

Speech therapy rehabilitation

La riabilitazione logopedica

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The speech therapy rehabilitation programme starts with diagnosis and continues during hospitalisation and after the patient's discharge.

The distance from the rehabilitation centre can be an unfavourable element for the correct application of the whole protocol and the achievement of optimal functional results, particularly from a vocal point of view.

Psychological support is important for controlling and respecting the anxiety and depression that arises following the diagnosis of a tumour. It is, therefore, essential that the speech therapist is able to meet the patient before the procedure in order to establish that relationship of trust which is fundamental for rehabilitation programme compliance. During the pre-operative meeting, the speech therapist will explain to the patient the functional issues connected with the procedure and the re-education strategies used to restore compromised function.

Adequate post-surgical rehabilitation is essential for all functional cancer surgery that, with the exclusion of cordectomies, in which it is conducted on a purely outpatient basis, involves a phase during hospitalisation and a subsequent post-discharge, outpatient or day hospital, phase.

Cordectomies

Post-cordectomy speech therapy is aimed at recovering the voice and to be fully efficacious, it must favour the meeting of the cord and neocord, to prevent disadvantageous non-spontaneous compensations. It is precisely for this reason that re-education starts early and, in any case, after full surgical healing.

In cases in which non-optimal vocal compensations and/or markedly dysfunctional attitudes are present, work will focus on eliminating these problems before adopting the best phonatory mode.

In those cases in which the new anatomical laryngeal situation does not make it possible to achieve physiological cord-neocord compensation¹⁻⁴, phonatory exercises will aim to strengthen the false cord or arytenoepiglottic (sphincteric) voice, which will, in any case, allow the cordectomy patient to obtain enough voice for normal interpersonal relationships.

The first step is always to achieve a correct respiratory dynamic (costo-diaphragmatic breathing) and good pneumoarticulatory coordination⁵.

To obtain a voice produced in the glottis (cord-neocord), vocal sounds (vowels and syllables with surd and sonant occlusive phonemic components) are used at acute pitch but moderate intensity constantly using laryngeal manipulation which will favour compensation by the healthy vocal cord. This will be followed by vocal exercises to prolong and strengthen the sound through the repetition of syllables (surd and sonant occlusives), monotonous variable combined vowels, pitch changes with vowels and syllables, disyllabic words, reading of words, sentences and stories.

In those cases in which one of the other vocal compensations is required, we use exercises with lowered head facilitating postures, vocal sounds with a low pitch and moderate intensity that are prolonged on nasal phonemes and on the vibrating phonemes, which can be proposed either individually or combined with sonant or surd velar occlusives. After which, the patient will practice, by reading sentences and short stories, to improve prosody, which is always lacking in these compensations and especially in the sphincteric voice.

Horizontal functional laryngectomies

In supraglottic horizontal laryngectomy (SHL), the residual sphincteric structure is represented by the glottic level (vocal cords and arytenoids). Consequently, at the end of re-education, in the absence of functional deficits of these structures, the three laryngeal functions are optimally restored.

Glottic horizontal laryngectomy (GHL) involves the resection of the glottic level, leaving the false cords, arytenoids and aryepiglottic folds.

Generally, there are no swallowing problems after therapy, due to the conservation of the two sphincteric structures (epiglottis and false cords), however the voice will be rough and have a low pitch, as it is generated by the vibrations of the false cords.

Subtotal laryngectomies

In subtotal laryngectomies, the sphincteric function, the basis for the protection of the airways and for phonation, is represented by the cricoarytenoid unit, in which there is a dynamic opposition between the arytenoids and the epiglottis (cricohyoidoepiglottopexy or CHEP, tracheohy-

oidoepiglottopexy or THEP) or the base of the tongue (cricohyoidopexy or CHP and tracheohyoidopexy or THP)⁶. The deglutition and phonatory abilities of these patients rely on the perfect function of the neoglottis and the conservation of mucosal sensitivity as well as the patient's ability to learn new swallowing and speech strategies.

The same rehabilitation techniques are used for all functional laryngectomies, albeit with a number of variations and customisations.

Before discussing post-operative rehabilitation training, we must stress the importance of giving these patients adequate psychological support, to avoid excessive anxiety and depression, which may negatively affect their compliance and confidence in a good rehabilitation outcome.

During the first meeting, the patient should be given detailed information about the procedure and about their post-operative anatomic and functional situation: they will temporarily have to breathe through a tracheotomy tube and feed through a nasogastric (NG) tube, or, in certain cases, through a percutaneous endoscopic gastrostomy (PEG). The speech therapist will also discuss the re-educational methods to be used for deglutition and phonatory recovery, attempting to instil a calm and trusting state of mind towards the procedure and post-operative recovery^{7,8}.

Rehabilitation objectives and schedule^{7,9}

The purposes of re-education are: the activation of the deglutition mechanisms, arytenoid mobilisation and activation of arytenoid mucosal vibration.

These objectives are achieved by following the rehabilitation steps:

- on the 5th post-operative day, if the cuffed tracheostomy tube has been replaced with a fenestrated one, the breathing exercises can commence;
- on the 6th post-operative day, arytenoid mobilisation exercises and mouth exercises in preparation for swallowing start;
- on day 7, the patient is taught the facilitating deglutition mechanism and tests will be performed swallowing both saliva and jelled water;
- on day 8, the patient will be expected to swallow a creamed meal administered directly with the speech therapist's help;
- in the days that follow, different foods, with different textures will be introduced, up to the introduction of water, the most difficult manoeuvre.

The presence of the NG tube can hamper rehabilitation as it gives the feeling of a foreign body and cricoarytenoid ankylosis, due to the position of the tube on the joint. Once the NG tube and tracheostomy tube have been removed (discharge), outpatient vibration and resonance exercises will start^{10,11}.

We will now analyse, in detail, the various phases of rehabilitation, schematically discussing the various speech therapy techniques.

Breathing exercises

These are performed in order to achieve correct costo-diaphragmatic breathing, allowing the airflow to pass through the natural respiratory tract, favouring a more rapid reabsorption of the post-operative oedema.

They are initially performed with the tracheostomy open, then later by closing it with a finger.

Costo-diaphragmatic breathing exercises:

- slow inspiration through the nose, slow expiration through the mouth;
- slow inspiration through the nose, expiration in 3, 4, 5 blows, through the mouth;
- slow inspiration through the nose, fast expiration through the mouth;
- slow inspiration through the nose, fast expiration with the articulation of an aphonous voice (preparatory exercise for arytenoid mobilisation)^{1,9,5}.

Muscle training exercises:

- exercises to control the head and neck, making rotating movements, bending forwards, to the right, left and in extension;
- shoulder movements: raising and lowering, rotating one way and then the other, lifting the arm to the side and to the front;
- lip exercises: protrusion and stretching, kissing;
- tongue exercises: sideways movements, sticking out the tongue, downwards, upwards, right and left, outwards rotation in one direction, then the other, pressing against the inside of the cheeks, rotations in the oral vestibule, brushing the palate with an antero-posterior movement^{7,11}.

Pharyngeal stimulation exercises

The aim of these exercises is to stimulate contraction of the pharynx and they consist in causing the vomiting reflex using a cold mirror or tongue depressor. If no evident reaction is observed when the palatine veil is stimulated, the palatine pillar area can be stimulated^{7,9}.

Laryngeal lift stimulation exercises

Following the procedure, the relationship between laryngeal lifting and opening the mouth of the oesophagus is altered and the exercises aim to restore this situation. However, these lifting manoeuvres are only partly possible, due to the presence of the tube^{9,10}.

Arytenoid mobilisation exercises

These are used to obtain the best neolaryngeal closure and to favour vibration of the arytenoid mucosa.

- Rasping: the patient is seated, the tracheostomy tube closed with a finger, and he/she must breathe in slowly then give the loudest rasp possible, with the mouth only;
- Rasp with vowel: the patient is asked to produce a rasp followed by a vowel, starting with /a/, then /e/ and /o/, and then trying with /i/ and /u/^{19 11}.

Swallowing exercises

The patient practices facilitating swallowing, in the following sequence:

1. closing the tracheostomy tube with a finger;
2. short nasal inspiration;
3. pause in apnoea during which the patient swallows, thrusting the tongue hard against the palate, as far back as possible and holding this muscular contraction for a few seconds after swallowing;
4. abrupt release of air from the mouth, with the possibility of expelling any food fragments remaining in the neolarynx or hypopharynx.

This mechanism is initially performed using:

- *facilitating postures*: the patient is seated with the head thrust forwards and the trunk bent downwards; head, trunk and neck must all be on the same plane, parallel to the floor. In the event of laterocervical stripping and removal of one arytenoid, the patient is asked to turn his/her head to the side of the residual arytenoid;
- *facilitating manoeuvre*: the therapist puts one hand behind the neck of the seated patient and places the other resting on his/her chin. As he/she swallows, the speech therapist pushes the patient's head forwards, inviting him/her to put up some resistance; at the same time, with the hand on the chin, he/she pushes downwards and backwards^{7 9-11}.

Eating stratagems

The first foods must be introduced in line with certain choices dictated by the different textures of the foods.

The first to be introduced are dense foods like puddings, mousses, mashed potatoes, soft cheese, cool yoghurt, to stimulate sensitivity (which is initially poor) and should respect the patient's favourite flavours to stimulate motivation. A whole, creamy meal is then introduced, of which at least 70% must be eaten before it can be replaced with a normal solid meal.

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It is best to avoid pasta in broth, short pasta shapes, spaghetti and rice, raw vegetables with filaments, pulses, acidic and spicy foods, all foods with both solid and liquid components, juicy fruit and that with seeds (strawberries, kiwi fruit, orange, watermelon, melon, etc.).

Liquids are introduced last of all, starting with milk and fruit juices which are more flavoursome and denser than water. Fizzy drinks and alcoholic beverages should be avoided.

Whilst eating, it is important that the patient is in a peaceful environment, has time as long as necessary and is not surrounded by distracting factors (television, visitors)^{4 8 9}.

Voice recovery

Once the patient has been discharged, rehabilitation training continues on an outpatient basis for setting the neovoice. Patients who have undergone supraglottic laryngectomy do not usually require voice therapy.

The first step is to teach the patient how to perform correct costo-diaphragmatic breathing^{3 5}.

In the case of GHL, training will follow the schedule indicated previously for false cord voice compensation following cordectomy³.

In other types of horizontal functional laryngectomy (CHEP, CHP, THEP, THP), the arytenoid neovoice is obtained by making a rasp that is articulated in the form of short, energetic vowels: /a/ /o/ /e/ /i/ /u/, using chest, arm and head pushing.

This is followed by nasal /m/, in syllables: MA, MO, ME, MI, MU, prolonging the final vowel with strong intensity each time; with the rapid and energetic production of the sonant and surd velar occlusive + uvular vibration + vowel: GRA, GRO, GRE, GRI, GRU, KRA, KRO, KRE, KRI, KRU; with the production of the syllables with single and double surd and sonant occlusives (KA, KO, KE, KI, KU; KAKA, KOKO, KEKE, KIKI, KUKU) and with various vowel combinations (KIKIKE, GHIGHIGA, GOGOGHE, GHIEGHIE).

The number of syllables repeated depends on the patient's phonatory duration.

Treatment will continue with the reading of the first words with a sonant and surd occlusive phonemic component, followed by a mixed component, then by reading nursery rhymes, sentences and, finally stories^{1 4 7 9 12}.

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