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ASSESSMENT OF SENSORIAL ORAL STIMULATION IN INFANTS WITH SUCK FEEDING DISABILITIES.

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Assessment of Sensorial Oral Stimulation in Infants with Suck Feeding Disabilities

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Abstract : A non-randomised single blind study was undertaken to determine the clinical and physiological changes in suck feeding after sensorial oral stimulation, in fourteen patients age 9 to 210 days old with sucking alterations. Patients lacked at least one of the five oral reflexes, plus two or more abnormal sucking sings or at least one abnormal sucking sign, plus two or more abnormal oral reflexes.

Oral sensorial therapy was performed thrice daily for five days. The number of absent oral reflexes, number of abnormal sucking signs, volume of milk for nursing and sucking rate, were registered. Differences of medians were tested using Freidman's test and differential of proportions using Cochran's Q test.

After therapy, oral reflexes were recovered (2, 0-4 vs. 5,5-5, p = 0.0000, median rank of absence oral reflexes) and the number of abnormal sucking signs decreased (6,1-9 vs. 1, 0-4; p = 0.0000). There were statistically significant improvements in patients who had lost launch up nipple ability (p = 0.005), delay at the beginning of sucking (p = 0.0022), drawing of milk from the mouth (p = 0.0001), cyanosis (p = 0.0084), weaning (p = 0.0004) and prolonged sucking (p = 0.0038). Even in patients with moderate improvement, no statistical differences were observed in nipple rooting (p = 0.09) and coughing (p = 0.09). No changes were observed in patients who had cried (p = 0.31) and spitted (p = 0.51) during feeding. At the end of therapy, volumes of consumed milk were increased at each feeding (10 ml, 0-40 vs. 50 ml, 25-60; p = 0.0001). Sucking rates also increased (22 sucks/minute, 10-35 vs. 40.5, 35-48; p = 0.0044).

Oral sensorial and motor stimulation normalise oral motor reflexes, diminish the clinical abnormal sucking signs and increase milk volumes ingested for nursing.
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Key words *: Sucking; Rehabilitation; Nursing.*

Recent advances in neonatal medicine have increased the number of high-risk newborns requiring long-stay hospitalisation and special care. The neonate's oral-motor function and ability to consume adequate milk volumes are some factors that influence the length of stay at the neonatal intensive care unit (NICU) and the type of follow-up services recommended at discharge[1]. Therefore, some authors have suggested that a feeding programme for high-

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risk neonates could be effective in avoiding hospital complications associated with the use of total parenteral nutrition (TPN) or oral-gastric, nasogastric, gastrostomy, and enterostomy tubes, if feeding disabilities are improved[2-4].

Feeding is a complex motor activity and serves as a marker of neurological maturation. Coordinated feeding in infants requires the sensorial and motor integration of suckling, swallowing and breathing, where several muscle groups participate in an observable rhythmic process[5].

Sucking abnormalities have been classified into three groups based on their causes. The first group is the immature sucking, seen in preterm infants less than 34 weeks postconceptional age, and has been characterised by a weak, poor and uncoordinated sucking pattern[6,8]. Some authors have suggested that infants who are subjected to mild or low stress conditions begin to develop a mature sucking pattern approximately two weeks after they reach the 37th week of postconceptional corrected age with or without therapy[1,6,9]. The second group comprises infants with dysfunctional sucking patterns associated with structural oral abnormalities requiring surgery[10,11]. The last group of infants have several degrees of disorganisation and/or dysfunction for sucking associated with various clinical pathologies which interfere with the development of normal sucking[1]. These infants have a history of serious forms of clinical pathologies requiring prolonged orotracheal intubation (for over a week), long periods of fasting, TPN or orogastric tube feeding. They are exposed to noxious oral stimuli that increase the development of aberrations on sucking patterns and/or structural oral abnormalities as palatal glove[12,13]. Some of them eventually develop neurological disabilities if they do not receive adequate therapy[6].

Various strategies have been implemented to improve the oral - motor skills of neonates with feeding disabilities. Some authors applied the non-nutritive sucking strategy using a pacifier to accelerate maturation of the sucking reflex when the infant was in the fasting periods. This facilitated a more rapid transition from non-oral to oral feeding[14,15]. Other researchers demonstrated that perioral stimulation with gentle pressure stimuli to the oral musculature significantly increased the rate of sucks per minute and the volume of milk consumed[7]. In 1987, Case-Smith applied perioral stimulation with rhythmical pressure to the infants' tongues and support to the jaw and tongue stability during feeding, with vestibular stimuli to three high risk preterm infants with feeding problems. After two days of therapy infants showed improvement in their total sucking scores, but it was observed that the improved score tendency did not change between the baseline to intervention phases, suggesting an effect of maturation.

Nevertheless, there are few studies that assessed the effect of oral therapy for improving sucking feeding disabilities. This study presents the result of our experience in fourteen infants with a history of serious illness that interfered with the normal development of sucking.

METHODS AND MATERIALS

The study was conducted at the Pediatrics Hospital of the 21st Century, National Medical Centre, Mexican Institute of Social Security. Patients were seen at the NICU and the Infants Department between March to October 1997.

Criteria for subject selection included : infants with more than four days of life; over 35 weeks of postconceptional corrected aged (gestational age at birth plus postnatal age); weight $\geq$ 2000 grams; medically stable (tolerant to room air, vital signs and blood chemistry within normal limits, and ability to maintain normothermia); without oral, nasal and/or tracheo-esophageal malformations; not on sedative medication; infection-free as referred by culture and a history of illness requiring medical care that interfered with the normal development of the sucking pattern.

All patients had suckling disabilities showing absence of at least one of five oral reflexes, plus two or more abnormal sucking signs, or at least one abnormal sucking sign plus the absence of two or more oral reflexes. The oral reflexes assessed were sucking reflex, rooting reflex; biting reflex, gagging reflex and Babkin's reflex.

The clinical sucking signs included (*a*) failure to latch on the nipple after stimulus of the lips, (*b*) failure to grasp the nipple without sealing lips and making choking sounds, (*c*) delay at the beginning of sucking after 20 seconds of oral stimuli, (*d*) reluctance for feeding after few sucks in less than a minute, (*e*) poor lip control with drawing of milk from mouth, (*f*) coughing during sucking with or without vomiting, (*g*) excessive crying with or without turning of the head, (*h*) cyanosis during sucking (none of the patients had central cyanosis), (*i*) spitting of the nipples during the feeding, and (*j*) prolonged sucking, manifested by more than 30 minutes for bottle-feeding or more than 45 minutes for nursing.

Patients who fulfilled the criteria were evaluated by one of the medical therapists to confirm the sucking disabilities and explore the oral reflexes. The patient's medical history, sex, gestational age, Apgar at 5 minutes, history of orotracheal intubation, neonatal sepsis or infection(s), fasting period(s), feeding formula(s) offered, parenteral nutrition, orogastric tube feeding and syringe nipple feeding were all recorded. In addition, the age of life, gestational corrected week, weight, height, diagnoses, duration of hospital stay and medications(s) at the beginning of the study were considered. After informed consent from parents the infants' were enrolled in the study.

The oral reflexes and feeding sessions were recorded on videotape three times i.e. before the beginning of therapy (baseline assessment); after 48 hours and; at 120 hours (outcome evaluation) after therapy. The video camera was positioned approximately 35 cm beside the baby at a 90 degrees angle. All videotapes were recorded by the same person, who was previously informed on angles and timing of recording. The recordings were done at the same hour of the day during the feeding session, always after three hours of fasting, in supine position, naked or in a diaper. The infants were fed by their parents or nurses with the milk or formula indicated by their physicians. Five minutes of videotape recording was done at two intervals. During the first minute, the therapist stimulated the patient's oral reflexes after which, the patient was fed. Total times for feeding were registered for assessing prolonged feeding periods, and volumes of milk ingested were measured (bottlefed infant by residual of initial volume less final volume, breast-fed infant by difference of weight before and after nursing). The next videotape recordings were done at 48 and 120 hours following the same pattern. Each record was labelled with a code known only by one of the re-

searcher (MERM).

Intervention

The strategic activities performed by the therapist using his/her fingertips were as follows:

1. Infant's head inclined (30 degrees) over the cradle surface.
2. Rooting reflex explored by light contact over the lips and cheeks with five fingertips, one to three times (depending on the infant's response).
3. A fine circular massage on the upper lip and the anterior gum side, for five minutes.
4. The massage was continued towards the lateral gum side and inside the cheeks for three minutes. The massage was done more extensively inside the cheeks (one centimeter cycles).
5. After cheeks are massaged tactile stimuli was applied to the lower lip with little pressure.
6. Finally, the therapist put pressure on the sucking point (located in the central area of the hard palate behind the upper gum).
7. For infants aged two months or more, a drop of honey was placed on the sucking point at the end of the therapy.
8. Between feeding periods, a pacifier was kept in their mouths.

Evaluation

From an ethical standpoint, the patients served as their own controls. In order to avoid biases on interpretation, all variables were blindly assessed by two occupational therapy physicians (MRMP and MMSR), who were unaware of the patient's clinical history and of the period the videotape recording took place (before or after intervention). They watched the videotape and by consensus assessed the variables viz. **number of oral reflexes absent** (five considered), **number of clinical sucking signs** (nine considered) and **sucks/minute**, the latter registered for the number of vertical mandibular movements during one minute for five minutes using a digital return chronometer (Casio model HS, 10W, USA). Each mandibular movement was registered using a manual counter (Counting devices, INC, North Branford, CT 06471, USA).

Analysis

Due to the small size of the population with abnormal measurement distribution, medians, 25-75 quartiles and ranks were calculated. For determining the statistical significant differences during the study, the medians on number of oral reflexes absent, the number of clinical sucking signs, milk volume ingested, and sucks/minutes rate, the non-parametrical Friedman test was used. For evaluating changes in frequency of clinical sucking sign and variables, a non-parametrical Q Cochran test was used. All statistical analysis was done using SPSS software.

RESULTS

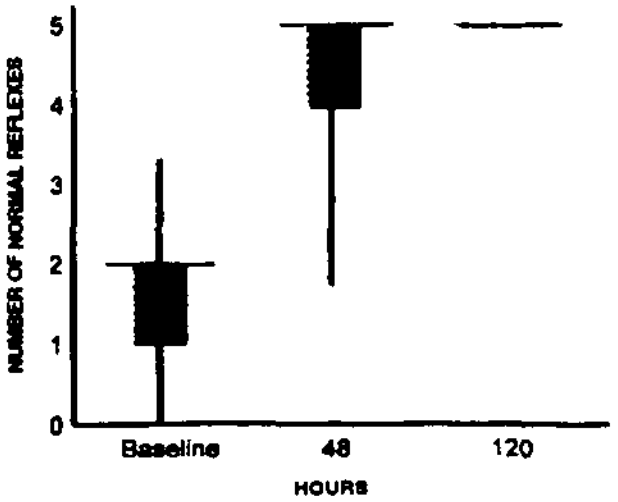
A total of 29 patients fulfilled all inclusion criteria at the beginning of the study. Fourteen finished the study and fifteen were eliminated (eight were discharged to another hospital and did not complete therapy, six were orotracheally reintubated during therapy, and one infant died 48 hours after therapy began due to causes not associated to any of the therapeutic procedures).

Table 1 shows the characteristics of the

TABLE 1. Clinical Characteristics of the Patients

N	Suckling previous day	Antecedents: Diagnoses	Accumulative days of: Orotracheal intubation	Fast	Orogastric tube feeding	Syringe nipple feeding	Baseline conditions: Milk or formula	Age (days)	Gestational corrected (weeks)	Weight (grams)
1.	0	Neonatal pneumonia, diaphragmatic paralysis, necrotizing enterocolitis	45	30	15	15	IF	60	46	2375
2.	0	Respiratory distress syndrome, bronchopulmonary dysplasia, laryngotracheomalacia	35	15	25	0	IF	40	40	2400
3.	4	Hypoplastic left heart syndrome	7	3	7	0	MM	14	37	2500
4.	0	Perinatal asphyxia, intrahospital pneumonia patent ductus arteriosus	3	3	7	4	MM	14	37	2700
5.	20	Bronchopneumonia, bronchopulmonary dysplasia, several pulmonary arterial hypertension	60	30	153	7	IF	210	68	3200
6.	0	Obstructive apnea with gastroesophageal reflux premature	8	7	6	3	PF	24	36	2100
7.	0	Perinatal asphyxia, atrial septal defect	8	15	6	0	MM	26	40	2410
8.	0	Hernia diaphragmatic, intrahospital pneumonia	24	18	18	0	IF	26	44	2540
9.	3	Necrotizing enterocolitis state IIIA	6	7	5	2	MM	17	42	3250
10.	0	Status epilepticus, licencephalia, cerebral atrophy	2	8	22	0	SF	30	40	2895
11.	4	Necrotizing enterocolitis state IIIB, septic shock	13	13	6	0	MM	23	44	2805
12.	0	Respiratory distress syndrome, neonatal pneumonia, pneumothorax, diaphragmatic eventration	8	4	10	0	IF	14	38	2200
13.	0	Respiratory distress syndrome, neonatal interstitial pneumonia	10	8	12	8	IF	28	39	2800
14.	10	Congenital hypertrophic pyloric stenosis with subglottic stenosis	16	16	8	0	IF	34	52	3250

MM = maternal milk, IF = infant formula, PF = premature formula, SF = soy formula



Horizontal line = median, square = quartiles 25-75, vertical line = rank.
Statistical difference with Friedman's test p = 0.0000
Suck, root, bite, gag and Babkin reflexes

Fig. 1. Effect of oral motor and sensorial therapy in the presence of oral reflexes (n = 14)

patients-nine males and five females. All had small weight increases and feeding difficulties. They had required an orogastric feeding tube for a long time after prolonged fasting, secondary to the use of orotracheal tubes. Eight patients were previously fed using the syring nipple technique with poor results. Five patients (number 3, 5, 9, 11 and 14) had been fed through sucking before they became ill. Although, many of them had to be given different types of formulae, only the one they were taking at the beginning of the study was registered. Five patients (3, 4, 7, 9, 11 patients) were breastfed. Twelve patients were considered to have abnormal sucking because they had more than two reflexes absent, plus more than two clinical sucking signs. In two other patients, one (patient number 4) had six oral reflexes absent with only one clinical sucking sign (drawing milk); the last

TABLE 2. Effect of Oral Motor and Sensorial Therapy in the Clinical Suckling Signs

	Clinical sign	Baseline	48 h	120 h	*p
1.	Failure to latch on the nipple after lip stimulus	6	3	1	0.09
2.	Failure to grasp the nipple without sealing lips and making choking sounds	6	1	0	0.005
3.	Delay at the beginning of sucking after 20 seconds of oral stimuli	10	5	2	0.0022
4.	Easily satisfied after few sucks for less than a minute	13	6	3	0.0004
5.	Poor lip control with drawing of milk from mouth	12	3	0	0.0001
6.	Coughing during the suckling with or without vomiting	4	2	0	0.09
7.	Excessive crying with turning of head or crying a lot	12	9	10	0.31
8.	Cyanosis during suckling	6	7	0	0.0084
9.	Spitting the nipples during the feeding	8	8	12	0.51
10.	Prolonged suckling	11	9	4	0.0038

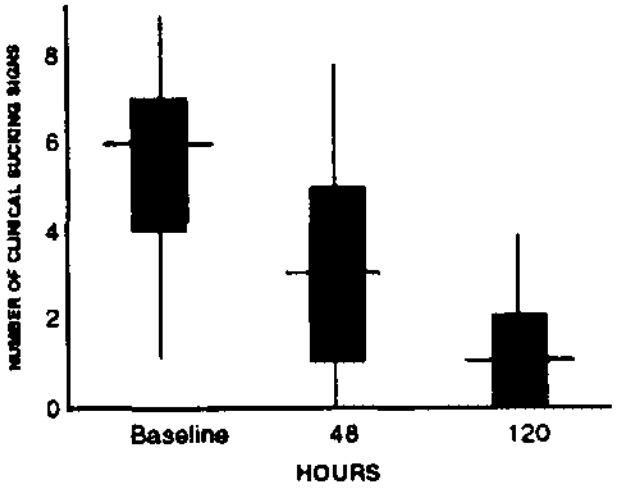
, *Q Cochran test

one had eight clinical sucking signs and absence of one sucking reflex.

Fig. 1 shows the effect of oral sensorial therapy in the recovery of reflexes. At baseline, the median number of normal oral reflexes was two (range 0 to 4) and at end of the study all the patients had recovered all of reflexes 120 hours later (Friedman's test X^2 22, p = 0.0000). Clinical sucking signs decreased from a median baseline amount of six to one at the end of the study (Friedman test X^2 24.14, p = 0.0000).

When analyzing the results obtained, demonstrable improvement was observed (table 2). The major effect of therapy was seen in the ability of the infants to form a mouth seal, that allowed for maintaining continuous sucking (signs 2, 4 and 5). In some patients, once the sucking was coordinated, no choking, cyanosis or coughing events (signs 2, 6 and 8) occurred during feeding. Patient 3 who did not have cyanosis at baseline presented with cyanotic event at 48 hours of therapy associated with nasal obstruction caused by the mother's breast, while changing from bottle feeding to breast-feeding. The time at which sucking began and sucking time (signs 3 and 10) also improved. Two signs (7 and 9) were not affected by therapy : excessive crying and frequent spitting, present in majority of the infants.

An increase in relation to the efficacy of sucking, assessed by the volume of ingested milk or formula, was shown (Freidman's test X^2 18.107, p = 0.0001). Two patients refused the feed before therapy and the rest consumed a median volume of 10 milliliters (range : 0 to 40 ml). After 48 hours, the median volume of milk ingested increased to 25 milliliters (range 10 to 60 ml) and at 120 hours, all patients were ingesting over 20 ml (fig. 3). The sucking rate for the group increased in a statistically significant form (Friedman X^2 10.85, p = 0.0044). The frequency of sucking per minute rose from a baseline median of 22 to 28.5 (rank 10 to 35)

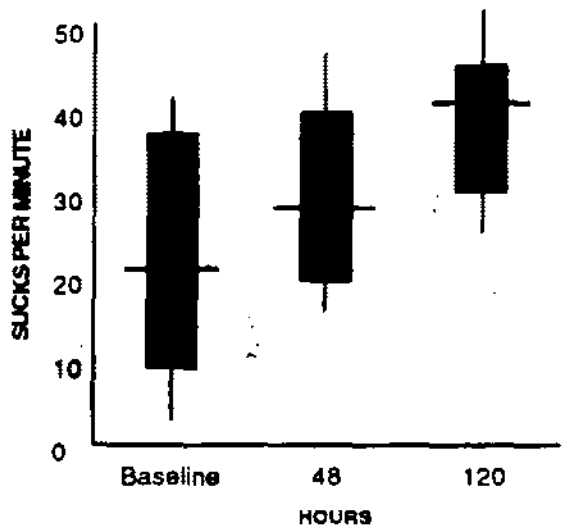


Horizontal line = median, square = quartiles 25-75, vertical line = rank.
Friedman's test 24.14, p = 0.0000

Fig. 2. Effect of oral motor and sensorial therapy in the number of clinical sucking signs (14 patients)

Horizontal line = median, square = quartiles 25-75, vertical line = rank.
Friedman's test 24.14, p = 0.0001

Fig. 3. Effect of oral motor and sensorial therapy in the milk or formula ingested (n = 14)



Horizontal line = median, square = quartiles 25-75, vertical line = rank.
Friedman's test X2 = 10.85, p = 0.0044

Fig. 4. Effect of the oral motor and sensorial therapy on the sucking rate (sucks/minute)

at 48 hours, and finally to 45 (rank 30-48), at 120 hours after therapy (fig. 4).

DISCUSSION

Nutritional sucking plays a major role in the maturation of several physiological systems[5,16] and neurobehavioural development[11,17]. Nevertheless, prevalence of sucking disabilities has increased, as well as the improved survival of newborns at the NICUs. These complications often result from extreme immaturity that often require frequent or long-term intubation, feeding through catheters and moderate to severe bronchopulmonary dysplasia, as was seen in the infant cohort of this study.

Rehabilitation of sucking in preterm infants may be achieved gradually and spontaneously at 34 weeks of gestational corrected age[6,7], but this transition from non-oral to oral feeding is more difficult when patients have dysfunctional sucking two weeks after birth and after 37 weeks of gestational corrected age[2-4]. Patients included in this study had these difficulties, and therefore oral therapy could be assessed in two ways. The first was based on the clinical abnormalities of sucking and the second was in the improvement in sucking efficiency.

In relation to clinical aspects, the absence of oral reflexes denotes some degree of neurological damage. The impairment of these protective mechanisms that keep airways free of foreign material or help to expel them, make them fundamental for oral feeding. The application of positive oral tactile stimuli with the removal of harmful stimuli, induced the recovery of oral reflexes in the infants of our study. In general, the recovery of reflexes occurred in a very short period of time (48 hours), suggesting that adequate stimuli are important factors. It may also be that the repetitive stimulus of sensorial oral receptors may help the development of reflex pathways[2].

Certain clinical scales have been constructed for assessing clinical sucking abnormalities and their recovery. Nonetheless, the neonatal oral motor assessment scale (NOMAS), a clinical assessment tool that describes jaw and tongue function during nutritive sucking, has been the most reliable[18]. NOMAS evaluation requires close observation of the neonate's sucking pattern and a certified examiner in neurodevelopment. Clinical signs associated with sucking difficulties were evaluated using videotape records for assuring the consistency on the interpretation of the information and maintaining the study's blindness; partially using the methodology employed by other investigators[5,19].

In this study, oral therapy improved the abnormal suckling pattern (with coughing,

cyanosis, choking, etc.) to a normal pattern. The principal rehabilitatory effect was seen in the capacity of lip sealing and the possible reorganization of the sucking muscles. Two signs were not modified after therapy, crying and nipple spitting during feeding. Crying during feeding may be associated with discomforts due to internal and/or external factors. The signs mentioned earlier are related to defence mechanism to avoid choking events during which the infant takes a deep breath. Our patients continued with this behaviour independent of the therapy, but did not show cyanosis or choking signs. It is possible that this crying could be related to frequent irritable behaviour observed in children hospitalized for long periods of time secondary to repetitive harmful external stimuli : noise, light, venal punctures, oral or nasal tubes, etc[20].

Nipple spitting is another defensive mechanism to avoid choking[19] and was seen in eight patients before beginning therapy; later disappearing in four, and at a reduced frequency in the remaining four. The reason why this was seen in cases without cyanosis or coughing, may have been related to being full and to a rapid ending of nursing.

Since the second goal of the sensorial stimuli was to modify the sucking feeding efficacy, or, in other words, to consume a greater volume of milk without any significant effort, both the ingested volume of milk and sucking rate were registered. After therapy, the median of ingested volume by sucking doubled for all patients. The optimal volume required for infants weighing approximately 3000 g, ill and malnourished, was higher than that ingested by the patients of this study, a volume intended to supply minimal nutritional requirements[21]. Nevertheless, oral sucking feeding is beneficial for the development of infants[22].

The sucking rate is this group also increased to a degree enough for maintaining continuous sucking[23,24] and reduced feeding time. Other studies have demonstrated increases in the amount of milk ingested and sucking rate by only modifying the type and/or hole size of the nipples[25,26]. We were unable to assess these factors because of the great variety in commercial nipples available and because five babies were breastfed. To avoid possible biases in interpreting sucking efficacy for these kinds of studies, control of nipple types should be included.

A fundamental aspect for recovering normal sucking feeding is the elimination of factors that interfere with normal oral feeding. These conditions were required for patients included in this study. Stable conditions per se could be beneficial for recovering normal sucking; however, this takes at least two weeks[2,6] and depends on the patient's maturity[6]. Our patients achieved their normal oral motor skills in a shorter time, and rehabilitatory therapy was performed when they were 37 or more weeks of gestational corrected age. Other questions remain to be answered, such as inclusion criteria, the expenditure of time on stimulation, criteria to change or maintain a rehabilitatory programme, therapy intensity, predictive factors regarding therapy failure and effects of this therapy for recovery of normal function of different organ systems.

To date, this study allows us to conclude that sensorial oral stimulatory therapy induces the recovery of oral protective reflexes, improvement of symptoms associated with suction and a more efficient suction in infants with sucking disabilities.

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SHORTER OTITIS MEDIA TREATMENT

Giving children a short-acting antibiotic for five days is an effective treatment for uncomplicated acute otitis media (AOM), according to a meta-analysis of 32 trials. Seven reviewers independently assessed methodological quality, and studies were included if :

(a) subjects were between ages 4 weeks and 18 years

(b) a clinical diagnosis of AOM was made, and antimicrobial therapy was not in progress at diagnosis;

(c) subjects were assigned randomly to antibiotic treatment of fewer than seven days;

(d) clinical resolution of AOM was assessed.

Trials were grouped by antibiotic used in the short course : (1) short-acting oral antibiotics, (2) i.m. ceftriaxone sodium and (3) oral azithromycin.

Researchers were interested primarily in whether treatment failed, which included AOM signs or symptoms not improving or subjects experiencing relapses or reinfections during 31 days following therapy initiation.

Results indicated that a reduction in treatment from 10 to 5 days of short-acting antibiotics may increase slightly the risk of a child experiencing signs or symptoms or relapse or reinfection when the evaluation was done at 8 to 19 days after therapy initiation. However, this difference no longer was evident at one month following treatment. The risk difference at 30 days following treatment dropped to 2.3 percent; suggests 44 children need to be treated with a longer course of antibiotics to prevent a single failure following shorter treatment.

Researchers added that a shortened course of short-acting antibiotics has the potential to save money, improve compliance and decrease antibiotic resistance.

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