute intervals during a four-minute basal run-in period and throughout treatment by an independent observer. The physiotherapist performing the treatment was blind to the pH data. Data were examined using pH software from Gas trosoft (Synectics Medical). Acid reflux was defined as a fall in LOPH to <4 for at least 15 s. The percentage of total time where pH <4 is the reflux index (RI) [7].

Results

The 20 h LOPH results demonstrated a greater overall incidence of GOR in the CF subjects (p<0.02), with 8/11 having RI >3.4% (range 1–21%) compared with 3/10 non-CF (range 1–16.5%).

During physiotherapy, the median change in pH from baseline to the lowest pH value occurring in treatment episode A was -0.32 (range -2.07 to +1.0) in non-CF subjects (p = nonsignificant (NS)) and -0.52 (range -2.7 to +0.52) in CF subjects (p<0.02). The median change in pH from baseline to the lowest pH value during episode B was -0.1 (range -1.7 to -0.15) in non-CF subjects (NS) and -0.05 (range -0.67 to +0.5) in CF subjects (NS). In the CF subjects, there was no significant difference in the pH changes during episodes A and B. ANOVA demonstrated no difference in pH measurements related to order of positioning (A/B or B/A). Between-subject variability was the most potent factor influencing pH changes (p<0.001).

Figure 1 shows individual patient pH median and range measurements for both CF and non-CF subjects during physiotherapy. For subject number 6, the only non-CF subject to experience a pH <4 with physiotherapy, the fall in pH occurred during both episodes whilst being treated in the upright sitting position but at no other time. In subjects 1 and 4 (both CF), reflux occurred (pH <4) during treatment episode A when they were placed in the sitting position. With treatment episode B, both subjects were refluxing during baseline recordings and subject 1 continued to reflux throughout physiotherapy. Subject 4, however, stopped refluxing when positioned tipped head downwards for treatment. The third patient with CF with a fall in pH <4 throughout baseline and episode A (subject 14) demonstrated no pH <4 during episode B. In CF subjects, the sitting position was twice as likely to have the lowest pH during physiotherapy than predicted (Chisquared=4.27; p<0.04; fig. 2).

The standard deviation for pH for the group was 0.7 pH units. Studying 11 children with CF gives a 55% chance of detecting a change of 0.5 pH units at the 5% level and a
70% chance of detecting a change between positions. Studying 21 patients (the whole group) gives at least an 80% chance of detecting differences between positions at the 5% level.

Discussion

The overall L0pH monitoring results show that the incidence of GOR in CF was more common than in the other respiratory non-CF conditions investigated. An incidence of 73% was found, which appears to be in line with the 81% described by Malfoot and Dab [8]. This study demonstrates, however, that performing chest physiotherapy in head-downward tipped positions neither caused nor aggravated GOR. The lowest pH measurements re-corded during physiotherapy tended to occur when sitting. Nevertheless, an actual drop to a pH of <4 occurred only rarely; in two CF subjects, when sitting, during one treatment episode and in one non-CF subject, when sitting, during both treatment episodes. The sitting position for physiotherapy is discontinued once the infant is walking.

The sitting position is generally considered in which GOR is worst in infants [9, 10]. A slumped position raises intra-abdominal pressure and this is one mechanism that may induce GOR [11]. Transient relaxations of the lower oesophageal sphincter (LOS), a cause of GOR, especially in CF [12], are also more frequent when sitting [13]. A head-downward tipped position may prevent GOR as intra-abdominal pressure falls and intrathoracic pressure rises, thus actually reducing the adverse gradient across the LOS which would otherwise favour reflux [14]. Furthermore, diaphragmatic work is increased in the tipped position, which would also enhance LOS competence [15]. In the head-downward positions, gastric contents would distend and lie in the areas of the stomach curvatures. Tobin et al. [16] found that GOR was decreased in the left lateral position and speculated that with the greater curvature acting as a reservoir, the pressure of gastric contents against the LOS would be reduced.

One limitation of the present study was the inability to identify alkaline reflux. Changes in hydrogen ions at concentrations over pH 7 are too small to be sensed by pH monitoring [17]. The importance of alkaline reflux in GOR disease is, however, controversial and clinical decisions are usually based on the presence or absence of acid reflux. This study could be criticized because neither aspiration nor respiratory symptoms induced via neural reflex arcs [18] were examined. Detection of aspiration would have necessitated isotope studies which were thought to be neither practical nor ethical. The cause and effect association of chest physical therapy to gastroesophageal reflux, Pediatr Res 1983; 17: Suppl. ii, 188A.

References

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