Head-Neck Intervention

2ND EDITION

Strategies for Oral-Motor Function

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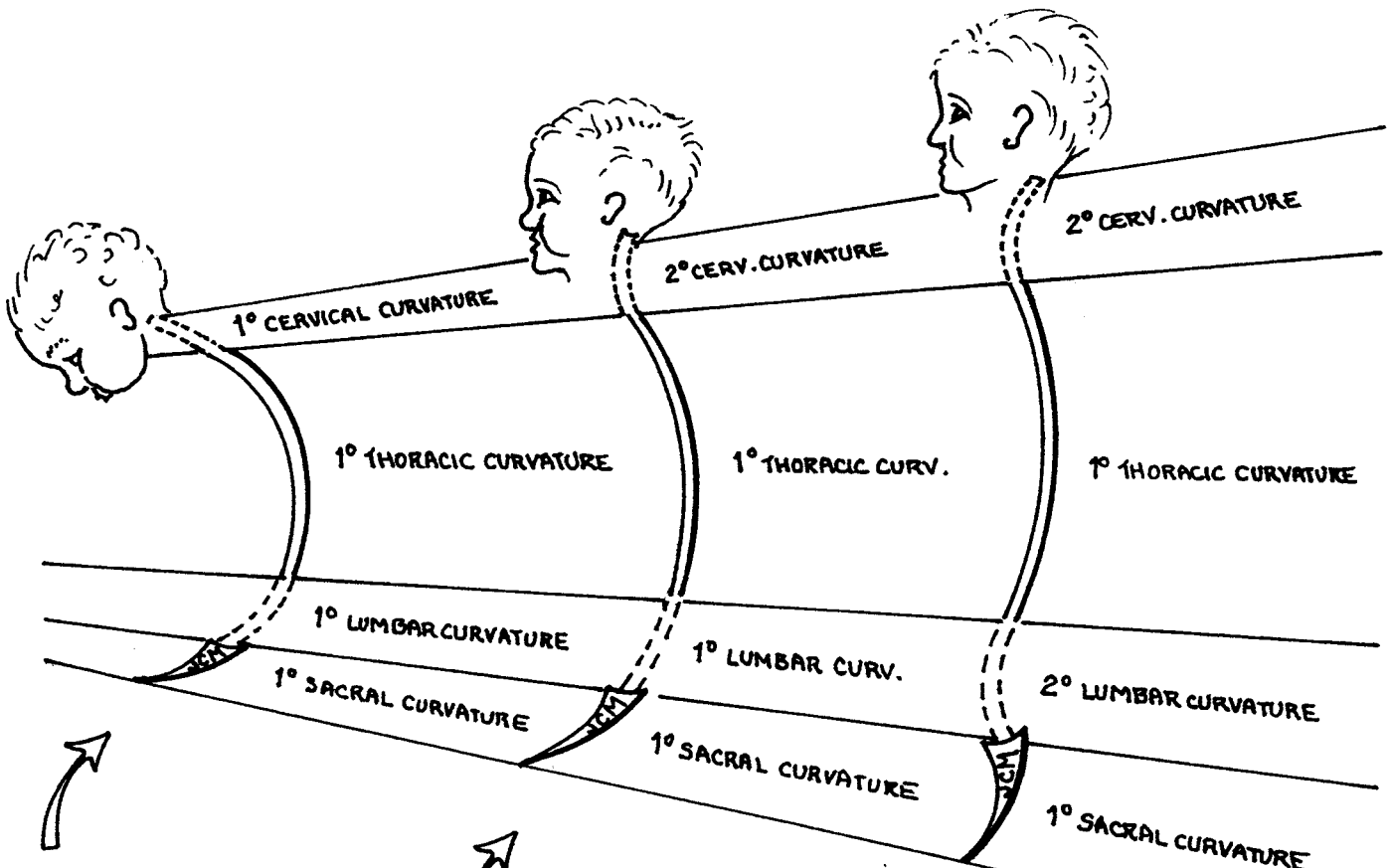
I N D E X

INTRODUCTION

This clinical manual is the outgrowth of a post-graduate course designed for occupational therapists, physical therapists and speech therapists who have previously earned basic certification in an eight week course in Neurodevelopmental (Bobath) Treatment. The original course included direct treatment under supervision and this manual attempts to anticipate some of the reader's questions and concerns at a clinical level. We have attempted to include the most important information that will be needed for effective treatment. The treatment issues presented are based on the collective clinical experience of the authors and the references listed. Themes are presented in a cross-referenced, topic oriented style that will permit the clinician to find the information needed at the moment. Through the illustrated neuroanatomy of Dr. Josephine C. Moore, the reader is presented with additional depth and clarity for understanding the relationships between structure and function, without having to seek out another reference book.

While it is not possible in a manual of this size to present a comprehensive coverage of all the available literature, we want to offer the reader an appreciation of the background necessary for understanding the basic inter-relationships of oral-motor function. Coverage of the basic anatomy of the areas where therapists will work is presented, coupled with an explanation and application of clinical techniques that have withstood the test of time. With a basic understanding of the function needed by the child and a concept of the interference that is blocking the response, the creative therapist will be able to build on this background. The text is designed to serve as a handy reference for related facts on structural components, while providing resources for further reading and sharing intervention strategies that have been successful. Clinical interventions are described in a logical sequence with discussion of the significance of different techniques. Suggestions for the creative directions and possibilities that are an integral part of this work, are based on careful observation of individual client responses.

FIGURE 2: EVOLUTION OF THE NATURAL CURVES OF THE SPINE

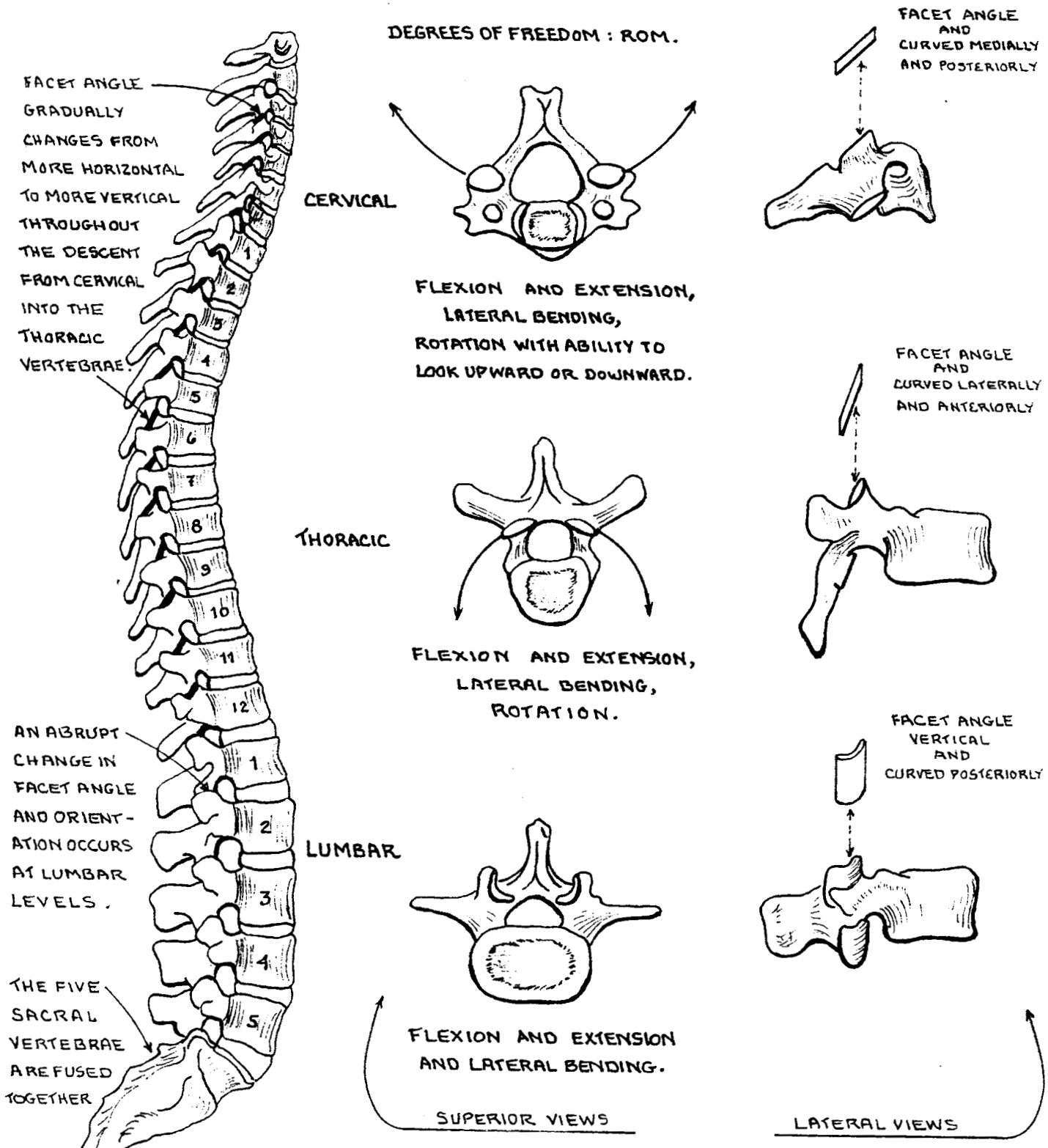


THE PRIMITIVE OR PRIMARY C-SHAPED VERTEBRAL COLUMN: THE IN-UTERO POSITION AND THE POST-NATAL POSTURE OF EARLY INFANCY.

THE 2° CERVICAL REVERSE CURVATURE DEVELOPS WITH ACTIVE HEAD RAISING (EXTENSION OR RETROFLEXION OF THE NECK MUSCULATURE), ALONG WITH DEVELOPMENT OF ANTIGRAVITY POSTURES AND MOVEMENT. THE CENTER OF GRAVITY GRADUALLY MOVES FROM THE UPPER TRUNK TOWARD THE PELVIC GIRDLE WITH GROWTH OF BODY.

THE 2° LUMBAR REVERSE CURVATURE DEVELOPS WITH CREEPING, CRAWLING, CRUISING AND WALKING. THIS FREES THE UPPER LIMBS, TRUNK, HEAD/NECK FROM ACTING AS STABILIZERS, AND BECOME MOBILIZERS. THAT IS, THE UPPER BODY IS FREE TO EXPLORE AND MANIPULATE THE ENVIRONMENT AND ACTIVELY LEARN FROM THESE NEW EXPERIENCES.

FIGURE 3: THE VERTEBRAL COLUMN SHOWING CHANGES IN THE ARTICULAR FACETS AND RANGE OF MOTION AT VARIOUS LEVELS



(ARTICULAR FACETS FOR RIBS NOT ILLUSTRATED). ILLUSTRATION MODIFIED FROM GRANT'S ATLAS OF ANATOMY; WM & WILKINS CO. PHIL.

NORMAL MOVEMENTS OF THE NECK

Head and neck relationships

Head control has long been a common therapeutic objective, based on the fact that in the normal individual the head can initiate a postural adjustment as easily as it can follow when the body initiates a movement. One of the first active responses of the newborn when lying in the prone position is the lifting and turning of the face just enough to clear the air passages. Considering that all movement of the head is mediated through the neck, it is important to consider the nature of neck movements and how they develop in relation to normal patterns of postural control.

Capital flexion forward and movement backward of the head on the upper neck evolve in normal infants with their early attempts at head control when they are held by the adult in the upright alignment. These beginnings are not pure movements, but rather are combined with small diagonal tilts, lateral movements and recovery with small circular adjustments. The variability and the quantity of movement in the first two months of life tend to ensure adequate mobility and range as the infant becomes more active visually and begins to explore his or her environment. Control of visual fixation will stimulate stability of the neck through the activation of vestibular-ocular, oculo-cervical, and vestibulo-cervical reflexes.

By three and a half or four months of age the healthy active infant has begun shifting the midline of the body laterally in order to free a hand to reach forward or adapt the arms for support when in the prone position. The head participates actively when the baby is helped to assume a sitting position from the supine alignment. Initial head lag is corrected as the body is in a stable position and the head rights itself. Lateral trunk flexion is active in the turning of the body to prone from supine. Vision, hearing and vestibular responses actively assist in these actions and help to motivate and modify the postural adaptations. The hands meet at the midline and “swat” at suspended toys. Neck function is an integral part of all changes in position and cannot be isolated as a simple function during the developmental process.

The infant is capable of lateral flexion of the trunk in side-lying at this three to four month stage, which is incorporated into lateral trunk flexion that supports reaching with arm lift at five months. The eyes can then follow the hand movement, which indicates that there is stability in the positioning of the neck and head. By the seventh month the neck brings the head to a more vertical alignment with an active shortening of the upper side of the neck and trunk and a corresponding lengthening of the underside of the body and the lateral position can be sustained for minutes. This ability to sustain such an anti-gravity posture allows peripheral function to evolve in the form of eye movements and coordination of the hands.

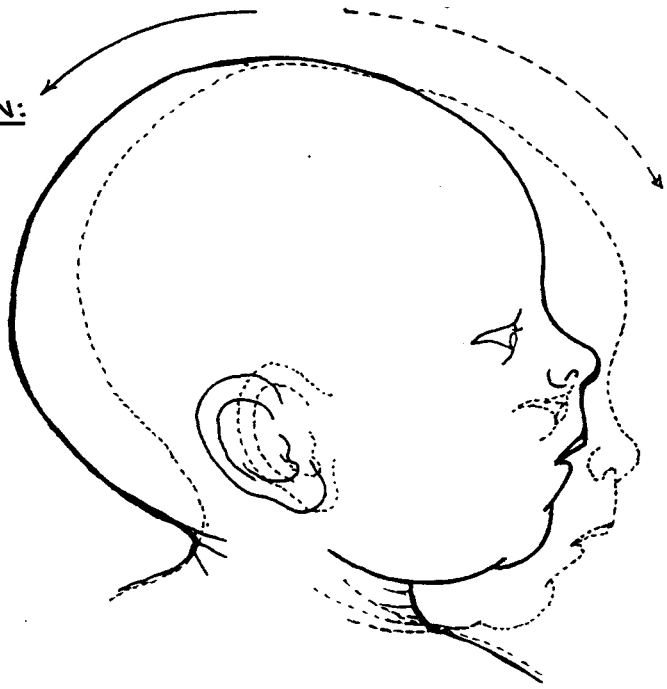
Lateral Flexion at 7 months

Controlled neck elongation at 4 months

Flexion and extension at the base of the neck, considered to be at the level of the seventh cervical and the first thoracic vertebrae, develops a little later than capital movements, as elongation of the neck occurs in the developing infant. (Fig. 10, pg.22) True cervical elongation reaches its peak as a functional ability when the infant can support weight in prone on extended arms and keep the eyes downward. The normal infant demonstrates this achievement by seven months of age after spending several months perfecting quality extension and lateral flexion of the trunk. Forward flexion of the head in this fully extended prone alignment also represents the dissociation or “breaking up” of a total extension pattern. By orienting the face in different directions, motivated primarily by auditory and visual stimuli, while the shoulders remain relatively stable over the supporting hands, the infant achieves further dissociation. This ability to move the head and neck over the stable alignment of the shoulders prepares the individual to take in more sensory information

FIGURE 10: CAPITAL FLEXION/EXTENSION AND CERVICAL FLEXION/ EXTENSION

CAPITAL EXTENSION:
A VERY SLIGHT MOVEMENT OF THE OCCIPITAL CONDYLES ON THE SUP. ARTIC. FACETS OF THE ATLAS AT THE ATLANTO-OCCIPITAL JOINT.



CAPITAL FLEXION
OR
CHIN TUCK:
A SLIGHT GLIDING MOVEMENT OF THE OCCIPITAL CONDYLES ON THE SUP. ARTIC. FACETS OF THE ATLAS AT THE ATLANTO-OCCIPITAL JOINT.

IN RESPECT TO THE HEAD ALIGNMENT SHOWN FOR CAPITAL EXTENSION, THE NEUTRAL POSITION IS SLIGHTLY FORWARD OR ANTERIOR TO OUTLINE OF THE BACK OF THE HEAD.

- TERMINOLOGY -
AND THE FUNCTIONAL AREAS WHERE MOVEMENT OCCURS

CAPITAL EXTENSION VS. **CERVICAL EXTENSION**

. OCCURS AT THE ATLANTO-OCCIPITAL JOINT WITH A SLIGHT GLIDING OR SLIDING MOTION OF THE CONCAVE-CONVEX SURFACES OF THIS JOINT

. OCCURS AT ALL ARTICULATING FACETS OF THE CERVICAL AND FIRST THORACIC VERTEBRAE. THE DEGREES OF CERVICAL EXTENSION IS MUCH GREATER THAN THAT OF CERVICAL FLEXION.

CAPITAL FLEXION VS. **CERVICAL FLEXION**

. OCCURS AT THE ATLANTO-OCCIPITAL JOINT WHICH ALLOWS FOR A SLIGHTLY GREATER DEGREE OF FLEXION (CHIN TUCK) IN COMPARISON TO EXTENSION, AS NOTED ABOVE.

. OCCURS AT ALL ARTICULATING FACETS OF THE CERVICAL AND FIRST THORACIC VERTEBRAE. HOWEVER, THE GREATEST AMOUNT OF FLEXION OCCURS IN THE ARTICULAR FACETS OF THE UPPER TWO CERVICAL, THE LAST CERVICAL AND THE FIRST THORACIC VERTEBRAE. THE LOWER FIVE CERVICAL VERTEBRAE, ONCE THEY COME INTO NEUTRAL (VERTICAL) ALIGNMENT DO NOT UNDERGO FURTHER FLEXION.

correct manually the alignment of the mandible there will be initial resistance, which is sometimes sufficient to make mouth closure impossible even at this passive level. It is helpful to perceive any potential freedom of motion to initiate change.

Gently restraining mandibular instability requires the child to actively adapt the resting position of the tongue inside the mouth.

Diagonal extension of the head and neck includes a slight turning of the face to the side, followed by a slow movement upward of the face. This is the motion used by the infant to initiate turning from prone to supine, with the eyes most often leading the motion. It combines some rotation with ventral lengthening that continues into the trunk. The clinician will be able to observe asymmetries at various stages of the movement so that possible intervention strategies will become apparent. In general the objective will be to release the tissue restrictions by supporting the body parts involved in the movement. Sequencing and timing is important for this type of motor learning to be successful. The infant with neuro-motor problems most often has difficulty initiating movement against gravity and then has a problem in sustaining the alignment of one body part while others activate in the sequential transition.

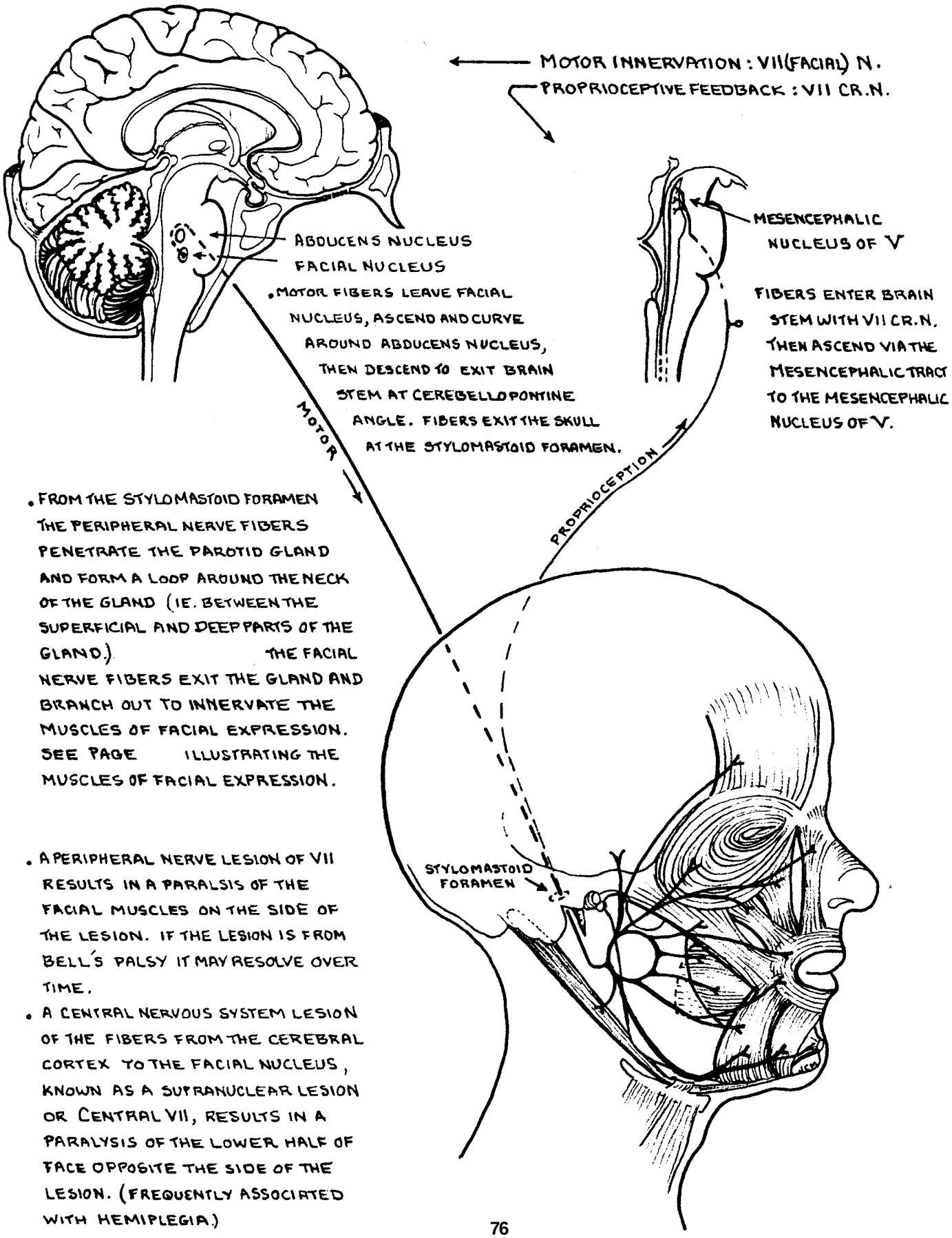
Visual observation can not substitute for palpation. By resting an open hand softly over the pectoral musculature and the clavicles, the clinician can move gently toward one shoulder and toward the other, to displace only the superficial tissues (skin and outer fascia). The response should be a brief displacement of soft tissue followed by readiness of the thoracic cage to continue the normal respiratory movement while adapting alignment

with the soft tissues. The clinician will note structural and functional asymmetries, tissue restrictions, respiratory changes and any signs of discomfort. The clinician who has noted the functional problems of the mouth will begin to relate these observations to the tissue resistance over the anterior neck and thorax. Regional mobilization of the soft tissues will begin to occur as the body adapts to the postural shifts and changes in the respiratory pattern. The clinician will maintain the slight change in alignment until appropriate adaptation of tissues occurs, while observing the spontaneous adaptations of the neck and head.

When neck instability exists, it is most common that the scalene muscles have attempted to give compensatory security by increasing their tension. This is more often a bilateral response, although there are instances where the scalenes are much more active on one side, combined with forward flexion or less often with extension of the head and neck. The lateral musculature attempts to maintain a stable position of the neck while avoiding any motion that would cause discomfort or a feeling of insecurity. When this type of situation exists over a period of time, the visual system makes its own adaptation and distortions in bilateral visual function may occur.

Neck activity is crucial to change the postural dysfunction of the child with low tone. Responses come more easily when direct intervention is introduced with the child in vertical alignment in a foam chair.

FIGURE 27: MUSCLES OF FACIAL EXPRESSION



- MOTOR FIBERS LEAVE FACIAL NUCLEUS, ASCEND AND CURVE AROUND ABDUCENS NUCLEUS, THEN DESCEND TO EXIT BRAIN STEM AT CEREBELLOPONTINE ANGLE. FIBERS EXIT THE SKULL AT THE STYLOMASTOID FORAMEN.

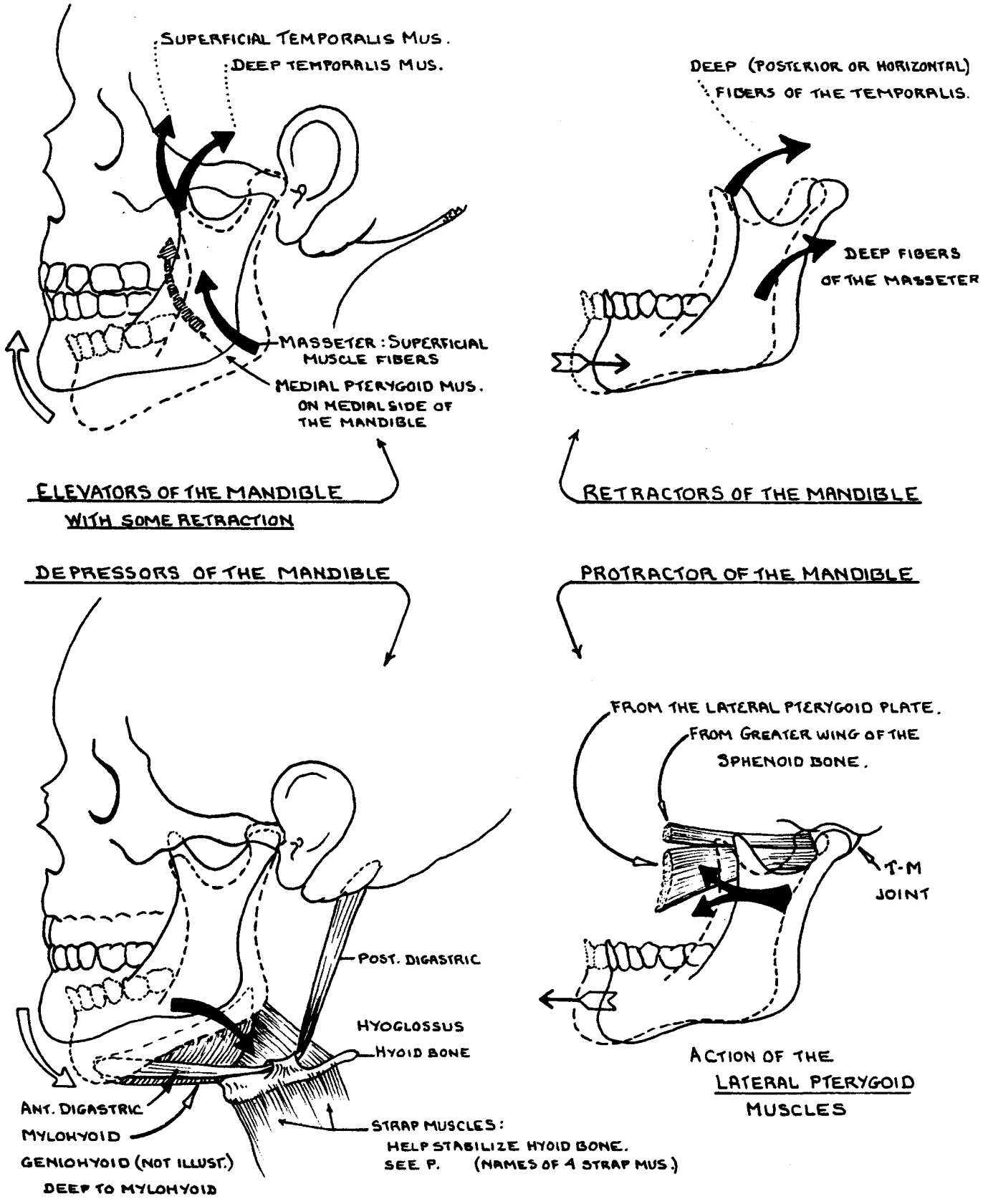
FIBERS ENTER BRAIN STEM WITH VII CR.N. THEN ASCEND VIA THE MESENCEPHALIC TRACT TO THE MESENCEPHALIC NUCLEUS OF V.

- FROM THE STYLOMASTOID FORAMEN THE PERIPHERAL NERVE FIBERS PENETRATE THE PAROTID GLAND AND FORM A LOOP AROUND THE NECK OF THE GLAND (IE. BETWEEN THE SUPERFICIAL AND DEEP PARTS OF THE GLAND.) THE FACIAL NERVE FIBERS EXIT THE GLAND AND BRANCH OUT TO INNERVATE THE MUSCLES OF FACIAL EXPRESSION. SEE PAGE ILLUSTRATING THE MUSCLES OF FACIAL EXPRESSION.

- A PERIPHERAL NERVE LESION OF VII RESULTS IN A PARALSIS OF THE FACIAL MUSCLES ON THE SIDE OF THE LESION. IF THE LESION IS FROM BELL'S PALSY IT MAY RESOLVE OVER TIME.
- A CENTRAL NERVOUS SYSTEM LESION OF THE FIBERS FROM THE CEREBRAL CORTEX TO THE FACIAL NUCLEUS, KNOWN AS A SUPRANUCLEAR LESION OR CENTRAL VII, RESULTS IN A PARALYSIS OF THE LOWER HALF OF FACE OPPOSITE THE SIDE OF THE LESION. (FREQUENTLY ASSOCIATED WITH HEMIPLEGIA.)

FIGURE 28: PRIMARY MUSCLE ACTIONS INVOLVED IN JAW MOVEMENTS

NOTE: ALL MUSCLES OF MASTICATION ARE INNERVATED BY THE MANDIBULAR BRANCH OF THE TRIGEMINAL NERVE OR CRANIAL NERVE V_3.



TREATMENT PREPARATION FOR IMPROVED ORAL-MOTOR FUNCTION

Positioning and direct therapeutic handling

Changes in the neck and in the mouth may be approached directly or indirectly. Most facilitated postural adjustments will improve the control of the head position in space, providing that the person starts with a basic ability to move the head within normal range. When movement responses are facilitated by a trained therapist using the concepts of Neurodevelopmental Treatment, a proximal point of control is given at the pelvis or shoulders to obtain an active response of the head position. Proprioceptive Neuromuscular Facilitation and other movement therapies that consider the entire body and its automatic control of the upright alignment against gravity may be used with similar effectiveness. Active movement responses that are monitored and controlled by the therapist assist in the integration of the new sensations after release of the soft tissue restrictions. It is essential that this assistance be given to support the integrative process. Extensive tissue change without opportunity for integration may result in a return to limited postural adjustments that offer more security for the individual. Movement by the client also assists the clinician in identifying limitations in tissue mobility before a planned therapeutic program begins.

In the seated alignment, very slight shifts away from and returning to midline seem to be the most effective way to stimulate balancing responses of the head and neck. Careful repetition of these postural adjustments that change the relationship of the head and trunk may lead to a change in the tonus of the face and assist in realigning the mouth toward improved symmetry. To obtain such changes the therapist must be aware of details in the client's postural adjustment, such as the movement of the thoracic cage over the pelvis and the quality of scapular adaptation. The timing and alignment during transitions over the vertical midline significantly affect the responsiveness of the neck. Passive displacement of the center of gravity or general weight-shifting to the opposite side will not be as effective as dynamic elongation responses of the weight-bearing side.

When working with young children or those who are more severely limited in their

control of movement the therapist will want to think in terms of developmental needs or "gaps" in the child's development. Functioning in the prone alignment may be difficult to obtain because the infant may have avoided this posture, and failed to develop head control in the usual sequences. Limited strength to lift the head or excessive tension in the musculature of the ventral trunk may cause the head to be in forward flexion much of the time. The therapist wants to offer an experience of support while maintaining the head in an upright alignment. Placing the child in a prone position, the therapist can use a cotton covered soft roll with a three to four inch diameter to support the head. The roll is placed over the forearms and under the mandible of the child while the therapist controls the child's arms and the roll. Lateral weight shifts cause the head to tilt while the therapist maintains control of the child's head alignment with the body. Through the roll the therapist controls the extent of the movement and the rate of displacement. The child or adult has the experience of head movement within a limited range without direct hand contact of another person.

A soft roll is placed over the forearms and under the mandible of the child, while the theapist controls the child's arms and the roll. Lateral weight shifts cause the head to tilt while the therapist maintains control of the child's head alignment in relation to his body.

Continuing the control described above, the therapist may expand the experience by slowly tipping the shoulders laterally until they arrive at a side-lying alignment while maintaining the consistent relationship between head and arms. The roll is kept parallel to the line of the shoulders. The entire transition is done slowly with constant attention being paid to the stability of the head alignment. The client may be positioned on a table or over a large ball or inflated roll. It is difficult for the clinician to have sufficient control of the movement when the work is done on a floor mat. It will often be observed that the transition to one side is much easier than to the other, giving the therapist a reason to check further possible holding patterns over the rib cage or in the neck/shoulder interaction of the more restricted side.

With the child in supine the same flexible four inch diameter soft polyurethane foam roll is placed behind the neck and the occiput. The therapist holds the arms of the child with the ends of the roll together to control lateral movement of the head. The roll keeps the child's head in the midline and facilitates head movement with the body. The child may also be assisted to a sitting position, as habitual head lag will be inhibited by the roll.

This same supine position is useful when therapy is directed to the oral-motor area. The anterior surface of the neck is shortened and excessive mouth opening is inhibited. Facilitated movement of the mandible is useful for initiating use of the oral cavity to modify sounds and for preparation of chewing movements. The sensory acceptance of changes in speed of movement and approximation of mouth parts prepares for voluntary movement initiation. With a larger child the therapist may sit on a floor mat facing the child, who is supported with a wedge. Smaller children may be handled on a wide table with the therapist standing or sitting to face the child.

It is useful to work with the older child, positioned on a foam wedge, when mandibular stability is needed for better articulation.

A bench that is long enough to accomodate both therapist and child and narrow enough to permit the child to assume a straddle-sit position is useful for working for head-neck reactions and oral-motor function. When more security or physical control is needed for the trunk the adult sits behind the child. This tandem position offers behavioral control for the child who may have difficulty staying in one place while the therapist works. A mirror is helpful for the therapist to observe facial expressions. Postural support is more complete for the youngster who is physically insecure. From this tandem position it is easy for the

therapist to assist the child during trunk rotation. Also the child's arm may be helped to cross the body midline in a smooth way, while changing the alignment of the shoulder girdle. Both of the client's arms may be supported to one side while the other hand of the therapist is free to assist the head and/or neck to help the child adapt to the new body alignment.

Seated facing the child in the same straddle position, the adult is able to assist oral-motor responses and facilitate sound production for the child who has some independent head control. Toys may be presented to motivate the movement desired and it is easier for the therapist to observe whether the eyes are engaged in the activity. By motivating visual responses of the client the therapist may successfully stimulate capital flexion. There is also the advantage in this face to face alignment on the bench that the child activates the trunk with no support directly behind the body. The clinician is free to guide movement with arms, shoulders, head or trunk. An inflated ball may be pressed against the child's ventral body for additional central stability.

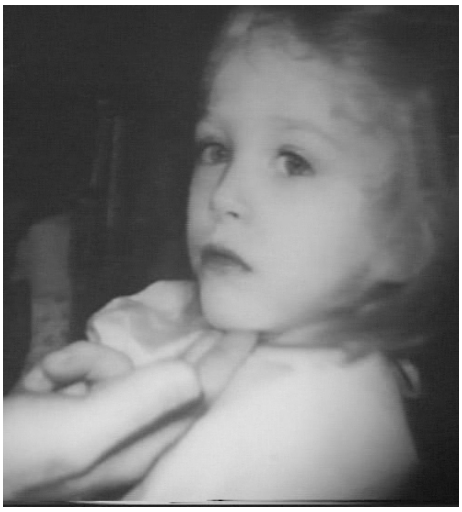
Working on the floor mat permits the therapist to use his or her own body to control the child in a long sit position. When the child has severe physical limitations, the positioning must proceed very slowly considering the comfort range of the child's lower limbs. As a general rule this alignment, which requires ninety degrees of flexion in the hips, is an important precursor to standing. The adult, by placing his or her abducted legs gently over the abducted legs of the child, can limit extraneous leg movements that distract from the postural control of the trunk while offering additional stability as needed. The knees of the child are never forced into more extension; more flexon is inhibited. The postural adjustments of the shoulders and the head/neck begin to dissociate from the lower part of the body. By moving with the child, the therapist can assist the experience of lateral flexion or side-bending by leaning the child's body over the therapist's leg. Initial responses are very general and of short range, adapting to the habit patterns, respiration and postural control of the client.

Resting the pad of the index finger on the forward surface of the tongue, the therapist waits for the base of the tongue to adapt.

Firm holding of the closed mouth position may be done when there are no TMJ alignment problems. This provides the child with a new proprioceptive experience.

Following oral-motor intervention, the young child often explores the oral area with his own finger or hand to confirm the changed sensations.

Closure of the mouth includes both the ability to approximate the teeth and the "soft" closure of the lips, with the cooperation of the TMJ and the muscles of facial expression. The clinician will receive clients who have one or the other of these skills without managing both of them. Closure should be accomplished without resistance. The pressure receptors of the teeth should accept the maintenance of contact, and achievement of this objective may assist in the total organization of oral-motor function. Closure of the lips often happens secondarily to approximation of the teeth and is based on a sensory orientation of one lip to the other. The tongue must also make its own adaptation to mouth closure. Achieving these last two skills may require direct intervention by the therapist when the neurologically impaired client presents an oral-motor problem.



In some cases it is enough just to maintain slight pressure under the jaw to maintain lip closure. This also tends to relax the base of the tongue and assists in maintaining a relaxed mouth and lips.

When more control is necessary the hand can be cupped around the jaw with slight pressure into the TMJ, and maintined until the face and lips relax.

Controlling the jaw with the child on the therapist's lap, allows for the therapist to assist head control and elongation of the neck, as the jaw is controlled and the lips maintain closure.

Tongue mobility includes the commonly known excursions forward to show the tip of the tongue and backward into a retracted position, as well as lateral touching of the corners of the mouth and the inner surface of the molars with the tongue tip. Prior to demonstrating these voluntarily controlled movements, the tongue must have a resting posture within the mouth and must be able to adapt to mouth closure. The tongue must be sufficiently dissociated in its movement to move while the size of the oral cavity is limited by mouth closure, which permits normal chewing with the mouth closed. The posterior part of the tongue moves away from the lateral surfaces of the molars on one side of the mouth to reach with the tongue tip to the internal surface of the cheek on the opposite side. This range of movement is important for bringing food bits into position for chewing and then for a swallow and requires sensory dissociation of the posterior tongue from the gums and back molars.

Normal speech requires further dissociation and even finer control of the tongue movements. The speed of these adjustments represents the fastest motor responses in the body and is managed by a feed forward mechanism that anticipates the words to be uttered. Speech production that is based on a single word production slows the associated cognitive processing.

Cheek mobility refers to the soft tissues and muscles that expand and contract during chewing or accomodating a substantial bite of food outside of the teeth. Even though softness appears to be present on the basis of observation, a finger placed in the space between teeth and cheek may reveal internal tension. The cheek also participates in the movement of food within the mouth to place the bits of food on the molar surfaces for adequate chewing and contributes to variability in facial expression.

The gums and the forward part of the hard palate should be able to accept touch without eliciting a gag reflex or other signs of nausea, such as watering of the eyes. When the finger of the clinician approaches the gum area past the molars it is possible to elicit a “normal” gag, as individuals differ greatly in their sensitivity. After the palate or the area between the gums and the cheeks is touched it is natural for the tongue to orient to the area in an exploratory manner, which helps to integrate the new sensation. Initial touching inside

Following the specific work with the tongue it is helpful for the clinician to return to the mandible to facilitate some general movement for the oral area. The use of external control by the therapist after direct intervention in the inner oral area serves to increase awareness by the client and requires adaptation of the tongue to the new constellation of sensory input.

By widely opening the space between thumb and index finger, the clinician can smoothly "wrap" the mandible with continuous contact to facilitate up-down motion.

The web space of the linician's hand maintains the alignment of the mandible and assists grading of the up-down motion.

Until the individual clinician has the opportunity to know a child who suffers from rather dramatic alterations in sensorimotor activity levels due to allergic reactions, it is difficult to believe the strength of the influence on the child's performance. The centers for environmental health and physicians in ecological medicine have carefully documented large numbers of such reactions in children who appear normal until exposed to the substance to which they are sensitive. In a population of persons with inadequate central nervous system functioning, the reactions are just that much more violent in their expression. The entire area of nutrition is one that is just beginning to unfold new possibilities for persons with neuromotor dysfunction.

Feeding is a natural way to organize oral-motor function so that the tongue movement relates to the oral-motor environment.

FOOD CHOICES AND TEXTURES

Food choices in the home are made on the basis of cultural patterns and family preferences. It is common for adults to indulge the disabled child with sweets and "junk food" perceived as "treats" when nutritious food is not accepted. The over-processed food may sometimes offer less resistance in the mouth, but it tends to disrupt the child's acceptance of vegetable and fruit flavors. The lack of this element in the diet then reduces mineral levels in the body, which negatively affects natural or normal appetite. It is very important to consider basic nutritional concepts when monitoring feeding or when orienting parents to the needs of their disabled youngster. Whether the child is receiving nutritional supplements or not, a balanced nutritious diet with adequate caloric value is of paramount importance to support central nervous system function and growth and development of the child's body. As allergies are more common in children with central nervous system dysfunction than in the general population, the clinician will want to be aware of behavioral or visible body changes after eating new foods. Common negative signs include increased salivation (often from sugar or milk), change in face color, irritability, hyperactivity or restlessness
..

SPOON FEEDING — sequential suggestions:

Level I: Yellow vegetables: squash and carrots, cooked beets
Fruits: blended banana, pear, apricots, peaches, mango, cereal

Level II: Green vegetables: peas, beans, spinach
Biscuits, crackers

Level III: Blended meats, which may need to be diluted

Level IV: Fork mashed table foods, kept separate to experience flavors

Level V: Varied textures and food combinations: soups with vegetables or noodles, spaghetti, sandwiches

The therapist wants to be able to bring the spoon to the mouth without causing mouth opening. Note that the eyes are closed, which reflects the difficulty that this girl has in maintaining focus of the two eyes on an approaching target.

Mouth closure should be maintained with different head alignments.

When placement of the spoon is possible over the molars, the reflexive bite response has been integrated.

The adult assistant waits for the upper lip to approach the spoon and the head to move back in slight capital flexion for spoon cleaning.

TEXTURE may be added to foods with the following:

Bran, cereal (rice or oat for less allergy risk), mashed potatoes, sweet potatoes, corn meal "polenta", Ricotta cheese, blended cottage cheese (unless allergic to milk products), pureed foods
Yogurt offers more consistency for easier drinking
Definite flavors enhance awareness of food in the mouth, so mixing of foods is counter-productive.

CHEWING DIFFICULTY may be graded as follows:

Level I: Mango, banana, ripe avocado, soft pears or peaches.

Level II: Lightly steamed green beans, carrots, zucchini, cucumber, apple slices, potatoes (cut in strips), celery.

Level III: Strips of cooked chicken, turkey, rare roast beef, ham
Strips of a cheese that does not crumble.

Level IV: Melba toast, dried fruit, orange segments, peeled raw apple slices.

Level V: Most difficult chewing: Raw celery, raw carrots, lettuce, raw apples with skins, and nuts.

Note: The above guidelines group similar textures in common foods. There are many foods that may be acceptable in a feeding program and the texture can be categorized by finding similar foods in the above levels. Altering specific methods of food preparation will change the texture and consequently the difficulty for the child to manage it in the mouth.

CAUTION: Unless the family brings the food, strictly avoid sausage or salami with nitrates and coloring, foods high in sugar, refined flour, and additives, as well as, excessive milk intake. These substances can interact negatively with medications and/or cause behavioral reactions.

Food inside the mouth or movement of the tongue may cause sensory over-stimulation, which requires time for accomodation.

When mouth opening can not be coordinated easily the adult assistant must wait patiently and reassure the client.

When eye contact is coordinated the mouth opens softly with anticipation of the approaching spoon. Loss of visual focus as the spoon is closer to the face, causes looking away, pushing back or closing the eyes.

As timing improves the mouth opening is easier and the entire face relaxes.

Ideally the spoon enters the mouth with an alignment perpendicular to the frontal plane of the face.

When the mouth is opening easily the rounded bowl of the spoon may be moved laterally over the surface of the tongue no more than twice before leaving the food in the mouth. This helps to normalize the tone in the tongue so that food can be moved more easily within the mouth.

The lips should participate actively in cleaning the spoon.

This type of facial expression may reflect difficulty in organizing tongue movement and/or mouth closure, especially when some of the food has moved to the back of the mouth.

CUP DRINKING AND ORAL-MOTOR MATURATION

The ability to drink from a cup is an important achievement, precisely because it represents a complete change in the organization of mouth movement. For successful sucking the tongue moves in midline, drawing the tongue posteriorly along the nipple to express the liquid. The lips seal around the nipple and the tongue presses against the nipple with assistance from the mandible.

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Gradual dissociation of the tongue from mandibular movement permits the more subtle motion of sucking up liquid through a straw. Some infants accomplish straw drinking before managing a cup.The ability to drink from a cup is an important achievement, precisely because it represents a complete change in the organization of mouth movement. For successful sucking the tongue moves in midline, drawing the tongue posteriorly along the nipple to express the liquid. The lips seal around the nipple and the tongue presses against the nipple with assistance from the mandible.

Gradual dissociation of the tongue from mandibular movement permits the more subtle motion of sucking up liquid through a straw. Some infants accomplish straw drinking before managing a cup.

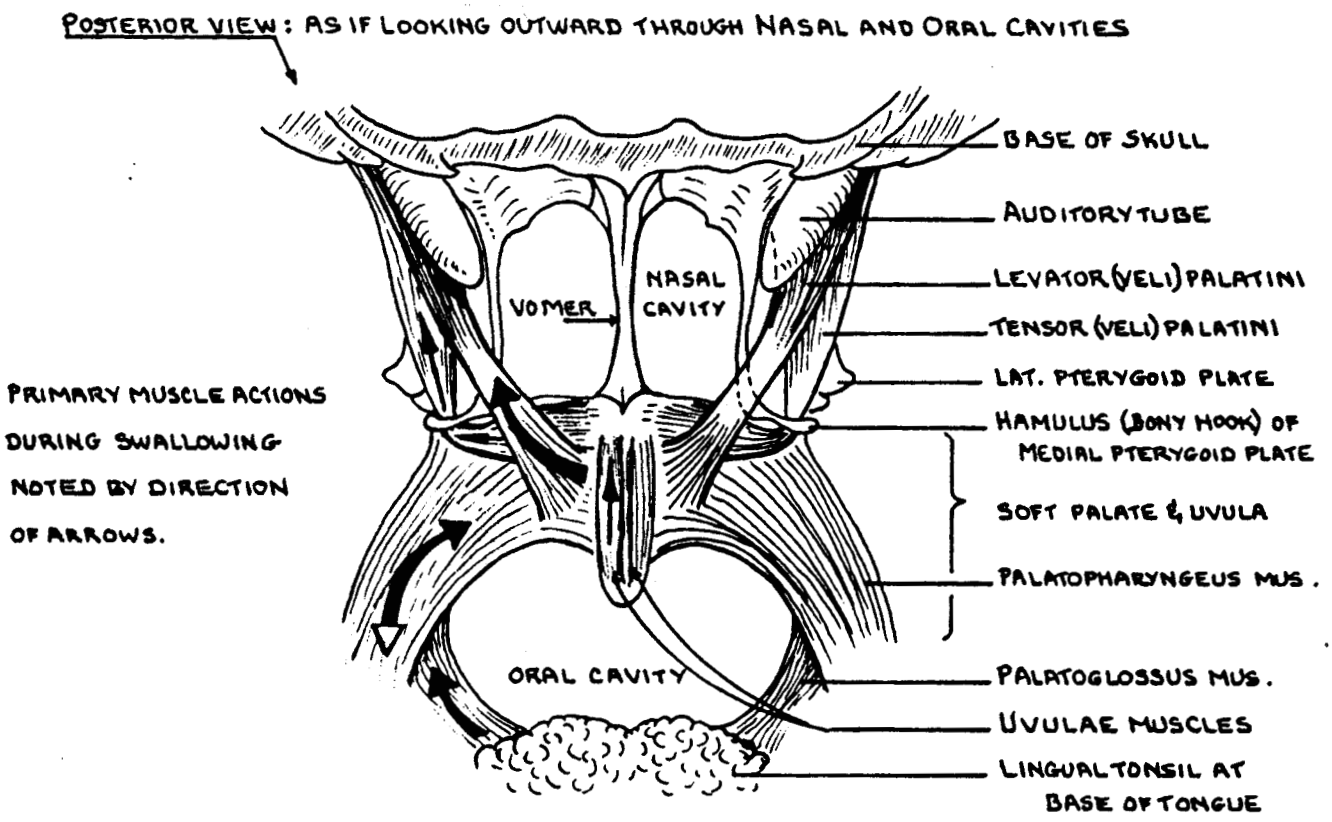
Cup drinking is a new step forward as the liquid comes toward the mouth in a continuous flow. Entrance of the liquid into the mouth for adequate swallowing is controlled by the tongue. To prevent the entry of an excessive amount of liquid the forward part of the tongue remains in a stable contact with the lips and the entering liquid. The tongue acts as a sentinel to permit entry for the amount of liquid that can be swallowed with control. When the movement of the tongue is not coordinated and the tongue is unable to move independently, the ability to manage the incoming liquid is compromised.

With the head tipped back in slight extension on the neck while drinking the liquid can easily enter the trachea, causing choking or silent aspiration of droplets that enter the bronchi or the lungs. As the entire body pushes backward toward a more horizontal

The cup is lowered while contact is maintained between cup and lower lip to limit tactile stimulation. The cup is raised to offer more liquid.

Ideally the client will be able to take several sequential swallows while coordinating respiration before stopping for a rest.

FIGURE 41: MUSCLES OF THE SOFT PALATE AND ASSOCIATED STRUCTURES



AUDITORY (EUSTACHIAN) TUBE: CARTILAGENOUS: FIRST TWO MUSCLES LISTED BELOW TAKE ORIGIN (IN PART) FROM THIS TUBE. SWALLOWING ACTION COMPRESSES TUBE MOMENTARILY, THEN IT "POPS OPEN" EQUALIZING THE PRESSURE BETWEEN THE MIDDLE EAR CAVITY AND THE OUTSIDE AIR IN THE NASAL-ORAL CAVITIES.

LEVATOR (VELI) PALATINI: ACTION AS NOTED ABOVE. ALSO ELEVATES SOFT PALATE HELPING TO CLOSE PASSAGEWAY BETWEEN NASAL AND ORAL-PHARYNGEAL CAVITIES.

TENSOR (VELI) PALATINI: ACTION AS NOTED UNDER AUDITORY TUBE. ALSO TENSES SOFT PALATE, I.E. PULLS PALATE LATERALLY AS LEVATOR PALATINI RAISES IT, THUS HELPING TO CLOSE PASSAGEWAY BETWEEN NASAL AND ORAL-PHARYNGEAL CAVITIES.

PALATOPHARYNGEUS MUSCLE: DURING SWALLOWING ELEVATES AND WIDENS OPENING OF SUPERIOR PHARYNGEAL CONSTRICTOR MUSCLES (ALONG WITH STYLOPHARYNGEUS MUSCLES...NOT ILLUSTRATED) FOR ACCEPTING A BOLUS (FOOD, LIQUID) THEN ACTS IN CONSTRICTING SUPERIOR PHARYNGEAL MUSCLES HELPING TO MOVE BOLUS DOWNWARD. ALSO ASSISTS IN LOWERING SOFT PALATE AS BOLUS MOVES (BY PERISTALTIC ACTION OF MID. & INFERIOR CONSTRICTORS) ON INTO THE ESOPHAGUS.

PALATOGLOSSUS MUS.: ELEVATES POST. TONGUE. HELPS CONSTRICT FAUCES IN FIRST STAGE OF SWALLOWING.

UVULAE MUSCLES: ELEVATES AND TENSES UVULA AND COMPLETES CLOSURE BETWEEN NASAL AND ORAL-PHARYNGEAL CAVITIES DURING SWALLOWING.

MOTOKINESTHETIC APPROACH TO ARTICULATION

Motokinesthetics is an approach developed originally for stuttering therapy, by Edna Hill Young and Sara Stinchfield Hawk. This approach has been adapted and applied with sucess to children with neuromotor and articulatory disorders. The approach centers around applying kinesthetic cues that can be given to the external parts of the face and jaw to stimulate more coordinated muscle activity and motor patterns needed to produce specific sounds.

Specific hand placement by the therapist is used to facilitate the production of vowels, diphthongs, voiced, and voiceless consonants. Stimulation and control are given to elevate the jaw. lower the jaw, and move the lips. Elevation and lowering of the jaw assist in the movement control of the tongue, while moving the lips allows shaping of the oral cavity for air space and control of exhalation of air on each sound.

Before using this approach it is important to understand the oral-motor function of the child and to use any necessary preparation activities to increase tolerance and the chances of success. **A full description and demonstration of this adapted approach is contained in a set of videos by Merry M. Meek M.S., CC-SLP available from Clinician's View ..**

For making the vowel sound "ae" as in the word "can," the therapist first starts by positioning her thumb and index finger on either side of the child's lower lip which helps direct the jaw downward.

After placement of the thumb and index finger on either side of the lips, the therapist creates a curve by spreading her fingers. The child phonates the sound as the therapist facilitates the jaw and lip movements.

To facilitate production of the " ue" sound as in the word "use'" the therapist places her thumb and index finger on the upper jaw as in the position used for facilitating the "e" sound. As the child makes the "e" sound, the jaw is facilitated forward to assist in making the "eu" sound.

APPENDIX C: TREATMENT GUIDELINES FOR TUBE FED CHILDREN

The management approach should include the following goals

1. Identifying factors interfering with oral feeding.
2. Establishing adequate caloric intake.
3. Facilitating more normal postural tone and alignment and oral-facial tone.
4. Improving respiratory control.
5. Normalizing response of the oral cavity to sensory stimulation.
6. Developing oral sound play where indicated.
7. Providing optimal seating system based on motoric status.
8. Encouraging non-nutritive sucking during tube feeding, and at other times if appropriate.
9. Initiating a "tasting" program in conjunction with oral-motor treatment appears to be better carryover towards oral feeding.

   a. Introducing flavors on the child's fingers if he can reach his mouth and gradually thicken the flavor.

   b. Encouraging hand-to-mouth and toy-to-mouth exploration if appropriate for his chronological age.

   c. Introducing thick "pasty" textures on adult finger or spoon to place laterally in mouth to encourage chewing.

   d. Using oral control to facilitate vertical chewing helps to organize oral rhythm while facilitating for jaw stability, tongue lateralization, lip closure and controlled movements. Graham cracker crumbs with adult finger in place laterally on the gums can be effective.