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Review of prognostic factors for esophageal voice

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ABSTRACT

Plan A of this study was completed. Plan B of the study is the subject for future research. A review of the laryngectomy literature, from the earliest mention of the laryngectomy surgical procedure to the present was conducted; with specific emphasis upon factors pertinent to laryngectomy rehabilitation and esophageal speech development. Psychological, idiosyncratic, social, therapeutic and physiological factors were reported as affecting esophageal voice development. There were a great diversity of variables that might be predictive in judging acquisition of esophageal voice. However, much of the information regarding predictive variables was based on subjective reports, poorly controlled statistical research, or insignificant correlations. A Preliminary Esophageal Voice Checklist was developed to provide a systematic survey of variables frequently reported in the literature as affecting esophageal voice development. A proposal for experimental study, Plan B, was made for development of a pre-intervention assessment tool. Such a tool would allow the clinician to judge a laryngectomy's potential for esophageal development or an alternate form of communication.

LOMA LINDA UNIVERSITY

Graduate School

REVIEW OF PROGNOSTIC FACTORS FOR ESOPHAGEAL VOICE

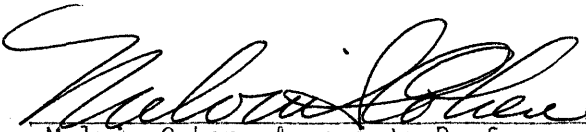
by

Christine G. Bravos

A Thesis in Partial Fulfillment
of the Requirements for the Degree Master of Science
in the Field of Speech Pathology

June 1980

Each person whose signature appears below certifies that this thesis in his opinion is adequate, in scope and quality, as a thesis for the degree Master of Science.



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KEY TERMS

Alaryngeal speech: speech produced without use of the larynx

Esophageal speech or voice: When this adjective is applied to "voice" or "speech," it refers to a method of producing sound from air in the esophagus.

Esophagus: a food passage from the mouth to the stomach

Laryngectomee: the person who has had a laryngectomy performed upon him

Laryngectomy: the surgical removal of the larynx

Larynx: a structure containing the vocal cords situated at the top of the trachea and below the root of the tongue

CHAPTER I

INTRODUCTION

At the end of the nineteenth and beginning of the twentieth century survival of the patient after laryngectomy was the prime consideration. The loss of the natural voice was a moot point to rehabilitation workers. Surgical and medical triumphs have shown an increase in longevity for the laryngectomee. A great many laryngectomees will live-out the remaining decades of their lives with this unique disability and its many physical, psychological, social and economic complications. Today, laryngectomy must be thought of as the beginning of the rehabilitation process, restoration of usable speech must follow. Re-learning of communication skills may facilitate the return to a "normal" lifestyle.

Cleopodias in 100 A.D. was the first to record cancer of the larynx (Winsor Morrison, M.D., Personal Communication). Progress in treatment of carcinoma of the larynx is due to the work of many men in several countries. In 1866, Patrick Watson of Edinburgh removed a non-functioning syphillitic larynx from a 36-year-old male. "Patient rallied from the operation but died some weeks after from pneumonia" (Watson, 1881). In 1873, Christian Theodore Billroth performed the first laryngectomy for cancer of the larynx. The tragic loss of his first twenty patients is documented (Thomason, 1939). Laryngeal cancer was regarded as an uncommon disease and was described as extremely rare by Cornil and Ranvier as late as 1876 (Thomson, 1939). In 1887, the case of Crown Prince Fredrich of Germany, a laryngectomee, brought the whole subject of laryngeal cancer and its surgical treatment into the world-wide prominence. By modern standards the disease in most of these early cases was far advanced and the surgical

mortality was high. Progress remained slow until 1900. Gluck and Soerensen in Berlin contributed greatly to surgical technique (Jesberg, 1960). The names of Sir St. Clair Thomson, Tapia, Solis-Cohen, Mackenty, and Buckley stand out as milestones that mark the "long and hazardous journey from the early disheartening failure to what today we call our most complete success in the treatment of cases of cancer of the larynx" (Cunning, 1943).

The number of patients that survived laryngectomy prior to 1920 was few (Struben, 1963). Mortality was high due to hemorrhage, sepsis, medias-tinitis, pneumonia, infection, suffocation, esophageal fistula and other profound complications (Thomson, 1939; Cunning, 1943; and Jesberg, 1960).

Overcoming the struggle to cure laryngeal cancer is associated with the invention of the laryngoscope, rapid advance of physiological and chemical knowledge, discovery of cocaine and adrenalin, perfection of elec-tronic illumination, discovery of X-ray, methods for arresting hemorrhage, developments in hygiene and dietetics, and the wonder of Listerian surgery (Thomson, 1939). The arrival of World War II brought sulfa drugs, anti-biotics, general anaesthesia, blood transfusion and knowledge of physiology of man to increase the survival of the laryngectomy patient (Struben, 1963).

Today neither radiation nor surgery is the absolute solution to the problem of laryngeal cancer. However, of the two methods, greater survival rates are expected with surgery (Jesberg, 1960). The five-year survival rate for laryngectomy is as high as 53 percent (Williams and Beetham, 1976).

Laryngeal cancer represents less than 2 percent of all human neoplasms (Harrison, 1969). The incidence for laryngectomy in the United States has markedly increased in the past few decades (Jackson and Jackson, 1941; Omerod and Shaw, 1956; and Levin, 1967). According to Nicholson (1975)

2,500 - 4,000 laryngectomies are performed annually. The American Cancer Society reports that there are 10,000 new cases of laryngeal cancer in the United States and a death rate of 3,000 each year (Trends in Cancer in Cancer News, 1974). In 1955, the American Cancer Society estimated 25,000 living laryngectomees in the United States (Keith et al, 1974). This figure is consistent with more current statistics of 23,000 - 40,000 living laryngectomees in the United States and other countries (Rovnick and Sokolow, 1965; Levin, 1967; Snidecor, 1967; Pitorak, 1968; and Nicholson, 1975).

Laryngeal amputation, though not high in incidence, imposes devastating physical, psychological, social and economic alterations in an individual's life. The larynx is a unique structure, combining the primary function of respiration and deglutition with the phylogenetically recent acquisition of speech. The valvular function of the larynx allows coughing, swallowing, and protection of the lungs from invasion of foreign material (Harrison, 1969). These biolaryngeal actions are achieved by completing closing and opening the laryngeal valve. In laryngectomy surgery, the functions of breathing and speaking are permanently altered. The trachea is terminated in an opening at the base of the throat and breathing is accomplished through this new orifice (stoma). Through the stoma, air is inhaled down to the lungs. Only the esophagus connects with the mouth and nasopharynx (Levin, 1967).

Alternative communication methods available to the new laryngectomee include;

- (1) whispering,
- (2) writing,

- (3) artificial larynx,
- (4) alaryngeal speech,

One of the early comprehensive analyses of alaryngeal speech was recorded in the American literature by Morrison (1941). He described four basic types of alaryngeal voice:

- (1) Pseudo-whisper (buccal voice),
- (2) Pharyngeal pseudospeech,
- (3) Stomach pseudospeech,
- (4) Esophageal speech.

In recent years there has been interest in surgical procedures for voice restoration after laryngectomy. Some techniques use appliances to shunt air from the tracheal stoma into the vocal tract. A summary of operative techniques for establishing tracheo-pharyngeal speech is presented by Shedd (1974). In other procedures, a shunt is made from body tissues, as in the Asai operation, developed by Dr. Ryoso Asai, a Japanese laryngologist (Miller, 1967). The Asai operation provides an airway consisting of a dermal tube for the utilization of pulmonary air introduced into the lower pharynx for vocalization. Each of the surgical procedures currently used has advantages and disadvantages. Many laryngectomees are not suitable candidates for these procedures (Montgomery, 1973).

Attempts have been made to produce effective laryngeal transplantation in animals. If successful, there may be applications for restoring laryngeal function after laryngectomy in man. To date, the re-planted excised larynx in the dog has proven to be impossible. There are technical difficulties in reestablishing blood supply and sensorimotor innervation. At the Laryngectomee Rehabilitation Seminar in Cheney, Washington, in

1975, Roger Boyle, M.D., lectured on the difficulty of laryngeal transplantation. Unlike kidney or heart organs, which can function by supportive techniques, the larynx requires perfect neurological reflex activity to work independently as a valvular structure. In addition, the larynx is in a particularly vulnerable location. Unlike the heart, the larynx is in a contaminated field: "It swallows spit" (Boyle, 1975). Major problems in laryngeal transplantation include:

- (1) Reestablishing blood supply to retain viability of the organ,
- (2) Reestablishing nerve supply,
- (3) Rejection of foreign materials,
- (4) Infection.

The first case of an individual using pseudovoice was reported by Czermak (1859). The subject was a young girl who had complete laryngeal stenosis and produced barely audible speech while breathing through a tracheal tube. Storch and Gersuny (1887) were apparently the first to publish verified cases of pseudovoice following laryngectomy. This was followed by Seiler, Strubing and Landois, Scripture, Lewis, Stern, and others (Hunt, 1964). In 1980, Gutzmann reported 25 cases in which intelligible pseudovoices followed laryngectomy (McCall, 1943).

The term "esophageal speech" was introduced by Seeman (1919). Esophageal speech differs from laryngeal speech in the anatomical structures involved. In normal laryngeal speech, air from the lungs passes on exhalation out through the narrow aperture of the closely approximated and vibrating vocal cords (glottis) (Levin, 1967). In esophageal speech, the laryngectomee speaker must learn to take air into the esophagus, push an air bubble with the tongue or pharyngeal muscles, and permit it to drop

into the esophagus. Gradually, the laryngectomee learns to control his swallowing so he can retain sufficient air to produce a sustained sound (Goldberg, 1974). The mechanism of esophageal speech in continuous action is best described by a composite picture made up of repeated clinical observations on laryngectomee speakers by using fluroscopic radiographic and cineradiographic evidence (Levin, 1967).

Martin (1963) states that "an appraisal of the quality or degree of effectiveness of any individual's esophageal voice is impossible except in broad, relative terms such as excellent, fair, indifferent, poor, offensive or absent."

An operational definition is important for the reader. Lauder (1969) describes "good" esophageal speech as having these characteristics:

- (1) Sufficient volume to be comfortably heard by a listener with normal hearing at a reasonable distance in fairly quiet surroundings.
- (2) Intelligibility supported by clarity of articulation, expressiveness, pitch variation, phrasing, and adequate visual cues.
- (3) Phonation produced with breath control resulting in a smooth speech flow, naturalness of expression, and avoidance of stoma blast.
- (4) A reasonable speech rate of at least 80 to 100 words per minute.
- (5) Few distracting speech mannerisms, facial grimaces, and inappropriate body movements during phonation.

STATEMENT OF THE PROBLEM

The speech-language pathologist indiscriminantly sets out to train each new laryngectomee patient "usable" esophageal speech. The problem is that the speech-language pathologist does not have at his disposal an objective evaluation procedure which is capable of predicting successful outcome from therapy. As a result, failure to develop esophageal speech often occurs after several weeks or months of therapy and after time and financial resources have been spent without reward.

Statistical predictions for mastery of esophageal speech are pessimistic. For the mastery of "usable" esophageal speech, patient success is reported from a low of 40 percent (King, Fowlks, and Peirson, 1968; Di Bartolo, 1971; Gilchrist, 1973; La Borwit, 1974; and Murry, 1975) to a high of 60 to 70 percent (Heaver et al, 1955; Putney, 1958; Gardner, 1961; Martin, 1963; Locke, 1966; and Bisi and Conley, 1975). Snidecor (1975) reports various surveys by the American Cancer Society, indicating 64 to 69 percent attain "usable" esophageal speech. Pietrantonì mentioned that 84 percent of his patients who had undergone laryngectomy were able to acquire esophageal speech, but he does not mention the quality of their speech (Struben, 1963). These figures do not provide documentation of how many laryngectomees consistently use their esophageal speech or how many attain "adequate" or "proficient" esophageal speech to facilitate their return to a normal vocational and social life. Of relevance, Shedd (1976) comments that only about 6 percent of laryngectomees attain "excellent" esophageal speech.

IMPORTANCE OF STUDY

There are at least three important reasons for this study. First, rehabilitation of persons with cancer of the larynx is a timely area of investigation consistent with the broad national approach to cancer rehabilitation. The incidence of laryngeal cancer in the United States is rising markedly and an increasing number of patients require speech rehabilitation (Gilchrist, 1973).

Second, the resultant increase in longevity makes speech rehabilitation a prime consideration in order to facilitate return to a useful person, social and economic life (Mc Call, 1943; Stoll, 1958; Levin, 1967; Gilchrist, 1973; Sokol et al, 1974; and Knox 1975). Over one-half of laryngectomy patients will live with their disabilities for a good number of years (Gilchrist, 1973).

Third, the speech-language pathologist needs a pre-intervention assessment tool which would allow him to:

- (a) predict if esophageal voice is a realistic goal for each patient, and, if not, then to
- (b) recommend an alternate form of alaryngeal communication without frustrating the patient by subjecting him to extensive attempts at esophageal speech training.

For approximately 100 years there have been efforts by rehabilitation workers to predict success of learning esophageal speech (Snidecor, 1975). Yet, even in the last two decades, these prognostic techniques have been of little practical assistance to the clinician. Two of the tools available to the speech-language pathologist for esophageal voice training have been the Verbal Rating Scale (Wepman et al, 1953) and Berlin's scale (1963).

Neither of these measures are administered before treatment begins.

The Verbal Rating Scale allows the clinician to judge stages of esophageal voice development and permits the patient to visualize the states through which he must progress if esophageal voice is to be achieved. The seven levels of Wepman's scale include:

- Level 1. automatic esophageal speech
- Level 2. esophageal sound produced at will with continuity; word grouping
- Level 3. esophageal sound produced at will; single-word speech
- Level 4. voluntary sound production most of the time; vowel sounds differentiated, monosyllabic speech
- Level 5. voluntary sound production part of the time; no speech
- Level 6. involuntary esophageal sound production; no speech
- Level 7. no esophageal sound production; no speech (Wepman et al, 1953).

The Wepman scale has been applied by Keith et al (1974). The purpose of Keith's study was to determine the relationship between mastery of esophageal speech and varying psychological factors in 49 subjects. The relatively low magnitude of the correlation (0.48) suggests a failure to determine the accurate prognosis for esophageal speech in a relatively large number of cases. Further, it may be "difficult to determine a patient's prognosis for developing esophageal speech until sometime after the patient has been dismissed from the hospital" (Keith et al, 1974).

Berlin's scale enables the clinician to observe the development of phonation early in the training process. Of the 38 laryngectomees (28 "good" speakers and 10 "poor" speakers), those who became "good" speakers

identified themselves early in treatment as having the ability to successfully:

- (a) phonate 100 percent of the time on demand after ten to 14 days of therapy
- (b) maintain a latency between demand and actual phonation of 0.2 - 0.6 seconds by the eighteenth day
- (c) sustain the vowel (a^h) for 2.2 - 3.6 seconds after 25 days of treatment (Berlin, 1963).

There have been two attempts to develop pre-intervention assessment tools to assist the clinician in predicting potential for esophageal speech. Dabul and Lovestedt (1974) devised an instrument based on the personal correlations of characteristics with "effective" esophageal speech in 30 laryngectomees. This tool consists of a test battery to be administered to laryngectomees at start of therapy to predict success:

1. SRA Nonverbal Test - If patient scores above the 50th percentile, "good speaker category" is predicted.
2. EAS - 5 Space Visualization Test - If patient scores above the 30th percentile, "good speaker category" is predicted.
3. Lip movements - (number of times subject says /p/ in one second over an average of three measurements). If patient scores a mean of seven or over, "good speaker category" is predicted; if patient scores a mean of three or under, "poor speaker" is predicted.

The findings were purely correlational: "It is uncertain whether the skills that appeared to be crucial to learning effective esophageal speech were determinants of effective learning, or were themselves the product of the effective use of esophageal speech."

Snidecor's tool provides an inventory of attitudinal operations that relate to effective esophageal speech development. This tool is discussed in depth in the content of this paper.

Neither of these instruments (prognostic attempts) considered the interplay of factors other than the relationship of psychology and personality to esophageal voice development. There may be a direct relationship between psychological, idiosyncratic, social-economic, therapeutic and physiological factors and a patient's ability to develop esophageal speech.

PURPOSE OF STUDY

The purpose of the present research is to;

- (1) determine if there are prognostic factors needed for mastery of esophageal speech, and if so,
- (2) propose the development of a pre-intervention assessment tool that would be of practical assistance to the clinician in treating the laryngectomee patient.

Other areas of speech-language pathology utilize indicators such as Porch Index of Communicative Ability (Porch, 1973) and Predictive Screening Tests of Articulation (Van Riper and Irwin, 1973) to provide predictive data for the clinician. An objective predictor is needed to enable the clinician to determine via pre-testing whether esophageal speech is a realistic goal for each laryngectomized patient.

Hypothesis: There is no significant relationship among certain variables for the speech-language pathologist to use in predicting esophageal voice development in the laryngectomee patient.

CHAPTER II

LITERATURE REVIEW

A literature review of the psychological, idiosyncratic, social, physiological and therapy factors pertinent to laryngectomee rehabilitation is presented. Each major factor is further divided into sub-factors to determine if there are quantifiable features which differentiate good and poor esophageal speakers.

There is voluminous information in the literature on each of these factors. An effort is made to

- (1) collate all of the available information on factors mentioned most frequently in the literature, and
- (2) distinguish subjective impressions from objective measurements reported in the literature.

At the conclusion of the paper a list of factors which have a direct relationship to successful esophageal speech will be collated. Later, a pre-intervention assessment tool will be designed and tested to assist the clinician in predicting the potential a laryngectomee has for the development of esophageal speech.

Psychological

"No operation performed today produces more profound alterations in the patient's physiology and psychology than laryngectomy" (Hunt, 1964). The clinician must be aware to both these physical and psychological adjustments in managing the laryngectomee (Greene, 1943; Greene, 1947; Freud, 1948; Pitkin, 1953; Lueders, 1956; Nahum and Golden, 1963; Hunt, 1964; King, Marshall and Gunderson, 1971; and Owlett, 1975). In a statistical study,

Barton (1965) compares the adjustment pattern of patients who have undergone laryngectomy to those who underwent laryngofissure. Only eight of the 23 laryngectomees were considered "well and adjusted" after surgery. In contrast 42 of the 44 patients were considered "well and adjusted" after laryngofissure. He concludes that the psychological and social well being of the laryngectomee should be a primary consideration in rehabilitation.

The major disability is unquestionably the loss of the natural voice (Holden, 1965; Drummond, 1967; Levin, 1967; Murphy and Ogura, 1967; Tait and Tait, 1969; and Edwards, 1976). Tait (1959) compares loss of voice to blindness and deafness in the isolation it produces in some patients. Lerman (1966) observes, "The complete loss of voice in laryngectomy is a basic threat to the integrity of the person, it will produce unendurable and thoughtless penalties and deprivations." The resultant inability to use speech for communication, the altered physical appearance and the social problems provide a basis for catastrophic behavior (Schall, 1938; Greene, 1947; Pitkin, 1953; Moses, 1958; Stoll, 1958; Heaver and Arnold, 1962; Webb and Irving, 1964 and Locke, 1966).

Speech is as much a psychological as a physical function. It is worthwhile to explore

- (1) the psychological implication involved in the organ, larynx and
- (2) the psychological function of speech/voice; in order to be able to understand why pre- and post-operative psychological problems can occur in the laryngectomee.

The organ involved in carcinoma has psychological implication to an individual's body image. Of special significance are the breasts of women (cosmetic disfigurement through mastectomy) and prostate gland in men

(threatened sexual impotence), and the speech mechanism in the genial extroverted patient (Webb and Irving, 1964). Nahum and Golden (1963) state that disfigurement of head and neck may have greater psychological effect than disfigurement of other body structures. Generally, the face and voice possess greater psychological meaning than other body parts (MacGregor et al, 1953; King, Marshall and Gunderson, 1971 and Goldberg, 1975). The philosopher, Descartes, placed the location of the soul in the pineal gland at the base of the neck. We perceive ourselves moving in space at the level of the forehead. Any disfigurement affecting the face or neck is felt more keenly as a blow to our physical attractiveness (Goldberg, 1975). All the special sense organs are situated in this area and because man had adapted the bulk of his living energy to that special sense analysis and response, interference or denial in this area has significant consequences. It follows then that loss of tissue in the head and neck causes a downgrading of the perception of the body image because the area is exposed and conspicuous (Conley, 1959a). Gardner (1966) discusses the special adjustment problems of women; stating the loss of physical attractiveness is particularly threatening to women living in a culture idealizing physical beauty.

In the casual thoughts of laymen, phonation is usually thought of as the vital function of the larynx. Physicians realize that in the list of laryngeal functions, phonation is well down in physiological importance. Jackson (1929) ranked it eighth. However, most agree that speech is man's most distinguishing human characteristic and simplest form of communication (Howie, 1947; Koepf-Baker, 1948; Pitkin, 1953; Silverberg, 1960; Bisi and Conley, 1965; Psychology of the Laryngectomy, EENT Monthly, 1967:

Murphy and Ogura, 1967; Adler, 1969; and Sheridan, 1976). Locke (1966) recalls of a patient, "When a man can no longer talk he feels himself less a man and this factor itself causes significant emotional disturbance." Also Tait (1959) recalls a patient, who stated "I didn't want to live if I couldn't speak. If you can't talk, you are just an animal." In essence, these patients feel they have lost the part of their personality which was expressed by means of voice.

Many authors have written the reasons why voice is so much a part of man's self-image (Merloo, 1952). It is essential in all relationships, social, educational, professional and industrial (Bangs et al. 1946; Koepp-Baker, 1947; Koepp-Baker, 1948; and Kitzing and Toremalm, 1969). Merloo (1952) says that "We use speech not only to communicate information, but to fulfill many other needs. We talk to express our feelings, to ease anxiety, to disarm hostility, to express aggression and social gestures as verbal contact to express a need for feelings, compassion and companionship. Sometimes we talk to just avoid silence." "By inflecting and changing the pitch of the voice, speakers readily express emotions such as love, anger, affection, happiness, sadness, love. Melody, rhythm and rate are the very personal qualities through which we can recognize the person even when we cannot see him" (Moses, 1958). In childhood and as an adult, speaking and listening make up 90% of the waking time (Clifford and Gregg, 1964). Bisi and Conley (1965) outline seven important psychological functions of voice-speech from early childhood:

- (1) A means of communication with other human beings beginning with the relationship of infancy with the parents even before the development of speech, by using different sounds.

- (2) The expression of emotion
- (3) The mastery of innumerable situations in the external world
- (4) A means of active dissent through attacking the adversary with words or screams or passively by pleading for help-mercy
- (5) A means of reassurance against fear
- (6) A source of gratification, especially in those who invested libido narcissistically in their own voice
- (7) A way of carrying out sublimation

Moses (1958) parallels loss of the larynx to loss of a secondary sex organ. Many men have a castration complex after laryngectomy. Many men consider laryngectomy a mutilating procedure leaving the victim in a condition worse than death (Schall, 1938). One patient admits, "It is like they cut off my balls; when they took out my larynx. I lost the prestige of being a man. You don't know what it means to be a man, I've got to kill that man to prove I'm a man . . ." (Locke, 1966). In lower animal forms the voice is used as a means of attracting a mate. In humans the female voice is termed "sexy;" and the male's Adam's apple which protrudes is equated with male sex organs, liable to castration by laryngectomy. In addition, the larynx acts as a fixator for the thorax enabling man to lift or hold heavy objects. The loss of the patient's ability to support heavy objects may represent a loss of sexuality (Locke, 1966).

Thus, the individual who undergoes laryngectomy suffers profound psychological and physical problems to his self-image. The new laryngectomee is suddenly deprived of voice, a function basic to the personality structure. The mastery of esophageal voice is of great importance in maintaining the health of the laryngectomee's psyche. A mechanical device can never

have the same psychological significance as the living organ in a newly developed function (Kallen, 1934). Mastery of a function, esophageal voice, becomes entirely identified with the personality.

There are several generalizations that psycho-dynamic problems contribute to inadequate esophageal voice development (Freud, 1943; Stoll, 1958; Snidecor, 1962; Barton and Hejna, 1963; Nahum and Golden, 1963; Bisi and Conley, 1965; Gardner, 1971; Klinger, 1971; Tait, 1959; Knox and Annenberg, 1975; Nelson et al, 1975; and Cantrell, 1974).

The psycho-dynamic factors:

- (1) fear,
- (2) anxiety,
- (3) depression and
- (4) motivation

are reviewed to determine their influence on acquisition of esophageal voice. These factors are selected for review based on

- (a) the frequency in which they are mentioned in the literature and
- (b) the increasing knowledge on the relationship between emotions and esophageal voice.

Fear

Pre-operative and post-operative fears are emphasized in the literature. Stoll mentions (1958)

- (a) fear of the word cancer,
- (b) fear of operations and
- (c) fear of permanent voice loss.

Pre-operatively, preoccupation of death is reported (Pitkin, 1953; Stoll, 1958; Silverberg, 1960; Nahum and Golden, 1963; Webb and Irving,

1964; Drummond, 1967; Bagsbaw, 1968; Kitzing and Toremaln, 1970; Goldberg, 1974; and Levin, 1975). There are many semantic implications involved in the word cancer: "It remains associated in the mind of most people with an incurable malignancy" (Silverberg, 1960). In a study by Kitzing and Toremaln (1969) designed to obtain information on patient's reactions; found fear of the word cancer was initially indicated as the most serious problem in 12 patients. The fear of cancer decreases as result of post-operative course without complications.

The most common post-operative fears include:

- (1) recurrence of cancer (Strother, 1945; Pitkin, 1953; Stoll, 1958; Nahum and Golden, 1963; Webb and Irving, 1964; Drummond, 1967; King, Marshall and Gunderson, 1971; and Goldberg, 1974).
- (2) Changing physiological relationships, such as inability to lift heavy objects, breathing and coughing from the tracheal stoma, impaired sense of smell and taste and cosmetic liabilities of the tracheal stoma (Stoll, 1958; Nahum and Golden, 1963; Webb and Irving, 1974; Sellars and Jarvis, 1976); and loss of physical attractiveness as well as changing body image and self-concept (Goldberg, 1974).
- (3) Fear of old age, aggravated by the fear of uselessness because of loss of speech (Stoll, 1958).
- (4) Fear of being unable to reestablish old patterns of interpersonal relationships and the fear of social isolation (Stoll, 1958; Nahum and Golden, 1963; Webb and Irving, 1964; Bagshaw, 1967; Drummond, 1967; Goldberg, 1974; and Levin, 1975).
- (5) Fear of economic loss (Stoll, 1958; Bagshaw, 1967; Drummond, 1967; and Levin, 1975).

- (6) Fear associated with being unable to learn a new method of speaking (Strother, 1945; Jesberg, 1954; Stoll, 1958; Nahum and Golden, 1963; Bisi and Conley, 1965; Bagshaw, 1967; Drummond, 1967; and Levin, 1975).

A patient's constant fear may cause him to become hopeless about the improvement of his condition. In turn he will accept the status of a chronic invalid; and this impairs rehabilitation (Strother, 1945). Investigators have assumed a relationship between emotions, such as fear, and esophageal voice quality (Faulkner, 1950; Greene, 1949b; and Levin, 1975). They report spasms of the esophagus can be increased and the lumen narrowed by such emotions as grief, fear, anxiety and apprehension, which hinder esophageal voice development. Conversely, the relaxation of the spasms and a widening of the lumen occur in such emotions as happiness, elation, contentment, security and enthusiasm; thereby relaxing the mechanism, and esophageal voice is achieved.

Statistical research points to a probable causal relationship between emotional states and esophageal voice development. Lindsay et al (1944) have analyzed the various stages of esophageal voice production with a fluoroscope, recorded by roegenogram. The action of the musculature of the cricopharyngeal junction shows a considerable variation among the patients' abilities to develop esophageal voice. They conclude that psychological factors do play a large part in mastery of esophageal voice. They suggest a roegenogram is of assistance in the early preparation and training of the patient for esophageal voice. Bentzen and Rasmussen (1976) used X-ray video tape to study the voices of 41 laryngectomees. They found three-fourths had good and one-fourth had poor voices. They conclude that a calm

patient would acquire a better voice than a patient who keeps his muscles tense. Apart from operative sequelae, the patient's age and psychological factors play an important role in development of esophageal voice.

The phenomenon of emotional blocking can interfere with development of esophageal speech and can interfere with the act of speaking in the accomplished speaker. Under emotional influences

- (1) The drying of nasal mucous membrane impedes clear effortless rapid swallowing or injection. Membranes shrink and swell, their dryness and moisture reflecting endocrine psychogenic changes (Moses, 1960),
- (2) Emotions influence faster and deeper respiration, explaining the marked expulsion of air from the stoma.

Frequently observed ineffectiveness or inability to accomplish the swallowing act that precedes esophageal speech could be related at least in part to breath-holding and pseudocroup, as emotionally induced asthma (Williams, 1971).

Anxiety

Investigators have observed specific patterns that occur in patients before and after laryngectomy (Silverberg, 1960; Nahum and Golden, 1963; and Barton, 1965). The most common reasons for anxiety are said to be associated with:

- (1) permanent aphonia (Stoll, 1958; Conley, 1959a),
- (2) change in interpersonal relationships, including job, security and friends (Stoll, 1958; King, Marshall, and Gunderson, 1971),
and
- (3) site of tumor (Szondi, 1952), and

(4) survival.

Drummond (1967) reports that among Australia's population of 11,000,000, 185 new cases of laryngeal cancer are seen each year. One hundred fifteen deaths occur of the 185 new cases. Two in three patients survive one year from the diagnosis, and one in three patients survives for four years. The death rate greatly diminishes after two years beyond the diagnosis. Williams and Beetham (1976) report the five year survival rate as high as 53%.

King, Marshall, and Gunderson (1971) state that the initial feelings of anxiety and despair may lead to the feelings of inadequacy, and even precipitate an attitude of hopelessness. For the clinician, then, there is concern that this anxiety may be carried over into the treatment process. In this regard, Williams (1971) warns that a patient's anxiety may interfere with the effectiveness of therapy. For example, a patient's anxieties may impair his ability to attend to all of the interrelated aspects of voice training. Williams (1971) reports that an important aspect of esophageal speech, such as "precise timing may elude" the patient. Di Bartolo (1971) investigated certain psychological, physical and sociological variables which might relate to attainment of esophageal voice. Ninety-four males responded to the Tennessee Self Concept Scale, IPAT anxiety scale questionnaire, and a standard personal interview, including a voice recording. He discovered that five variables self-concept, body concept, anxiety level, age at surgery, and defensive distortion of self-concept responses were significant in differentiating groups of non-esophageal, below average, average, and above average esophageal speakers. The variables of self-concept, body concept and anxiety were about three

times more influential than those of age of surgery and defensive distortion in identifying groups of speakers. Additional support for this statement is provided by (Locke, 1966; Snidecor, 1968; Keith et al, 1974; Sako et al, 1974). Di Bartolo (1971) concluded that the laryngectomee attempting to preserve his integrity, may lower his self-concept or body-concept, and may approach extremes in anxiety or set up a variety of psychological defenses. These processes may serve to impede or prevent development of esophageal voice.

Depression

There is extensive agreement that laryngectomy precipitates a reaction of depression in the laryngectomee. The depression appears directly connected with

- (a) The social and economic barriers imposed by total aphonia (McCall, 1943a). A questionnaire study by Locke (1966) found 63 of the 70 patients reported being extremely depressed, and one-third indicated that worries about holding their job was an important contributor to their depression.
- (b) Permanent disfigurement and physiological changes, including change in breathing patterns imposed by laryngectomy, lead to depression (MacGregor, 1953; Silverberg, 1960; Nahum and Golden, 1963; King, Marshall, and Gunderson, 1971).
- (c) Enforced aphonia leads to mental depression (Morrison, 1931; Kallen, 1934; Jackson, 1940; Morrison, 1941; Levin, 1952; Mooleenaar-Bijl, 1953; Nahum and Golden, 1963; Barton, 1965; Holden, 1965; King, Marshall, and Gunderson, 1971; Goldberg and Bigwood,

1975; and Sheridan, 1976). Kallen (1934) suggested that aphonia leads to depression and also low resistance which can cause a recurrence of the cancer which can otherwise remain latent.

The term "Depressive Illness" is a well defined syndrome; and is distinguished from a "feeling state." Synonyms include "depressive reaction," "reactive depression," "manic depression." A number of symptoms occur after laryngectomy:

- (1) Low mood in the post-operative course,
- (2) Fatigue due to strangeness of tracheal breathing and to loss of the Valsava maneuver,
- (3) Anorexia due to loss of olfactory sense,
- (4) Social withdrawal due to unesthetic nature of stoma and loss of voice, and
- (5) Hopelessness due to the magnitude of the adjustment.

Other symptoms which occur, but are not readily explainable after laryngectomy include insomnia, persisting disinterest, impaired concentration and indecisiveness (Murphy and Ogura, 1967).

The statistical data reveal that depression is associated with laryngectomy. Heaver et al (1955) in a questionnaire to 204 laryngectomees found the most frequent emotional reactions pre- and post-operatively were symptoms of pathologic depression: fright, anxiety, confusion, self-pity and fear of death, and insomnia. A reaction-formation was observed which resembled a euphoria. Following surgery the incidence of the semi-euphoric reactions almost doubled. Haase (1960) investigated the psychological aspects of 40 patients pre- and post-operatively. Twenty-one patients calmly accepted the necessity for complete laryngectomy; but 19 reacted

with depression, mainly because of anticipated aphonia. He found the most common psychopathic symptoms was increased affective irritability due to the deprivation of the cathartic function of speech.

Locke (1966) described the patient's reaction as ranging from "philosophical resignation" to "suicidal depression." A number of investigators point out that depression after laryngectomy may become so severe as to lead to suicide (Martin, 1963; Webb and Irving, 1964; Ranney, 1969). Depression accounts for nearly half of all suicides (Robins et al, 1959). Suicide appears to be an uncommon but definite complication of mental disturbance resulting from laryngectomy. Murphy and Ogura (1967) comment that when patients discovered the disappointment of voicelessness and poor prospect of acquiring a new voice, a number of them committed suicide in the early weeks after the operation. However, this is disputed by the early studies. In the 1930's, Orton (1938) reported 102 cases of laryngectomees without a single suicide. Schall (1938) reported a large series of 800 cases and there was only one suicide. This was not on account of loss of voice, but due to incurable recurrence. Schall quotes Jackson, "When going over the records I have found two cases in which the patient committed suicide." Neither of them had a laryngectomee, one was under treatment by radiation and the other 11 years after laryngofissure. Heaver et al (1955) in a series of 274 cases found only one patient attempted suicide. In later studies there is an increase of suicides. Webb and Irving (1964) in a series of 77 cases found three suicides and seven attempts. Barton (1965) in a series of 50 laryngectomees and 50 partial procedures (preserving the natural airway) found five of the laryngectomees committed suicide. The results of the earlier studies by Jackson, Orton, Schall and Heaver, et al

are in sharp contrast to the increase in suicides reported in later studies by Webb and Irving, and Barton. Barton (1965) questions whether the country's emotional climate and attitude toward society has changed through the years or this may simply be a unique experience in an atypical segment of society.

Despite this emphasis on suicide after laryngectomy others, such as Schall (1938) and King, Marshall, and Gunderson (1971) are in agreement that suicide is no more frequent than that which occurs following other disease conditions.

It is generally agreed that whether depression antedates or follows surgery it has a negative effect on the patient's rehabilitation (Pitkin, 1953; Murphy, Bisno, and Ogura, 1964; Bisi and Conley, 1965). Depression is accompanied by the abandonment of any effort to obtain training and use of the new voice (Freud, 1943; Bisi and Conley, 1965; Locke, 1966; Drummond, 1967; Murphy and Ogura, 1967; *Psychology of the Laryngectomee*, EENT Monthly). In only one study, in a series of 123 laryngectomees, Bagshaw (1967) found the greatest number of failures in developing voice due to depression, inability to accept the operation or voice, alcoholism, lack of concentration, failure to attend and shell shock. With such limited studies, depression has not been statistically shown to have a direct relationship in failure to develop esophageal voice.

During the time of the patient's depression, rehabilitation efforts may prove futile since the patient "may see no point in trying" (Murphy and Ogura, 1967). Perhaps the particular time that voice training is initiated may have some influence on the success/failure of the final voice attained. Oswald (1965), while recognizing the depressed emotional state of a

laryngectomee, believed that management at this stage has a great effect on the sound content on the new voice. He related his investigation of acoustic patterns of the normal laryngeal speech mechanism to esophageal speech. He found different patterns of sound energy for adjusted and depressed speakers.

Motivation

The term "motivation" is a broad behavioral term (Snidecor, 1962). Motivation is the observable result of a drive that is unobservable. There is a popular notion that acquisition of esophageal voice may not be directly related to morphological or physiological factors, but rather to such variables as the motivational and aspirational levels of the patient (Shames et al, 1963; Diedrich and Youngstrom, 1966). Gilchrist (1973) states, "In only a handful of patients is there a possibility of pathological cause for failure."

It is generally accepted that motivation is a vital factor in the acquisition of esophageal voice (Morrison and Fineman, 1936; Schall, 1938; Greene, 1947; Levin, 1961; Levin, 1962; Snidecor, 1962; Wintersteen, 1963; Dubin, 1964; Psychology of the Laryngectomee, EENT Monthly, 1967; Greene, 1967; Flower, 1968; Snidecor, 1969; Palmer, 1970, Edward, 1976).

Gilchrist (1973) studied 50 patients and found motivation the principal factor determining esophageal voice. Others claim that inadequate motivation is responsible for failure in acquiring esophageal voice (Weinstein, 1955; Smith et al, 1966; Levin, 1967; Zwitman and Disinger, 1975).

Objective measurements include those of Jesberg (1964). In a series of 111 cases 70 developed satisfactory voice; he concluded that the remain-

ing patients gave up easily or did not try. Hudson (1965), in a series of veterans found motivation was a significant (.01) factor in successful acquisition of esophageal speech. Gardner (1966), in questionnaires administered to 240 women, found motivation and self-discipline were two of the nine prerequisites mentioned for successful acquisition of esophageal voice. Smith et al (1966) rated 131 esophageal voices of laryngectomees and cited inadequate motivation for inability to develop esophageal voice in those who failed to develop voice.

Review of the literature leads one to believe that acquisition of esophageal speech is within the reach of anyone who needs it. The themes of "perseverance and practice" (Morrison and Fineman, 1936; Brighton and Boone, 1937; and Morrison, 1941), "necessity and willingness," (Levin, 1940; Levin, 1952), and being "willing to make the effort," (Gatewood and Tribble, 1945; Strother, 1945; Gatewood and Tribble, 1946; Jesberg, 1954; Moore, 1955; Stoll, 1958; and Gilchrist, 1973) are all the prerequisites needed to develop esophageal voice. Marvin (1963) believes "It is unrealistic and unfair to categorize those who fail to acquire esophageal voice as lacking interest, insight, or the necessary drive." There will always be some laryngectomees who regardless of their "perseverance and practice," and "willingness," and despite expert and extensive vocal rehabilitation, never attain functional esophageal voice (Hudson, 1967; Murphy and Ogura, 1967; and Winans et al, 1974).

Idiosyncratic Factors

For years clinicians have been observing the variance with which the laryngectomee acquires esophageal voice. The idiosyncratic personal factors:

- (1) Personality traits,
- (2) Home environment and
- (3) Attitude toward esophageal speech

are reviewed to determine their influence on acquisition of esophageal voice. These factors are selected for review based on the frequency that investigators cite them in their efforts to predict success in esophageal voice development.

Personality Traits

There is evidence that suggests a patient's pre-morbid traits may have negative effect on the development of esophageal speech. Webb and Irving (1964) studied the relationship of the personality to the type of illness to which a person is predisposed. He compared 77 laryngectomees, 200 normal Europeans, 43 institutionalized veterans and 33 emphysematous patients, by means of anamnestic, demographic and psychologic data. The majority of the laryngectomees manifest an oral triad of excessive speaking, drinking and smoking. Signs of instability and adjustmental difficulty were also observed. This was in marked contrast to the normal persons studied. Psychoanalytically, this indicates orality as a factor in the genesis of laryngeal carcinoma, particularly if coupled with a loquacious occupation. Sales workers, (a conglomerate group whose occupations involve frequent vocal communication) constitute the highest percentage of laryngectomees; compared to the U.S. population as a whole. Sales workers

are four times as numerous among laryngectomees (Webb and Irving, 1964). In contrast to earlier research by Greene (1949b) and Heaver et al (1955) said that only one-quarter of the laryngectomees were from occupations involving frequent use of voice.

Through Szondi profiles, Webb and Irving (1964) demonstrate certain amorous and aggressive needs, tendencies toward withdrawal and self-concealment, and a tendency to repress and internalize in the laryngectomee. They conclude, unequivocally, "the personal adjustmental difficulties of the laryngectomee render them atypical speech students." They propose a holistic approach to rehabilitation.

For years investigators have tried to predict the relative success or failure of esophageal speech; by assuming a relationship between the speaker's personality traits to the esophageal voice obtained (Kallen, 1934; Schall, 1938; Fontaine and Mitchell, 1960; Locke, 1966; Greene, 1967). As Delavan (1904) so aptly writes: "Patient's ability to adapt himself . . . would depend on the tolerance with which he will meet this loss."

The intent over-anxious individual jeopardizes his chances of success because of his inability to relax physically (Warner, 1971). The person with an introverted personality is someone who lives wholly within himself, self-centered, brooding, whose world revolves around himself. He faces any crisis with the greatest difficulty and has trouble making the mental readjustment necessary after laryngectomy. He finds it difficult to learn anything new (Schall, 1938; Stoll, 1958; Wallen, 1966; Pitkin and Toremaln, 1967; MacComb, 1972). He has not fully recovered from the psychic trauma incident to the diagnosis of cancer, the subsequent radical operation and hospitalization. Levin (1940), Mason (1950), LeJeune et al (1960), and

Levin (1975) state the introverted individual gives up the struggle easily and quits after a few days of instruction. Apparently he lacks the confidence and drive needed to maintain the morale during a protracted training period.

In a questionnaire study, Pitkin (1953) confirmed that the self-centered individual has the most difficulty developing esophageal voice. In a series of 65 laryngectomees, self-pity and resentment at their fate were obstacles to developing voice. He adds: "Some individuals are so maladjusted in their emotional make-up that they may never be able to make the adjustment required by laryngectomy." Agreement is also given by (Reed, 1958; Mitchell, 1960; Long, 1960; and Drummond, 1965).

In contrast, the extroverted personality makes rapid adjustment and voice training is easier. The extroverted personality type has an outlook to the future rather than the past and is involved in professional and social activities (Levin, 1940; Greene, 1947; Levin, 1952; LeJeune et al, 1960; Snidecor, 1962; Wintersteen, 1963; Locke, 1966; Levin, 1975).

Shames et al (1963) administered the EDWARDS PERSONAL PREFERENCE SCHEDULE and reports significant relationships for speech intelligibility and the factors of exhibition (attention seeking), aggression and achievement. In another study of 25 patients studied before and after surgery, Nahum and Golden (1963) concluded that certain characteristics are predictive of smoother post-operative course and more satisfactory rehabilitation. These include

- (1) Satisfactory medical and/or surgical experience in the past,
- (2) Prior history of good and pleasing relationship with physicians,
- (3) The ability to verbalize fears and problems, no inclination to

worry incessantly, to brood unnecessarily about his concerns or to try to keep problems inside of him,

- (4) Good relationships generally with other people,
- (5) Ability to adjust adequately to new stressful experiences,
- (6) Security in life situation including family and job so that loss of voice does not seriously disrupt relations with people or affect jobs, and
- (7) Strength of adaptability of personality structure.

They urge a pre-operative interview in order to anticipate and manage post-operative problems. Also, (Koepp-Baker, 1948; Fontaine and Mitchell, 1960; Rovnick and Sokolow, 1965; and MacComb, 1972) conduct a pre-operative interview. In reviewing 300 laryngectomees, Rovnick and Sokolow (1965), studied their ability to adjust and to learn to speak. They report about one-quarter had considerable ego strength, economic resources, family support, physical ability and courage. "They are stout people."

Investigators have made an effort to differentiate or profile the successful from the poor speaker. Koepp-Baker (1948) created three broad categories to demonstrate personal characteristics of the patient who acquires esophageal voice. Those who

- (1) Make rapid progress in developing esophageal voice are individuals who feel completely adjusted to their laryngectomy, feel not embarrassed about it and are willing to do whatever is necessary to learn to talk,
- (2) Those who are reluctant to make a genuine effort, Progress is slower, because they are embarrassed about their condition when meeting even their close friends, and are skeptical regarding

their vocal re-education.

(3) Those individuals who won't try.

Another classification system was devised by Bisi and Conley (1965).

Group I includes individuals who mastered esophageal speech and accepted it as a satisfactory means of communication. The emotional status of these individuals have been proven adequate for demands of adaptation imposed by the loss of the voice-producing organ. The interval of the time needed to adjust to the new circumstances is in direct proportion to the flexibility of their adaptive emotional pattern. They comprise about 70% of laryngectomees.

Group II includes individuals who accept the artificial larynx. Their emotional status may prove adequate or inadequate with respect to adaptation. They comprise 15% of all laryngectomees.

Group III includes persons who fail to acquire esophageal voice or speech and who reject the artificial larynx. They communicate by writing, making lip movements, whispers, and utilizing gross movements of the head, and neck. They comprise 15% of all laryngectomees.

Recent statistical efforts are inconclusive in differentiating "good" and "poor" speakers based on personality traits. Beamer (1954) administered the Minnesota Multi-phasic Personality Inventory to eight laryngectomees. He found most adjustment for vocational factors and for general mental health, and least adjustment for self-concept and general physical health.

One's ability to use speech after laryngectomy does not guarantee adjustment. Amster et al (1972) studied a series of 38 male veterans (20 laryngectomees, ten with surgery for non-laryngeal malignancy, and eight

without history of malignancy). An investigation of relationships between speech intelligibility and the variables of age, hearing, social adjustment, years of education, pre-surgical occupation, post-operative time, amount and frequency of speech therapy, intelligence, anxiety level, achievement motive, aspiration level and frustration tolerance was made. The subjects were restudied at the end of a three-year period. Low positive correlations were obtained for speech intelligibility of the laryngectomee and the variables of achievement motive anxiety level, months after surgery, years of education and verbal intelligence. It is stressed that no single correlation was of sufficient magnitude to be considered useful as a predictive index. Dabul and Lovstedt (1975), in questioning 30 laryngectomees, were unable to demonstrate personality differences between good and poor speakers.

There have been two studies that were successful in differentiating groups of speakers. Di Bartolo (1971), in a series of 94 male laryngectomees, studied five variables: self-concept, body concept, anxiety level, age at surgery, and defensive distortion of self-concept were significant in differentiating groups of non-esophageal, below average and above average esophageal speakers. They responded to the Tennessee Self Concept Scale, IPAT Anxiety Scale Questionnaire, a standardized personal interview and a voice recording. The results isolate those behavioral traits a candidate for psychotherapy might possess (See Appendix). "Attention to those laryngectomees whose defensive scores rise above those for the above-average speakers may be an interesting factor in the process of learning esophageal speech." Di Bartolo (1971) suggested that this classification system be used as a preliminary step to increase the probability of developing esophageal voice.

Snidecor (1975) has developed an inventory of physical and attitudinal operations which relate to esophageal speech. The questionnaire study items were developed from behavior patterns of effective speakers as observed by Hudson, Oswald, Snidecor, Diedrich et al. Snidecor provides a valuable description on a series of clients who rapidly achieved esophageal voice. "These individuals have been drivers of huge earth moving machines. They worked for months or even years in a variety of soil types without even the filtering action of a bandana or handkerchief." One man said, "I spit mud for 20 years." Almost without exception these men phonated during the first day of instruction. The following traits were noted in each physically strong, competitive, gusty, proud of their work and the wages they earn, ate large quantities of food, above average intelligence, but limited education: took directions willingly from clinician: age range 40 - 62 years. A semi-final questionnaire was devised. It contained 31 questions with three-way multiple choice questions in the order of never, usually and always. Four hundred laryngectomees completed this questionnaire and were rated for general effectiveness of esophageal speech on five point scale:

- (1) = Poor
- (2) = Fair
- (3) = Average
- (4) = Good
- (5) = Superior

Only those prognostic items with the positive correlation with the speech rating and ranging from .001 - .002 level of confidence were selected from the original questionnaire. The twelve prognostic power items are reported

as:

- (1) "Eats rapidly when at home in private,
- (2) Can swallow food in rather large chunks (steak),
- (3) Had a moderate retirement income, would work and spend the difference,
- (4) Can easily break wind when this will not bother others,
- (5) Age 62 and under,
- (6) Relations with family are active and at times scrappy,
- (7) Stomach growling in public doesn't bother them,
- (8) More talkative than most in a small group,
- (9) Does not fear or hate old age,
- (10) Welcomes new learning situations,
- (11) Is ego-centric or proud of self,
- (12) Drinks socially or not at all,"

Home Environment

According to researches; a patient's home environment may be a contributory factor in success/failure to develop esophageal speech. Success or failures in acquisition of speech may depend on the attitude of the spouse toward the patient (Gardner, 1961). Greene (1967) reported a patient who acquired reasonable esophageal voice in the hospital but whispered at home because his wife did not think "that sort of voice is nice." Levin (1975) reported that an attitude of indifference could result in less positive speech results. On the other hand, Damste (1975), cautioned that extravagant praise may be detrimental to voice development. The patients becoming overconfident results in a voice replete with misarticulations and stoma blasts. In a questionnaire study of 240 laryngectomee women Drummond (1967)

found 65% had depressing experiences at home, and 30% received little encouragement from relatives. The success ratio in esophageal voice development was not reported by Drummond (1967).

Diedrich (1966) observed "living alone" as one psychological factor for failure to develop esophageal voice. Sako et al (1974) reported on 80 patients who underwent laryngectomy in continuity with radical neck dissection. Forty-eight (60%) patients were able to develop esophageal voice. Nineteen patients (22.4%) did not learn or had no desire to learn speech. They concluded that lack of motivation, lack of practice, and living alone were important factors in failure to develop esophageal speech. Seemingly, the person who lives alone has very little verbal stimulation; self-imposed isolation reduces speaking opportunity.

In contrast, living within a family unit provides social contact for the patient following surgery and provides encouragement and inspiration during early rehabilitation (Moore, 1955; Tait, 1959; Horn, 1962; Shames et al, 1963; Wallen, 1966; Tait and Tait, 1969; and Owlett, 1975). McCall (1943b) has said that "if the patient segregates himself from family and friends, he is more likely to keep from practicing than if someone is around." In a series of 20 laryngectomees, Amster et al (1972) through questionnaire evaluated the variable, months after surgery, and its relationship to speech intelligibility and social adjustment. It was found that the supportive attitudes of family members, and duration and quality of relationships with physicians and paramedical personnel following surgery were responsible in part for high level of social adjustment.

It is important that the speech pathologist establish contact with the patient and enlist the sympathy and cooperation of the family to avoid

reactions which might discourage esophageal voice training (McCall, 1943b; Tait and Tait, 1969).

Attitude Toward Esophageal Speech

The laryngectomee's evaluation or mis-evaluation of society's attitude toward his esophageal voice is responsible for reduced motivation to learn esophageal voice (Anderson, 1951; Hyman, 1953; Amster et al, 1955; Stoll, 1958; Wintersteen, 1963; Knox and Annenberg, 1975). Common negative responses or attitudes toward esophageal speech from society are:

- (a) poor intelligibility, associated with belching (Stoll, 1958),
- (b) people do not give speaker "a chance to speak," either by supplying words or by making believe they understand when they do not (Gilmore, 1961),
- (c) responses of fear of being contagious; concern about imagined pain of using esophageal voice; and
- (d) assumption that the speaker is mentally retarded or deaf (Gilmore, 1961).

The laryngectomee's perception of society's attitude and responses towards his esophageal speech may influence his rehabilitation (Barton and Hefna, 1963; Drummond, 1965; Rovnick and Sokolow, 1965; Klinger and Martin, 1971; and Warner, 1971). A cycle is recognized (Stoll, 1958): If the patient feels his speech is not being accepted by society, he will reduce number of speaking contacts. If he reduced number of speaking contacts, he will not have enough practice to achieve intelligible speech. If he does not achieve more intelligible speech, society will not accept him. In an unpublished study discussed by Stoll (1958), it was reported that society's attitude and acceptance of esophageal speech correlates significantly with

objective measurements of intelligible esophageal speech. For this reason, Stoll (1958) and Gilmore (1961) require counseling sessions, so the patient may express feelings regarding unfavorable experiences and to learn how to correct misconceptions of his auditor.

A laryngectomee's negative reactions to esophageal voice may be due to his/her being told the production of voice is based on physiological principle of "belching." Early investigators used "belch" in description of esophageal voice process. Stetson (1937) writes, "The subject gulps a large amount of air . . . and speaks his phrase on the long, hasty-belching breath." Levin (1962) concedes that women "need help in overcoming early training in being a lady in order to master the method of eructating sound which sounds like a belch, certainly unacceptable in most social situations." Levin admits that women have a more difficult time adjusting to the new sound than men. Gilchrist (1973), in agreement, presents two females who never attained voice, rejecting it as "unfeminine." Bisi and Conley (1965) and Tait and Tait (1969) report that the laryngectomee who cannot produce esophageal voice typically have negative reactions to the tracheal stoma, mucous crusting and coughing.

There is a relationship between pre-morbid verbal attitudes and final voice obtained. In discussion of his unpublished study, Stoll (1958) reports a significant relationship to esophageal speech intelligibility in those laryngectomees who

- (a) Scored highest on a test measuring healthiness of speech attitudes, and
- (b) The degree of pre-morbid verbal expressions motivated the laryngectomee to learn more-refined esophageal speech patterns to continue his verbal behavior pattern.

This is consistent with Knower's (1938) hypothesis "in the learning of any speech pattern, a favorable attitude or set toward speech indicates a pre-disposition to speak and reflects an interest which should broaden experiences through which learning may take place." The favorable attitude itself facilitates learning.

There is evidence that a laryngectomee's line of acceptance may vary in different situations, such as social, sexual and vocational spheres, and telephone use (Horn, 1962; and Shames et al, 1963). The most common example of situational acceptance of esophageal voice is the esophageal speaker's use of the telephone. Horn (1962) reports that while 64% of persons surveyed used esophageal voice, only 34% routinely spoke over the telephone. Another example is provided by Drummond (1967) in a series of 30 laryngectomees. Four laryngectomees acquired esophageal voice rapidly and fluently in clinical situations but did not use it socially except under stress. Two interesting cases:

- (a) A successful, well-educated man admitted rejection of a good esophageal voice for an intelligible buccal whisper, which he claimed socially was the result of an old war injury.
- (b) A middle-aged German migrant who developed excellent esophageal voice refused to use it socially, claiming it set him apart as "an object of self-pity in his social circle."

Social Factors

In a society in which the individual survives economically and socially largely because of his capacity to communicate on a vocal level, results of laryngectomy are disastrous. The social factors:

- (1) Employment
- (2) Type of employment
- (3) Early or late return to work
- (4) Age

are reviewed to determine their influence on acquisition of esophageal voice.

Employment

The laryngectomy may prevent return to work because of loss of natural speech (Guttman, 1935; Gatewood and Tribble, 1943; Gatewood and Tribble, 1945; Howie, 1947; Levin, 1956; Struben, 1963; Barton, 1965; King, Fowlks and Peirson, 1968; and Warner, 1971). Heaver et al (1955) reports "these new situations present a sharp reduction of income, ego satisfaction and level of prestige."

Results of survey studies coincide that re-employment is dependent on the laryngectomy's communication ability. The majority of studies conducted on large populations report re-employment figures between 50 - 80% (Greene, 1949; Pitkin, 1953; Gardner, 1964; DeBeule and Damste, 1972; Gilchrist, 1973; Sako et al, 1974; Goldberg and Bigwood, 1975). However, the re-employment figure of 27% is incompatible with results from a VA sample population (King, Fowlks, Peirson, 1968). All of the laryngectomees had some form of pensions or compensation. Half of the laryngectomees who used esophageal voice had some form of employment, while none of those without voice were employed. The statement of Goldberg and Bigwood (1975) that there is a positive relationship between "previous employment and employment after laryngectomy corroborates other studies of chronic disability."

A high proportion of data state that the desire to return to work is

one of the strongest motivation forces for developing esophageal voice (Morrison, 1931; Morrison, 1941; Schall, 1954; Gardner, 1961; Gardner, 1964; Gardner, 1966; Wallen, 1966; Murphy and Ogura, 1967; Tait and Tait, 1969; Fisher and Longman, 1970; and Levin, 1975). Statistical studies support the theory that speech development and employment are significantly associated. In a series of 26 laryngectomees, 15 developed esophageal voice. Mason (1950) concluded that the stimulus of having to "hold their own among their fellows exercised an invaluable effect" and they made rapid progress in a short time. Smith et al (1966), in rating 131 laryngectomees on the Wepman Scale, found two factors, young age and high socio-economic status, differentiated good from poor speakers. In studying 255 laryngectomee women on more than 10,000 questions, Wallen (1966) concluded that return to work was associated significantly with patient's ability to regain speech. Functional speech was regained by 84% of all patients who returned to work, 66% of those who did not return to work; by 90% of the married women who returned to work and 73% of the single women who returned to work.

In a study of Goldberg and Bigwood (1975), 130 laryngectomees were questioned on 26 measures of vocational adjustment. They report

- (a) re-motivation,
- (b) realism, and
- (c) rehabilitation outlook

correlated significantly with presence of speech. They defined "re-motivation" as "desire of the person to resume prospective employment in conformity with realistic capacities and limitations." They defined rehabilitation outlook as "A person's optimism or pessimism about the future and his chance of making an adequate adjustment to his limitation caused by cancer,

as well as previous vocational plans, highest educational grade, education plans and acquisition of speech." Therefore, the laryngectomee with greater motivation to return to work, with greater realistic assessment of his disability, and with greater optimism about the future makes a better candidate for acquisition of speech.

Type of Employment

Wallen (1966) reports that the individual who is highly intelligent and whose occupation is on a higher social or economic plane is more handicapped than the man who works with his hands. Greene (1947) reports that a patient on a higher social or economic level is frequently more sensitive and anxious following laryngectomy than the day laborer, as he has suffered greater ego deflation.

In a study with 15 laryngectomee patients, Hoople and Brewer (1954) studied voice production by utilizing kymographic and tape recordings of the phonatory apparatus. There was a definite difference in the mechanics by which air was locked in the esophagus by highly intelligible speakers as compared to low intelligible speakers. Of particular relevance is that employment acts as a motivator for acquisition of esophageal voice. There is the suggestion that certain socio-economic factors are correlated with the final speech result. Yet there is still a paucity of data to show that laryngectomees on higher socio-economic levels develop better voices. The return to work in itself has been statistically proven as a determining factor in developing esophageal voice. They found the highly intelligible speakers were

- (a) better educated,
- (b) had demanding economic commitments,

(c) had normal hearing and

(d) had natural ability to imitate;

spoke earlier after laryngectomy. Nemeč and Vrticka (1962 in Prague investigated effectiveness of esophageal speech in relation to age, social adequacy, intellectual capacity, and eroticism. Significant correlations are reported between effective speech, age, and intellectual capacity. It was concluded that socialization and return to former employment were very important to a laryngectomee, and that neurotic trouble does not adversely affect voice development. In 85 patients who underwent laryngectomy in continuity with radical neck dissection, Sako et al (1974) report both white- and blue-collar workers were successful in acquiring speech. The women who did not work outside the home did poorly.

Early or Late Return to Work

The laryngectomee needs to resume a fully active social and working life if it is possible, in order to make quicker readjustment to his condition (Gordon, 1971) without any sense of being handicapped (Tait, 1971). Kitzing (1953), in a questionnaire study reported that his patients returned to work before mastering esophageal voice: Some as early as two weeks after the operation and others within the first three months. Murphy and Ogura (1967) encourage early return to work, as soon as the patient is physically recovered and even before esophageal speech is mastered. On the other hand, Gardner (1961) does not believe a laryngectomee should return to work until fluent esophageal speech has been mastered. The reason being that he may develop bad habits in his struggle to be understood. In turn, the fellow employees might reject such speech and the laryngectomee may refrain, become discouraged, and resort to writing or whispering. However, there

have been no statistical measures that correlate early or late return to work with esophageal speech proficiency.

Age

There are conflicting data regarding the extent to which age influences esophageal voice development. Many researchers have been unable to isolate poor from good esophageal speakers on the basis of age. Wolfe et al (1971) comment that "Success or failure . . . seemed to be independent of age." Gilchrist (1973) agreed, "There is no evidence . . . that age plays a great part in the degree of vocal rehabilitation." The average age for his good and poor speakers was the same. Additional data are found in the publications of Berlin, 1964; Hunt, 1964; Diedrich and Youngstrom, 1966. Wolfe et al (1971) by using fluroscope evaluated the distal esophageal sphincter in 13 laryngectomees. He concluded success or failure in developing esophageal speech is independent of age, socio-economic status, type of operation and length of speech therapy.

The influence of age has been shown to be a determining factor in esophageal voice development according to Sako et al (1974) and Winans et al (1974). In a VA study, King, Fowlks and Peirson (1968) report their youngest group developed significantly better esophageal voice. Of 12 patients over 70 years of age, only one achieved esophageal voice. Other clinicians agree that the elderly patient is less motivated (Levin, 1940; Warner, 1971; MacComb, 1972; Glasgold and Zullo, 1973; and Goode, 1975).

The relationship between age and work to esophageal voice development has been discussed. Functional esophageal speakers are significantly younger and employed (Di Bartolo, 197; and Simpson et al, 1972). Smith et al (1966) stresses young age and high socio-economic status are major

factors in developing esophageal voice. Dabul and Lovestedt (1974) conclude that good speakers are younger as a group than poor speakers. The older and poorer speakers elect retirement more often. In the survey by Sako et al (1974), of 85 laryngectomees, the retired group did not achieve esophageal voice. In a questionnaire study of 130 laryngectomees, younger patients tended to return to occupations requiring speech (Zwitman and Disinger, 1975).

Therapeutic Factors

The following factors pertain to the immediate post-operative course of the laryngectomee's rehabilitation:

- (1) Pre-operative Training
- (2) Pre-operative Visitation by Esophageal Speaker
- (3) Pre-operative Visitation by Laryngectomee
- (4) Post-operative Visitation by Esophageal Speaker
- (5) Speech Pathologist versus a Lay Laryngectomee in Voice Training
- (6) Speech Pathologist with Supportive Assistance from Laryngectomee in Voice Training
- (7) Early/Late Speech Therapy Intervention
- (8) Group versus Individual Voice Training
- (9) Esophageal Voice Technique Used
- (10) Facilitory Voice Techniques
- (11) Participation in Laryngectomee Associations

Pre-operative Training

Pre-operative training of voice may influence the success or failure in developing esophageal voice. A number of researchers claim that pre-operative training leads to a greatly increased number of successful

post-operative esophageal speakers (McCall, 1943a; McCall and Stover, 1944; Strother, 1945; Gatewood and Tribble, 1946; Howie, 1947; Mason, 1950; Gardner, 1961; Martin, 1963; Clifford and Gregg, 1964; Holden, 1965; and Gordon, 1971). The theory behind pre-operative voice training is that the patient will develop voluntary control over the cricopharyngeus and it will be easier to master air intake before laryngectomy rather than after. Pre-operative training shortens the post-operative training period for development of voice. According to Gordon (1971), the benefit of pre-operative training is twofold:

- (1) It reduces unnecessary muscle tension which could interfere with learning a new skill, and
- (2) It calms and occupies a nervous patient.

McCall (1943a) believes that the laryngectomee meets greater difficulty in learning air intake post-operatively.

Strother (1945), Bangs et al (1946), Howie (1946), Howie (1947), Mukerji (1953), and Gordon (1971) report that the program should be initiated seven to ten days before surgery. Furthermore, they agree that time needed to master the esophageal sound production technique is short; a brief surgical postponement does not jeopardize the patient's survival. This is contrary to Nahum's (1950) statement that, "While patient should receive his first lesson pre-operatively, it is not always practical since once cancer is diagnosed removal is urgent."

Pitkin (1953) proposes a preliminary training program to include

- (a) explanation of esophageal voice production for the patient, and
- (b) practice in producing esophageal voice sound,

McCall (1943a)

- (a) Establishes a correct breathing pattern to prevent faults which

sometime detract from esophageal voice (excessive exhalation noise at the tracheous stoma caused by forced breathing).

McCall (1943) and Gardner (1961) agree that it is easier pre-operatively for the patient to isolate the action of breathing.

- (b) Diaphragmatic breathing is practiced with relaxation of the shoulders, neck and upper thorax. The patient is taught to make short noiseless inhalations and slow controlled exhalations. This method of breathing becomes habitual and the patient benefits post-operatively from the increased negative pressure on the esophagus on inspiration.
- (c) Injection of the air into the esophagus and expulsion of voice is practiced casually at the pre-operative stage.
- (d) Therapy is resumed after operation (McCall, 1943a).

There is only one statistical study available by McCall (1943b) to illustrate the value of preliminary voice training. A series of 32 laryngectomees, 19 had no pre-operative training. Of the 19 only three acquired esophageal voice after operation. Of the 13 patients who had pre-operative training, all developed ability to speak well enough to be understood over the telephone.

There are investigators who state that pre-operative training is contra-indicated to final voice. Colledge (1943), Jesberg (1954), and Martin (1963) claim that, for psychological reasons, esophageal voice is developed easier after laryngectomy. Seeman (1967) believes the unfamiliar sound of esophageal phonation depresses the patient and causes neurosis. In a questionnaire study of 65 laryngectomees, Pitkin (1953) reports 87% had not been given voice training before operation. Of those who received

'some' pre-operative training, only five felt that this was adequate. Robe et al (1956) report only one subject in their group received pre-operative training; but did not state the final speech results.

Pre-operative Visitation of Speech Pathologist

Many investigators recommend a pre-operative visitation (separate from voice training) to establish the speech program, and assist the patient in making personal and social adjustments to the laryngectomy procedure. The visitation should include a discussion on speech production, personal hygiene, and breathing through the trachea (Koepp-Baker, 1948; Rickenberg, 1953; Wallen, 1966; Bagshaw, 1967; King, Marshall and Gunderson, 1971; Warner, 1971; and Owlett, 1975). Pamphlets or bibliographical material, such as Self-Help for the Laryngectomee, How to Speak Again--A Manual With a Recording for Laryngectomees, are recommended by West et al (1957), Reifer and Erwin (1958). Both bibliographical material and use of films have been recommended pre-operatively (King, Marshall and Gunderson, 1971). The film NEW VOICES is shown by Gardner (1955) and Berry and Eisenson (1956). Gardner (1961) also recommends the film YOU CAN TALK AGAIN. These films are available through the American Cancer Society. The films portray a patient's recovery after surgery, his enthusiasm for speaking and his return to business. The films answer questions that may come to the mind of the patient.

Only one available study has dealt with the effectiveness of films in the patient's overall adjustment. Pitkin (1953), reported a series of 65 laryngectomees, approximately half had seen NEW VOICES. The reactions of those who saw the film were mixed. The majority felt it was helpful but there were numerous patients who felt it discouraged rather than encouraged

them. A few were indifferent in their reaction.

The relationship of pre-operative visitation by the speech pathologist and use of bibliographical and film resources to final voice obtained has not been studied.

Pre-operative Visitation by Esophageal Speakers

Pre-operative visitations by an esophageal speaker to the laryngectomee patient are supported by (Gatewood and Tribble, 1943; McCall, 1943b; Equen, 1956; Letton and Wilson, 1960; Heaver et al, 1962; Martin, 1963; Clifford and Gregg, 1964; Holden, 1965; Sykes, 1966; Wallen, 1966; Bagshaw, 1967; Seeman, 1967; and Tait, 1971).

The esophageal speaker who does the visitation should possess certain traits (Equen, 1956; and Wallen, 1966):

- (a) Good mental outlook toward himself and others
- (b) Sufficient intelligence
- (c) Insight
- (d) Sophistication to handle himself during the visit and not inadvertently traumatize the patient, and
- (e) Have mastery of esophageal voice and be a good speech model.

Gardner (1961) and Warner (1971) states the esophageal speaker's voice should include good quality, fluent speech and rhythm. If such a speaker is not available, the visitation should be cancelled; as a poor speaker can alarm and depress the patient. Fontaine and Mitchell (1960), Hunt (1964) and Locke (1966) stress the importance that the visitor be within the same educational and vocational level as the patient.

The statistical work in the area of pre-operative visitation by an esophageal speaker demonstrates favorable relationship with esophageal voice

development. In a questionnaire study of 65 laryngectomees, one of the principal factors in building patients' morale pre- and post-operatively is a visitation with an esophageal speaker. However, 18 patients, nearly a third of the entire group, reported they did not have a visitation in the hospital. Those who did receive a visit in the hospital had various reactions. Six patients were discouraged because of the visitor's voice quality (Pitkin, 1953).

Heaver et al (1955), in surveying 274 laryngectomees, report that patients react more favorably and are more reassured by an esophageal speaker's visitation than by the speech pathologist who has not had a laryngectomy. In relation to the final voice attained, Johnson (1960), in a survey of 209 patients, found that an important factor in esophageal voice development was pre-operative visitation to the patient by an esophageal speaker. Forty-eight percent of those who became esophageal speakers were visited, none of the non-speakers were visited pre-operatively.

Hollinger et al (1957), Barton (1965), Lauder (1965), Klinger and Martin (1971), Warner (1971), and Owlett (1975) believe that pre-operative visitation by an esophageal speaker is a contraindication to the voice development. They theorize the visit may cause psychological damage and no real gain is made. Furthermore, it is unadvisable to expose a patient who is depressed and confused to someone whose voice is aesthetically poor. There are no objective data to support the claim that pre-operative esophageal speakers' visitations to prospective laryngectomees is detrimental to voice development.

Post-Operative Visitation by Esophageal Speakers

Post-operative visitations by esophageal speakers to new laryngectomies is favored by (Stetson, 1937; Moolenaar-Bijl, 1953; Stoll, 1958; Barton, 1965; Hudson, 1967; Murphy and Ogura, 1967; and Owlett, 1975). There are no statistical data available on the efficacy of the post-operative visitation in relation to final voice obtained.

Speech Pathologist Versus Lay Laryngectomee in Voice Training

One of two individuals has traditionally assumed responsibility for voice training:

- (1) A person who has suffered from cancer of the larynx and has developed esophageal speech, or
- (2) A trained speech-language pathologist.

Speech Pathologist

There are those who believe the trained speech-language pathologist should be assigned the task of esophageal voice training (Ormerod, 1954; Moses, 1958; Murphy and Ogura, 1967; Ranney, 1969; and Tait, 1971). Koepf-Baker (1948) lists the merits of the speech pathologist in providing voice training to the new laryngectomee.

- (a) The speech-language pathologist approaches the task of reeducation with the full possession of the knowledge and procedures,
- (b) Understands the physiological details of the new speech processes and the psychological processes that underlie all learning and relearning, and
- (c) Knows how to motivate the learner and is able to hasten the process of developing skills through ways that are impossible for

the patient to do for himself.

Lay Laryngectomee

The lay laryngectomee has tended to dismiss the role of the speech-language pathologist in esophageal voice training because "he has never lived through it." Essentially, the lay laryngectomee feels the individual does not have a speech defect and simply needs a new way to produce sound. Clarke and Hoops (1973) and Hoops et al (1975) feel that this is an unfortunate attitude because it ignores the complicated nature of the problem and assumes that any individual can make adequate adjustment after surgery.

There are those who believe the lay laryngectomee should be assigned the task of esophageal voice training (Stetson, 1937; Bateman, 1953; Hunt, 1964; Johannessen and Foy, 1964). A lay laryngectomee provided esophageal voice training at the Los Angeles Eye and Ear Hospital as was reported by Jesberg (1964). Today, in 1980, a lay laryngectomee is responsible for esophageal voice training in the Hollywood Presbyterian Medical Center (Tekla Tibbs, personal communication) in Los Angeles. Clarke and Hoops (1973) and Hoops et al (1975) list the attributes of the lay laryngectomee:

- (a) Common advantage of the problem
- (b) Constant reminder to the patient as to what can be accomplished
- (c) Reassurance from experience about general health or progress
- (d) Demonstration of esophageal speech with great competence, and
- (e) Most importantly, an excellent figure for the new laryngectomee to use for strong, positive identification.

In opposition, Martin (1963) believes that the greatest inefficiency of present day facilities is "where the effort is directed solely by

esophageal voice teachers." "It would be contrary to human nature for him to provide a mechanical aid even if only temporary." In this regard, Hoops and Clarke (1973) and Hoops et al (1975) confirm that an untrained person should not attempt to deal with speech disorders of any kind.

"Having had a laryngectomy is not the only criterion for qualification for being a teacher of esophageal speech, such as to treat a condition of aphasia, one must be aphasic." The literature does not mention if there are legal implications of a lay laryngectomee providing speech therapy; without the proper academic and training qualifications. What is more the aspect of licensure is not considered in the literature.

Speech Pathologist With Supportive Assistance from Lay Laryngectomees

There is general agreement that voice training should be undertaken by the speech pathologist, with proper academic background, and with supportive assistance from a lay laryngectomee who has excellent esophageal speech skills (Morrison, 1931; Levin, 1952; Ormerod, 1954; Schall, 1954; Gardner, 1955; Fontaine and Mitchell, 1960; Gardner, 1961; Wintersteen, 1963; Hunt, 1964; Webb and Irving, 1964; Lauder, 1965; Sykes, 1966; Wallen, 1966; Drummond, 1967; Ranney, 1969; Clarke and Hoops, 1973; Hoops et al, 1975).

Lauder (1965) sent a form letter to 88 lay laryngectomees, speech-language pathologists and physicians who possessed particular comprehension and training in post-laryngectomy rehabilitation. They were asked for their opinions as to who provides more effective esophageal training, the lay laryngectomee or the "normal speech pathologist." Of the total 56 respondents, fewer than half (26) favored the team approach in the instruction of the new laryngectomee. Thirteen speech pathologists were specific

in recommending lay laryngectomees be used only in an adjunctive capacity. Sixteen respondents believed post-laryngectomy voice instruction depends on the instructor's training and background, regardless of whether or not he is a laryngectomee. Seven respondents claimed only normal 'speech pathologist' should train. Three favored utilization of lay laryngectomees only. Four speech pathologists surveyed had no experience in esophageal voice training and did not offer any opinions.

The case of Edmund Lauder, himself, is of interest. He underwent a laryngectomy while in the Air Force in 1962. He received therapy from two lay laryngectomees, which was unsuccessful. He was later seen by a speech pathologist at Walter Reed Army General Hospital, in Washington D.C.; and was successful in developing esophageal voice. Finally, he underwent proper academic and training in the area of speech-language pathology. He became certified by the American Speech and Hearing Association as a speech pathologist. He now specializes in esophageal voice training.

There is one unpublished study (Miller, 1974) which was designed to differentiate speech proficiency in laryngectomees taught by lay laryngectomees and those trained by speech pathologists. In a series of 30 laryngectomees, there was no significant difference in the rated proficiency or psycho-social attitudes between speakers of the two groups. It was concluded:

- (1) Speaker proficiency was not influenced by profession of instructor who implemented the training program
- (2) Amount of time since the subject's surgery was positively related to speech proficiency, regardless of profession of instructor
- (3) Most subjects taught by lay laryngectomees remained in training longer than those taught by speech pathologists

- (4) There was absolutely no difference in speech proficiency between speakers of the two groups.

Early/Late Speech Therapy Intervention

Early intervention of voice training is essential to the development of final voice obtained, according to (Jackson and Jackson, 1942; Freud, 1948; Moolenaar-Bijl, 1953; Jesberg, 1954; Lueders, 1956; Reed, 1961; and Sheridan, 1976). The effect of delay in initiating voice training may cause psychological problems, development of bad habits (buccal, whispering) and failure to develop voice (Gatewood and Tribble, 1944; Moolenaar-Bijl, 1953a; Lueders, 1956; and Lerman, 1966).

It has been mentioned that speechlessness leads to depression. Enforced silence may cause building of resentments and frustrations that tend to make the patient uncooperative in therapy (Lueders, 1956). Investigators have observed acute depression periods varying between three to ten days post-operatively (Schall, 1938; Pitkin, 1953; Hunt, 1964; Locke, 1966; Sellars and Jarvis, 1976); and between four weeks to six months (Pitkin, 1953; and Locke, 1966). Gilchrist (1973) observed in 50 patients, depression persisting from six to 12 months. Nine of his patients described it as severe lasting up to 12 months. Of relevance are the findings of Locke (1966). In a series of 200 laryngectomees, the length of depression was inversely related to the learning of esophageal speech and returning to work. Sellars and Jarvis (1976) in a series of 147 laryngectomees found height of depression persisted until the removal of the feeding tube and the beginning of speech therapy on the ninth to tenth day following surgery.

The effect of early voice training appears to have a positive influence on development of esophageal voice. There are two encouraging

objective studies. Moolenaar-Bijl (1953b) reports initiating therapy immediately after removal of the feeding tube. Of 35 patients he operated upon, 30 obtained reasonably good voice. In the study reported by Godfrey and Bagshaw (1962), 123 laryngectomees received voice training at various times post-operatively. The researchers concluded that early institution of therapy after laryngectomy results in acquisition of voice without complications.

Group Versus Individual Voice Training

Few investigators have dealt with the effect of group versus individual instruction. Of those who have, a combination of group and individual lessons is recommended. Group therapy embodies psychological as well as re-educational measures (Pitkin, 1953; and Jesberg, 1954). Robe et al (1956), in a series of 32 cases, found the average number of speech lessons for the patient who developed fluent esophageal speech was class=9, individual=7, and a combination of class/individual=8. Jesberg (1954) recommends a group session followed by individual sessions. Bagshaw (1967), in a study of 123 laryngectomees, found that the best results were obtained by initially providing individual therapy. Then, when voice is established, small group sessions should be continued.

Esophageal Voice Techniques Used by Speaker

The selected technique used by a speaker may influence the success or failure of esophageal voice development. In order to produce voice using anatomical structures other than the larynx, two elements are required:

- (1) Some closely approximated tissues to serve as substitute vocal cords, and
- (2) Moving column of air to set these tissues in vibration.

The vibrating air is then molded with the lips, teeth, tongue and palate to produce voiced speech sounds. Once sound is produced, the patient must coordinate the sound with articulation.

There are at least three common techniques for producing esophageal voice. In the earlier years, Seeman (1924) referred to the technique as "aspiration of air." Later, Owlett (1975) referred to the technique as the "suction method." However, this technique is commonly known as the inhalation method; fully described by Hodson and Oswald (1965) as well as by Seeman (1958), Fisher and Longman (1970); Warner (1971), and Damste (1975).

In using the inhaling method, the patient takes a breath, and the chest expands to draw air into the lungs through the tracheal stoma. This increases negative pressure in the esophagus. Simultaneously, the esophageal sphincter should relax so that air is drawn in through the mouth or nose and into the esophagus. The vibrating air is molded with the articulators to produce voiced-speech sounds.

The second technique is commonly known as the injection method, described by Gardner (1962), Gordon (1971), and Owlett (1975). In using the injection method, the patient traps air in the mouth and forces it downward into the pharyngeal-esophageal area, where it is immediately returned as vibration. The vibrating air is molded with the lips, mouth, teeth and tongue, and palate to produce voice and speech sounds.

Fisher and Longman (1970) report three specific techniques for injecting air into the esophagus:

- (1) Lip press: Pressing air into the esophagus by "taking a mouth full of air" and closing the lips,

- (2) Lingual press: Forcing air into the esophagus by the backward motion of the tongue against the palate, or
- (3) Pharyngeal press: Pushing the tongue back against the pharyngeal wall.

The third technique is known as the plosive injection method of tongue-locking. This technique was originally advocated by Moolenaar-Bijl (1951; 1952), and Damste (1958). Later, the technique was described by Fisher and Longman (1970), Warner (1971), and Owlett (1975). The technique relies on air pressure exerted by production of the sounds /p,t,k/ causing a vibration in the cricopharyngeus sphincter muscles. This sound can be carried into the mouth and articulated into speech. In an experiment, Moolenaar-Bijl (1951) concluded that voiced sounds /b,d,g/ need more esophageal air as well as more thoracic pressure than unvoiced sounds. In contrast, explosive consonants /p,t,k/ function as aspirations of new air into the esophagus (they do not need esophageal air). In particular, Moolenaar-Bijl (1951) indicated that the /t/ sound gives excellent control of voice and articulation, leading to fluency and clarity. Owlett (1975) found initial sounds which use the back of the tongue, such as /k,g/, commonly lead to the build up of oral tension are best avoided.

Investigators have found differences between good and poor speakers based on the technique used to produce voice. Fisher and Longman (1970) report that the best speakers are those who use the inhalation technique because it is the least noticeable. The majority of investigators agree that the best esophageal speakers are those who use a combination of the initial major inflation followed by a series of small consonant-like re-inflations to maintain a smooth flow of speech (Berlin, 1963). These

investigators point out that the most effective speakers initially learn to produce voice through inhalation, and then gradually proceed to use of injection (Stetson, 1937; Moolenaar-Bijl, 1952; Damste, 1958; and Moolenaar-Bijl, 1958).

Facilitory Voice Techniques

There have been four facilitory techniques described in the literature to aid the patient in establishing initial sound production.

Mukerji (1953) and Rickenberg (1953) suggest the use of carbonated fluid sips to initiate voice production. Rickenberg does caution however, that carbonation can cause organic complications, such as abdominal distress and flatulence.

Gatewood and Tribble (1945) suggest use of a catheter to help the patient get air into their esophagus. When the inhalation method has failed for a patient, Damste (1975) inserts a catheter via the nose into the uppermost part of the esophagus. He does not specify which individual (speech pathologist or physician) should assume responsibility for this task. This maneuver succeeds in drawing air into the esophagus during inhalation. The catheter is connected to a balloon so that enough air can be blown gently into the esophagus to allow the patient to make some sounds. This trick serves to allow the patient to get the feeling of air passing through the (mouth of the esophagus) so that he can learn to control muscle tension. A lateral radiograph is advised before using this special technique.

Gardner (1962) uses the "whistle technique." One of his patients had observed that the manner of using impounded air to blow a whistle is similar to what he did when he trapped air for esophageal speech. The

theory is that the whistle is helpful in initiating impounded air and moving it into the pharyngeal-esophageal area. The speech pathologist uses a small plastic curved tube with a larger cavity for the plastic ball to interrupt the flowing air. The slit-like opening is 2mm x 8mm. This small opening requires concentration of air pressure in back of the teeth. At first, the patient simulates the production of /t/ and then the tongue is dropped sharply from the /t/ position (released air is forced through the whistle). Then, the patient removes the whistle and makes the movements with the lips slightly closed (the air is compressed). At that moment, he lifts the back of the tongue and relaxes his throat, he will inject air into the esophagus.

Klinger and Martin (1971) utilized the chewing technique in two patients. In theory, chewing is preparatory to the swallowing act. This approach might be sufficient to relax the cricopharyngeal sphincter for air charging of the esophagus in injection. One of their patients produced esophageal voice in the first session by using this technique and continued to use this voice in subsequent sessions without chewing. The chewing technique is based on the work of Negus (1948-1949) and Damste (1958) on cricopharyngeal hyperfunctioning. The cricopharyngeal muscles normally contract during speech and relax during swallowing. The relaxation of the cricopharyngeal muscle during speech is not a natural act; and it is a function that the laryngectomee must learn in order to speak successfully. In support of this facilitory technique, Weiss and Beamer (1951), Froeschels (1951), Brodnitz (1965), Klinger and Martin (1971) state that, since the chewing approach is being used as an active relaxation technique for laryngeal hyperfunctioning, it might be useful as a relaxing agent for

certain portions of the alimentary tract.

Participation in Laryngectomy Associations

The International Association of Laryngectomees (IAL) was formed in 1952, Cleveland, Ohio. The Association was formed by the Cleveland Lost Chord Club founded in 1947, the Anamilo (Greek "I speak again") Club of New York and Detroit, together with groups from other cities (Gardner, 1961). Other groups such as NU VOICE and NU SPEECH are affiliated with the IAL which is under the sponsorship, but not the regulation, of the American Cancer Society (Martin, 1963). At present, the IAL has 60 affiliated member clubs and 20 non-affiliated member clubs in the United States, Australia, New Zealand, South Africa, Japan, France and England. The goal of these clubs is to provide assistance to the new laryngectomee in making early adjustments to the loss of voice and to overcoming psycho-social problems. This is accomplished by serving as host for new laryngectomees at club meetings and by collaborating with surgeons in pre- and post-operative speech orientation (Gardner, 1961). The clubs involve patients, members of the family, and interested community members.

There is general agreement that participation in laryngectomy clubs motivates the patient to acquire esophageal speech as quickly as possible (Letton and Wilson, 1960; Silverberg, 1960; Gilmore, 1961; Gordon, 1971; and Owlett, 1975). While Martin (1963) sees the value of the relationship established at laryngectomy clubs, he is concerned about throwing together individuals from different economic and social levels. He writes "Membership of such a club must necessarily be limited to those of similar social and economic background. Even though there is a strong bond between all laryngectomees it is not strong enough to overcome the self-consciousness

of embarrassment."

There is one questionnaire study available by Pitkin (1953) on the subject of group involvement in learning of esophageal voice. In his study, only 23 of the 61 patients (slightly more than a third) indicated they were active in laryngectomy clubs. The relation to final voice obtained was not reported. Winans et al (1974) reported that successful esophageal speakers remain active in the associations; and those who cannot master the technique withdraw. This concurs with the reports that the vast majority of laryngectomees withdraw from associations and from societal, personal and social contacts and live in isolation (Silverberg, 1960; Reed, 1961; Locke, 1966; Wallen, 1966; Murphy and Ogura, 1967; King, Marshall, and Gunderson, 1971). Greene (1947) reports more than half become secluded and disregard good friends. King, Fowlks and Peirson (1968) found that half of the laryngectomees in their series were never out of their homes socially and had no hobbies.

There are between 25,000 - 30,000 laryngectomees in the United States. The International Association of Laryngectomees registry has about 5,000 names (Wallen, 1966). The question as to why the vast majority withdraw from society is usually associated with loss of speech (Reed, 1961; Murphy and Ogura, 1967; Silverberg, 1968; Tait and Tait, 1969). How many laryngectomees remain without communication is unknown because of poor statistics.

Little if any objective measurement is available on the direct relationship of participation in a laryngectomy association with final voice. Research by Gardner (1966) emphasizes the importance of laryngectomees retaining support of friends: Speech was regained by 83% of laryngectomees who "kept their friends;" "but only 30% of those who "lost all of

their friends."

Physiological Factors

The physiological factors:

- (1) Natural ability,
- (2) Alcoholism,
- (3) Radiotherapy, and
- (4) Fistula complication

are reviewed here.

Natural Ability

An impressive number of investigators have observed "natural ability" in some patients; they possess or have an immediate ability to produce esophageal sound. As early as 1893, J. Solis-Cohen presented a patient who spontaneously acquired esophageal voice after laryngectomy (Jesberg, 1954). Since then others have observed patients who have natural spontaneous voices (Stetson, 1937; Gatewood and Tribble, 1943; Gatewood and Tribble, 1944; Damste, 1966; Zwitman and Disinger, 1975; and Edwards, 1976). In a series of 65 laryngectomees, certain patients learned the technique of belching and could control the muscles easily; they possess a "natural ability" (Bagshaw, 1967). Martin (1963) admits that some of the best esophageal speakers are "self-taught." They believe success in developing esophageal voice is more by precept and practice than by instruction. In about a third of all laryngectomees, this inadequacy to learn voice is permanent. Support for this theory is found in Winans et al (1974).

At least two explanations in the literature are offered on the origin of "self-taught, natural ability." First, these individuals possess aptitude and determined enthusiasm in teaching themselves esophageal voice

(Stetson, 1937; Gatewood and Tribble, 1943; Gatewood and Tribble, 1944; Switman and Disinger, 1974; and Edwards, 1976). Second, these individuals possess a predisposition favorable to learning the inhaling method (Seeman, 1924; Burger and Kaiser, 1925; Kallen, 1934; Brighton and Boone, 1937; and Negus, 1938). In this regard, Froeschels (1931) observed that certain laryngectomee patients acquire the ability of filling the esophagus with air during the act of inhaling into the lungs, without swallowing. Damste (1958) observed certain patients have a natural eructation pattern using sphincteric action.

In Bagshaw's (1967) study of 123 laryngectomees, a comparison was made of patients with "natural facility" to others. The natural ability speaker

- (a) Produces sound pre-operatively, and this appears to be a voluntary process
- (b) Acquires the tongue-lock method easily. When slight pressure was exerted, the sphincter action would occur and it was observed that the sphincter action occurred involuntarily when the patient was swallowing
- (c) Displays a tongue thrust pattern. The action is extensive and directly connected to this forward action of the tongue.

These facile speakers showed strong lip closure at tongue-lock. Bagshaw (1967) made an observation of the long-standing esophageal speakers: Originally many were taught to "swallow air into the stomach and burp." Those who attained acceptable voice had changed to focus of voice to the upper esophageal sphincter involuntarily using tongue-lock and injection. Bagshaw (1967) emphasized that even with the extensive surgery, such a patient obtained voice that was intelligible but may have had weak volume,

Bagshaw stresses that a patient should be tested at start of treatment to determine if this inherent ability is present. She cautions that it may be inhibited if the patient does not understand what he is doing. Bagshaw does not describe a systematic testing procedure to be assessed by the speech pathologist. In terms of her own management, the natural speakers were encouraged

- (a) To feel the sphincter action occurring on locking sounds,
- (b) Not to consciously swallow before tongue pressure,
- (c) To become aware that the tongue pressure and "bump" sphincter action occur simultaneously.

A correlation was observed: In young children with tongue-thrusts, they are often able to burp involuntarily or the patient states he is an "air-swallower."

There has been no statistical measurement to differentiate the "self-taught," "natural ability" speakers from speakers who undergo formal therapy, in the final voice obtained. However, investigators have summarized defective speech habits and mannerisms associated with esophageal voice in the patient who

- (a) Tried to train himself (Jackson, 1940; and Rickenburg, 1953) or
- (b) Follows the example of one who has mastered the method and/or
- (c) Discontinues training prematurely (Levin, 1940).

Lists of defects and mannerism engrained from habitual use include

- (a) Loud emission of air through the tracheal stoma when attempting speech (detracts from speech clarity and obscures confidence) (Levin, 1940; Clifford and Gregg, 1964),
- (b) Unnecessary and exaggerated lip movements (Levin, 1940; Rickenburg, 1953; Jesberg, 1954),

- (c) Exaggerated tongue and pharyngeal movements (Jesberg, 1954),
- (d) Tendency to revert to buccal or whispered speech (Levin, 1940),
- (e) Audible efforts at swallowing (Levin, 1940; Rickenburg, 1953),
- (f) Excessive facial mannerisms and oropharyngeal contortions
(Komorn, 1973) and
- (g) Dyslalic or slurred speech (Levin, 1940; Rickenburg, 1953).

There is concensus of opinion (Mason, 1950; Rickenburg, 1953; and Jesberg, 1954) that once bad speech habits or peculiar mannerisms are established, they are irreversible or difficult to correct. In a group of 40 laryngectomees, Levin (1940) had an early clinic series and a larger private series. He reports the great majority of patients do not go beyond the point at which they discontinue formal training. However, Hoople and Brewer (1945) state that, with subsequent voice training, certain poorly intelligible speakers may become highly intelligible. They observed this by utilizing kymographic and tape recording of the phonatory apparatus. When checked by statistical analysis, there was a definite difference in the mechanics by which air was trapped in the pharynx and esophagus, by highly intelligible speakers as compared with low intelligible speakers.

Alcoholism

There is clear-cut evidence that compulsive, heavy smoking plays an etiological role in the development of laryngeal cancer. Webb and Irving (1964) found significant differences in the incidence of laryngeal cancer between smokers and non-smokers. In addition, there is now increasing evidence that alcoholism plays an etiological role in the development of laryngeal cancer (Nahum and Golden, 1963; Locke, 1966; King, Marshall, and Gunderson, 1971). Webb and Irving (1964), found that laryngectomees

manifest an oral triad of excessive speaking, drinking, and smoking along with other signs of instability and adjustmental difficulty.

Post-operative reliance on alcohol is frequently encountered; but the incidence was not estimated by Martin (1963), Webb and Irving (1964), Locke (1966), Bagshaw (1967), King, Fowlks, and Peirson (1968), King, Marshall, and Gunderson (1971), Wolfe (1971). In a statistical study, Barton (1965) studied the last fifty laryngectomees and the last fifty partial laryngeal procedures on which he performed surgery. Eight of the 23 living laryngectomees were problem drinkers, in contrast to one out of 44 of the subtotal surgical cases. Four were alcoholics pre-operatively. In contrast, Kitzing and Toremalm (1970) found alcoholic consumption did not seem to be influenced statistically by the operation. Their findings, based on frequent post-operative consultation, suggest a moderate increase in alcoholism post-operatively.

Locke (1966) and Bagshaw (1967) suggest alcoholism may have adverse effects on esophageal voice development. To date, there have not been any statistical research to support their claim.

Radiotherapy

The physiological changes that occur due to post-irradiation after laryngectomy are recognized (Harrison, 1964; and Greene, 1967).

Physiological changes resulting from radiation that can impair esophageal voice development include:

- (1) Post-irradiation fibrosis of the neck (Bisi and Conley, 1965; Flower, 1968; Polpathapee and Chiwapong, 1975);
- (2) Radiotherapy scarring causing reduction of mobility and elasticity (Damste et al, 1958; Warner, 1971; Owlett, 1975). Greene

(1967) adds that formation of scar tissue causes difficulties in healing of fistulae;

- (3) Losing sensation in the throat for months;
- (4) Peripheral damage to the nerve supply to the tongue causing difficulty with articulation;
- (5) Loss of porosity of the muscular structures, making vibrating or pulsation of air impossible (Greene, 1967);
- (6) Irradiation to the cervical esophagus may prevent a speaker from achieving adequate relaxation of the esophageal sphincter (Calcaterra, 1972), and
- (7) Stenosis of the cricopharyngeus secondary to radiation therapy (Nelson et al, 1975).

There is conflicting statistical evidence on the influence of radiation to esophageal voice development. From a series of 123 laryngectomees, Godfrey and Bagshaw (1962) concluded that the major cause for failure to develop voice was a tight esophageal sphincter secondary to extensive surgery plus radiation. In contrast, Gilchrist (1973) found no correlation between pre-operative radiation and subsequent voice production, in 28 out of 50 patients who underwent a full course of pre-operative radiation.

Two alternatives have been suggested for the laryngectomee who has undergone radiation therapy.

- (1) Bisi and Conley (1965) suggest orientating the patient toward an artificial larynx.
- (2) Greene (1967) states that acquisition of voice may be possible after many months.

Board-like induration of the skin decreases with time; subsequently, the tissues become increasingly soft and pliable, for speech.

Fistula Formation

The occurrence of the formation of a fistula has been cited as the most serious medical complication following laryngectomy and radical neck dissection (Hunt, 1964; Millard et al, 1965; Greene, 1967; De Jong and Struben, 1970; Bresson et al, 1974). Although a fistula complication does not necessarily affect the patient's long-term survival, it prolongs hospitalization from a routine of two to three weeks to a stay lasting many months; and profoundly influences the patient's overall rehabilitation (Bresson et al, 1974; De Jong and Struben, 1970).

As early as 1893, Solis-Cohen reported a patient who developed a fistula resulting from laryngectomy (De Jong and Struben, 1970). The frequency of fistula formation varies from 20 percent to more than 40 percent (Silverstone et al, 1963; Cachin and Lalanne, 1965; Debina, 1965; Radzinimski, 1966; Baclesse, 1967; Goldman et al, 1967; Jensen and Balslev, 1967; Portman et al, 1968; Cachin et al, 1969; Debain et al, 1969; Harris et al, 1969; Svane-Knudsen, 1969; Jorgensen and Sell, 1971; Lalanne et al, 1971; Lavelle and Maw, 1972; Bresson et al, 1974).

In terms of prognosis for survival, the onset of fistula formation is relatively unimportant. The fistula is a deep sinous ulcer opening upon the skin and leading into an internal cavity; occurring at some site on the neck. Onset of fistula formation is usually between the fifth to fifteenth day following laryngectomy (Maw and Lavelle, 1972; Seymour-Jones, 1973; Whitman, 1973; Sellars and Jarvis, 1976).

The origin of fistula formation is directly associated with:

- (a) Extent of surgery and neck dissection: There is a direct relationship in cases of extensive surgery and fistula formation (Imperatori, 1937; Ormerod and Shaw, 1956; Hunt, 1964; Radzinski, 1966; Vieta et al, 1968; Meyers, 1962; and Bresson, 1974). Pharyngeal fistulae are more apt to appear if too little mucosa was left so that the sutures are under tension.
- (b) Radiation: There is a relationship in cases of radiation and fistula formation (Imperatori, 1937; Ormerod and Shaw, 1956; Sarkar, 1965; Seymour-Jones, 1973; Sellars and Jarvis, 1976). When radiation has been performed prior to surgery, changes in the tissue both histologic and biologic occur. Histologic studies of the tissues show marked changes in elemental structures of the epidermis and the derma and even atrophy of the adjacent muscle tissue. Previously irradiated tissues are not prone to unite when separated.

The comprehensive work of Lavelle and Maw (1972) with 170 patients revealed post-operative fistulae occurring in 37.6 percent of the cases. There was a significant correlation between fistula and the combined effects of pre-operative radiation and radical neck dissection.

- (c) Hemoglobin level: There is a relationship of low post-operative hemoglobin levels with high rates of fistulizations: 12.5 grams/100 mg. Post-operative low hemoglobin level is outstandingly the most single important variable associated with raised incidence of fistula formation (Lavelle and Maw, 1972).
- (d) Pre-operative Tracheostomy: There is a relationship of fistula

in patients who had pre-operative tracheostomy (Lavelle and Maw, 1972).

- (e) Swallowing: There is an association between swallowing and fistula formation (Imperatorì, 1937; De Jong and Struben, 1970).

There has been very little research on the relationship of fistula formation and the development of esophageal voice. There is no relationship between the start of speech therapy and fistula formation (Gordon, 1971). Robe (1956), Damste (1966), Greene (1967) and Bentzen et al (1976) agree that a fistula close above the entrance of the esophagus that retains sputum and mucous can have a detrimental effect on esophageal voice training. In such cases, voice prognosis is said to be "poor."

CHAPTER III
METHODS AND PROCEDURES

Plan A: Completed for submittance of this paper

Methods

1. Survey the laryngectomy literature dating from the first mention of the surgical procedure to the present.
2. Identify all factors pertinent to laryngectomy, esophageal speech development and laryngectomy rehabilitation.
3. Design a checklist to cover variables reported in the literature which affect esophageal speech development.

Plan B: To be the subject for future research.

Materials

1. Complete literature review on physiological and surgical factors that affect esophageal speech development.
2. Construct a questionnaire by using variables from the preliminary esophageal voice checklist, investigate any relationship that exists between psychological, personal, social, therapeutic and physiological factors and the development of esophageal speech. The questionnaire will contain:
 - (a) three-way multiple choice answers in order of "never," "usually" and "always";
 - (b) narrative description of what the esophageal voice instructor did which was helpful or a hinderance to developing esophageal speech. The behaviors reported by the subjects will

later be extracted from the narratives and sorted into categories of teaching behavior.

3. Obtain medical information pertaining to site and class of lesion, extent of surgery, post-operative medical progress and general physical status of the subjects, from physician or medical facility. Appropriate consent forms will be signed by each subject for release of medical information.
4. Evaluation of oral structure:
 - (a) test visual - spacial abilities
 - (b) test lip movements
 - (c) test for natural ability and presence of:
 - tongue-thrust pattern
 - pre-operative esophageal sound
 - tongue-lock.
5. Obtain three speech samples:
 - (a) A reading of the Harvard Sentence Intelligibility Lists (Abrams, et al., 1944). Each list contains 20 sentences and is designed to measure speech intelligibility.
 - (b) A reading of the "Rainbow Passage" (Fairbanks, 1960). This is a 110 word paragraph from a passage containing the major sounds of the English language.
 - (c) A two-minute spontaneous speech sample. Each subject will be asked to comment about his favorite pasttime, food, etc. There may be differences in esophageal speech output as noted in reading (monologue) and then in a dialogue.

Population Sample

1. One hundred subjects will be selected for this experimental study.
2. Subjects will be contacted through the files of:
 - (a) Lost Chord Clubs of the International Association of Laryngectomees,
 - (b) Hollywood Presbyterian Medical Center, Los Angeles,
 - (c) University of California Medical Center, Los Angeles,
 - (d) Veterans Administration Hospitals in the Los Angeles area,
 - (e) Loma Linda University Medical Center.
3. Subject selection criteria:
 - (a) Each subject has at least a total laryngectomy.
 - (b) Each subject's vocal training has been terminated.
 - (c) Each subject be at least one year post-laryngectomy to ensure he has developed a preference for esophageal speech.
 - (d) There will be 50 male and 50 female subjects.
 - (e) There will be an age range distribution of the subjects.
4. The subjects will be chosen using a stratified random selection procedure, designed to ensure a wide range of speaking ability.

Instrumentation

1. Each subject's speech sample will be recorded on a Quasar VH 5000 video cassette recorder. The Bohsei TV will be used for monitoring (Model W TC-700). An RCA color camera is to be used. Hoops and Noll (1971) in a statistical study stressed the importance of visual components of the esophageal speech process to the overall judging process.
2. A sound-level of known intensity will be established on the

cassette recorder and be set at the same point for all data collection.

3. A microphone-distance of twelve inches from the subject's mouth will be used for all data collection.
4. The head, neck, shoulders and upper chest will be filmed in a three-quarter profile. A camera distance of six feet from the subject will be used for all data collection.
5. The speech-sample recordings will be collected in more than one location. Visual continuity will be maintained by each subject wearing a white lab coat and speaking against a neutral background.
6. The camera will be activated and each subject will be signaled to begin reading the Harvard Sentence Intelligibility Lists, then to progress to the Rainbow Passage and to the spontaneous dialogue.

Judging

1. Listener criteria:

- (a) Prior to the experiment, each listener's auditory acuity will be determined by administration of a pure tone audiometric test using a sweep check technique at 10dB. Only those with normal bilateral hearing in the speech range will be used in the experiment.
- (b) There will be two panels of judges; each consisting of ten individuals. One group to be composed of speech-language pathologists who have extensive listening experience and/or therapy experience with laryngectomees using esophageal speech. The other group to be composed of naive listeners who have never heard or been exposed to a laryngectomee using

esophageal speech. The inclusion of two panels of judges excludes professional bias that may affect judgement of esophageal speech. Hoops and Noll (1971) noted a tendency for speech-language pathologists to judge esophageal speech more critically than naive listeners.

2. Listening condition;

- (a) Judgement sessions will be conducted in a room with good acoustic quality.
- (b) The two panels of judges will be seated directly across from each other.
- (c) The videotaped speech samples will be played-back on the Bohsei model W TC-700 TV monitor.

3. Speech rating:

- (a) The speech performance of the subjects will be assessed by having each judge use the Wepman Scale of Rating (Wepman et al., 1953). Seven levels of Wepman's scale include:

Level 1. automatic esophageal speech

Level 2. esophageal sound produced at will with continuity; word grouping

Level 3. esophageal sound produced at will; single word speech

Level 4. voluntary sound production part of the time; no speech

Level 5. voluntary sound production part of the time; no speech

Level 6. involuntary esophageal sound production; no speech

Level 7. no esophageal sound production; no speech

The implementation of the Wepman Scale reduces the role of various levels of sophistication among listeners in the testing of intelligibility. For instance, for example, the judgement dimensions proposed by Shipp (1967) requires sophistication and training of listeners to judge the components of intelligibility, vocal intensity, vocal quality, rate, lack of extraneous noises, number of words per air-charge and latency between charging the esophagus with air and sound production.

4. Appearance rating: After completion of the speech-rating, the judges will fill out a prescribed information sheet on the subject's general appearance. These comments will later be sorted into categories on general appearance.

Data Analysis

1. The judges responses on the first three sentences of the Harvard Sentence Intelligibility lists will not be included in the final analysis of data. This allows each listener equal time to adjust to the speaker's manner of talking.
2. The overall mean rating will be considered to be the measure of speech ability for each subject.
 - (a) The speech ratings will be related to each item in the questionnaire, medical information, narrative description and general appearance categories.
3. Statistical treatment will consist of three stages:
 - (a) multivariate analysis of variance, to determine if variables

are significant in differentiating groups of speakers.

- (b) multiple group discriminant analysis, to determine the relative predictive importance of each of the variables on esophageal speech development;
- (c) group classification, to determine if there is a relationship between predicted and actual speaker groups. This classification system should be able to provide a good indication of the validity of the "intervention assessment tool" as a prediction method for esophageal speech development.

4. Cross Validation:

- (a) The aim of this study is to make determinations of probable speech development for future populations based upon data obtained from this early sample.
- (b) The importance of the study is to determine whether this series of analysis can effectively predict an alaryngectomee's potential for developing esophageal speech. Therefore, instead of using the same subjects for both the analysis of variance and the classification; a cross-validation procedure will be carried out by applying the multivariate analysis to the scores of fifty subjects selected on a random basis from the original sample population. Then the results will be used in classifying the remaining fifty subjects,

CHAPTER IV

SUMMARY

The medical and surgical triumphs in the field of laryngeal cancer and laryngectomy offer a bright outlook for survival of the patient. Loss of the natural voice imposes a unique disability on the patient, with its many physical, psychological, social and economic complications. Retraining the patient in the esophageal voice technique, can be an emotionally exhaustive and financially expensive task, often without reward for the patient.

Voice and speech are basic to the individual's self-image. The laryngectomee suffers profound psychological as well as physical insult to his self-image. Out of desperation the laryngectomee may set up psychological defenses, such as fear and anxiety, which can impede or prevent esophageal voice development. The emotional reaction of depression is common after laryngectomy. According to numerous subjective statements this "feeling state" can have a negative effect on voice development. The statistical research indicates that depression can become so severe as to lead to abandonment of therapy.

The subjective statements posit that motivation, more than any other single factor, is responsible for esophageal voice development. The purely statistical studies have:

- (a) been conducted on small population samples,
- (b) not demonstrated significant correlations.

Lack of motivation can hinder esophageal voice development; however, some of the patients with superior motivation do not develop esophageal speech.

Use of the term "motivation" is of little clinical value in dealing with patients who are in fact the determinants of "motivation." Because the variables which motivate people are so subtle the clinician must understand the factors which might prevent each patient from achieving the motivation necessary for acquiring esophageal voice.

The subjective and statistical data suggest that isolated personality traits are not responsible for esophageal voice development. In fact, a typical profile for an effective esophageal speaker may not exist. Instead, there is a great diversity of traits to differentiate a "good" from a "poor" speaker. The extroverted, aggressive, and achievement-oriented are assigned to a "good speaker" category. Such traits as smoking, irritability, and introversion render the patient a poor therapy candidate because he is unable to accept his disability and look to the future.

The laryngectomee's home environment and family support are thought to have a positive overall effect on esophageal voice. Conversely, living alone in a form of self-imposed isolation, reduces the patient's speaking opportunities and might preclude esophageal voice development.

Laryngectomy may have far reaching effects on the patient's re-employment and may distort his self-esteem because he is no longer the "bread winner." Both subjective and statistical data reinforce that re-employment is one of the strongest motivating forces to development of esophageal voice. There is contradictory evidence on the role of socio-economic influence on esophageal voice. There are emerging data, however, that both "blue and white collar workers" are potential therapy candidates.

A long-standing debate is the effect of age on esophageal voice development. The equivocal results occur because not all variables are

controlled for in the respective studies.

There has been only one major contribution suggesting the laryngectomee's pre-morbid speech patterns and his perception of society's attitude toward him may be responsible for reduced motivation in developing esophageal voice. The implications are important; If society will accept only intelligible speech, it is urgent that the variables which prevent intelligible speech be determined.

In theory, pre-operative speech training to the prospective laryngectomee is well recognized in the literature, Yet there has been only one statistical effort on a small population sample to illustrate its value. There are several contradictions to pre-operative training; yet no statistical measures to document negative effects on the final esophageal voice obtained. Even in the early literature the importance of early post-operative esophageal voice training was recognized. Delay in training can result in irreversible defects or mannerisms. The positive effect on early intervention has been studied on increasingly larger population samples.

The positive contribution of the lay laryngectomee esophageal speaker is well recognized. There is much disagreement as to the optimal time for introducing the lay laryngectomee to the prospective laryngectomee. As well, there is an apparent competition between the lay laryngectomee and the speech-language pathologist as to whom is best qualified to undertake esophageal voice training. There is a belief that both offer unique contributions, and that the ideal method would favor the speech-language pathologist directing the program, with supportive assistance coming from the lay laryngectomee.

The influence of group or individual voice training in the final esophageal voice obtained has received little attention. There is agreement that a good speaker uses the technique of major inhalation followed by a series of small consonant-linked re-inflations to maintain a smooth flow of speech. Only a few authors have proposed special techniques such as using carbonated fluids, a catheter, whistle technique and chewing technique to facilitate esophageal voice production. The usefulness of these techniques is speculative because of their limited application. Statistical experimental studies are needed to determine if "good" from "poor" speakers can be differentiated through the use of some special technique or "trick" to produce esophageal voice.

There has been little agreement that participation in laryngectomy clubs motivates a patient to acquire esophageal voice. What seems to be of importance is that the laryngectomee is establishing and maintaining personal and social contact with other people. The literature explains that the vast majority of laryngectomees withdraw from these clubs because of failure to develop esophageal voice. However, the possibility that many laryngectomees withdraw because they have resumed active and productive lives is not considered. This researcher personally knows of several such cases.

A comparison of "natural" ability speakers to other esophageal speakers revealed "natural" ability speakers were able to:

- (1) produce sound pre-operatively,
- (2) acquire a tongue-lock easily,
- (3) display tongue-thrust pattern,
- (4) exhibit strong lip closure.

The implications here are that such "natural" ability speakers could be

differentiated at the start of therapy and be managed differently from other patients (who do not possess "natural" ability).

The etiological role of alcohol and smoking on laryngeal cancer is well documented. Within recent years the increasing effect of alcoholism is becoming more apparent. Statistical work reveals consumption of alcohol is not influenced statistically by operation. There is only mention of the adverse effect of alcoholism on the esophageal voice obtained. The effect of alcoholism may play an essential role on the esophageal voice obtained, in light of its etiological influence and alcohol as a sign of "personal instability."

There are conflicting results on the effects of post-operative irradiation to esophageal voice development. Specific problems, such as scarring and damage to the nerve innervation are documented. The conflicting results are possible due to the fact that the respective study did not control for the same variables.

There have been no objective data on the importance of a fistula on final esophageal voice development. A few subjective statements indicate that fistula formation is detrimental to voice.

There is a need for the following variables to be reviewed before consideration of experimental study.

Social Factors

- (1) patient's sex
- (2) educational level
- (3) intellectual capabilities
- (4) social class

Therapeutic Factors

- (1) opportunity for speech pathology services
- (2) use of an artificial larynx in the interim stage
- (3) effect of whispering in the interim stage

Physiological Factors

- (1) general physical problems
- (2) ulcers and gastrointestinal problems
- (3) respiratory lung capacity
- (4) function of pseudoglottis
- (5) diet and nutrition
- (6) olfactory acuity
- (7) auditory acuity
- (8) senility
- (9) the function of the articulators including:
 - (a) tongue
 - (b) lips
 - (c) palate
 - (d) esophagus and diaphragm

Surgical factors are not reviewed within the constraints of the present research. Although review of site of lesion, class of lesion, extent of surgical intervention and type of surgical procedure must be studied to determine their effect on esophageal speech development.

RESULTS AND DISCUSSION

This review has been a major research attempt to trace the emergence of variables that affect esophageal voice development. Of the leading psychological, idiosyncratic, social, therapeutic and physiological factors, there are a great diversity of variables that might be predictive in judging acquisition of esophageal voice. Much of the literature regarding predictive factors have been based on;

- (1) subjective reports,
- (2) objective research--that many times dealt with a small population sample and/or had not controlled for extraneous variables.

There is greatest author-agreement, on a subjective level, that therapeutic variables positively affect acquisition of esophageal voice. There is greatest author-agreement, on a subjective level, that psychological and idiosyncratic variables negatively affect esophageal voice development. Motivation, as an isolated variable, was thought to be important to esophageal voice development. However, this is an overstatement, based on the lack of statistically significant data. There is a steadily increasing amount of information, suggesting re-motivation to return to work and age, are statistically significant to esophageal voice development. There is controversy regarding the influence of selected physiological variables and esophageal voice development. It is still too early to accept or reject the hypothesis. The results of experimental research will provide data indicating whether a correlation exists between specific variables and one's ability to acquire esophageal speech.

In order to make recovery of satisfactory communication after laryngectomy a more positive and predictable process; a pre-intervention

assessment tool is proposed. This might enable the clinician to judge the patient's

- (1) potential for esophageal voice development, or
- (2) potential for use of an alternate form of communication.

Such a tool must of necessity include all variables which affect esophageal speech acquisition and proficiency.

The Preliminary Esophageal Voice Checklist provides a systematic survey of variables frequently reported in the literature as affecting esophageal voice development. Subjective and statistical data have been collated. Each variable is listed under CATEGORY; and the number of authors reporting on each variable is shown in the STATISTICAL or SUBJECTIVE columns. The variables are listed in alphabetical sequence. Two separate categories are shown: POSITIVE and NEGATIVE, affecting esophageal voice development.

The variables are grouped into the areas of:

- (1) Psychological - Idiosyncratic
- (2) Social
- (3) Therapeutic
- (4) Physiological

The preliminary Esophageal Voice Checklist is not a test. Rather, it is a checklist to be applied in the experimental design of future research.

PRELIMINARY ESOPHAGEAL VOICE CHECKLIST

Psychological and Personal Factors

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Acceptance of physical change and outlook to future	5	2	Amorous and aggressive tendencies	1	
Active ties with family	3	1	Depression	1	6
Aggressive	2		Embarrassed with old friends		1
Attention-seeking	1		Emotional blocking (Drawing nasal mucous membrane, fast respiration, breath-holding)		2
"Breaks wind" (flatulence)	1		Fear		2
Calm	1		High anxiety level	1	6
Competitive		1	Intent/over anxious		1
Courageous/stout	1		Introvert (self-centered, broods, into self)	2	9
Doesn't embarrass easily		1	Lacks concentration	1	
Doesn't worry unnecessarily	1		Lacks motivation	2	4

Psychological and Personal Factors (continued)

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Eats large quantity of food		1	Lives alone	1	1
Eats rapidly at home in private	1		Low body concept	1	4
Emotional support from spouse	1		Low self-concept	1	4
Egocentric "Proud of self"	3		Misevaluates society's attitude to his speech		6
Extrovert: Involved in social activities		6	Negative reaction to stoma, mucous		2
Good verbal attitude/abilities, pre-operatively	1		Resentment at fate	1	
Gusty		1	Self-pity	1	
High motivation level	3	16	Society's negative responses to his/her speech	1	7
High self-concept	1		Trouble readjusting to disability	2	4
History, good medical-surgical experience in past	1		Withdraws/internalizes	1	
History, good relations with other people	2	1			

Psychological and Personal Factors (continued)

CATEGORY	POSITIVE Statistical	POSITIVE Subjective	CATEGORY	NEGATIVE Statistical	NEGATIVE Subjective
Lives in family unit		7			
Low anxiety level	1				
Persistent		3			
Realistic assessment of disability	1				
Stomach growl in public doesn't bother him/her	1				
Swallow food in large chunks	1				
Talkative in small groups	1				
Verbalizes fears	1				
Willing to do whatever in order to talk		8			

PRELIMINARY ESOPHAGEAL VOICE CHECKLIST

Social Factors

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Above average verbal intelligence	2	1	Age, elderly	1	5
Age/high intellectual capability	1		Family, extravagant praise	1	
Age/high socio-economic level	3		Family, indifferent spouse		1
Age range 40 - 62		1	Gives up easily, doesn't try	2	2
Age, 62 and under	1		Lives alone	1	1
Age/work	2	3	Retires/old age	2	1
Age, young	2	2	Situational acceptance of voice		3
Drinks socially or never		1	Women		2
Driver of earth mover		1	Women, doesn't work out of home	1	
Doesn't fear old age	1		Worries about job	1	
Education, high level	2				

Social Factors (continued)

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Education limited but above average intelligence	1				
Moderate retirement income; continues work to spend difference	1				
Non-verbal ability good	1				
Proud of work		1			
Proud of wages earned		1			
Re-motivated to return to work	5	8			
Socio-economically comfortable	1				
White and/or blue collar	No difference				

PRELIMINARY ESOPHAGEAL VOICE CHECKLIST

Therapeutic Factors

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Bibliographic/film resources		5	Air intake--difficult post-operatively		1
Early speech intervention	1	7	Communicates by writing, lip movements, whisper, head and neck gestures		1
Esophageal speaker visitation pre-operatively		13			
Esophageal speaker visitation post-operatively	7		Delay in speech intervention post-operatively		4
			Discontinues treatment prematurely		1
Facilitation of sound: carbonation		2			
Facilitation of sound: catheter		2	Self-taught	1	3
Facilitation of sound: chewing technique		14	Skeptical regarding speech rehabilitation		1
Facilitation of sound: whistle technique		1	Visitation, pre-operatively esophageal speaker		6
Laryngectomy club participation		5	Withdraws from laryngectomy club		6

Therapeutic Factors (continued)

CATEGORY	POSITIVE Statistical	POSITIVE Subjective	CATEGORY	NEGATIVE Statistical	NEGATIVE Subjective
Laryngectomy club is active	1	1			
Maintains adequate duration of phonation	1				
Maintains short latency between inflation of the esophagus and vocalization	1				
Phonates reliably on demand	1				
Practice and perseverance (vs. instruction)		3			
Pre-operative interview, speech pathologist		7			
Pre-operative therapy	1	11			
Pre-operative therapy 7-10 days		5			
Returns to work after mastering voice		1			
Sustains phonation during articulation	1				

Therapeutic Factors (continued)

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Takes directions willingly	1	17			
Instructor: Lay laryngectomee	No difference	6			
Instructor: Speech pathologist	No difference	7			
Instructor: Team approach		17			
Technique: Use of consonants to aspirate	1				
Technique: Inhalation	1	1			
Technique: Initial inhalation graduates to injection		4			
Welcomes new learning situation	1				

PRELIMINARY ESOPHAGEAL VOICE CHECKLIST

Physiological Factors

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Acquires tongue-lock easily	1		Alcoholism	1	2
Even with extensive surgery natural ability present	1		Fistula		4
Good space visual ability	1		Poor physical health	1	
Natural ability to imitate	1		Radiation to cervical esophagus		1
Natural eructation without swallowing	1	1	Radiation, fibrosis of neck		3
Normal hearing	1		Radiation, peripheral nerve damage to tongue		1
Physically strong	2		Radiation, scarring		3
Possesses natural ability, produces sound pre-operatively, voluntary process, acquires tongue-lock easily, displays tongue-thrust pattern	1	12	Radiation, stenosis of cricopharyngeus		1
	1		Radiation, tight esophageal sphincter	1	
Radiation	No difference		Shell shock	1	

Physiological Factors (continued)

CATEGORY	POSITIVE	POSITIVE	CATEGORY	NEGATIVE	NEGATIVE
	Statistical	Subjective		Statistical	Subjective
Rapid lip movements number of times /p/ per sec.	1				
Strong lip closure at tongue-lock	1				
Uses lip closure when speaking rapidly	1				

CHAPTER V

FUTURE RESEARCH

Future research will involve statistical experimentation and development of a pre-intervention assessment tool for predicting a patient's potential for acquisition of esophageal voice, or another communication method, after laryngectomy.

The statistical design for future research is explained in Chapter III. The results of this study might enable the researcher:

- (1) to determine which combinations of variables predict esophageal speech development,
- (2) to assign values to certain isolated variables or to combinations of variables, based on statistical measures, and
- (3) to describe the nature of the data which could be used in identifying successful versus unsuccessful esophageal speakers.

If the data analysis demonstrates validity, the application of predictive features would have important clinical implications in treating future populations.

- (1) The construction of a test battery would follow.
- (2) The test battery would be administered at the initial speech-pathology evaluation session: it would be thorough yet rapid enough to be administered in one session.
- (3) The test battery could be administered in a variety of treatment settings: hospital, clinic, home; and findings would remain reliable.
- (4) The test battery would isolate deficiencies. If possible, the clinician might be able to train the patient selected skills

necessary for esophageal voice development.

Future research might also meet the task of developing an "ongoing assessment tool" to check progress at weekly intervals.

Voice-speech is man's exclusive gift by which he controls his environment--his world. When laryngectomy eradicates disease and the patient is given a "second chance;" the challenge to reintegrate him into society must be met.

It is this researcher's hope that the speech-language pathologist will in the near future be able to meet this challenge with his:

- (1) academic knowledge,
- (2) clinical expertise,
- (3) application of a reliable pre-intervention assessment tool,
- (4) compassion for his fellow man.

When "speech" is reestablished, both the clinician and patient are reminded of the human organism's remarkable adaptability.

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APPENDIX

A laryngectomee with a self-concept score below 62, a body-concept score below 56, an anxiety level in area of 35-41, an age of 56 years or more and a defensive distortion score around 49 should be counseled in an effort to modify his self-attitudes and anxiety level. The variables were weighted in importance: SELF-CONCEPT - 3; BODY CONCEPT - 3; ANXIETY - 3; AGE AT SURGERY - 1; DEFENSIVE DISTORTION - 1.