Research Article

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Investigation of the Efficacy of a Treatment Program for Deviant Swallowing and Allied Problems Part II

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Purpose and Procedures

This is the second of three articles relating to this investigation.

The purpose of this study was to investigate the possible relationship within a triad of problems: (1) deviant swallowing, classified as tongue thrusting, (2) orthodontic problems of an openbite and overjet variety, and (3) interdental /S/ speech defects. The efficacy of a treatment program was determined for a group of children exhibiting this combination of problems. An orthodontic population, consisting of children referred to this investigator by orthodontists in private practice, was examined and diagnosed as having deviant anterior tongue-thrust swallowing, based on several kinesiologic and dental diagnostic signs. The children with tongue-thrust swallowing who did not have the triad of problems were not used in this investigation. The children who did have the triad of problems were selected for further study and were designated as the "orthodontic" group. They were then randomly assigned to one of two orthodontic subgroups.

Specific swallow therapy was administered to all the children. One subgroup was given swallow therapy and speech therapy for the interdental /S/ speech defect, while the other subgroup had swallow therapy only. Each of the subgroups received the specified therapy or therapies for a period of approximately nine months. Retest procedures were administered and improvement in each of the problem areas constituting the triad assessed.

Principal Research Question

Are deviant tongue-thrust swallowing, orthodontic problems of an openbite and/or overjet variety, and interdental /S/ speech defects so interrelated that swallow therapy

procedures will, by themselves, correct deviant swallowing, cause dental openbites and/or overjets to become more normal, and correct interdental /S/ speech defects?

Operational Research Question

The following questions were structured to secure the necessary segments of information needed to answer the second part of the principal question.

1. Will the specified therapy result in the establishment of normal swallowing patterns?
2. Will the specified swallow therapy by itself correct interdental /S/ speech sound defects?
3. Will speech therapy, concomitant with the specified swallow therapy, result in a more significant correction of interdental /S/ speech sound defects?

Initial Examination Measures

All children seen in the orthodontic population were examined as follows:

1. All children seen were visually examined for dental problems of an openbite and/or overjet variety.
2. All children seen were examined for normal or deviant tongue-thrust swallowing.
3. All children seen were tested for the presence of interdental /S/ speech sound defects.

Each child was tested for the presence of an interdental /S/ speech defect:

- a. Each child repeated at least four sentences after the examiner, each of which contained many /S/ sounds.
- b. Each child was asked questions about school and home, and the examiner noted the child's unguarded production of /S/.
- c. The production of the /S/ sound was evaluated visually as well as aurally by the examiner. Judgements were based on commonly accepted standards for anatomical placement and acoustic properties.

It should be pointed out that, due to the fact that many children make interdental /S's/ which tend to sound "good," aural evaluation was not considered to be reliable.

Assignment of Subjects

Originally 76 children from the orthodontic group comprised the two subgroups in this part of the study. Both Orthodontic Subgroup I and Orthodontic Subgroup II contained 38 children.

The assignment of a child to either orthodontic subgroup was determined prior to his or her full examination. This examiner randomly determined that the "next" child to be examined who had all of the problems making up the triad would be placed in one or the other subgroups. Neither the severity of the dental problems nor the severity of the speech defect altered this pre-examination determination.

Group Matching Criteria

Experimental Variables: All children in both orthodontic subgroups were diagnosed as having deviant tongue-thrust swallowing. All children had orthodontic problems of an openbite and/or overjet variety. All children were diagnosed as having interdental /S/ speech sound defects.

Age: The two subgroups were matched, insofar as each group had according to age, children from each age grouping represented, seven through twelve years. Groups contained both male and female subjects.

Intelligence: Any child whose composite percentile rank for the *Iowa Test of Basic Skills* fell below sixteen for the grade and school attended was not used.

THERAPEUTIC PROCEDURES

Orthodontic Subgroup I

Children assigned to this subgroup were given swallow therapy only. Each child was on a variable time schedule for therapy. Each one was seen one week after the initial diagnostic and treatment session. After that, there were therapeutic sessions scheduled at 2, 3, 4, 5, 6, 8, and 10-week intervals, extending over a nine-month period. Treatment in swallowing was formulated on kinesiologic principles and was based on the premise that normal swallowing could be taught by positioning the tongue and mandible in their proper postures just prior to the initiation of reflex swallowing behavior. Each therapy session lasted approximately 15 minutes and was conducted by the investigator.

Parents were instructed each session relative to the home program for their child's swallowing practice. Specifically, swallow practice was to be done for five minutes before each meal using a half a glass of water, milk, or juice. Practice on different kinds of food was added during therapy, progressing from semi-solids to hard, chewy, difficult-to-swallow food.

Orthodontic Subgroup II

Children assigned to this subgroup were given both swallow and speech therapy. Procedures for swallow therapy were identical to those given to Orthodontic Subgroup I. Procedures for speech therapy utilized an acoustic and phonetic placement approach. Speech practice was done for 15 minutes before the child went to bed. Practice materials, word lists, phrases, and sentences were suggested. Speech therapy sessions were given in addition to the swallow therapy; however, the combined sessions did not last more than 15 minutes. Children in this group were seen on the same schedule as Group I, over a nine-month period.

The Effects of Swallow Therapy on Deviant Swallowers

The children assigned to both orthodontic subgroups received swallow therapy. The children in the Orthodontic Subgroup II also received speech therapy. Thirty-eight children were originally assigned to each of the subgroups; for various reasons, there was an attrition of subjects during the course of the investigation and the study was finally resolved with 48 children: 20 children in the speech-and-swallow group, Group II, and 28 children in the swallow-only group, Group I. The reasons for the children leaving the study were not numerous. The majority either moved from the community or were placed under orthodontic treatment by their parents. The latter treatment, of course, invalidated their continued participation in the study.

The children in both groups were re-examined after a therapy period of nine to ten months to determine whether or not they had developed the ability to swallow correctly. The original examination methods and the same diagnostic criteria were used by the investigator to make these post-therapy judgements. In addition, certain criteria were used to determine whether the "new swallow pattern" had become habituated: (1) the apparent

smoothness and flexibility of the swallow, (2) the consistency in maintaining the tongue tip on the posterior portion of the gingiva, and (3) appropriate contraction of the temporalis and masseter muscles. Simple *yes* and *no* decisions were used by the investigator in making these judgments.

Findings

Of 48 children participating in this part of the study, 41, or 85 per cent, were judged to have developed swallow patterns after therapy that consistently were within normal limits. A breakdown of children by subgroups showed that for Group I, the swallow-only therapy group, 86 per cent, or 24 of 28 children, showed essentially normal swallow patterns. For Group II, the speech-and-swallow group, 85 per cent, or 17 of 20 children, showed patterns which were classified as normal.

These judgments were made after nine to ten months of swallow therapy. Of the remaining seven children who did not show normal swallowing at that time, all but two eventually developed normal swallowing; apparently, they needed longer periods of time to develop a habitually acceptable pattern.

The children in this program who had learned normal swallowing during therapy were followed up at 12-week and three-month intervals and all 41 of them continued to show acceptable swallowing behavior.

To determine that statistical significance of these findings, the McNemar test for significance of changes was used. For the Orthodontic Subgroup I, swallow-therapy-only, an observed value of chi-square was found to be 22.04 which is significant beyond the 0.0005 level, when the direction of predicted difference is one-tailed. This level of significance permitted the conclusion that the children in the Orthodontic Subgroup I, as a group, did show significant change as a result of the swallow therapy administered.

For the Orthodontic Subgroup II, swallow-and-speech therapy, the observed value of chi-square was found to be 15.06 which is also significant beyond the 0.0005 level, when the direction of predicted difference is one-tailed. This level of significance likewise permitted the conclusion that a significant change occurred as a result of therapy administered.

For the total orthodontic group, the McNemar test for the significance of changes was found to be 39.02 which is significant beyond the 0.0005 level. This finding also supported the decision to reject the hypothesis of no change.

The Effect of Swallowing Therapy Only on Interdental /S/ Speech Defects

Children assigned to Orthodontic Subgroup I were given swallow therapy only. Each of these children exhibited an interdental /S/ speech defect, before therapy. However, no speech therapy was given to this group for the correction of interdental /S/ defect. No encouragement even was given to any child to improve his or her speech.

The original judgments for identifying the existence of an interdental /S/ speech defect, and the re-examination measures, were based on seeing the tongue protrude between the anterior teeth as the child repeated prepared sentences and answered questions. Questions concerning school, play, television, etc., were asked to get a sample of propositional speech. The children found the series of short sentences quite humorous and responded enthusiastically.

Observer Reliability: The original examination and re-examinations were done by the investigator who has had 20 years of experience examining children with speech defects

and teaching speech correction. On a random sample of 24 children, test-retest observer reliability was found to be 100 per cent.

Findings

Re-examination of the children in Orthodontic Subgroup I, after nine to ten months of training, found that 85 per cent, or 24 of 28 children, had developed and were using normal /S/ speech sounds in unguarded conversation and speech without having received formal or informal speech therapy. The McNemar test for significance of changes revealed a chi-square of 22.04, which is significant beyond the 0.0005 level. It was concluded, therefore, that there is functional relationship between deviant swallowing and concomitant interdental /S/ speech defects, and that therapy for deviant swallowing by itself can have a positive influence on the remediation of interdental /S/, even in the absence of formalized speech therapy.

The Effects of Swallow Therapy and Speech Therapy of Interdental /S/ Speech Defects

Children assigned to Orthodontic Subgroup II were given swallow therapy and speech therapy. The swallow therapy program was identical to that given the Orthodontic subgroup I, the swallow-therapy-only group. The speech program consisted in giving the children instructions as to where the tongue was to be placed to produce a normal /S/ achieved by each child during the first therapy session. Habituation of the correct /S/ sound in conversational speech took several sessions. Each child was given homework to practice. Practice was to be for 15 minutes each evening before going to bed. Examinations before and after therapy were identical to those administered to Orthodontic Subgroup I.

Findings

Re-examination of the children in Orthodontic Subgroup II, after the specified nine to ten months period of training, found that 75 per cent, or 15 of the 20 children, had developed and were using normal /S/ speech sounds in the test sentences and in unguarded conversational speech. The McNemar test for the significance of changes revealed a chi-square of 13.06 which is significant at the 0.0005 level. It was concluded that a combination of swallow therapy and speech therapy does have a significant influence on the remediation of interdental /S/ speech defects.

Conclusions

On the basis of the findings in this investigation the following conclusions may be drawn:

1. Deviant swallowers with interdental /S/ speech defects tend to correct such speech defects automatically, as their swallow behavior changes toward swallowing considered to be normal, without any intervening speech therapy.
2. Combined swallow therapy and speech therapy tend to correct interdental /S/ speech defects, but no more expeditiously than swallow therapy alone.
3. Children with the triad of problems of deviant swallowing, openbite and/or overjet orthodontic problems and interdental /S/ speech defects profit significantly from swallow therapy in the alleviation of all three problems.

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