Lip and Tongue Postures Following Maxillary Impaction Surgery

Harvey L. Grandstaff, Ph.D.
Robert M. Mason, Ph.D., D.M.D.

The myofunctional clinician is becoming increasingly interested in the improvement of facial cosmesis as a worthy goal of therapy. Working to promote an esthetically pleasing lip, jaw and tongue posture has recently been discussed in a position paper by Case.[1]

One of the significant attributes of facial cosmesis is the resting position of the lips. A lips-apart posture often suggests a "mouthbreathing" habit,[2] a relative level of unattractiveness,[3] and may lead to the impression of a reduced intelligence level.[3,4]

Lip posture is related, in part, to the vertical growth of the lips. Vig and Cohen[5] have reported data on the vertical growth of the lips, showing that the development of a lip seal, or lip competence, is usually a spontaneous occurence. They comment that proponents of myofunctional therapy claim that muscle exercises are able to improve deficiencies of the lip tissue and lip seal, while growth and development changes may create the same improvements without therapy.[5] While this criticism may be valid occasionally for the younger patient whose vertical lip growth can eventually modify an existing problem, it should not preclude therapy as a means of improving cosmesis when it is considered an undesirable condition or problem in a child.

Lip *posture* as contrasted to lip *strength* shows no clear relationship at present. Is it possible to change or modify lip posture by working on lip strength? Many clinicians would assume so, although most would agree that definitive research is needed as to these possible relationships. In a well controlled study, Barber and Bonus[6] reported on circumoral myofunctional exercises in a group of 20 tongue-thrusting children and a control group of 21 children. Dental casts and cephalometric x-ray films were used to monitor skeletal and dental characteristics during and following a period of lip strengthening. It was found that the tongue-thrusting children exhibited weak circumoral muscle strength at the beginning of therapy, and were able to increase and maintain lip strength by a factor of 450% at 18 months following the initiation of therapy. The study indicated that increasing muscle strength of the lips does not produce any great effect on the dentition of children exhibiting a tongue-thrust habit and an anterior open bite with protrusive maxillary incisors.[6]

The Barber and Bonus study did not address any changes in resting lip posture as a product of therapy, nor did the authors comment on any cosmetic differences seen as a function of treatment. Nonetheless, their research provides an impetus for further work, and suggests a possible relationship between lip strength and lip posture.

The adult patient with vertical maxillary excess is typically considered a candidate for orthognathic surgery for the correction of this condition. Vertical maxillary excess is characterized by an anterior, skeletal open bite malocclusion, a "toothy" smile, lip incompetence (with lips apart and mouth open), a tongue thrust, and a steep mandibular plane.[7] The usual reason for the vertical maxillary excess is increased vertical growth of the maxilla, with more growth posteriorly than anteriorly. The magnitude of the posterior overgrowth is highlighted by the fact that there is an anterior openbite even though too much upper tooth structure is showing at rest.

The surgical procedure of choice for vertical maxillary excess is, usually, a maxillary impaction osteotomy. This is a variation of a LeFort I osteotomy.[7,8]

The patient with vertical maxillary excess (VME) who undergoes surgical treatment for this condition is an excellent subject for study of spontaneous improvement in lip competence following a measurable change in orofacial morphology. In an adult sample of surgical patients, growth and development changes would play no apparent role.

STUDY OF SURGICAL PATIENTS WITH *VME*

Out of an interest in speech and postural adaptation of surgery patients, and as part of a sabbatical study experience by Dr. Grandstaff at Duke University Medical Center with Dr. Mason, six adult females with VME were tested at one year following maxillary impaction osteotomy. None of these patients had received speech or myofunctional therapy at the time of postoperative assessment.

RESULTS

The age range of the six subjects was 20-32 years at the time of surgery. Mean age was 23 years. Each subject had undergone

ADDRESS CORRESPONDENCE TO:

HARVEY L. GRANDSTAFF, Ph.D.
Speech and Hearing Clinic
Miami University
Oxford, Ohio 45056

AUTHOR AFFILIATIONS:

Harvey L. Grandstaff, Ph.D.
Associate Professor of Speech Pathology and Audiology
Department of Cummunication and Theatre
Miami University
Oxford, Ohio

Robert M. Mason, Ph.D., D.M.D.
Associate Professor of Orthodontics
Department of Surgery
Duke University Medical Center
Durham, North Carolina

a 6 month preoperative course of orthodontic therapy in preparation for the maxillary osteotomy. An additional period of 3-9 months of postoperative orthodontics had been acomplished. At the time of postoperative assessment, the patients were at least one year past the release of intermaxillary fixation, the 6 week period of jaw fixation associated with this operation.

Pre- and postoperative assessments were made of resting lip position, the degree of lip separation at rest (in millimeters), the postural position of the tongue, and the swallow pattern (subjective evaluations). Lip separation was judged in three separate evaluations after the patient was asked to permit measurements to be made of the nasal area. In this way, nasal and lip features were recorded without direct attention to the lips. In our view, this aided in reducing an artifact of a patient's conscious attempt to modify resting lip posture. Swallowing pattern was subjectively evaluated by lightly separating the subject's lips during a saliva swallow. Tongue posture was assessed preoperatively and postoperatively by having the patient lick the lips, assume a rest position, followed by the examiner separating the lips to identify the position of the tongue tip in relation to the anterior dentition.

At initial examination, all six subjects exhibited lip incompetence which averaged 6 millimeters (range of 3-10 mm). All subjects exhibited an anterior, interdental resting tongue posture and a tongue-thrust pattern in swallowing.

The appearance of these six patients at one year postoperative was varied. Two of six subjects showed lip competence and no tongue-thrust, while four showed lip incompetence from 3-5 millimeters. All subjects exhibited a normal overbite in contrast to the openbites seen preoperatively.

The two subjects with a competent lip seal postoperatively also exhibited a normal, more posterior resting tongue position. In the remaining four subjects, 2 of 4 showed a change to a normal, more posterior tongue position with some inconsistent tongue-thrusting retained in swallowing.

Tongue functions were not the "thrust" of this study in that the evaluations focused specifically on *posturing*. While all patients seemed to improve in functional use of the tongue, occasional thrusting was noted in swallowing in 4 of 6 patients.

The four patients who retained a lips-apart posture following surgery improved on an individual basis from the preoperative level. Of the two subjects who showed a normal lip seal following surgery, one had had a 3 millimeter lip incompetence prior to surgery, while the other, an 8 millimeter lip incompetence.

Although the purpose of this study was not to evaluate myofunctional therapy for postoperative conditions of lip incompetence or anterior tongue posture, some experimental work was done with the four subjects with retained problems in these areas. Generally, improvements in resting lip position increased at the rate of one millimeter per month in an experimental myofunctional therapy program. The procedures used in achieving decreases in lip opening included holding a tongueblade flat between the lips for at least 30 minutes per day, a series of isometric resistance exercises, and the button pull exercise for increasing lip strength. In this exercise, a button was inserted behind the lips with an attached string projecting out of the mouth. Subjects were instructed to pull steadily on the string and to resist this force with the lips.

Attempts to modify tongue posture or thrust with therapy were purposely avoided. However, tongue posture and swallow patterns were monitored during the period of trial therapy with the lips. Our curiosity was aroused to the possible improvement in tongue posture or swallow pattern as a function of improved lip seal. In the four patients studied, two showed a commensurate change to a posterior, more normal resting tongue posture as the lip incompetence decreased. For the other two patients, tongue posture had spontaneously adapted prior to the experimental therapy. The inconsistent and infrequent tongue-thrust swallows of the four patients were not apparently altered significantly by the therapy procedures directed at the lips.

IMPLICATIONS OF THE STUDY

Due to the small number of subjects and the lack of control over several variables, this research is considered by us as preliminary data. It would have been useful to have had measures of lip strength of these subjects at the initial examination and in the postoperative assessments.

The status of the posterior airway was not closely assessed prior to surgery from the standpoint of determining the etiology of the problem. We assume that there were contributing airway interference components to the VME exhibited by these patients, although there is no reliable way of determining this in the absence of longitudinal study. While all patients were assessed by aerodynamic procedures prior to surgery, postoperative followup studies of nasal conductance have not been completed.

Overall, it appears that *tongue posture* changes are greater in the VME subjects than spontaneous change in *lip posture*. Further, it appears that functional and postural characteristics of the tongue do not follow a similar adaptive course following maxillary impaction surgery. The creation of a normal overbite relationship and elimination of an openbite by surgery does appear to stimulate spontaneous but variable changes in tongue posture and function.

The experimental myofunctional therapy with four subjects one year postoperative suggests that it may be possible to influence tongue posture by reducing lip incompetence. Therapy to increase lip strength appeared to reduce lip incompetence, generally at the rate of a one millimeter decrease per month of lip separation. Whether this represents a true relationship between lip strength and lip posture remains unclear and lacking in sufficient scientific support at present.

Our impression of studying six patients who underwent maxillary impaction surgery for VME is that the myofunctional clinician should be an important resource on the multidisciplinary team to treat the patient with VME. For many patients, the lack of a lip seal is the major complaint at initial examination. Accordingly, it is suggested that those professionals with expertise in treating myofunctional problems should be involved in the examination of and treatment planning for the VME patient. While myofunctional therapy should not be expected to resolve problems such as lip incompetence in a skeletal openbite patient with vertical maxillary excess, it is also apparent that surgical creation of a normal maxillo-mandibular skeletal and dental relationship is not always accompanied automatically by favorable adaptations of adjacent soft tissues.

CONCLUSIONS

Surgical impaction of the maxilla for patients with vertical maxillary excess and associated skeletal, anterior openbite, is often accompanied by modifications in lip and tongue posture and tongue functions during swallowing. Patients differ in adaptive responses to maxillary surgery for skeletal openbite conditions. Myofunctional therapy for retained problems of lip incompetence has been demonstrated to be effective in selected patients, and may also influence tongue adaptations postoperatively.

Our experience with the VME osteotomy patients reported in this study should encourage the inclusion of the myofunctional clinician on multidisciplinary teams dealing with facial variations. The myofunctional clinician should follow the lead of Case[1] in emphasizing that therapy to improve oral posturing can benefit the patient both in cosmetic and psychosocial areas.

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